TOWN OF WAREHAM

Invitation for Bids

For

Improvements to Bayview Park,

Highland Avenue Sidewalk Improvements, and

Improvements to the Lillian Gregerman Bandshell

Town of Wareham
Department of Municipal Maintenance
95 Charge Pond Road, Wareham, Massachusetts 02571
https://www.wareham.ma.us/

BID #1048

Release Date:
January 3, 2024 at 10:00 AM

Pre-Bid Meeting:
January 18, 2024 at 10:00 AM at 186 Onset Avenue, Wareham, MA 02558

Deadline for Questions:
January 25, 2024 at 4:00 PM

Bid Deadline:
February 1, 2024 at 10:00 AM

SECTION 00 01 10:

TABLE OF CONTENTS

APPENDICES:

SECTION 00 11 13

ADVERTISEMENT

LEGAL NOTICE
TOWN OF WAREHAM
DEPARTMENT OF NATURAL RESOURCES
IMPROVEMENTS TO BAYVIEW PARK, HIGHLAND AVENUE SIDEWALK, AND THE LILLIAN GREGERMAN BANDSHELL

The Town of Wareham, the Awarding Authority as represented by the Wareham Town Administrators Office, invites sealed bids for Improvements to Bayview Park at 186 Onset Avenue, Highland Avenue Sidewalk Improvements on Highland Avenue between Onset Avenue to 11th Street, and Improvements to the Lillian Gregerman Bandshell at 4 Union Avenue in Wareham, MA.

1. Improvements to Bayview Park
The scope of improvements for Improvements to Bayview Park include, but is not limited to, the following:

- Accessible walkways
- ADA-compliant ramps and stairs with handrails
- Widening of the sidewalk on Onset Avenue
- Metal guardrail and fencing modification and repair
- Relocation of existing benches and monuments
- Protection and pruning of existing trees for health and reinvigoration
- New tree plantings
- Removal of existing guardrail and replacement of new steel post and picket guardrail on existing retaining wall along Onset Avenue
- Modifying existing perimeter fence and gate along the memorial boulder
- Stormwater management and drainage
- Relocation of the flagpole and uplighting
- Removal of the wooden pole and streetlight and replacement with a pedestrian light pole (requires coordination with the utility company)
- New plantings for slope stabilization bioretention, and bank restoration. Rain gardens will be outfitted with area drains and piping for proper drainage.
- Other elements and work as required by the contract documents.

2. Highland Avenue Sidewalk Improvements, from Onset Avenue to 10th Avenue:
The scope of improvements for Highland Avenue Sidewalk Improvements includes, but is not limited to, the following:

- Replacement of concrete sidewalk and concrete driveway aprons
- Protection of existing trees
- Bituminous and gravel driveway repair
- Resetting of pavers and granite curbing
- Site feature protection
- Pavement marking installation
- Signage installation
- Loaming & seeding of disturbed areas
- Other elements and work as required by the contract documents.

The scope of improvements for **Add Alternate #1 – Highland Avenue Sidewalk Improvements, from 10th Street to 11th Street**, include, but is not limited to, the following:

- Replacement of concrete sidewalk and concrete driveway aprons
- Bituminous and gravel driveway repair
- Removal of existing paver sidewalk
- Resetting of pavers and granite curbing
- Site feature protection
- Loaming & seeding of disturbed areas
- Other elements and work as required by the contract documents.

The scope of improvements for **Add Alternate #2 – Improvements to the Lillian Gregerman Bandshell** include, but is not limited to, the following:

- New cast-in-place concrete walkways
- Removal and replacement of bench seating, including accessible seating locations
- New ramp and handrail
- Removal, regrading and reinstallation of unit paver plaza
- New lighting bollards
- Protection of existing trees to remain
- Landscape restoration and other elements and work as required by the contract drawings

Bidding procedures shall be in accordance with Massachusetts General Law, Chapter 30, Section 39M (MGL C.30, S.39M) as amended.

Beginning **January 3, 2024**, complete sets of bidding documents, including bid forms, may be obtained Town of Wareham's bid opportunities website at https://www.wareham.ma.us/bids-rfps.

A non-mandatory pre-bid conference will be held at the (3) project sites. The conference will begin at 186 Onset Avenue, then move to Highland Avenue between Onset Avenue and 11th Street, and lastly to 4 Union Avenue in Wareham, MA, on **January 18, 2024 at 10:00AM**. Contractors are invited to meet the designers and owner's representative at this conference.

Sealed bids for the contract will be received in the Town Administrators Office, located at 54 Marion Road, Third floor, Memorial Town Hall in Wareham, MA 02571 until **February 1, 2024**

at 10:00 AM. All bids will be publicly opened and read aloud immediately thereafter at the location set forth in the previous sentence.

The Awarding Authority reserves the right to reject any and all bids, in whole or in part, as determined to be in the best interest of the Town and to waive minor informalities. The Town Administrator is the Awarding Authority.

No less than the minimum salaries and wages as established by the Massachusetts Department of Labor and Industries shall be paid to employees on this project, as set forth in the bidding documents.

The estimated costs of the base bid are $1,500,000 for Improvements to Bayview Park and $200,000 for Highland Avenue Sidewalk Improvements for a total of $1,700,000. The estimate cost of Add Alternate #1 is $180,000 and the estimated cost of Add Alternate #2 Improvements to the Lillian Gregerman Bandshell is $500,000.

Any questions regarding the project may be directed to the Town's Representative via email to be received no later than **January 25, 2024 at 4:00 PM**:

Cassie Bethoney, RLA, Project Manager – bethoneyc@wseinc.com
Weston & Sampson Engineers, Inc.

SECTION 00 21 13

INSTRUCTIONS TO BIDDERS

1. Project Overview
2. Special Notice to Bidders
3. Receipt and Opening of Bids
4. Location and Work to be Done
5. Preparation of Bid
6. Modification of Bids
7. Obligation of Bidder
8. Information not Guaranteed
9. Bid Security
10. Time for Completion
11. Addenda and Interpretations
12. Bid Opening Procedure
13. Comparison of Bids
14. Statutes Regulating Competitive Bidding
15. Right to Reject Bid
16. Ability and Experience of Bidder
17. Conditions of Work
18. Security for Faithful Performance
19. Power of Attorney
20. Laws and Regulations
21. Liquidated Damages for Failure to Enter into Contract
22. Indeterminate Items and Estimated Quantities
23. CONTRACTOR Records
24. Bidder Certification – OSHA Training
25. Prevailing Wage Rates
26. Guarantee
27. Safety and Health Regulations
28. Efficiency Guarantee
29. MBE and WBE Policies

1. Project Overview

In accordance with M.G.L. c. 30 39M, the Town of Wareham is seeking sealed bids from qualified contractors for the construction of improvements for Improvements to Bayview Park at 186 Onset Avenue, Highland Avenue Sidewalk Improvements on Highland Avenue between Onset Avenue to 11th Street, and Improvements to the Lillian Gregerman Bandshell at 4 Union Avenue in Wareham, MA, as identified in the bidding and contract documents. The scope of work is described below.

1. Improvements to Bayview Park

The scope of improvements for Improvements to Bayview Park include, but is not limited to, the following:

- Accessible walkways
- ADA-compliant ramps and stairs with handrails
- Widening of the sidewalk on Onset Avenue
- Metal guardrail and fencing modification and repair
- Relocation of existing benches and monuments
- Protection and pruning of existing trees for health and reinvigoration
- New tree plantings
- Removal of existing guardrail and replacement of new steel post and picket guardrail on existing retaining wall along Onset Avenue
- Modifying existing perimeter fence and gate along the memorial boulder
- Stormwater management and drainage
- Relocation of the flagpole and uplighting
- Removal of the wooden pole and streetlight and replacement with a pedestrian light pole (requires coordination with the utility company)
- New plantings for slope stabilization bioretention, and bank restoration. Rain gardens will be outfitted with area drains and piping for proper drainage.
- Other elements and work as required by the contract documents.

2. Highland Avenue Sidewalk Improvements, from Onset Avenue to 10th Street:

The scope of improvements for Highland Avenue Sidewalk Improvements includes, but is not limited to, the following:

- Replacement of concrete sidewalk and concrete driveway aprons
- Protection of existing trees
- Bituminous and gravel driveway repair
- Resetting of pavers and granite curbing
- Site feature protection
- Pavement marking installation
- Signage installation
- Loaming & seeding of disturbed areas
- Other elements and work as required by the contract documents.

The scope of improvements for **Add Alternate #1, on Highland Avenue from 10th Street to 11th Street** include, but is not limited to, the following:

- Replacement of concrete sidewalk and concrete driveway aprons
- Bituminous and gravel driveway repair
- Removal of existing paver sidewalk
- Resetting of pavers and granite curbing
- Site feature protection
- Loaming & seeding of disturbed areas
- Other elements and work as required by the contract documents.

The scope of improvements for **Add Alternate #2 – Improvements to the Lillian Gregerman Bandshell** include, but is not limited to, the following:

- New cast-in-place concrete walkways
- Removal and replacement of bench seating, including accessible seating locations
- New ramp and handrail
- Removal, regrading and reinstallation of unit paver plaza
- New lighting bollards
- Protection of existing trees to remain
- Landscape restoration and other elements and work as required by the contract drawings

2. Special Notice to Bidders

Appended to these instructions is a complete set of bid and general contract forms. These forms may be detached and executed for the submittal of bids. The specifications and other documents designated in the proposal form will be considered as part of the bid, whether attached or not.

All bidders must submit a completed Statement of Bidder's Qualifications form.

Addenda to this invitation for bids, if any, including written answers to questions, will be emailed to the parties registered to receive the bids documents at the Town of Wareham's bid opportunities website at https://www.wareham.ma.us/bids-rfps. Contractors submitting a bid should check their email daily for addenda and updates after the release date. Firms must print out, sign, and return addenda with their bid submission. Failure to do so may result in disqualification.

A non-mandatory pre-bid conference will be held at the (3) project sites. The conference will begin at 186 Onset Avenue, then move to Highland Avenue between Onset Avenue and 11th Street, and lastly to 4 Union Avenue in Wareham, MA, on **January 18, 2024 at 10:00AM.** Contractors are invited to meet the designers and owner's representative at this conference.

The deadline for questions and additional information is **January 25, 2024 at 4:00 PM.** Questions should be directed to:

Cassie Bethoney, RLA, Project Manager – bethoneyc@wseinc.com
Weston & Sampson Engineers, Inc.

Sealed bids will be accepted until **February 1, 2024 at 10:00 AM** and can be delivered by mail or in person to:

Town Administrator's Office
Town of Wareham
54 Marion Road, Third floor
Memorial Town Hall
Wareham, MA 02571

All submissions must be plainly marked on both the outside of the mailing envelope as well as the sealed bid envelope with **"Improvements to Bayview Park, Highland Avenue Sidewalk Improvements, and Improvements to the Lillian Gregerman Bandshell". All bid submissions must be accompanied by an electronic submission, to be provided on a portable drive or disk.** Immediately after the deadline for submission, all bids will be publicly opened.

Interested contractors must have at least five (5) years of relevant experience with similar scope and size projects, specifically including excavation and site improvement projects. The bid submission must be accompanied by a list of completed projects.

3. Receipt and Opening of Bids

The Town of Wareham herein called the OWNER, acting by and through its Town Administrator's Office will receive sealed Bids for the construction of **Bid #1048, Improvements to Bayview Park, Highland Avenue Sidewalk Improvements, and Improvements to the Lillian Gregerman Bandshell** projects.

Such bids addressed to the Town of Wareham will be received at the Town Administrator's Office until **10:00 AM on February 1, 2024** at which time and place said bids will be publicly opened and read aloud.

If the building at which bids are to be received is closed for any reason on the date and time that bids are due, receipt of bids by the Owner will be postponed until the next business day at the time originally stated for receipt of bids.

Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified will not be considered. By submission of a bid, the bidder agrees that this bid shall be good and may not be withdrawn for the number of days, after the opening of bids, as stipulated in the FORM OF GENERAL BID.

4. Location and Work to be Done

The location, general characteristics, and principal details of the Work are indicated on a set of drawings titled **"Improvements to Bayview Park, Highland Avenue Sidewalk Improvements, and Improvements to the Lillian Gregerman Bandshell,",** inclusive.

Additional drawings showing details in accordance with which the Work is to be done may be furnished by addendum from time to time during the bidding period by the Owner's Representative and shall then become a part of the Contract Documents.

The CONTRACTOR shall furnish all superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to do all work required for the completion of each item of the Work and as herein specified.

The Work to be done and paid for under any item shall not be limited to the exact extent mentioned or described but shall include all incidental work necessary or customarily done for the completion of that item.

5. Preparation of Bid

Each bid must be submitted on the prescribed form in Section 00 41 13 or 00 41 43 as applicable. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, its address, and endorsed with the name of the project as specified in Receipt and Opening of Bids, above.

If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in Receipt and Opening of Bids, above.

6. Modification of Bids

Any bidder may modify its bid by written communication at any time prior to the scheduled closing time for receipt of bids. Any telegraphic communication must be received by the OWNER prior to the closing time, and, provided further, for any telegraphic communication that modifies a bid the OWNER is satisfied that a written confirmation of the modification over the signature of the bidder was mailed prior to the closing time.

The modification communication shall not reveal the bid price but shall provide the addition or subtraction or other modification so that the final prices or terms will not be known by the OWNER until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the facsimile transmission.

7. Obligation of Bidder

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Contract Documents (including

all addenda). The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect of its bid.

8. Information not Guaranteed

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the OWNER. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

It is agreed and understood that the OWNER does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents.

It is further agreed and understood that no bidder or CONTRACTOR shall use or be entitled to use any of the information made available to it or obtained in any examination made by it in any manner as a basis of or grounds for any claim or demand against the OWNER or the OWNER'S REPRESENTATIVE, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

9. Bid Security

Each bid must be accompanied by a certified check, a bid bond, cash, a treasurer's or cashier's check, payable to the OWNER, in the amount stated in Section 00 11 13, ADVERTISEMENT FOR BIDS. Such deposits will be returned to all except the three lowest responsible and eligible bidders within five days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids, and the remaining deposits will be returned promptly after the OWNER and the accepted bidder have executed the Contract, or if no notice of intent to award has been presented to any bidder within 30 days, Saturdays, Sundays and legal holidays excluded, after the date of the opening of bids, upon demand of the bidder at any time thereafter.

10. Time for Completion

The successful general bidder must agree to commence work on or before a date to be specified in the written "Notice to Proceed" from the OWNER and to fully complete the project within the time limit stated in the FORM OF GENERAL BID.

11. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications or other prebid documents will be made to any bidder orally, and if provided orally, shall not be relied upon by

bidders unless confirmed in a written addendum. All information given to bidders other than by means of the plans, specifications, or by addenda, as described below, is given informally and shall not be used as the basis of a claim against the OWNER or the OWNER'S REPRESENTATIVE.

Every request for such interpretation should be in writing (typed, not handwritten) addressed to:

Weston & Sampson Engineers, Inc.
100 Foxborough Boulevard, Suite 250
Foxborough, MA 02035
Attention: Cassie Bethoney, RLA, Project Manager – bethoneyc@wseinc.com
Weston & Sampson Engineers, Inc.

Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, when issued, will be emailed to all prospective bidders to email addresses furnished by them for such purposes. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under its bid as submitted, and each bidder must confirm for itself that it has received all addenda. All addenda so issued shall become part of the Contract Documents.

12. Bid Opening Procedure

The following list of requirements shall be met by each filed bid.

Bids shall be filed at the place and before the time specified in Receipt and Opening of Bids, above.

The bid and all accompanying documents so required shall be signed by the Bidder or its authorized representative before submission.

All bidders shall include with their bids written acknowledgment of receipt of all addenda. Refer to acknowledgment form provided in the FORM OF GENERAL BID.

The total dollar amount of each bid will be read, and the three apparent lowest bids will be selected for further consideration. These three apparent low bids will be read aloud for the benefit of the other bidders and the bid opening procedure will be closed. All those present at the bid opening may examine all bids after the bid opening and after the reading of the three apparent low bids.

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13. Comparison of Bids

Bids will be compared on the basis of the quantities and unit and lump sum prices stated in the bid forms.

In the event that there is a discrepancy in the FORM OF GENERAL BID between the lump sum or unit prices written in words and figures, the prices written in words will govern.

The OWNER agrees to examine and consider each FORM OF GENERAL BID submitted in accordance with the terms and conditions set forth herein and as set forth in the FORM OF GENERAL BID.

14. Statutes Regulating Competitive Bidding

Any bid, which does not comply with the provisions of Massachusetts General Laws Chapter 30, Section 39M as amended, need not be accepted and the OWNER may reject every such bid.

15. Right to Reject Bid

The OWNER may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids, should the OWNER deem it to be in the public interest to do so.

The OWNER may also reject bids which in its sole judgment are either incomplete, conditional, obscure or not responsive or which contain additions not called for, erasures not properly initialed, alterations, or similar irregularities, and may reject bids for any other reason permitted by law, or the OWNER may waive such omissions, conditions or irregularities.

16. Ability and Experience of Bidder

No award will be made to any bidder who cannot satisfy the OWNER that it has sufficient ability and experience in this class of work and sufficient capital and plant to enable it to prosecute and complete the work successfully within the time named. The OWNER's decision or judgment on these matters will be final, conclusive, and binding to the fullest extent permitted by law.

The OWNER may make such investigations as it deems necessary, and the bidder shall furnish to the OWNER, under oath if so required, all such information and data for this purpose as the OWNER may request.

17. Conditions of Work

Each bidder must inform itself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of its obligation to furnish all material and labor necessary to carry out the provisions of its contract. Insofar as possible the CONTRACTOR, in carrying out its work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

18. Security for Faithful Performance

Simultaneously with its delivery of the executed Contract, the CONTRACTOR shall furnish a surety bond or bonds as security for faithful performance of this Contract and for the payment of all persons performing labor and materials under this Contract as specified in Section 00 72 00, GENERAL CONDITIONS included herein, each in the amount of 100 percent of its bid. The surety on such bond or bonds shall be a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the OWNER. The bonds shall remain in force for one year after final acceptance of the work by the OWNER, unless the OWNER, in writing, releases the CONTRACTOR from the obligation sooner.

19. Power of Attorney

Attorneys-in-fact who sign Contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

20. Laws and Regulations

Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Contract and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where a conflict between Federal and State Laws and Regulations exists, the more stringent requirement shall apply.

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances or bylaws, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

Attention is directed to Section 00 73 73.13 STATE REGULATIONS and to other applicable sections of this specification. In the event of any conflict between provisions of law or regulation quoted or paraphrased in the Contract Documents, the actual provisions of law or regulation shall control.

21. Liquidated Damages for Failure to Enter into Contract

The successful bidder, upon its failure or refusal to execute and deliver the Contract, Bonds and Certificates of Insurance required within 10 days after receipt of notice of the acceptance of the bid, shall, except as otherwise provided by applicable law, forfeit to the OWNER, as liquidated damages for such failure or refusal, the security deposited with its bid, provided that the amount forfeited shall not exceed the difference between its bid price and the bid price of the next lowest responsible and eligible bidder. In case of

death, disability, bonafide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the bidder, its bid deposit will be returned.

22. Indeterminate Items and Estimated Quantities

The work to be done under this Contract has been divided into parts or items, if applicable, to enable each bidder to bid on different portions of the work in accordance with its estimate of their cost and so that the actual quantity of work executed under each item may be paid for at the price bid for that particular item, even though each bidder may have judged that such quantity may be greater or less than the estimated quantity stated in the FORM OF GENERAL BID.

23. CONTRACTOR Records

The CONTRACTOR shall comply with the provisions of Massachusetts General Laws, Chapter 30, Section 39R, concerning CONTRACTOR records. This section has been reprinted in Section 00 73 73.13, STATE REGULATIONS.

24. Bidder Certification – OSHA Training

All employees who work on Massachusetts public works construction sites, on projects estimated to cost more than $10,000, must have no less than ten (10) hours of OSHA-approved safety and health training.

The Massachusetts Attorney General is authorized to restrain award of construction contracts to any contractor who is in violation of this requirement and to restrain the performance of these contracts by non-complying contractors.

Noncompliance with this law will disqualify contractors from bidding on public contracts.

25. Prevailing Wage Rates

Prevailing Wage Rates as determined by the Director of the Executive Office of Labor and Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H, as amended, apply to this project. It is the responsibility of the bidder, before bid opening, to request if necessary, any additional information on Prevailing Wage Rates for those trades people who may be employed for the proposed work under this contract.

The Contractor is responsible for requesting up to date wage rates from the Owner prior to the one-year anniversary of the notice to proceed of this contract. The Owner shall obtain updated wage rates from the Director and provide them to the Contractor upon said request.

26. Guarantee

The Contractor shall guarantee that the Work and Services to be performed under the Contract, and all workmanship, materials and equipment performed, furnished, used or installed in the construction of the same shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Drawings, Specifications, and other contract documents, that the strength of all parts of all manufactured equipment shall be adequate and as specified and that the performance test requirements of the contract shall be fulfilled. This guarantee shall be for a period of **one year** from and after the date of completion and acceptance of the Work as stated in the final estimate. If part of the Work is accepted in accordance with that subsection of this AGREEMENT titled "Partial Acceptance", the guarantee for that part of the Work shall be for a period of one year from the date fixed for such acceptance.

If at any time within the said period of guarantee any part of the Work requires repairing, correction or replacement, the Owner may notify the Contractor in writing to make the required repairs, correction or replacements. If the Contractor neglects to commence making such repairs, corrections or replacements to the satisfaction of the Owner within seven (7) days from the date of receipt of such notice, or having commenced fails to prosecute such Work with diligence, the Owner may employ other persons to make said repairs, correction or replacements, and charge the costs, including compensation for additional professional services, to the Contractor.

27. Safety and Health Regulations

This Project is subject to the Safety and Health Regulations of the U.S. Department of Labor set forth in Title 29 CFR, Part 1926 and to all subsequent amendments, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety 'Rules and Regulations for the Prevention of Accidents in Construction Operations' (Chapter 454 CMR 10.00 et seq.). Contractors shall be familiar with the requirements of these regulations.

28. Efficiency Guarantee Bond

Whenever it is written that an equipment manufacturer must have a specified period of experience with its product, equipment which does not meet the specified experience period can be considered if the equipment supplier or manufacturer is willing to provide an "Efficiency Guarantee Bond" or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.

29. MBE and WBE Policies

MBE and WBE Policies of the Town of Wareham are applicable to this contract.

END OF SECTION

SECTION 00 31 32

SUBSURFACE DATA

PART I - GENERAL

1.01 SCOPE:

A. The attached stormwater report in Appendix C is provided for informational purposes only and is not a warranty of subsurface conditions. The Contractor has no right to rely on the interpretations, opinions, conclusions or recommendations included in the report, only the factual data relative to the specific times, locations, and depths/elevations referenced in the report. Specific project requirements, including any options selected from the stormwater report, are referenced only in the drawings and specifications.

C. Subsurface information provided in the Contract Documents and the above report is limited by the methods used for obtaining and expressing such data and is subject to various interpretations. The terms used to describe soils, rock, groundwater and such other conditions are subject to local usage and individual interpretation.

D. Subsurface exploration data are for the general information of the Contractor. The Contractors bidding on the project are obligated to examine the site and all available information and records of explorations, investigations and other pertinent data for the site, and then based upon their own interpretations and investigations decide the character of material to be encountered and excavated, the suitability of the materials to be used for backfilling and such other purposes, the groundwater conditions, difficulties or obstacles likely to be encountered, and other conditions affecting the work. The subsurface data is accurate only at the particular locations and times the subsurface explorations were made. No other warranty either expressed or implied by the Owner, Owner's Representative or their agents is made as to the accuracy of the subsurface information and data shown on the drawings or presented in the Contract Documents.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 00 31 43

PERMITS

PART 1 – GENERAL

1.01 DESCRIPTION:

This Section provides specific information and defines specific requirements of the Contractor regarding the preparation and acquisition of permits required to perform the work of this project.

1.02 RELATED WORK:

A. Section 01 11 00, CONTROL OF WORK AND MATERIALS

B. Section 01 14 19.16, DUST CONTROL

C. Section 01 57 19, ENVIRONMENTAL PROTECTION

D. Section 02 41 13, SELECTIVE SITE DEMOLITION

E. Section 31 00 00, EARTHWORK

1.03 GENERAL REQUIREMENTS:

A. The Owner has obtained or will obtain and pay for the permits listed below, which are required for this project. The Contractor shall assist in obtaining certain permits, as indicated. The Contractor shall obtain and pay for all other permits required, as defined under the Permits subsection of Section 00 72 00, GENERAL CONDITIONS.

Permits by Owner	Status
WPA Form 5 - Order of Conditions	Attached – Appendix A

1.04 CONSERVATION COMMISSION ORDERS:

The Conservation Commission has under the authority of Massachusetts General Laws Chapter 131, Section 40, issued an Order of Conditions on the work under this contract. This Order is to become a part of the Contract Documents and the Contractor shall perform all work in strict conformance with said Order. A copy of this Order is included as Appendix A.

PART 2 - PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS:

A. The Contractor shall perform the work in accordance with the Contract Documents, including the attached permits/order of conditions, and any applicable municipal requirements.

B. Prior to commencing any construction activities, the Contractor shall demonstrate to the Owner and the Owner's Representative, through on-site inspection and submitting copies of permits or approvals, that it is in full compliance with the terms and conditions of all permits specified herein. The Contractor shall maintain full compliance with all permits throughout the performance of the work, and upon request, grant access to permitting authorities to inspect the site for the purpose of verifying such compliance.

END OF SECTION

SECTION 00 41 13

FORM OF GENERAL BID

Proposal of _____ (hereinafter called "Bidder")*

(__) a corporation, organized and existing under the laws of the State of _____

(__) a partnership

(__) a joint venture

(__) a limited liability company

(__) an individual doing business as _____

*Check corporation, partnership, joint venture, LLC or individual as applicable.

To the Town of Wareham (hereinafter called "Owner").

Gentlemen:

The undersigned Bidder, in compliance with your invitation for bids for construction of **Improvements to Bayview Park, Highland Avenue Sidewalk Improvements, and Improvements to the Lillian Gregerman Bandshell,** having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to construct the project in accordance with the contract documents, within the time set forth below, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the contract documents, of which this bid is a part.

The Bidder hereby agrees that if selected as the Contractor it will commence work under this contract on or before a date to be fixed in the written “Notice to Proceed” given by the Owner to the Contractor and to fully complete the project within **270** Consecutive days of the start date fixed in the “Notice to Proceed”. The Bidder further agrees to pay as liquidated damages the sum

of $750.00 for each consecutive calendar day thereafter during which the work has not been fully completed, as provided in the "Liquidated Damages" provisions of Section 00 73 00, SUPPLEMENTARY CONDITIONS.

Bidder acknowledges receipt of the following addenda:

No. _____ Dated: _____

No. _____ Dated: _____

No. _____ Dated: _____

No. _____ Dated: _____

Item 1. BASE PROPOSAL: Bidder agrees to perform all work described in the specifications and shown on the plans for the sum of: _____ Dollars and Cents ($_____)
(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

The BASE PROPOSAL shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, bond premiums, engineering costs, etc., to cover the finished work of the several kinds called for.

Item 2. ALTERNATES

This bid includes Alternates as follows:

ADD Alternate No. 1 – Highland Avenue Improvements from 10th Street to 11th Street:	Replacement of concrete sidewalk and concrete driveway aprons; Bituminous and gravel driveway repair; removal of existing paver sidewalk; resetting of pavers and granite curbing; protection of site features; loaming and seeding of disturbed areas; and other elements and work as required by the Contract Documents.

ADD Alternate No. 1: _____ dollars

and _____ cents ${_____).

ADD Alternate No. 2 – Improvements to the Lillian Gregerman Bandshell:	Furnishing and installation of new cast-in-place concrete walkways and lighting bollards; removal and replacement of bench seating, including accessible seating locations; furnishing and installing new ramps and handrails; removal, regrading and reinstallation of unit pavers; protection of existing trees to remain; and landscape restoration and other elements and work as required by the Contract Drawings.

ADD Alternate No. 2:_____dollars

and_____cents ${_____).

Each ADD ALTERNATE PROPOSAL shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, bond premiums, engineering costs, etc., to cover the finished work of the several kinds called for.

The Bidder understands that all bids for this project are subject to the applicable bidding laws of the Commonwealth of Massachusetts, including General Laws Chapter 30, Section 39M, as amended.

The contract will be awarded to the lowest responsible and eligible bidder. Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding. The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids.

Within 10 days of receipt of the written notice of acceptance of this bid, the Bidder will execute the formal agreement attached in Section 00 52 00 AGREEMENT and provide the requisite payment and performance bonds and certificates of insurance.

Bid security is attached in the sum of five percent (5%) of the total bid in accordance with the conditions of Section 00 21 13 INSTRUCTIONS TO BIDDERS. The bid security may become

the property of the Owner in the event the contract and bond are not executed within the time set forth above.

The selected Contractor shall furnish a performance bond and a payment bond in an amount at least equal to one hundred percent (100%) of the contract prices in accordance with Section 00 61 13.13 PERFORMANCE BOND, Section 00 61 13.16 PAYMENT BOND, and as stipulated in Section 00 72 00, GENERAL CONDITIONS of these specifications.

The undersigned offers the following information as evidence of its qualifications to perform the work as bid upon according to all the requirements of the plans and specifications.

1. Have been in business under present name for _____ years.

2. The names and addresses of all persons interested in the bid (if made by a partnership or corporation) as Principals, are as follows:

   _____

   _____

   _____

   (Attach supplementary list if necessary)

3. The Bidder shall state below what work of a similar character to that included in the proposed contract it has done and give references that will enable the Owner to judge its experience, skill and business standing (add supplementary page if necessary).

	Completion Date	Project Name	Contract Amount	Design Engineer	Reference Name	Telephone No.
a.						
b.						
c.						
d.						
e.						
f.						

Pursuant to M.G.L. CH. 62C, Sec 49A, the undersigned Bidder certifies under the penalties of perjury that it is in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

The undersigned Bidder hereby certifies it will comply with the minority workforce percentage ratio and specific affirmative action steps contained in the EEO/AA provisions of this Contract, including compliance with the Disadvantaged Business Enterprise as required under these contract provisions. The contractor receiving the award of the contract shall be required to obtain from each of its subcontractors a copy of the certification by said subcontractor, regardless of tier, that it will comply with the minority workforce ratio and specific affirmative action steps contained in these EEO/AA contract provisions prior to the award of such subcontract.

The undersigned Bidder hereby certifies that (1) it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and 3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration.

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity which sells materials, equipment or supplies used in or for, or engages in the performance of, the same or similar construction, reconstruction, installation, demolition, maintenance or repair work or any part thereof.

The undersigned Bidder hereby certifies, under pains and penalties of perjury, that the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an amount no less than the applicable prevailing wage rates established for the project by the

Massachusetts Department of Labor and Workforce Development. The undersigned bidder agrees to indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work arising out of or as a result of (1) the failure of the said bid to be based upon the payment of the said applicable prevailing wage rates or (2) the failure of the bidder, if selected as the Contractor, to pay laborers employed on the project the said applicable prevailing wage rates.

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth of Massachusetts under the provisions of Section Twenty-Nine F of Chapter Twenty-Nine, Section 25C (10) of Chapter 152 (workers' compensation) or any other applicable debarment provisions of any other Chapter of the General Laws or any rule or regulations promulgated thereunder

Respectfully submitted:

Date _____ By _____
(Signature)

_____
(Name - Typed or Printed)

_____
(Title)

(SEAL - if bid is by a corporation)

_____
(Business Name)

_____
(Federal ID Number)

_____
(Business Address)

_____
(City and State)

_____
(Telephone Number)

END OF SECTION

BID BOND FORM

TOWN OF WAREHAM

KNOW ALL PERSONS BY THESE PRESENTS

That _____

of _____, as

PRINCIPAL, and _____
_____,

a _____ Corporation, as SURETY, are held firmly bound unto the Town of Wareham, as **OBLIGEE** in the sum of

_____ Dollars ($_____), for the payment of which sum, well and truly to be made, the **PRINCIPAL** and **SURETY** bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the **PRINCIPAL** has submitted a bid for _____
_____

_____

NOW, THEREFORE THE CONDITION OF THIS OBLIGATION is such that if the bid of the aforesaid **PRINCIPAL** shall be awarded the Contract for the above-cited project, the **PRINCIPAL** will enter into a Contract with the **OBLIGEE** in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, then this **OBLIGATION** shall be null and void. **OTHERWISE**, the **PRINCIPAL** and **SURETY** will pay unto the **OBLIGEE** the difference in money between the amount of the bid of the said **PRINCIPAL** and the amount for which the **OBLIGEE** legally contracts with another party to perform the work covered by said bid, if the latter amount be in excess of the former, but in no event shall liability exceed the penal sum hereof.

IN WITNESS WHEREOF, the parties have signed, sealed and delivered this instrument at Wareham, MA this

_____ day of _____, 20___.

_____(Affix Corporate
(Name of **PRINCIPAL**) Seal HERE)

_____
(Signature/Title of PRINCIPAL)

_____(Affix Corporate
(Name of SURETY) Seal HERE)

_____
(Attorney-in-Fact)

[Attach Power of Attorney to this page]

END OF SECTION

SECTION 00 52 00

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, _____, by and between The Town of Wareham, hereinafter called "OWNER," acting herein through its _____ _____ _____, and _____ doing business as (a corporation) (a limited liability company) (a partnership) (a joint venture) (an individual)* located in the Town of Wareham County of Plymouth, and State of Massachusetts, hereinafter called "CONTRACTOR."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the project described as follows:

Bid #1048
Improvements to Bayview Park, Highland Avenue Sidewalk Improvements, and Improvements to the Lillian Gregerman Bandshell

Hereinafter called the project, for the sum of _____ _____ Dollars and _____ Cents ($_____) and all extra work in connection therewith, under the terms as stated in the Contract Documents; and at its own proper cost and expense to furnish superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to complete the said project in accordance with the conditions and prices stated in Section 00 41 13, FORM OF GENERAL BID, Section 00 72 00, GENERAL CONDITIONS, Section 00 73 0, SUPPLEMENTARY CONDITIONS, Section 00 73 73.13, STATE REGULATIONS, the plans, which include all maps, plates, drawings, blue prints, and the specifications and all other contract documents therefor as prepared by Weston & Sampson Engineers, Inc., including all bid documents

The CONTRACTOR hereby agrees to commence work under this contract on or before a date to be fixed in the written Notice to Proceed given by the OWNER to the CONTRACTOR and to fully complete the project within 270 consecutive days of the start date fixed in the Notice to Proceed. The CONTRACTOR further agrees to pay as liquidated damages the sum of $750 for each consecutive calendar day thereafter during which the work has not been fully completed, as provided in the Liquidated Damages provisions of Section 00 73 00 SUPPLEMENTARY CONDITIONS.

The CONTRACTOR shall not discriminate against or exclude any person from participation herein on grounds of race, color, religious creed, national origin, sex, sexual orientation, ancestry, or age; and that it shall take affirmative actions to insure that applicants are employed, and that employees

are treated during their employment, without regard to race, color, religious creed, national origin, sex, sexual orientation, ancestry, age, or handicapped status.

The CONTRACTOR shall not participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue Code of 1986, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.

Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Agreement and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where conflict between Federal and State Laws and Regulations exists, the more stringent requirement shall apply.

Subject to G.L. c.30, sec. 39K and/or sec. 39G and G.L. c.30, sec. 39F, as applicable, the OWNER agrees to pay the CONTRACTOR in current funds for the performance of the Agreement, subject to additions and deductions, as provided in Section 00 72 00, GENERAL CONDITIONS, and to make payments on account thereof as provided in Section 00 72 00, GENERAL CONDITIONS and Section 00 73 00, SUPPLEMENTARY CONDITIONS

In accordance with the requirements of G.L. c.149, §27B, the Contractor shall submit, and shall require all of its subcontractors required to keep a record of hours and wages paid to laborers employed on the project to submit, to the awarding authority on a weekly basis, copies of such records. All such weekly submissions shall be accompanied by the following certification:

> The undersigned contractor hereby certifies, under the pains and penalties of perjury, that the foregoing payroll records are true and accurate records of the wages paid to laborers employed on the project for the period stated and said wages are in an amount no less than the prevailing wage rates established for the project by the Massachusetts Department of Labor and Workforce Development. The undersigned contractor agrees, in addition to any other remedies available to the awarding authority, to indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of (1) the contractor's failure to pay laborers employed on the project the said applicable prevailing wage rates; (2) the failure of the foregoing payroll records to accurately state the said applicable prevailing wage rates; or (3) the failure of the foregoing payroll records to accurately represent the wages actually paid to laborers employed on the project.

The Agreed upon DIRECT LABOR MARKUP (percentage) for Change Orders on this project shall be _____ percent.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement in six (6) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

AGREED:

_____ , Massachusetts
(Owner)

By _____

_____
(Name)

_____
(Title)

_____
(Contractor)

By _____

_____
(Name)

_____
(Title)

_____
(Address)

_____
(City and State)

Approved as to Form:

By_____
(Owner's Counsel)

_____
(Name)

In accordance with M.G.L. C.44, Section 31C, this is to certify that an appropriation in the amount of this Contract is available therefor and that the _____ has been authorized to execute the Contract and approve all requisitions and change orders.

By_____
(Owner's Accountant)

_____
(Name)

CERTIFICATE OF VOTE
(to be filed if Contractor is a Corporation)

I, _____, hereby certify that I am the duly qualified and acting Secretary of
(Secretary of Corporation)
_____ and I further certify that a meeting of the Directors of said company,
(Name of Corporation)
duly called and held on _____, at which all members were present and voting, the
(Date of Meeting)
following vote was unanimously passed:

VOTED: To authorize and empower

_____

_____

_____

_____

_____

Anyone acting singly, to execute Forms of General Bid, Contracts or Bonds on behalf of the Corporation.

I further certify that the above vote is still in effect and has not been changed or modified in any respect.

By:_____
(Secretary of Corporation)

A True Copy:

Attest: _____
(Notary Public)

My Commission Expires:_____
(Date)

Contractor's Certification

A Contractor will not be eligible for award of a contract unless such Contractor has submitted the following certification, which is deemed a part of the resulting contract:

CONTRACTOR'S CERTIFICATION

_____

Name of the General Contractor

certifies that it:

1. Will not discriminate in their employment practices;

2. Intends to use the following listed construction trades in the work under the contract:

   _____

   _____

   and

3. Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained herein; and

4. Is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and

5. Will provide the provisions of the "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" to each and every subcontractor employed on the Project and will incorporate the terms of this Section into all subcontracts and work orders entered into on the Project.

6. Agrees to comply with all provisions contained herein.

_____

Signature of authorized representative of Contractor Date

_____

Printed name of authorized representative of Contractor

Contractor's Certification (Continued)

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean natural person, business, partnership, corporation, committee, union, club or other organization, entity, or group of individuals.

Signature_____ Date_____

_____ _____

Print Name & Title Company Name

CERTIFICATE OF TAX COMPLIANCE

Pursuant to Chapter 62C of the Massachusetts General Laws, Section 49A (b), I

_____, authorized signatory for _____

Name of individual *Name of contractor*

do hereby certify under the pains and penalties of perjury that said contractor has complied with all laws of the Commonwealth of Massachusetts relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

_____ _____

Signature Date

LABOR HARMONY AND OSHA TRAINING REQUIREMENTS

The undersigned certifies under penalties of perjury that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed at the work ***and*** that all employees to be employed at the worksite and in the work will have completed an OSHA-approved construction safety and health course lasting at least ten (10) hours.

Signature_____ Date_____

_____ _____

Print Name & Title Company Name

Subcontractor's Certification

Prior to the award of any subcontract, regardless of tier, the prospective subcontractor must execute and submit to the General Contractor the following certification, which will be deemed a part of the resulting subcontract:

SUBCONTRACTOR'S CERTIFICATION

_____

Name of the Subcontractor

certifies that it:

7. Will not discriminate in their employment practices;

8. Intends to use the following listed construction trades in the work under the contract:

_____

_____

and

9. Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained herein; and

10. Is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and

11. Will provide the provisions of the "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" to each and every subcontractor employed on the Project and will incorporate the terms of this Section into all subcontracts and work orders entered into on the Project.

12. Agrees to comply with all provisions contained herein.

_____

Signature of authorized representative of Subcontractor Date

_____

Printed name of authorized representative of Subcontractor

END OF SECTION

SECTION 00 61 13.13

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____
(Name of Contractor)
a _____ hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture, LLC or Individual)
_____of _____, State of _____
(Surety) (City)
hereinafter called the "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the Town of Wareham, Massachusetts, hereinafter called "Owner", in the penal sum of _____ Dollars and _____Cents($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas the Principal has entered into a certain contract with the Owner (the "Contract"), dated the _____ day of _____, 20___, which Contract is by reference made a part hereof, for the construction described as follows:

Bid #1048
Improvements to Bayview Park, Highland Avenue Sidewalk Improvements, and Improvements to the Lillian Gregerman Bandshell

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of the Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under the Contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this obligation shall remain in full force and effect.

PROVIDED, FURTHER, that the Surety's obligation under this Bond shall arise after (1) the Owner has declared the Principal in default of the Contract or any provision thereof, or (2) has declared that the Principal has failed, or is otherwise unable or unwilling, to execute the work consistent with, and in conformance to, the Contract (collectively referred to as a "Contractor Default"). The determination of a Contractor Default shall be made solely by the Owner. The Owner need not terminate the Contract to declare a Contractor Default or to invoke its rights under this Bond, and Contractor hereby agrees not to assert any claims against Surety under any indemnity or similar agreements on the grounds that Surety has interfered with the Contract by fulfilling its obligations hereunder in the absence of a termination of said Contract.

When the Surety's obligation under this Bond arises, the Surety, at its sole expense and at

the consent and election of the Owner, shall promptly take one of following steps: (1) arrange for the Principal to perform and complete the work of the Contract; (2) arrange for a contractor other than the Principal to perform and complete the work of the Contract; (3) reimburse the Owner, in a manner and at such time as the Owner shall reasonably decide, for all costs and expenses incurred by the Owner in performing and completing the work of the Contract. Surety will keep Owner reasonably informed of the progress, status and results of any investigation of any claim of the Owner.

If the Surety does not proceed as provided in this Bond with due diligence and all deliberate speed, the Surety shall be deemed to be in default of this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

After the Surety's obligation under this Bond arises, the Surety is obligated, to the limit of the amounts of this Bond, for (1) the correction of defective work and completion of the Contract; (2) additional design, professional services, and legal costs, including attorney's fees, resulting from the Contractor Default or from the default of the Surety under this Bond; (3) any additional work beyond the Contract made necessary by the Contractor Default or default of the Surety under this Bond; (4) indemnification obligations of the Principal, if any, as provided in the Contract; and (5) liquidated damages as provided in the Contract, or if no such damages are specified, actual damages and consequential damages resulting from the Contractor Default or any default of the Surety under this Bond.

Any proceeding, legal or equitable, under this Bond shall be instituted in any court of competent jurisdiction in the Commonwealth of Massachusetts.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work or to the specifications.

The Surety providing the Bond shall have a rating of A or better within Best's Key Rating Guide.

IN WITNESS WHEREOF, this instrument is executed in _____ ( ) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20___.

ATTEST:

_____	_____
Principal	Witness as to Principal Signature
By_____	_____
Signature	Name and Title
_____	_____
Name and Title	Address
_____	_____
Address	City and State
_____	
City and State	
	(SEAL)

ATTEST:

_____	_____
Surety	Witness as to Surety Signature
By_____	_____
Attorney-in-Fact Signature	Name and Title
_____	_____
Name and Title	Address
_____	_____
Address	City and State
_____	
City and State	
	(SEAL)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF SECTION

SECTION 00 61 13.16

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____
(Name of Contractor)
a _____hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture, Limited Liability Company, or Individual)
_____of _____, State of _____
(Surety) (City) (State)
hereinafter called "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts are held and firmly bound to the Town of Wareham, Massachusetts, hereinafter called "Owner," in the penal sum of_____
_____ Dollars and _____
_____ Cents ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal has entered into a certain contract with the Owner (the "Contract"), dated the _____ day of _____ _____, 20____, which Contract is by reference made a part hereof, for the construction described as follows:

Bid # 1048
Improvements to Bayview Park, Highland Avenue Sidewalk Improvements, and Improvements to the Lillian Gregerman Bandshell

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this Contract or to the work or to the specifications. The Surety Company providing the bond shall have a rating of A or better within the Best Key Rating Guide.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ ( ) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20___.

ATTEST:

_____	_____
Principal	Witness as to Principal Signature
By_____	_____
Signature	Name and Title
_____	_____
Name and Title	Address
_____	_____
Address	City and State
_____	
City and State	
	(SEAL)

ATTEST:

_____	_____
Surety	Witness as to Surety Signature
By_____	_____
Attorney-in-Fact Signature	Name and Title
_____	_____
Name and Title	Address
_____	_____
Address	City and State
_____	
City and State	
	(SEAL)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF SECTION

SECTION 00 63 63

ATTACHMENT D - CHANGE ORDERS

Policy:

This section supplements Article 11, Amending the Contract Documents; Changes in the Work, in the General Conditions and Supplementary Conditions.

All executed change orders submitted to the Engineer for review and processing must be prepared in accordance with the attached change order format (Appendix A) with the appropriate number of copies, calculation sheet(s) (Appendix B) and all other supporting documentation necessary for evaluation. Failure to comply with these instructions will result in delays in processing the change order.

In order to avoid possible delays with approval of change orders, at the beginning of the project and as circumstances warrant, the Contractor shall submit a list of construction equipment, identifying major pieces of equipment to be utilized on the project. The list shall include the Contractor's designation, if any, the manufacturer, model, year of manufacture, serial number, size and horsepower of equipment. The Contractor shall also provide for approval a proposed bluebook equipment rental rate development that separately lists for each piece of equipment the monthly rental rate, area adjustment factor, depreciation factor, estimated operating cost per hour and total hourly rate. In the event the Contractor fails or is unable to provide appropriate rate information the Engineer may develop equipment rental rates for use on change orders.

Payment of Change Orders:

Payment of all change orders shall be in accordance with the relevant provisions of Massachusetts General Laws, Chapter 30, Section 39G for non-building construction and Section 39K for building construction as amended from time to time.

Payment of change orders shall be made in accordance with one of the following three methods:

A. Existing unit prices as set forth in the contract; or

B. Agreed upon lump sum or unit prices; or

C. Time and materials

A. Payment for work for which there is a unit price in the contract:

Where the contract contains a unit price for work and the Engineer orders a change for work of the same kind as other work contained in the contract and is performed under similar physical conditions, the Contractor shall accept full and final payment at the contract unit price(s) for the acceptable quantities. Under certain circumstances, the unit prices may be subject to revaluation and adjustment. See Article 13 in the Supplementary Conditions.

B. Payment for work or materials for which no price is contained in the contract:

If the Engineer directs, the Contractor shall submit promptly in writing to the Engineer an offer to do the required work on a lump sum or unit price basis, as specified by the Engineer. The stated price, either lump sum or unit price, shall be divided so as to show that it is the sum of:

1. The estimated cost of Labor, plus
2. Direct Labor Cost, plus
3. Material and Freight Costs, plus
4. Equipment Costs, plus
5. An amount not to exceed 15% of the sum of items 1 through 4 for overhead and profit, plus (if applicable),
6. In the case of work done by a subcontractor an amount not to exceed 5%, for the general contractor of the sum of the cost (not including subcontractor's overhead and profit) of items 1 through 4 for his overhead and profit (less, if applicable),
7. Credits for work deleted from the contract, including actual costs of the deleted work plus the percentage of overhead, profit, bonds and insurance attributable to such credit amount.

C. Payment for work on a time and materials basis:

Unless an agreed lump sum and/or unit price is obtained as noted above and is so stated in the change price, the Contractor shall accept as full payment for which no agreement is contained in contract, an amount equal to:

1. The estimated cost of Labor, plus
2. The Direct Labor Costs, plus
3. Equipment Costs, plus
4. Material and Freight Costs, plus
5. An amount not to exceed 15% of the sum of items 1 through 4 for overhead and profit, plus, if applicable,
6. In the case of work done by a subcontractor an amount not to exceed 5%, for the general contractor of the sum of the cost (not including subcontractor's overhead and profit) of items 1 through 4 for his overhead and profit (less, if applicable),
7. Credit for work deleted from the Contract, including actual costs of the deleted work plus the percentage of overhead, profit, bonds and insurance attributable to such credit amount.

Explanation of items 1 through 7 as outlined in "B" and "C" above:

1. Labor - Only those workers employed on the project who are doing the extra work, including the foreman in charge, are allowable. General foremen, superintendents, or other supervisory personnel are considered to be included in the overhead markup as provided in items 5 and/or 6. Hourly labor rates in excess of those as listed in the contract wage rates

require documentation. As a minimum, an explanation and the appropriate copy of the certified payroll are required.

2. Direct Labor Costs - These costs are limited to those which are required in the contract document. Coverage in excess of the contract provisions, secured by the contractor/subcontractor(s) at his option, are ineligible. The following list of typical direct labor charges is provided for your assistance and is in no way intended to be complete or all encompassing:

   Workman's Compensation

   Federal/State: Social Security Tax and Unemployment Tax;

   Health, Welfare and Pension Benefits; (this cost is included in the wage rates appearing in the Attachment A Massachusetts Wage Rates.

Liability insurance:	Bodily injury; excess umbrella; property damage; public liability
Blasters insurance:	If applied to any required direct labor costs
Builders risk insurance:	If applied to any required direct labor costs
Experience modification insurance:	If applied to any required direct labor costs
Surcharges:	If applied to any required direct labor costs

Following award and prior to execution of a construction contract, the Contractor and filed subbidders (where applicable) shall submit for review by the Owner, documentation to establish the markup percentage(s).

The documented direct labor markup for this contract may be adjusted on an annual basis as measured from the date the contract is executed. The contract agreement will provide for the establishment of the Direct Labor Cost percentage.

3. Material and Freight - Only those materials required as a result of the change order and reasonable freight charges for delivery of same are allowable.

4. Equipment - Only the equipment required as a result of the change order is allowable. Equipment rental rates shall be governed by the current EquipmentWatch, division of Intertec Publishing [Formerly Nielson/Dataquest] Rental Rate Bluebook for Construction Equipment (the "Bluebook"). In determining the rental rate the following shall apply:

   a. For equipment already on the project - the monthly prorated rental rate by the hourly use shall be applicable;

b. For equipment not on the project the daily rate, the weekly rate, or monthly rate will prevail, whichever will prove to be most cost effective. Small tools and manual equipment are examples of costs not allowable under this item. These costs are considered to be included in the overhead markup as provided in items 5 and/or 6.

(1 Month (Normal Use) = 176 hours)

5.& 6. Overhead and Profit - All other costs not previously mentioned are considered to be included in this item, be it for the general contractor or subcontractor(s).

7. Credits - Work deleted, material and equipment removed from the contract, stored and/or returned shall be credited to the cost of the change order, less documented costs.

This change order will be prepared in such manner as to clearly separate Eligible and Ineligible Costs (as applicable to state-funded projects).

The Contractor shall furnish itemized statements of the cost of the work ordered and shall give the Engineer access to all accounts, bills and vouchers relating thereto; and unless the Contractor shall furnish such itemized statements, and access to all accounts, bills and vouchers, he shall not be entitled to payment for any items of extra work for which such information is sought by the Engineer.

APPENDIX A

CHANGE ORDER
(Enter Project Name)
(Enter Location)

Sheet __ of

Date_____

Project No. _____

Contract No. _____

Change Order No. _____

Owner's Name: _____

Owner's Address: _____

Contractor's Name: _____

Contractor's Address: _____

Item 1:

Description of Change:_____

Reason for Change:_____

Backup Information:_____

Cost: $_____

Item 2

Description of Change:_____

Reason for Change:_____

Backup Information:_____

Cost: $_____

Change Order (Continued)
(Enter Project Name)
(Enter Location)

Sheet __ of

Date_____

Project No. _____

Contract No. _____

Change Order No. _____

Contract Amount (As Bid) $_____

Amount of Previous Change Orders $_____

Net Change in Contract Price (this Change Order) $_____

Total Adjusted Contract Price (including this Change Order $_____

This Change Order extends the time to complete the work by ____ calendar days.

The extended completion date is _____.

This Change Order checked by: _____
Resident Representative Date

This Change Order is requested by: _____

This Change Order is recommended by:

_____
Consultant Engineer P.E. # Date

The undersigned agree to the terms of the Change Order.

_____
Contractor Date

_____
Owner Date

Certification of Appropriation under M.G.L. c.44, s.31C: Adequate funding in an amount sufficient to cover the total cost of this change order is available.

By: _____ _____
Certification Officer (Auditor, Accountant, Treasurer) Date

Appendix B
Example Calculation Sheet

1. Labor

Foreman	10 hours @	$10.00/hour	$100.00
Engineer	10 hours @	8.80/hour	85.00
Operator	10 hours @	9.50/hour	95.00
Laborers	24 hours @	7.00/hour	168.00
			$448.00

2. Direct Labor Cost (use the agreed upon Direct Labor Cost)

*(30)% of $448.
*(used for example purposes only) $ 134.00

3. Materials & Freight

150 1.f. of 12" pipe @ $2.00/1.f.	$ 300.00
15 v.f. precast SMH	1,700.00
Freight (slip#___ enclosed)	25.00
	$2,025.00

4. Equipment

1 Backhoe	10 hours @	$ 80.00/hour	$ 800.00
1 Truck-crane	10 hours @	100.00/hour	1000.00
			$1800.00

TOTAL (items 1 through 4): $4,407.00

5. (20%) markup for Overhead, Profit

(20%) of $4,407 $ 881.00

6. (7½ %) markup on subcontractor's cost for general contractor (if subcontractor is involved)

(7½ %) of $4,407 $ 331.00

7. Credits (deductibles) -$323.00

TOTAL COST: $5,296.00

Reminder: Provide support documentation as necessary i.e. vouchers, correspondence, calculation, photographs, reports**.**

END OF SECTION

SECTION 00 72 00

GENERAL CONDITIONS

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

EJCDC®
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

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ASCE
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National Society of Professional Engineers®

These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

National Society of Professional Engineers

1420 King Street, Alexandria, VA 22314-2794

(703) 684-2882

www.nspe.org

American Council of Engineering Companies

1015 15th Street N.W., Washington, DC 20005

(202) 347-7474

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Engineer*—The individual or entity named as such in the Agreement.

21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.

23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work*—Work to be paid for on the basis of unit prices.

47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*:

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*:

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*:

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide*:

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. abnormal weather conditions;

3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or

2. is of such a nature as to require a change in the Drawings or Specifications; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and

    d. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

2. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.H shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.

2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

2. claims for damages insured by reasonably available personal injury liability coverage.

3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:

a. Such insurance shall be maintained for three years after final payment.

b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Broad form property damage coverage.

4. Severability of interest.

5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.

7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

6. extend to cover damage or loss to insured property while in transit.

7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

8. allow for the waiver of the insurer's subrogation rights, as set forth below.

9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.

11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.

12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) it has a proven record of performance and availability of responsive service; and

4) it is not objectionable to Owner.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

a. shall certify that the proposed substitute item will:

1) perform adequately the functions and achieve the results called for by the general design,

2) be similar in substance to that specified, and

3) be suited to the same use as that specified.

b. will state:

1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,

2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from that specified, and

2) available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings*:

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples*:

   a. Contractor shall submit the number of Samples required in the Specifications.

   b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review*:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures*:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal;

6. the issuance of a notice of acceptability by Engineer;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.

D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. an itemization of the specific matters to be covered by such authority and responsibility; and

3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer's authority as to Change Orders is set forth in Article 11.

D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. *Change Orders*:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require special inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. the Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. the Contract Price has been reduced by Change Orders;

i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

   d. a list of all disputes that Contractor believes are unsettled; and

   e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance*:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such other adjacent areas;

2. correct such defective Work;

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00 73 00

SUPPLEMENTARY CONDITIONS

TABLE OF CONTENTS

SUPPLEMENTARY CONDITIONS

AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2013 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

ARTICLE 1. DEFINITIONS AND TERMINOLOGY

Delete the words "The individual or entity named as such in the Agreement" in 1.01.A.20 of the General Conditions, “Engineer”, and insert the following in their place:

> "The individual or entity duly appointed by the Owner to undertake the duties and powers herein assigned to the Engineer, acting either directly or through duly appointed representatives."

ARTICLE 2. PRELIMINARY MATTERS

SC-2.02

Delete paragraph 2.02A of the General Conditions in its entirety.

SC-2.03

Delete paragraph 2.03 A.3 of the General Conditions and replace with the following:

“3. a preliminary Schedule of Values for each Lump Sum item listed in the Bid, which includes quantities and prices of items which when added together equal the Lump Sum Bid Price and subdivides the Lump Sum Bid item into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.”

SC-2.05

Delete paragraph 2.05 A.3 of the General Conditions and replace with the following.

“3. Contractor’s Schedule of Values for Lump Sum Items will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Lump Sum Price to the component parts of the Work associated with the Lump Sum Item.”

ARTICLE 3. DOCUMENTS: INTENT, REQUIREMENTS, REUSE

SC-3.01

Add the following sentence at the end of Paragraph 3.01A of the General Conditions:

"...by all. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to make such insertion."

SC-3.03

Delete the last phrase of paragraph 3.03 A.3 of the General Conditions starting with "had", and substitute the following:

"knew or reasonably should have known thereof."

ARTICLE 4. COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01

Add a new paragraph immediately after paragraph 4.01A of the General Conditions which is to read as follows:

"B. Notwithstanding the time limitations provided in paragraph 4.01A, the OWNER may desire to commence the Contract Times later than the sixtieth day after the bid opening. The OWNER and CONTRACTOR, upon mutual agreement, may extend the commencement of the Contract Times to any date that they elect. OWNER must obtain CONTRACTOR's approval for extending the time beyond the dates/times stated in the Contract Documents."

SC-4.03

Add a new paragraph immediately after paragraph 4.03A of the General Conditions which is to read as follows:

"B. Engineer may check the lines, elevations and reference marks set by Contractor, and Contractor shall correct any errors disclosed by such check. Such a check shall not be considered as approval of Contractor's work and shall not relieve Contractor of the responsibility for construction of the entire Work in accordance with the Contract Documents. Contractor shall furnish personnel to assist Engineer in checking lines and grades."

SC-4.04

Add the following paragraph after paragraph 4.04B of the General Conditions:

"C. The Contractor's resident superintendent shall attend weekly progress meetings at the site of the work with the Engineer and others as appropriate to review schedule status and such other pertinent subjects as may be listed on the agenda by the Engineer."

SC-4.05

Delete Article 4.05A in its entirety and replace with the following:

“A. The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Designer on account of any delay in the commencement or performance of any of the work or any delay or suspension of any portion of the work, whether such delay is caused by the Owner, the Designer, or otherwise except as provided for within the prevailing statutes. The Contractor acknowledges that the Contractor’s sole remedy for any such delay and/or suspension will be an extension of time as provided in the Contract Documents. The Contractor will under no circumstances be eligible for additional compensation on account of any delay even if an extension of time is granted by the Owner.

Delete Article 4.05G in its entirety and replace it with the following:

“G. Change Order requests for an extension of time under this paragraph must be submitted no later than 14 calendar days from the commencement of the event giving rise to the claimed delay, and must be accompanied by a detailed analysis identifying each action(s) or additional work item(s) which caused the delay and identifying exactly which items along the critical path were impacted or delayed. Accumulating the amount of time required to complete a series of additional work items or delays and adding this time to the original Contract Time will not be considered justification for an extension of time. To justify an extension of Contract Time, the Contractor must prove clearly and convincingly that the critical path for construction has been impacted by circumstances beyond the control of the Contractor and that the CPM schedule cannot be revised to eliminate the need for the requested time extension.”

Add the following new paragraphs after paragraph 4.05G of the General Conditions:

"4.06 Liquidated Damages:

A. If the Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contract shall be in default after the time stipulated in the Contract for completing the work. Such damages may be retained from time to time by the Owner from progress payments or any amounts owing to the Contractor, or otherwise collected.

B. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

C. It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications wherein as definite and certain length of times if fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract. Provided that the Contractor shall not be charged with liquidated damages of any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; Provided, further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

1) to any preference, priority or allocation order duly issued by the Government;

2) to unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather; and

3) to any delays of subcontractors or suppliers occasioned by any of the causes specified in subsections C (1) and C (2) above;

D. Provided, further, that the Contractor shall, within thirty (30) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the Contract, notify the Owner, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter."

ARTICLE 5. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03

Delete the term "Supplementary Conditions" of paragraph 5.03A of the General Conditions and replace it with "Contract Documents".

Delete the term "Supplementary Conditions" of paragraph 5.03B line 2 of the General Conditions and replace it with "Contract Documents".

SC-5.05

Delete the following words from lines 3 and 4 of paragraph 5.05 E.1 of the General Conditions:

"...or was not shown or indicated with reasonable accuracy"

SC-5.06

Delete the term Supplementary Conditions in paragraph 5.06A of the General Conditions and replace it with "Contract Documents".

Add the following to the first sentence of paragraph 5.06C:

"or unless Contractor caused or contributed to such Hazardous Environmental Condition."

ARTICLE 6. BONDS AND INSURANCE

NOTICE TO CONTRACTOR:

1. Proof of Insurance coverage shall be furnished to the Owner in accordance with the schedule for submittal of Bonds and Agreements.

2. Additionally, refer to Article 2. PRELIMINARY MATTERS, Paragraph SC-2.01 B of the General Conditions.

SC-6.01

Insert these sentences following SC-6.01.A of the General Conditions: The Surety Company providing the bonds shall have a rating of A or better within the Best Key Rating Guide and be licensed by the **Massachusetts Division of Insurance.** The CONTRACTOR shall pay the premiums for such Bonds.

SC-6.02

Delete paragraph 6.02D of the General Conditions in its entirety if Owner is not providing insurance policies, coverages or endorsements for the Work.

SC-6.03

Add the following to paragraph 6.03C:

"9. Independent Contractors Coverage."

The limits of liability for the insurance required by paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:

6.03AWorkers' Compensation.

(1)	Worker's Compensation per	Statutory Requirements
(2)	Coverage B - Employer's Liability	$100,000/$500,000/$100,000

6.03B and 6.03C Commercial General Liability Limits shall include coverage for Independent Contractors, explosion, collapse and underground hazard coverage (XCU), broad form property damage, blanket contractual liability and products/completed operations. The general aggregate limits shall be endorsed so that they respond on a per project and per location basis.

Limits:

$1,000,000 each occurrence

$2,000,000 general aggregate

$2,000,000 products/completed operations aggregate

6.03D Automobile Liability for owned, hired and non-owned vehicles:

$1,000,000 Bodily Injury and Property Damage combined single limit

6.03E Umbrella or Excess Liability

Combined single limit of not less than $5,000,000 per occurrence and in the aggregate

6.03F Contractor's Pollution Liability

$2,000,000 each occurrence and $2,000,000 in the aggregate

6.03H Contractor's Professional Liability

$1,000,000 per claim and $1,000,000 in the aggregate

Delete paragraph 6.03.I.3 of the General Conditions in its entirety and insert the following in its place:

"3. contain a provision that notice of cancellation of insurance be delivered in accordance with policy provisions. In addition, the Contractor and/or its insurance broker/agent shall immediately notify the Owner and Engineer should any insurance coverage be cancelled. The Contractor shall immediately stop work on the Project and shall not resume work until the Contractor provides evidence, to the Owner and Engineer, in the form of an acceptable insurance certificate, of new insurance coverage that replaces all cancelled coverage that is required for the Project."

Add the following paragraphs to SC-6.03I of the General Conditions:

"6. If the aggregate limits of liability indicated in Contractor's insurance provided in accordance with paragraph 6.03 are not sufficient to cover all claims for damages arising from its operations under this Contract and from any other work performed by it or if the commercial general liability insurance policy of insurance does not provide that the general aggregate limits apply on a per project and per location basis, Contractor shall have the policy amended so that the aggregate limits of liability required by this Contract will be available to cover all claims for damages due to operations under this Contract.

7. Include by endorsement that the insurer shall waive all rights of subrogation in favor of the Owner, Engineer and any other party named in the written contract against whom the insurer must agree to waive rights of subrogation."

SC-6.04

Delete paragraph 6.04 of the General Conditions in its entirety.

SC-6.05

Delete Article 6.05 of the General Conditions in its entirety.

SC-6.06

Amend the last sentence of paragraph 6.06A of the General Conditions by striking out the words "held by Owner or Contractor as trustee or fiduciary, or." As so amended, paragraph 6.06A remains in effect.

SC-6.08

Add the following paragraph 6.08 after paragraph 6.07 of the General Conditions:

"A. If Owner has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by Contractor in accordance with this Article 6 on the basis of its not complying with the Contract Documents, Owner will notify Contractor

in writing thereof within thirty days of the date of delivery of such certificates to Owner in accordance with paragraph 6.02C. Contractor will provide such additional information in respect of insurance provided by him as Owner may reasonably request."

ARTICLE 7. CONTRACTOR'S RESPONSIBILITIES

SC-7.01

Delete paragraph 7.01B of the General Conditions in its entirety and replace with the following:

"B. At the site of the Work the Contractor shall employ a full-time construction superintendent or foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Engineer and shall be one who will be continued in the capacity for the particular job involved unless the representative ceases to be on the Contractor's payroll. If at any time during the Work the representative is deemed by the Engineer to be no longer acceptable, the representative shall be promptly replaced by the Contractor. All communications to the superintendent or foreman shall be as binding as if given to the Contractor."

SC-7.07

Delete the second sentence in paragraph 7.07A of the General Conditions.

SC-7.12

In line 2 of paragraph 7.12C of the General Conditions change “Supplementary Conditions” to “Contract Documents”.

SC-7.13

Delete the text in parentheses at the end of the third sentence of paragraph 7.13B of the General Conditions.

SC-7.16

In paragraph 7.16D.1 of the General Conditions, delete the word “timely” from the first line.

SC-7.18

Change the phrase “negligent act or omission” to “negligent or wrongful act or omission” in line 11 of paragraph 7.18A of the General Conditions.

Add the following to the end of paragraph 7.18A of the General Conditions:

“The Contractor hereby acknowledges its obligation under the foregoing paragraph to indemnify the Engineer and Owner against judgments suffered because of the contractor's

work and to assume the cost of defending the Engineer and Owner against claims as described in the foregoing paragraph."

Delete paragraph 7.18C of the General Conditions in its entirety.

ARTICLE 9. OWNER'S RESPONSIBILITIES

SC-9.02

Delete the phrase “provided Contractor makes no reasonable objection to the replacement engineer” in paragraph 9.02A of the General Conditions.

SC-9.06

Delete paragraph 9.06A of the General Conditions in its entirety.

SC-9.09

Insert the following after the first sentence of paragraph 9.09A of the General Conditions:

“However, the Owner shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto.”

ARTICLE 10. ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.01

Add a new paragraph 10.01B after paragraph 10.01A of the General Conditions, which is to read as follows:

"B. Nothing contained in the Contract Documents shall be construed to create a contractual relationship of any kind (1) between the Engineer and Contractor, (2) between the Owner and a Subcontractor or Subcontractors, or (3) between any person or entities other than the Owner and Contractor. The Engineer shall, however, be entitled to performance and enforcement of obligations under the Contract Documents intended to facilitate performance of the Engineer's duties."

SC-10.02

Insert the following at the end of paragraph 10.02B of the General Conditions:

“However, the Engineer shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto.”

SC-10.03

Delete the last sentence of paragraph 10.03A.

SC-10.08

Insert the following after the first sentence of paragraph 10.08B of the General Conditions:

“However, the Engineer shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto.”

ARTICLE 13. COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

Delete Article 13 of the General Conditions in its entirety and replace with the following:

"A. The unit price of an item of Unit Price work shall be subject to reevaluation and adjustment under the following conditions:

(1) If the total extended bid price [Estimated Quantity times the Bid Unit Price] of a particular item of Unit Price Work amounts to 5 percent or more of the Original Contract Price and the variation in the quantity of the particular item of Unit Price Work performed by Contractor differs by more than 15 percent from the estimated quantity of such item indicated in the Agreement; and

(2) If there is no corresponding adjustment with respect to any other item of work; and

(3) If Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may make a claim for an adjustment in the Contract Price in accordance with Article 12 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed. If Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner shall be entitled to an adjustment in the unit price in an amount determined by the Engineer. Engineer shall not be liable in connection with any determination relating to adjustments which is rendered in good faith."

ARTICLE 14. TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-14.03

Delete the word “Prompt” at the beginning of paragraph 14.03C of the General Conditions.

SC-14.07

Revise paragraph 14.07A of the General Conditions as follows:

A. Delete the word “seven” and replace it with the word “ten” so that it reads “after ten days’ written notice to Contractor.”

ARTICLE 15. PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC-15.01

Delete paragraph 15.01B.3 of the General Conditions and insert the following in its place:

"3. Retainage with respect to progress payments will be five percent or, if stipulated, the maximum allowed by law."

Delete the word “immediate” from subparagraph 15.01E.2 of the General Conditions.

Delete subparagraph 15.01E.3 of the General Conditions in its entirety.

SC-15.02

Delete paragraph 15.02A in its entirety and insert the following in its place:

"A. Contractor warrants and guarantees that title to all work, material and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than at the time of Application for Payment free and clear of all liens. Contractor shall provide written transfer of title and a certified paid invoice provided by the supplier."

SC-15.03

Delete the third sentence of paragraph 15.03C of the General conditions and replace it with the following:

> “Owner shall review the preliminary certificate and make written objection to Engineer as to any provisions of the certificate or attached punch list.”

In the same paragraph, delete the phrase “within 14 days after submission of the preliminary certificate to Owner” in the fourth sentence; delete the phrase “within said 14 days” in the fifth sentence.

SC-15.06

Delete from paragraph 15.06B.1 of the General Conditions the phrase “within 10 days after receipt of the final Application for Payment,” in the first sentence.

SC-15.08

Delete paragraph 15.08A of the General Conditions and insert the following in its place:

“A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract

Documents, any work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions: (i) correct such defective work, or, if it has been rejected by Owner, remove it from the site and replace it with work that is not defective, and (ii) satisfactorily correct or remove and replace any damage to other work or the work of others therefrom. If Contractor does not begin the repairs within ten (10) days of receipt of written notification and promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk, loss or damage, Owner may have the defective work corrected or the rejected work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor."

ARTICLE 16. SUSPENSION OF WORK AND TERMINATION

SC-16.02

Add a new paragraph immediately after paragraph 16.02 A.4 of the General Conditions which is to read as follows:

"5. If the Work to be done under this Contract shall be abandoned, or if this Contract or any part thereof shall be sublet, without the previous written consent of Owner, or if the contract or any claim thereunder shall be assigned by Contractor otherwise than as herein specified."

ARTICLE 18. MISCELLANEOUS

SC-18.09, 18.10, 18.11, 18.12, 18.13

Add the following new paragraphs after paragraph 18.08 of the General Conditions:

"18.09 Assignment:

A. The Contractor shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder until thirty (30) days prior notice in writing has been given to the Owner of the intention to assign, which notice shall state the identity and address of the prospective assignee. No assignment shall be made without the Owner's prior written consent. Such consent shall not be unreasonably withheld. In case the Contractor assigns all or any part of the moneys due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations of services rendered or materials supplied for the performance of the work called for in this Contract.

18.10 Liability

It is understood and agreed that members of the Owner or any agent or employees of the Owner signing this Agreement shall not be personally liable hereunder for any action incurred in connection with this Agreement.

18.11 State Statutes and Regulations

See Section 00830 of these Specifications for further modifications of the General Conditions due to state statutes and regulations.

18.12 Severability

If any provision of this Agreement shall be invalid or unenforceable to any extent or in any application, then the remainder of this Agreement and of such terms and conditions, except to such extent or in such application, shall not be affected thereby, and each and every term and condition of this Agreement shall be valid and enforced to the fullest extent and in the broadest application permitted by law."

END OF SECTION

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SECTION 00 73 73.13

STATE STATUTES AND REGULATIONS
COMMONWEALTH OF MASSACHUSETTS

A. REVISIONS TO GENERAL CONDITIONS

1. Definitions
2. Subsurface Conditions Found Different
3. Proprietary Specifications
4. Substitutions and "Or Equals" – Contractor's Expense
5. Subcontracting
6. Permits
7. Massachusetts Sales and Use Tax
8. Contractor Records
9. Engineer's Decisions on Requirements of Contract Documents and Acceptability of Work
10. Change of Contract Price
11. Payments
12. Suspension of Work and Termination
13. Special Requirements for Hazardous Wastes Contracts
14. Labor Classifications and Prevailing Wage Rates
15. Contractor's Surety

B. OTHER REGULATORY REQUIREMENTS

1. Working Hours
2. Commonwealth of Massachusetts Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program
3. DEP Community Sound Level Criteria
4. OSHA 10 Hour Certification Requirements

ATTACHMENT A – Prevailing Wage Rates

ATTACHMENT B

Excerpts from Chapter 149, Chapter 30 and Chapter 82 of the Massachusetts General Law

A. REVISIONS TO GENERAL CONDITIONS:

1. Definitions

The term "Awarding Authority," as used herein, shall be considered to be synonymous with the term "Owner," described in definition 1.01 A.28.

Delete definition 1.01 A.40 entitled "Substantial Completion" in the General Conditions in its entirety and insert the following in its place:

"Substantial Completion shall be interpreted in accordance with Massachusetts General Law (MGL) c. 30, §39G or 39K as appropriate."

2. Subsurface Conditions Found Different

Add the following sentence to the end of paragraph 5.04A of the General Conditions:

"...to do so. Adjustments resulting from subsurface or latent physical conditions will be in accordance with MGL c. 30, §39N."

3. Proprietary Specifications

Revise the third sentence of Paragraph 7.04A of the General Conditions to read as follows:

“Unless the specification indicates that a proprietary item is called for, other items of material or equipment or material or equipment of other suppliers may be submitted to Engineer for review under the circumstances described below, and in accordance with MGL c. 30, §39M.”

4. Substitutions and “Or Equals” – Contractor’s Expense

Insert the following at the beginning of Paragraphs 7.04B and 7.05E of the General Conditions:

“Except as required by and indicated in the specifications and contract documents pursuant to MGL. c. 149, §44F,”.

5. Subcontracting

Add the following language at the end of paragraph 7.06L of the General Conditions:

"Except as required otherwise by MGL c. 149, §44F, for Work governed by MGL c. 149, §44A through 44H.”

6. Permits

Delete paragraph 7.08A of the General Conditions in its entirety and insert the following in its place:

"A. Unless otherwise provided for in Section 00 31 43 PERMITS, the Awarding Authority shall be responsible for identifying and obtaining all federal, state, and local permits required by the nature and location of construction, including but not limited to railroad permits, building construction permits, and permits for street and highway cuts and openings. Contractor shall be responsible for obtaining all permits required of its equipment, work force, or particular operations (such as blasting) in the performance of the Work and not otherwise specified to be obtained by the Awarding Authority. These permit fees shall be paid by Contractor. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of bids, or, if there are no Bids, on the Effective Date of the Agreement."

7. Massachusetts Sales and Use Tax

Add the following paragraph after paragraph 7.09A of the General Conditions:

"B. The materials and supplies to be used by the Contractor in the Work of this Contract are exempt from the Sales and Use Tax of the Commonwealth of Massachusetts. The Awarding Authority tax exemption certificate number will be furnished to the Contractor."

8. Contractor Records

Add a new paragraph immediately after paragraph 7.10C of the General Conditions, which is to read as follows:

"D. The Contractor shall comply with all applicable provisions Chapter 30, Section 39R of the Massachusetts General Laws regarding, Contractor's records."

9. Engineer’s Decisions on Requirements of Contract Documents and Acceptability of Work

Add the following language at the end of paragraph 10.07A of the General Conditions:

"The Engineer's interpretation will be made in accordance with the requirements of MGL c. 30, §39P."

10. Change of Contract Price

Delete paragraphs 11.04, 13.01, 13.02 and 13.03 of the General Conditions, having to do with Change of Contract Price. Changes in contract price will be governed by the section called "Change Orders," in Attachment D, Section 00830 and Article 13 in the Supplementary Conditions.

11. Payments

Add the following paragraph after Paragraph 15.01B.3 of the General Conditions:

"4. The Contractor shall submit Weekly Payroll Records Report and Statement of Compliance verifying compliance with the Minimum Prevailing Wage Law, MGL c. 149, §26-27H. These Statements of Compliance shall be submitted as a condition of payment for work performed during the period the reports apply."

Delete paragraph 15.01C.1 of the General Conditions in its entirety and insert the following in its place:

"1. Progress Payments will be made in accordance with MGLc. 30, Section §39G, or 39K, as applicable."

Delete paragraph 15.01D.1 of the General Conditions in its entirety and replace it with the following:

"1. Payment shall be made in accordance with MGL c. 30, §39G."

Add the following new paragraph following paragraph 15.01D.1 of the General Conditions:

"2. The Contractor shall make payments to Subcontractors in accordance with the requirements of MGL c. 30, §39F."

Delete paragraph 15.06B.1 of the General Conditions in its entirety and insert the following in its place:

"1. If, on the basis of the Engineer's observation of the Work during construction and final inspection and, upon the Engineer's review of the final Application for Payment and accompanying documentation, the Engineer is satisfied that the Work has been completed and that the Contractor's other obligations under the Contract Documents have been fulfilled, the Engineer will indicate in writing its recommendation of payment and present the Application to the Awarding Authority for payment. Thereupon the Engineer will give written notice to the Awarding Authority and the Contractor that the Work is acceptable subject to the provisions of paragraph 15.07. Otherwise, the Engineer will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment. In such case the Contractor shall make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, the Awarding Authority shall in accordance with the applicable provisions of the Massachusetts General Laws, make payment to the Contractor."

Delete paragraph 15.06D of the General Conditions in its entirety and replace it with the following:

"1. Payment shall be made in accordance with MGL c. 30, §39G."

12. Suspension of Work and Termination

Delete paragraph 16.01A of the General Conditions in its entirety and insert the following in its place:

"A. The Awarding Authority may order, at any time and without cause, the Contractor to suspend or delay the Work in accordance with MGL c. 30, §39O."

13. Special Requirements for Hazardous Wastes Contracts

Add the following at the end of the first sentence of Paragraph 18.13 of the General Conditions:

", and to the "Rules and Regulations for the Prevention of Accidents in Construction Operations Chapter 454 CMR (Code of Massachusetts Regulations) 10.00 et seq."

14. Labor Classifications and Prevailing Wage Rates

Add the following paragraphs under the heading "Prevailing Wage Rates" after paragraph 18.13 of the Supplementary Conditions:

"18.14 Prevailing Wage Rates

A. Prevailing Wage Rates as determined by the Director of the Executive Office of Labor and Workforce Development under the provisions of MGL c. 149, §26-27H apply to this project. A copy of the wage schedule is included in Attachment A of Section 00 73 73.13. If, after the Notice of Award, it becomes necessary to employ any person in a trade or occupation not classified in the wage determinations, such person shall be paid at not less than such rates as shall be determined by the Director. Such approved minimum rate shall be retroactive to the time of the initial employment of such person in such trade or occupation. The Contractor shall notify the Awarding Authority of its intention to employ persons in trades or occupations not classified in the wage determinations as soon as possible in order to allow sufficient time for the Awarding Authority to obtain approved rates for such trades or occupations.

B. The schedule of wages referred to above are minimum rates only, and the Awarding Authority will not consider any claims for additional compensation made by Contractor because of payment by the Contractor of any wage rate in excess of the applicable rate contained in the Contract.

C. The said schedule of wages shall continue to be the minimum rates to be paid during the life of this Agreement, except in the case of the duration of this Agreement exceeding one year, when the Contractor will be responsible for requesting and obtaining updated prevailing wage rates from the Owner before the one-year anniversary of the project's start date, and a legible copy of said schedule shall be kept posted in a conspicuous place at the site of the Work.

D. Contractor and subcontractors shall submit a copy of weekly payroll records to the Awarding Authority and the Awarding Authority shall retain the records for a minimum of three years."

15. Contractor's Surety

Add the following sentences at the end of paragraph 6.01A:
"The Surety Company providing the bonds shall have a rating of A or better within the Best Key Rating Guide and be licensed by the Massachusetts Division of Insurance**.** The Contractor shall pay the premiums for such Bonds."

B. OTHER REGULATORY REQUIREMENTS:

1. Working Hours

No laborer, workman, mechanic, foreman, or inspector, working within the Commonwealth, in the employ of the Contractor, subcontractor, or other person doing or contracting to do the whole or a part of the work contemplated by this contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency.

2. Commonwealth of Massachusetts Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program.

The Contractor shall abide by the Commonwealth of Massachusetts Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program, which is attached in its entirety on pages 00 73 73.16.

3. DEP Community Sound Level Criteria

The Community Sound Level Criteria as established by the Commonwealth of Massachusetts' Department of Environmental Protection (DEP) must be conformed to prior to the Awarding Authority's acceptance of the structure. The following sound level criteria must be met at the construction site:

A. The increase in the broadband noise level shall not be in excess of ten (10) dB(A) above ambient at the station boundary. The ambient level is defined as the A-weighted noise level that is exceeded ninety (90) percent of the time measured during the period in question.

B. The primary noise source(s) shall not produce a puretone condition. Puretone is any given octave band center frequency that exceeds the two adjacent center frequencies by three (3) or more decibels.

4. OSHA 10 Hour Certification Requirements

All employees of the Contractor who work at the jobsite must have received OSHA 10 Hour safety training, and have proof, at the jobsite, of being certified by OSHA as having received the training. The Contractor must provide written proof (copy of OSHA card each employee is required to carry is preferred) of this certification for every employee with submission of the first certified payroll report for each employee.

END OF SECTION

ATTACHMENT A

SECTION 00 73 73.43 STATE STATUTES AND REGULATIONS

COMMONWEALTH OF MASSACHUSETTS

PREVAILING WAGE RATES

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H

Awarding Authority: Town of Wareham

Contract Number: 1048 **City/Town:** WAREHAM

Description of Work: Renovation of several sites in Onset Village. Pathway and sidewalk upgrades, new ADA-compliant stairs and ramps with handrails, new guardrail, stormwater management, site lighting, and other elements.

Job Location: 186 Onset Ave, Highland Ave, and 4 Union Ave

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- **The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor.** For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The annual update requirement is not applicable to 27F "rental of equipment" contracts. **The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.**
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Issue Date: 12/14/2023 **Wage Request Number:** 20231213-031

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2023	$38.95	$14.57	$18.67	$0.00	$72.19
	01/01/2024	$38.95	$15.07	$18.67	$0.00	$72.69
	06/01/2024	$39.95	$15.07	$18.67	$0.00	$73.69
	12/01/2024	$39.95	$15.07	$20.17	$0.00	$75.19
	01/01/2025	$39.95	$15.57	$20.17	$0.00	$75.69
	06/01/2025	$40.95	$15.57	$20.17	$0.00	$76.69
	12/01/2025	$40.95	$15.57	$21.78	$0.00	$78.30
	01/01/2026	$40.95	$16.17	$21.78	$0.00	$78.90
	06/01/2026	$41.95	$16.17	$21.78	$0.00	$79.90
	12/01/2026	$41.95	$16.17	$23.52	$0.00	$81.64
	01/01/2027	$41.95	$16.77	$23.52	$0.00	$82.24
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2023	$39.02	$14.57	$18.67	$0.00	$72.26
	01/01/2024	$39.02	$15.07	$18.67	$0.00	$72.76
	06/01/2024	$40.02	$15.07	$18.67	$0.00	$73.76
	12/01/2024	$40.02	$15.07	$20.17	$0.00	$75.26
	01/01/2025	$40.02	$15.57	$20.17	$0.00	$75.76
	06/01/2025	$41.02	$15.57	$20.17	$0.00	$76.76
	12/01/2025	$41.02	$15.57	$21.78	$0.00	$78.37
	01/01/2026	$41.02	$16.17	$21.78	$0.00	$78.97
	06/01/2026	$42.02	$16.17	$21.78	$0.00	$79.97
	12/01/2026	$42.02	$16.17	$23.52	$0.00	$81.71
	01/01/2027	$42.02	$16.77	$23.52	$0.00	$82.31
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2023	$39.14	$14.57	$18.67	$0.00	$72.38
	01/01/2024	$39.14	$15.07	$18.67	$0.00	$72.88
	06/01/2024	$40.14	$15.07	$18.67	$0.00	$73.88
	12/01/2024	$40.14	$15.07	$20.17	$0.00	$75.38
	01/01/2025	$40.14	$15.57	$20.17	$0.00	$75.88
	06/01/2025	$41.14	$15.57	$20.17	$0.00	$76.88
	12/01/2025	$41.14	$15.57	$21.78	$0.00	$78.49
	01/01/2026	$41.14	$16.17	$21.78	$0.00	$79.09
	06/01/2026	$42.14	$16.17	$21.78	$0.00	$80.09
	12/01/2026	$42.14	$16.17	$23.52	$0.00	$81.83
	01/01/2027	$42.14	$16.77	$23.52	$0.00	$82.43
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
	06/01/2024	$39.94	$9.65	$17.14	$0.00	$66.73
	12/01/2024	$41.27	$9.65	$17.14	$0.00	$68.06
	06/01/2025	$42.66	$9.65	$17.14	$0.00	$69.45
	12/01/2025	$44.04	$9.65	$17.14	$0.00	$70.83
	06/01/2026	$45.48	$9.65	$17.14	$0.00	$72.27
	12/01/2026	$46.92	$9.65	$17.14	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
ASBESTOS WORKER (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)*	12/01/2023	$40.80	$14.50	$11.05	$0.00	$66.35
	06/01/2024	$41.80	$14.50	$11.05	$0.00	$67.35
	12/01/2024	$42.80	$14.50	$11.05	$0.00	$68.35
	06/01/2025	$43.80	$14.50	$11.05	$0.00	$69.35
	12/01/2025	$44.80	$14.50	$11.05	$0.00	$70.35
ASPHALT RAKER *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$55.03	$15.00	$16.40	$0.00	$86.43
	06/01/2024	$56.33	$15.00	$16.40	$0.00	$87.73
	12/01/2024	$57.78	$15.00	$16.40	$0.00	$89.18
	06/01/2025	$59.08	$15.00	$16.40	$0.00	$90.48
	12/01/2025	$60.53	$15.00	$16.40	$0.00	$91.93
	06/01/2026	$61.83	$15.00	$16.40	$0.00	$93.23
	12/01/2026	$63.28	$15.00	$16.40	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$55.03	$15.00	$16.40	$0.00	$86.43
	06/01/2024	$56.33	$15.00	$16.40	$0.00	$87.73
	12/01/2024	$57.78	$15.00	$16.40	$0.00	$89.18
	06/01/2025	$59.08	$15.00	$16.40	$0.00	$90.48
	12/01/2025	$60.53	$15.00	$16.40	$0.00	$91.93
	06/01/2026	$61.83	$15.00	$16.40	$0.00	$93.23
	12/01/2026	$63.28	$15.00	$16.40	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 2*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
	06/01/2024	$39.94	$9.65	$17.14	$0.00	$66.73
	12/01/2024	$41.27	$9.65	$17.14	$0.00	$68.06
	06/01/2025	$42.66	$9.65	$17.14	$0.00	$69.45
	12/01/2025	$44.04	$9.65	$17.14	$0.00	$70.83
	06/01/2026	$45.48	$9.65	$17.14	$0.00	$72.27
	12/01/2026	$46.92	$9.65	$17.14	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2023	$47.37	$7.07	$20.31	$0.00	$74.75
	01/01/2024	$48.12	$7.07	$20.60	$0.00	$75.79

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$30.79	$7.07	$13.22	$0.00	$51.08
2	65	$30.79	$7.07	$13.22	$0.00	$51.08
3	70	$33.16	$7.07	$14.23	$0.00	$54.46
4	75	$35.53	$7.07	$15.24	$0.00	$57.84
5	80	$37.90	$7.07	$16.25	$0.00	$61.22
6	85	$40.26	$7.07	$17.28	$0.00	$64.61
7	90	$42.63	$7.07	$18.28	$0.00	$67.98
8	95	$45.00	$7.07	$19.32	$0.00	$71.39

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$31.28	$7.07	$13.22	$0.00	$51.57
2	65	$31.28	$7.07	$13.22	$0.00	$51.57
3	70	$33.68	$7.07	$14.23	$0.00	$54.98
4	75	$36.09	$7.07	$15.24	$0.00	$58.40
5	80	$38.50	$7.07	$16.25	$0.00	$61.82
6	85	$40.90	$7.07	$17.28	$0.00	$65.25
7	90	$43.31	$7.07	$18.28	$0.00	$68.66
8	95	$45.71	$7.07	$19.32	$0.00	$72.10

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (NEW BEDFORD)*	08/01/2023	$62.40	$11.49	$22.34	$0.00	$96.23
	02/01/2024	$63.65	$11.49	$22.34	$0.00	$97.48
	08/01/2024	$65.75	$11.49	$22.34	$0.00	$99.58
	02/01/2025	$67.05	$11.49	$22.34	$0.00	$100.88
	08/01/2025	$69.20	$11.49	$22.34	$0.00	$103.03
	02/01/2026	$70.55	$11.49	$22.34	$0.00	$104.38
	08/01/2026	$72.75	$11.49	$22.34	$0.00	$106.58
	02/01/2027	$74.15	$11.49	$22.34	$0.00	$107.98

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 New Bedford*

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.20	$11.49	$22.34	$0.00	$65.03
2	60	$37.44	$11.49	$22.34	$0.00	$71.27
3	70	$43.68	$11.49	$22.34	$0.00	$77.51
4	80	$49.92	$11.49	$22.34	$0.00	$83.75
5	90	$56.16	$11.49	$22.34	$0.00	$89.99

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.83	$11.49	$22.34	$0.00	$65.66
2	60	$38.19	$11.49	$22.34	$0.00	$72.02
3	70	$44.56	$11.49	$22.34	$0.00	$78.39
4	80	$50.92	$11.49	$22.34	$0.00	$84.75
5	90	$57.29	$11.49	$22.34	$0.00	$91.12

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$45.48	$9.65	$18.22	$0.00	$73.35
	06/01/2024	$46.96	$9.65	$18.22	$0.00	$74.83
	12/01/2024	$48.43	$9.65	$18.22	$0.00	$76.30
	06/01/2025	$49.93	$9.65	$18.22	$0.00	$77.80
	12/01/2025	$51.43	$9.65	$18.22	$0.00	$79.30
	06/01/2026	$52.98	$9.65	$18.22	$0.00	$80.85
	12/01/2026	$54.48	$9.65	$18.22	$0.00	$82.35
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.33	$9.65	$18.22	$0.00	$72.20
	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.33	$9.65	$18.22	$0.00	$72.20
	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	03/01/2023	$45.12	$9.33	$19.97	$0.00	$74.42

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.56	$9.33	$1.73	$0.00	$33.62
2	60	$27.07	$9.33	$1.73	$0.00	$38.13
3	70	$31.58	$9.33	$14.78	$0.00	$55.69
4	75	$33.84	$9.33	$14.78	$0.00	$57.95
5	80	$36.10	$9.33	$16.51	$0.00	$61.94
6	80	$36.10	$9.33	$16.51	$0.00	$61.94
7	90	$40.61	$9.33	$18.24	$0.00	$68.18
8	90	$40.61	$9.33	$18.24	$0.00	$68.18

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $30.71/ 3&4 $36.93/ 5&6 $56.82/ 7&8 $63.06

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME *CARPENTERS-ZONE 3 (Wood Frame)*	04/01/2023	$24.16	$7.21	$4.80	$0.00	$36.17
All Aspects of New Wood Frame Work						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER (Wood Frame) - Zone 3*

Effective Date - 04/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.50	$7.21	$0.00	$0.00	$21.71
2	60	$14.50	$7.21	$0.00	$0.00	$21.71
3	65	$15.70	$7.21	$0.00	$0.00	$22.91
4	70	$16.91	$7.21	$0.00	$0.00	$24.12
5	75	$18.12	$7.21	$3.80	$0.00	$29.13
6	80	$19.33	$7.21	$3.80	$0.00	$30.34
7	85	$20.54	$7.21	$3.80	$0.00	$31.55
8	90	$21.74	$7.21	$3.80	$0.00	$32.75

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $17.86/ 3&4 $20.22/ 5&6 $27.57/ 7&8 $29.94

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (NEW BEDFORD)*	07/01/2023	$48.19	$13.00	$23.57	$1.30	$86.06
	01/01/2024	$49.33	$13.00	$23.57	$1.30	$87.20

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (New Bedford)*

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.10	$13.00	$15.93	$0.00	$53.03
2	60	$28.91	$13.00	$18.57	$1.30	$61.78
3	65	$31.32	$13.00	$19.57	$1.30	$65.19
4	70	$33.73	$13.00	$20.57	$1.30	$68.60
5	75	$36.14	$13.00	$21.57	$1.30	$72.01
6	80	$38.55	$13.00	$22.57	$1.30	$75.42
7	90	$43.37	$13.00	$23.57	$1.30	$81.24

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.67	$13.00	$15.93	$0.00	$53.60
2	60	$29.60	$13.00	$18.57	$1.30	$62.47
3	65	$32.06	$13.00	$19.57	$1.30	$65.93
4	70	$34.53	$13.00	$20.57	$1.30	$69.40
5	75	$37.00	$13.00	$21.57	$1.30	$72.87
6	80	$39.46	$13.00	$22.57	$1.30	$76.33
7	90	$44.40	$13.00	$23.57	$1.30	$82.27

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$56.13	$15.00	$16.40	$0.00	$87.53
	06/01/2024	$57.45	$15.00	$16.40	$0.00	$88.85
	12/01/2024	$58.93	$15.00	$16.40	$0.00	$90.33
	06/01/2025	$60.26	$15.00	$16.40	$0.00	$91.66
	12/01/2025	$61.73	$15.00	$16.40	$0.00	$93.13
	06/01/2026	$63.06	$15.00	$16.40	$0.00	$94.46
	12/01/2026	$64.54	$15.00	$16.40	$0.00	$95.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$35.62	$15.00	$16.40	$0.00	$67.02
	06/01/2024	$36.47	$15.00	$16.40	$0.00	$67.87
	12/01/2024	$37.42	$15.00	$16.40	$0.00	$68.82
	06/01/2025	$38.27	$15.00	$16.40	$0.00	$69.67
	12/01/2025	$39.22	$15.00	$16.40	$0.00	$70.62
	06/01/2026	$40.08	$15.00	$16.40	$0.00	$71.48
	12/01/2026	$41.03	$15.00	$16.40	$0.00	$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2023	$55.51	$9.65	$23.70	$0.00	$88.86
	01/01/2024	$56.06	$9.95	$23.95	$0.00	$89.96
	07/01/2024	$57.26	$9.95	$23.95	$0.00	$91.16
	01/01/2025	$58.46	$9.95	$23.95	$0.00	$92.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.76	$9.65	$0.00	$0.00	$37.41
2	55	$30.53	$9.65	$6.55	$0.00	$46.73
3	60	$33.31	$9.65	$7.14	$0.00	$50.10
4	65	$36.08	$9.65	$7.74	$0.00	$53.47
5	70	$38.86	$9.65	$20.13	$0.00	$68.64
6	75	$41.63	$9.65	$20.73	$0.00	$72.01
7	80	$44.41	$9.65	$21.32	$0.00	$75.38
8	90	$49.96	$9.65	$22.51	$0.00	$82.12

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$9.95	$0.00	$0.00	$37.98
2	55	$30.83	$9.95	$6.66	$0.00	$47.44
3	60	$33.64	$9.95	$7.26	$0.00	$50.85
4	65	$36.44	$9.95	$7.87	$0.00	$54.26
5	70	$39.24	$9.95	$20.32	$0.00	$69.51
6	75	$42.05	$9.95	$20.93	$0.00	$72.93
7	80	$44.85	$9.95	$21.53	$0.00	$76.33
8	90	$50.45	$9.95	$22.74	$0.00	$83.14

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN *LABORERS - ZONE 2*	12/01/2023	$44.48	$9.65	$18.07	$0.00	$72.20

For apprentice rates see "Apprentice- LABORER"

DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 2*	12/01/2023	$45.48	$9.65	$18.07	$0.00	$73.20

For apprentice rates see "Apprentice- LABORER"

DEMO: BURNERS *LABORERS - ZONE 2*	12/01/2023	$45.23	$9.65	$18.07	$0.00	$72.95

For apprentice rates see "Apprentice- LABORER"

DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 2*	12/01/2023	$45.48	$9.65	$18.07	$0.00	$73.20

For apprentice rates see "Apprentice- LABORER"

DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 2*	12/01/2023	$45.23	$9.65	$18.07	$0.00	$72.95

For apprentice rates see "Apprentice- LABORER"

DEMO: WRECKING LABORER *LABORERS - ZONE 2*	12/01/2023	$44.48	$9.65	$18.07	$0.00	$72.20

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53
ELECTRICIAN *ELECTRICIANS LOCAL 223*	09/01/2023	$47.87	$11.75	$16.86	$0.00	$76.48

Apprentice - *ELECTRICIAN - Local 223*

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$19.15	$11.75	$0.57	$0.00	$31.47
2	45	$21.54	$11.75	$0.65	$0.00	$33.94
3	50	$23.94	$11.75	$0.72	$0.00	$36.41
4	55	$26.33	$11.75	$7.79	$0.00	$45.87
5	60	$28.72	$11.75	$8.31	$0.00	$48.78
6	65	$31.12	$11.75	$8.65	$0.00	$51.52
7	70	$33.51	$11.75	$9.38	$0.00	$54.64
8	75	$35.90	$11.75	$9.90	$0.00	$57.55

Notes:

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2022	$65.62	$16.03	$20.21	$0.00	$101.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.81	$16.03	$0.00	$0.00	$48.84
2	55	$36.09	$16.03	$20.21	$0.00	$72.33
3	65	$42.65	$16.03	$20.21	$0.00	$78.89
4	70	$45.93	$16.03	$20.21	$0.00	$82.17
5	80	$52.50	$16.03	$20.21	$0.00	$88.74

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2022	$45.93	$16.03	$20.21	$0.00	$82.17

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2023	$50.30	$14.50	$16.15	$0.00	$80.95
	05/01/2024	$51.54	$14.50	$16.15	$0.00	$82.19
	11/01/2024	$52.83	$14.50	$16.15	$0.00	$83.48
	05/01/2025	$54.27	$14.50	$16.15	$0.00	$84.92
	11/01/2025	$55.56	$14.50	$16.15	$0.00	$86.21
	05/01/2026	$57.00	$14.50	$16.15	$0.00	$87.65
	11/01/2026	$58.29	$14.50	$16.15	$0.00	$88.94
	05/01/2027	$59.72	$14.50	$16.15	$0.00	$90.37

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2023	$51.87	$14.50	$16.15	$0.00	$82.52
	05/01/2024	$53.12	$14.50	$16.15	$0.00	$83.77
	11/01/2024	$54.42	$14.50	$16.15	$0.00	$85.07
	05/01/2025	$55.87	$14.50	$16.15	$0.00	$86.52
	11/01/2025	$57.17	$14.50	$16.15	$0.00	$87.82
	05/01/2026	$58.62	$14.50	$16.15	$0.00	$89.27
	11/01/2026	$59.92	$14.50	$16.15	$0.00	$90.57
	05/01/2027	$61.37	$14.50	$16.15	$0.00	$92.02

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2023	$24.93	$14.50	$16.15	$0.00	$55.58
	05/01/2024	$25.66	$14.50	$16.15	$0.00	$56.31
	11/01/2024	$26.42	$14.50	$16.15	$0.00	$57.07
	05/01/2025	$27.27	$14.50	$16.15	$0.00	$57.92
	11/01/2025	$28.03	$14.50	$16.15	$0.00	$58.68
	05/01/2026	$28.88	$14.50	$16.15	$0.00	$59.53
	11/01/2026	$29.64	$14.50	$16.15	$0.00	$60.29
	05/01/2027	$30.49	$14.50	$16.15	$0.00	$61.14
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 223*	09/01/2020	$43.66	$10.90	$14.66	$0.00	$69.22
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING*ELECTRICIANS* *LOCAL 223*	09/01/2020	$36.86	$10.90	$12.45	$0.00	$60.21
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$44.47	$15.00	$16.40	$0.00	$75.87
	06/01/2024	$45.53	$15.00	$16.40	$0.00	$76.93
	12/01/2024	$46.71	$15.00	$16.40	$0.00	$78.11
	06/01/2025	$47.77	$15.00	$16.40	$0.00	$79.17
	12/01/2025	$48.94	$15.00	$16.40	$0.00	$80.34
	06/01/2026	$50.00	$15.00	$16.40	$0.00	$81.40
	12/01/2026	$51.18	$15.00	$16.40	$0.00	$82.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$25.48	$9.65	$17.14	$0.00	$52.27
	06/01/2024	$26.51	$9.65	$17.14	$0.00	$53.30
	12/01/2024	$26.51	$9.65	$17.14	$0.00	$53.30
	06/01/2025	$27.59	$9.65	$17.14	$0.00	$54.38
	12/01/2025	$27.59	$9.65	$17.14	$0.00	$54.38
	06/01/2026	$28.71	$9.65	$17.14	$0.00	$55.50
	12/01/2026	$28.71	$9.65	$17.14	$0.00	$55.50
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	03/01/2022	$51.77	$9.33	$20.27	$0.00	$81.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 03/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.89	$9.33	$1.79	$0.00	$37.01
2	55	$28.47	$9.33	$1.79	$0.00	$39.59
3	60	$31.06	$9.33	$14.90	$0.00	$55.29
4	65	$33.65	$9.33	$14.90	$0.00	$57.88
5	70	$36.24	$9.33	$16.69	$0.00	$62.26
6	75	$38.83	$9.33	$16.69	$0.00	$64.85
7	80	$41.42	$9.33	$18.48	$0.00	$69.23
8	85	$44.00	$9.33	$18.48	$0.00	$71.81

Notes: Steps are 750 hrs.
% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $32.94/ 3&4 $39.66/ 5&6 $60.32/ 7&8 $67.10

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$55.03	$15.00	$16.40	$0.00	$86.43
	06/01/2024	$56.33	$15.00	$16.40	$0.00	$87.73
	12/01/2024	$57.78	$15.00	$16.40	$0.00	$89.18
	06/01/2025	$59.08	$15.00	$16.40	$0.00	$90.48
	12/01/2025	$60.53	$15.00	$16.40	$0.00	$91.93
	06/01/2026	$61.83	$15.00	$16.40	$0.00	$93.23
	12/01/2026	$63.28	$15.00	$16.40	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$35.62	$15.00	$16.40	$0.00	$67.02
	06/01/2024	$36.47	$15.00	$16.40	$0.00	$67.87
	12/01/2024	$37.42	$15.00	$16.40	$0.00	$68.82
	06/01/2025	$38.27	$15.00	$16.40	$0.00	$69.67
	12/01/2025	$39.22	$15.00	$16.40	$0.00	$70.62
	06/01/2026	$40.08	$15.00	$16.40	$0.00	$71.48
	12/01/2026	$41.03	$15.00	$16.40	$0.00	$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 1333*	06/01/2020	$39.18	$10.80	$10.45	$0.00	$60.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *GLAZIER - Local 1333*

Effective Date - 06/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.59	$10.80	$1.80	$0.00	$32.19
2	56	$22.04	$10.80	$1.80	$0.00	$34.64
3	63	$24.49	$10.80	$2.45	$0.00	$37.74
4	69	$26.94	$10.80	$2.45	$0.00	$40.19
5	75	$29.39	$10.80	$3.15	$0.00	$43.34
6	81	$31.83	$10.80	$3.15	$0.00	$45.78
7	88	$34.28	$10.80	$10.45	$0.00	$55.53
8	94	$36.73	$10.80	$10.45	$0.00	$57.98

Notes:

Apprentice to Journeyworker Ratio:1:3

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$55.03	$15.00	$16.40	$0.00	$86.43
	06/01/2024	$56.33	$15.00	$16.40	$0.00	$87.73
	12/01/2024	$57.78	$15.00	$16.40	$0.00	$89.18
	06/01/2025	$59.08	$15.00	$16.40	$0.00	$90.48
	12/01/2025	$60.53	$15.00	$16.40	$0.00	$91.93
	06/01/2026	$61.83	$15.00	$16.40	$0.00	$93.23
	12/01/2026	$63.28	$15.00	$16.40	$0.00	$94.68

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$30.27	$15.00	$0.00	$0.00	$45.27
2	60	$33.02	$15.00	$16.40	$0.00	$64.42
3	65	$35.77	$15.00	$16.40	$0.00	$67.17
4	70	$38.52	$15.00	$16.40	$0.00	$69.92
5	75	$41.27	$15.00	$16.40	$0.00	$72.67
6	80	$44.02	$15.00	$16.40	$0.00	$75.42
7	85	$46.78	$15.00	$16.40	$0.00	$78.18
8	90	$49.53	$15.00	$16.40	$0.00	$80.93

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$30.98	$15.00	$0.00	$0.00	$45.98
2	60	$33.80	$15.00	$16.40	$0.00	$65.20
3	65	$36.61	$15.00	$16.40	$0.00	$68.01
4	70	$39.43	$15.00	$16.40	$0.00	$70.83
5	75	$42.25	$15.00	$16.40	$0.00	$73.65
6	80	$45.06	$15.00	$16.40	$0.00	$76.46
7	85	$47.88	$15.00	$16.40	$0.00	$79.28
8	90	$50.70	$15.00	$16.40	$0.00	$82.10

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - B*	10/01/2023	$39.74	$14.43	$19.04	$2.20	$75.41
	04/01/2024	$41.24	$14.43	$19.04	$2.20	$76.91
	10/01/2024	$42.49	$14.43	$19.04	$2.20	$78.16
	04/01/2025	$43.99	$14.43	$19.04	$2.20	$79.66
	10/01/2025	$45.24	$14.43	$19.04	$2.20	$80.91
	04/01/2026	$46.74	$14.43	$19.04	$2.20	$82.41
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 223*	09/01/2020	$43.66	$10.90	$14.66	$0.00	$69.22
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - B*	10/01/2023	$39.74	$14.43	$19.04	$2.20	$75.41
	04/01/2024	$41.24	$14.43	$19.04	$2.20	$76.91
	10/01/2024	$42.49	$14.43	$19.04	$2.20	$78.16
	04/01/2025	$43.99	$14.43	$19.04	$2.20	$79.66
	10/01/2025	$45.24	$14.43	$19.04	$2.20	$80.91
	04/01/2026	$46.74	$14.43	$19.04	$2.20	$82.41
For apprentice rates see "Apprentice- SHEET METAL WORKER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING -WATER) *PLUMBERS & PIPEFITTERS LOCAL 51*	08/28/2023	$51.99	$10.15	$19.95	$0.00	$82.09
	08/26/2024	$54.74	$10.15	$19.95	$0.00	$84.84
	08/25/2025	$57.49	$10.15	$19.95	$0.00	$87.59
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PLUMBERS & PIPEFITTERS LOCAL 51*	08/28/2023	$51.99	$10.15	$19.95	$0.00	$82.09
	08/26/2024	$54.74	$10.15	$19.95	$0.00	$84.84
	08/25/2025	$57.49	$10.15	$19.95	$0.00	$87.59
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 2*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.61	$9.65	$17.14	$0.00	$65.40
	06/01/2024	$39.94	$9.65	$17.14	$0.00	$66.73
	12/01/2024	$41.27	$9.65	$17.14	$0.00	$68.06
	06/01/2025	$42.66	$9.65	$17.14	$0.00	$69.45
	12/01/2025	$44.04	$9.65	$17.14	$0.00	$70.83
	06/01/2026	$45.48	$9.65	$17.14	$0.00	$72.27
	12/01/2026	$46.92	$9.65	$17.14	$0.00	$73.71
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (SOUTHERN MASS)*	09/01/2023	$48.15	$14.75	$19.61	$0.00	$82.51
	09/01/2024	$51.23	$14.75	$19.61	$0.00	$85.59
	09/01/2025	$54.31	$14.75	$19.61	$0.00	$88.67
	09/01/2026	$57.38	$14.75	$19.61	$0.00	$91.74

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Southern MA*

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.08	$14.75	$14.32	$0.00	$53.15
2	60	$28.89	$14.75	$15.37	$0.00	$59.01
3	70	$33.71	$14.75	$16.43	$0.00	$64.89
4	80	$38.52	$14.75	$17.49	$0.00	$70.76

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.62	$14.75	$14.32	$0.00	$54.69
2	60	$30.74	$14.75	$15.37	$0.00	$60.86
3	70	$35.86	$14.75	$16.43	$0.00	$67.04
4	80	$40.98	$14.75	$17.49	$0.00	$73.22

Notes:
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER *IRONWORKERS LOCAL 37*	03/16/2021	$42.46	$7.70	$17.10	$0.00	$67.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 37*

Effective Date - 03/16/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	70	$29.72	$7.70	$17.10	$0.00	$54.52
2	75	$31.85	$7.70	$17.10	$0.00	$56.65
3	80	$33.97	$7.70	$17.10	$0.00	$58.77
4	85	$36.09	$7.70	$17.10	$0.00	$60.89
5	90	$38.21	$7.70	$17.10	$0.00	$63.01
6	95	$40.34	$7.70	$17.10	$0.00	$65.14

Notes:

Apprentice to Journeyworker Ratio:1:4

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 2*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65

Apprentice - *LABORER - Zone 2*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.72	$9.40	$16.89	$0.00	$49.01
2	70	$26.50	$9.40	$16.89	$0.00	$52.79
3	80	$30.29	$9.40	$16.89	$0.00	$56.58
4	90	$34.07	$9.40	$16.89	$0.00	$60.36

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
	06/01/2024	$39.19	$9.65	$17.14	$0.00	$65.98
	12/01/2024	$40.52	$9.65	$17.14	$0.00	$67.31
	06/01/2025	$41.91	$9.65	$17.14	$0.00	$68.70
	12/01/2025	$43.29	$9.65	$17.14	$0.00	$70.08
	06/01/2026	$44.73	$9.65	$17.14	$0.00	$71.52
	12/01/2026	$46.17	$9.65	$17.14	$0.00	$72.96

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER (Heavy & Highway) - Zone 2*

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$22.72	$9.65	$17.14	$0.00	$49.51
2	70	$26.50	$9.65	$17.14	$0.00	$53.29
3	80	$30.29	$9.65	$17.14	$0.00	$57.08
4	90	$34.07	$9.65	$17.14	$0.00	$60.86

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$23.51	$9.00	$16.89	$0.00	$49.40
2	70	$27.43	$9.00	$16.89	$0.00	$53.32
3	80	$31.35	$9.00	$16.89	$0.00	$57.24
4	90	$35.27	$9.00	$16.89	$0.00	$61.16

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 2*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 2*	12/01/2023	$38.36	$9.40	$16.89	$0.00	$64.65
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 2*	12/01/2023	$37.95	$9.65	$17.20	$0.00	$64.80
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 2*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 2*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2023	$47.89	$11.49	$20.37	$0.00	$79.75
	02/01/2024	$48.89	$11.49	$20.37	$0.00	$80.75
	08/01/2024	$50.57	$11.49	$20.37	$0.00	$82.43
	02/01/2025	$51.61	$11.49	$20.37	$0.00	$83.47
	08/01/2025	$53.33	$11.49	$20.37	$0.00	$85.19
	02/01/2026	$54.41	$11.49	$20.37	$0.00	$86.27
	08/01/2026	$56.17	$11.49	$20.37	$0.00	$88.03
	02/01/2027	$57.29	$11.49	$20.37	$0.00	$89.15

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.95	$11.49	$20.37	$0.00	$55.81
2	60	$28.73	$11.49	$20.37	$0.00	$60.59
3	70	$33.52	$11.49	$20.37	$0.00	$65.38
4	80	$38.31	$11.49	$20.37	$0.00	$70.17
5	90	$43.10	$11.49	$20.37	$0.00	$74.96

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.45	$11.49	$20.37	$0.00	$56.31
2	60	$29.33	$11.49	$20.37	$0.00	$61.19
3	70	$34.22	$11.49	$20.37	$0.00	$66.08
4	80	$39.11	$11.49	$20.37	$0.00	$70.97
5	90	$44.00	$11.49	$20.37	$0.00	$75.86

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2023	$62.42	$11.49	$22.31	$0.00	$96.22
	02/01/2024	$63.67	$11.49	$22.31	$0.00	$97.47
	08/01/2024	$65.77	$11.49	$22.31	$0.00	$99.57
	02/01/2025	$67.07	$11.49	$22.31	$0.00	$100.87
	08/01/2025	$69.22	$11.49	$22.31	$0.00	$103.02
	02/01/2026	$70.57	$11.49	$22.31	$0.00	$104.37
	08/01/2026	$72.77	$11.49	$22.31	$0.00	$106.57
	02/01/2027	$74.17	$11.49	$22.31	$0.00	$107.97

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.21	$11.49	$22.31	$0.00	$65.01
2	60	$37.45	$11.49	$22.31	$0.00	$71.25
3	70	$43.69	$11.49	$22.31	$0.00	$77.49
4	80	$49.94	$11.49	$22.31	$0.00	$83.74
5	90	$56.18	$11.49	$22.31	$0.00	$89.98

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.84	$11.49	$22.31	$0.00	$65.64
2	60	$38.20	$11.49	$22.31	$0.00	$72.00
3	70	$44.57	$11.49	$22.31	$0.00	$78.37
4	80	$50.94	$11.49	$22.31	$0.00	$84.74
5	90	$57.30	$11.49	$22.31	$0.00	$91.10

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MILLWRIGHT (Zone 2) *MILLWRIGHTS LOCAL 1121 - Zone 2*	01/02/2023	$41.92	$8.58	$21.57	$0.00	$72.07

Apprentice - *MILLWRIGHT - Local 1121 Zone 2*

Effective Date - 01/02/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$23.06	$8.58	$5.72	$0.00	$37.36
2	65	$27.25	$8.58	$17.93	$0.00	$53.76
3	75	$31.44	$8.58	$18.98	$0.00	$59.00
4	85	$35.63	$8.58	$20.01	$0.00	$64.22

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 $5.72, Step 2 $6.66)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

MORTAR MIXER *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$24.41	$15.00	$16.40	$0.00	$55.81
	06/01/2024	$25.01	$15.00	$16.40	$0.00	$56.41
	12/01/2024	$25.67	$15.00	$16.40	$0.00	$57.07
	06/01/2025	$26.27	$15.00	$16.40	$0.00	$57.67
	12/01/2025	$26.93	$15.00	$16.40	$0.00	$58.33
	06/01/2026	$27.52	$15.00	$16.40	$0.00	$58.92
	12/01/2026	$28.19	$15.00	$16.40	$0.00	$59.59
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$29.86	$15.00	$16.40	$0.00	$61.26
	06/01/2024	$30.58	$15.00	$16.40	$0.00	$61.98
	12/01/2024	$31.38	$15.00	$16.40	$0.00	$62.78
	06/01/2025	$32.10	$15.00	$16.40	$0.00	$63.50
	12/01/2025	$32.90	$15.00	$16.40	$0.00	$64.30
	06/01/2026	$33.62	$15.00	$16.40	$0.00	$65.02
	12/01/2026	$34.42	$15.00	$16.40	$0.00	$65.82
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2023	$55.51	$9.65	$23.70	$0.00	$88.86
	01/01/2024	$56.06	$9.95	$23.95	$0.00	$89.96
	07/01/2024	$57.26	$9.95	$23.95	$0.00	$91.16
	01/01/2025	$58.46	$9.95	$23.95	$0.00	$92.36

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.76	$9.65	$0.00	$0.00	$37.41
2	55	$30.53	$9.65	$6.55	$0.00	$46.73
3	60	$33.31	$9.65	$7.14	$0.00	$50.10
4	65	$36.08	$9.65	$7.74	$0.00	$53.47
5	70	$38.86	$9.65	$20.13	$0.00	$68.64
6	75	$41.63	$9.65	$20.73	$0.00	$72.01
7	80	$44.41	$9.65	$21.32	$0.00	$75.38
8	90	$49.96	$9.65	$22.51	$0.00	$82.12

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.03	$9.95	$0.00	$0.00	$37.98
2	55	$30.83	$9.95	$6.66	$0.00	$47.44
3	60	$33.64	$9.95	$7.26	$0.00	$50.85
4	65	$36.44	$9.95	$7.87	$0.00	$54.26
5	70	$39.24	$9.95	$20.32	$0.00	$69.51
6	75	$42.05	$9.95	$20.93	$0.00	$72.93
7	80	$44.85	$9.95	$21.53	$0.00	$76.33
8	90	$50.45	$9.95	$22.74	$0.00	$83.14

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2023	$46.41	$9.65	$23.70	$0.00	$79.76
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2024	$46.96	$9.95	$23.95	$0.00	$80.86
	07/01/2024	$48.16	$9.95	$23.95	$0.00	$82.06
	01/01/2025	$49.36	$9.95	$23.95	$0.00	$83.26

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.21	$9.65	$0.00	$0.00	$32.86
2	55	$25.53	$9.65	$6.55	$0.00	$41.73
3	60	$27.85	$9.65	$7.14	$0.00	$44.64
4	65	$30.17	$9.65	$7.74	$0.00	$47.56
5	70	$32.49	$9.65	$20.13	$0.00	$62.27
6	75	$34.81	$9.65	$20.73	$0.00	$65.19
7	80	$37.13	$9.65	$21.32	$0.00	$68.10
8	90	$41.77	$8.65	$22.51	$0.00	$72.93

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.48	$9.95	$0.00	$0.00	$33.43
2	55	$25.83	$9.95	$6.66	$0.00	$42.44
3	60	$28.18	$9.95	$7.26	$0.00	$45.39
4	65	$30.52	$9.95	$7.87	$0.00	$48.34
5	70	$32.87	$9.95	$20.32	$0.00	$63.14
6	75	$35.22	$9.95	$20.93	$0.00	$66.10
7	80	$37.57	$9.95	$21.53	$0.00	$69.05
8	90	$42.26	$9.95	$22.74	$0.00	$74.95

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2023	$44.47	$9.65	$23.70	$0.00	$77.82
	01/01/2024	$45.02	$9.95	$23.95	$0.00	$78.92
	07/01/2024	$46.22	$9.95	$23.95	$0.00	$80.12
	01/01/2025	$47.42	$9.95	$23.95	$0.00	$81.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.24	$9.65	$0.00	$0.00	$31.89
2	55	$24.46	$9.65	$6.55	$0.00	$40.66
3	60	$26.68	$9.65	$7.14	$0.00	$43.47
4	65	$28.91	$9.65	$7.74	$0.00	$46.30
5	70	$31.13	$9.65	$20.13	$0.00	$60.91
6	75	$33.35	$9.65	$20.73	$0.00	$63.73
7	80	$35.58	$9.65	$21.32	$0.00	$66.55
8	90	$40.02	$9.65	$22.51	$0.00	$72.18

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.51	$9.95	$0.00	$0.00	$32.46
2	55	$24.76	$9.95	$6.66	$0.00	$41.37
3	60	$27.01	$9.95	$7.26	$0.00	$44.22
4	65	$29.26	$9.95	$7.87	$0.00	$47.08
5	70	$31.51	$9.95	$20.32	$0.00	$61.78
6	75	$33.77	$9.95	$20.93	$0.00	$64.65
7	80	$36.02	$9.95	$21.53	$0.00	$67.50
8	90	$40.52	$9.95	$22.74	$0.00	$73.21

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	07/01/2023	$45.01	$9.65	$23.70	$0.00	$78.36
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2024	$45.56	$9.95	$23.95	$0.00	$79.46
	07/01/2024	$46.76	$9.95	$23.95	$0.00	$80.66
	01/01/2025	$47.96	$9.95	$23.95	$0.00	$81.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.51	$9.65	$0.00	$0.00	$32.16
2	55	$24.76	$9.65	$6.55	$0.00	$40.96
3	60	$27.01	$9.65	$7.14	$0.00	$43.80
4	65	$29.26	$9.65	$7.74	$0.00	$46.65
5	70	$31.51	$9.65	$20.13	$0.00	$61.29
6	75	$33.76	$9.65	$20.73	$0.00	$64.14
7	80	$36.01	$9.65	$21.32	$0.00	$66.98
8	90	$40.51	$9.65	$22.51	$0.00	$72.67

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.78	$9.95	$0.00	$0.00	$32.73
2	55	$25.06	$9.95	$6.66	$0.00	$41.67
3	60	$27.34	$9.95	$7.26	$0.00	$44.55
4	65	$29.61	$9.95	$7.87	$0.00	$47.43
5	70	$31.89	$9.95	$20.32	$0.00	$62.16
6	75	$34.17	$9.95	$20.93	$0.00	$65.05
7	80	$36.45	$9.95	$21.53	$0.00	$67.93
8	90	$41.00	$9.95	$22.74	$0.00	$73.69

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	07/01/2023	$43.07	$9.65	$23.70	$0.00	$76.42
	01/01/2024	$43.62	$9.95	$23.95	$0.00	$77.52
	07/01/2024	$44.82	$9.95	$23.95	$0.00	$78.72
	01/01/2025	$46.02	$9.95	$23.95	$0.00	$79.92

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 07/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.54	$9.65	$0.00	$0.00	$31.19
2	55	$23.69	$9.65	$6.27	$0.00	$39.61
3	60	$25.84	$9.65	$6.84	$0.00	$42.33
4	65	$28.00	$9.65	$7.41	$0.00	$45.06
5	70	$30.15	$9.65	$19.78	$0.00	$59.58
6	75	$32.30	$9.65	$20.35	$0.00	$62.30
7	80	$34.46	$9.65	$20.92	$0.00	$65.03
8	90	$38.76	$9.65	$22.06	$0.00	$70.47

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.81	$9.95	$0.00	$0.00	$31.76
2	55	$23.99	$9.95	$6.66	$0.00	$40.60
3	60	$26.17	$9.95	$7.26	$0.00	$43.38
4	65	$28.35	$9.95	$7.87	$0.00	$46.17
5	70	$30.53	$9.95	$20.32	$0.00	$60.80
6	75	$32.72	$9.95	$20.93	$0.00	$63.60
7	80	$34.90	$9.95	$21.53	$0.00	$66.38
8	90	$39.26	$9.95	$22.74	$0.00	$71.95

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$37.86	$9.65	$17.14	$0.00	$64.65
	06/01/2024	$39.19	$9.65	$17.14	$0.00	$65.98
	12/01/2024	$40.52	$9.65	$17.14	$0.00	$67.31
	06/01/2025	$41.91	$9.65	$17.14	$0.00	$68.70
	12/01/2025	$43.29	$9.65	$17.14	$0.00	$70.08
	06/01/2026	$44.73	$9.65	$17.14	$0.00	$71.52
	12/01/2026	$46.17	$9.65	$17.14	$0.00	$72.96

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2023	$38.78	$14.57	$18.67	$0.00	$72.02
	01/01/2024	$38.78	$15.07	$18.67	$0.00	$72.52
	06/01/2024	$39.78	$15.07	$18.67	$0.00	$73.52
	12/01/2024	$39.78	$15.07	$20.17	$0.00	$75.02
	01/01/2025	$39.78	$15.57	$20.17	$0.00	$75.52
	06/01/2025	$40.78	$15.57	$20.17	$0.00	$76.52
	12/01/2025	$40.78	$15.57	$21.78	$0.00	$78.13
	01/01/2026	$40.78	$16.17	$21.78	$0.00	$78.73
	06/01/2026	$41.78	$16.17	$21.78	$0.00	$79.73
	12/01/2026	$41.78	$16.17	$23.52	$0.00	$81.47
	01/01/2027	$41.78	$16.77	$23.52	$0.00	$82.07
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.54	$9.40	$23.12	$0.00	$57.06
2	60	$29.44	$9.40	$23.12	$0.00	$61.96
3	70	$34.35	$9.40	$23.12	$0.00	$66.87
4	75	$36.80	$9.40	$23.12	$0.00	$69.32
5	80	$39.26	$9.40	$23.12	$0.00	$71.78
6	80	$39.26	$9.40	$23.12	$0.00	$71.78
7	90	$44.16	$9.40	$23.12	$0.00	$76.68
8	90	$44.16	$9.40	$23.12	$0.00	$76.68

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $34.01/ 3&4 $41.46/ 5&6 $62.80/ 7&8 $69.25

Apprentice to Journeyworker Ratio:1:5

PIPELAYER *LABORERS - ZONE 2* For apprentice rates see "Apprentice- LABORER"	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PLUMBER & PIPEFITTER *PLUMBERS & PIPEFITTERS LOCAL 51*	08/28/2023	$51.99	$10.15	$19.95	$0.00	$82.09
	08/26/2024	$54.74	$10.15	$19.95	$0.00	$84.84
	08/25/2025	$57.49	$10.15	$19.95	$0.00	$87.59

Apprentice - *PLUMBER/PIPEFITTER - Local 51*

Effective Date - 08/28/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$20.80	$10.15	$2.50	$0.00	$33.45
2	50	$26.00	$10.15	$2.50	$0.00	$38.65
3	60	$31.19	$10.15	$8.80	$0.00	$50.14
4	70	$36.39	$10.15	$14.08	$0.00	$60.62
5	80	$41.59	$10.15	$17.60	$0.00	$69.34

Effective Date - 08/26/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$21.90	$10.15	$2.50	$0.00	$34.55
2	50	$27.37	$10.15	$2.50	$0.00	$40.02
3	60	$32.84	$10.15	$8.80	$0.00	$51.79
4	70	$38.32	$10.15	$14.08	$0.00	$62.55
5	80	$43.79	$10.15	$17.60	$0.00	$71.54

Notes:

Steps 2000hrs. Prior 9/1/05; 40/40/45/50/55/60/65/75/80/85

Apprentice to Journeyworker Ratio:1:3

PNEUMATIC CONTROLS (TEMP.) *PLUMBERS & PIPEFITTERS LOCAL 51*	08/28/2023	$51.99	$10.15	$19.95	$0.00	$82.09
	08/26/2024	$54.74	$10.15	$19.95	$0.00	$84.84
	08/25/2025	$57.49	$10.15	$19.95	$0.00	$87.59
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWDERMAN & BLASTER *LABORERS - ZONE 2*	12/01/2023	$38.86	$9.65	$17.14	$0.00	$65.65
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$39.36	$9.40	$16.89	$0.00	$65.65
	06/01/2024	$40.69	$9.40	$16.89	$0.00	$66.98
	12/01/2024	$42.02	$9.40	$16.89	$0.00	$68.31
	06/01/2025	$43.41	$9.40	$16.89	$0.00	$69.70
	12/01/2025	$44.79	$9.40	$16.89	$0.00	$71.08
	06/01/2026	$46.23	$9.40	$16.89	$0.00	$72.52
	12/01/2026	$47.67	$9.40	$16.89	$0.00	$73.96
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$55.03	$15.00	$16.40	$0.00	$86.43
	06/01/2024	$56.33	$15.00	$16.40	$0.00	$87.73
	12/01/2024	$57.78	$15.00	$16.40	$0.00	$89.18
	06/01/2025	$59.08	$15.00	$16.40	$0.00	$90.48
	12/01/2025	$60.53	$15.00	$16.40	$0.00	$91.93
	06/01/2026	$61.83	$15.00	$16.40	$0.00	$93.23
	12/01/2026	$63.28	$15.00	$16.40	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$35.62	$15.00	$16.40	$0.00	$67.02
	06/01/2024	$36.47	$15.00	$16.40	$0.00	$67.87
	12/01/2024	$37.42	$15.00	$16.40	$0.00	$68.82
	06/01/2025	$38.27	$15.00	$16.40	$0.00	$69.67
	12/01/2025	$39.22	$15.00	$16.40	$0.00	$70.62
	06/01/2026	$40.08	$15.00	$16.40	$0.00	$71.48
	12/01/2026	$41.03	$15.00	$16.40	$0.00	$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS 653 - Southeastern Concrete (Weymouth)*	08/01/2023	$25.00	$13.91	$6.90	$0.00	$45.81
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	08/01/2023	$50.03	$12.78	$20.20	$0.00	$83.01
	02/01/2024	$51.28	$12.78	$20.20	$0.00	$84.26
	08/01/2024	$52.78	$12.78	$20.20	$0.00	$85.76
	02/01/2025	$54.03	$12.78	$20.20	$0.00	$87.01
	08/01/2025	$55.53	$12.78	$20.20	$0.00	$88.51
	02/01/2026	$56.78	$12.78	$20.20	$0.00	$89.76

Apprentice - *ROOFER - Local 33*

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.02	$12.78	$5.59	$0.00	$43.39
2	60	$30.02	$12.78	$20.20	$0.00	$63.00
3	65	$32.52	$12.78	$20.20	$0.00	$65.50
4	75	$37.52	$12.78	$20.20	$0.00	$70.50
5	85	$42.53	$12.78	$20.20	$0.00	$75.51

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.64	$12.78	$5.59	$0.00	$44.01
2	60	$30.77	$12.78	$20.20	$0.00	$63.75
3	65	$33.33	$12.78	$20.20	$0.00	$66.31
4	75	$38.46	$12.78	$20.20	$0.00	$71.44
5	85	$43.59	$12.78	$20.20	$0.00	$76.57

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
(Hot Pitch Mechanics' receive $1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	08/01/2023	$50.28	$12.78	$20.20	$0.00	$83.26
	02/01/2024	$51.53	$12.78	$20.20	$0.00	$84.51
	08/01/2024	$53.03	$12.78	$20.20	$0.00	$86.01
	02/01/2025	$54.28	$12.78	$20.20	$0.00	$87.26
	08/01/2025	$55.78	$12.78	$20.20	$0.00	$88.76
	02/01/2026	$57.03	$12.78	$20.20	$0.00	$90.01
For apprentice rates see "Apprentice- ROOFER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - B*	10/01/2023	$39.74	$14.43	$19.04	$2.20	$75.41
	04/01/2024	$41.24	$14.43	$19.04	$2.20	$76.91
	10/01/2024	$42.49	$14.43	$19.04	$2.20	$78.16
	04/01/2025	$43.99	$14.43	$19.04	$2.20	$79.66
	10/01/2025	$45.24	$14.43	$19.04	$2.20	$80.91
	04/01/2026	$46.74	$14.43	$19.04	$2.20	$82.41

Apprentice - *SHEET METAL WORKER - Local 17-B*

Effective Date - 10/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$15.90	$14.27	$4.18	$1.06	$35.41
2	45	$17.88	$14.27	$4.71	$1.13	$37.99
3	50	$19.87	$14.27	$11.44	$1.40	$46.98
4	55	$21.86	$14.27	$11.44	$1.46	$49.03
5	60	$23.84	$14.27	$14.99	$1.59	$54.69
6	65	$25.83	$14.27	$15.28	$1.65	$57.03
7	70	$27.82	$14.27	$15.58	$1.72	$59.39
8	75	$29.81	$14.27	$15.87	$1.79	$61.74
9	80	$31.79	$14.27	$16.17	$1.86	$64.09
10	85	$33.78	$14.27	$16.46	$1.92	$66.43

Effective Date - 04/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$16.50	$14.27	$4.18	$1.06	$36.01
2	45	$18.56	$14.27	$4.71	$1.13	$38.67
3	50	$20.62	$14.27	$11.44	$1.40	$47.73
4	55	$22.68	$14.27	$11.44	$1.46	$49.85
5	60	$24.74	$14.27	$14.99	$1.59	$55.59
6	65	$26.81	$14.27	$15.28	$1.65	$58.01
7	70	$28.87	$14.27	$15.58	$1.72	$60.44
8	75	$30.93	$14.27	$15.87	$1.79	$62.86
9	80	$32.99	$14.27	$16.17	$1.86	$65.29
10	85	$35.05	$14.27	$16.46	$1.92	$67.70

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2023	$39.24	$14.57	$18.67	$0.00	$72.48
	01/01/2024	$39.24	$15.07	$18.67	$0.00	$72.98
	06/01/2024	$40.24	$15.07	$18.67	$0.00	$73.98
	12/01/2024	$40.24	$15.07	$20.17	$0.00	$75.48
	01/01/2025	$40.24	$15.57	$20.17	$0.00	$75.98
	06/01/2025	$41.24	$15.57	$20.17	$0.00	$76.98
	12/01/2025	$41.24	$15.57	$21.78	$0.00	$78.59
	01/01/2026	$41.24	$16.17	$21.78	$0.00	$79.19
	06/01/2026	$42.24	$16.17	$21.78	$0.00	$80.19
	12/01/2026	$42.24	$16.17	$23.52	$0.00	$81.93
	01/01/2027	$42.24	$16.77	$23.52	$0.00	$82.53
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2023	$39.53	$14.57	$18.67	$0.00	$72.77
	01/01/2024	$39.53	$15.07	$18.67	$0.00	$73.27
	06/01/2024	$40.53	$15.07	$18.67	$0.00	$74.27
	12/01/2024	$40.53	$15.07	$20.17	$0.00	$75.77
	01/01/2025	$40.53	$15.57	$20.17	$0.00	$76.27
	06/01/2025	$41.53	$15.57	$20.17	$0.00	$77.27
	12/01/2025	$41.53	$15.57	$21.78	$0.00	$78.88
	01/01/2026	$41.53	$16.17	$21.78	$0.00	$79.48
	06/01/2026	$42.53	$16.17	$21.78	$0.00	$80.48
	12/01/2026	$42.53	$16.17	$23.52	$0.00	$82.22
	01/01/2027	$42.53	$16.77	$23.52	$0.00	$82.82
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2*	10/01/2023	$61.16	$10.90	$23.20	$0.00	$95.26
	03/01/2024	$62.78	$10.90	$23.20	$0.00	$96.88
	10/01/2024	$64.40	$10.90	$23.20	$0.00	$98.50
	03/01/2025	$66.02	$10.90	$23.20	$0.00	$100.12

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SPRINKLER FITTER - Local 550 (Section B) Zone 2*

Effective Date - 10/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$21.41	$10.90	$12.80	$0.00	$45.11
2	40	$24.46	$10.90	$13.60	$0.00	$48.96
3	45	$27.52	$10.90	$14.40	$0.00	$52.82
4	50	$30.58	$10.90	$15.20	$0.00	$56.68
5	55	$33.64	$10.90	$16.00	$0.00	$60.54
6	60	$36.70	$10.90	$16.80	$0.00	$64.40
7	65	$39.75	$10.90	$17.60	$0.00	$68.25
8	70	$42.81	$10.90	$18.40	$0.00	$72.11
9	75	$45.87	$10.90	$19.20	$0.00	$75.97
10	80	$48.93	$10.90	$20.00	$0.00	$79.83

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$21.97	$10.90	$12.80	$0.00	$45.67
2	40	$25.11	$10.90	$13.60	$0.00	$49.61
3	45	$28.25	$10.90	$14.40	$0.00	$53.55
4	50	$31.39	$10.90	$15.20	$0.00	$57.49
5	55	$34.53	$10.90	$16.00	$0.00	$61.43
6	60	$37.67	$10.90	$16.80	$0.00	$65.37
7	65	$40.81	$10.90	$17.60	$0.00	$69.31
8	70	$43.95	$10.90	$18.40	$0.00	$73.25
9	75	$47.09	$10.90	$19.20	$0.00	$77.19
10	80	$50.22	$10.90	$20.00	$0.00	$81.12

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 223*	09/01/2023	$39.40	$11.50	$13.91	$0.00	$64.81
	09/01/2024	$40.69	$11.75	$14.53	$0.00	$66.97

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 223*

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	0	$0.00	$0.00	$0.00	$0.00	$0.00

Notes: See Electrician Apprentice Wages

Telecom Apprentice Wages shall be the same as the Electrician Apprentice Wages

Apprentice to Journeyworker Ratio:2:3***

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	08/01/2023	$61.34	$11.49	$22.34	$0.00	$95.17
	02/01/2024	$62.59	$11.49	$22.34	$0.00	$96.42
	08/01/2024	$64.69	$11.49	$22.34	$0.00	$98.52
	02/01/2025	$65.99	$11.49	$22.34	$0.00	$99.82
	08/01/2025	$68.14	$11.49	$22.34	$0.00	$101.97
	02/01/2026	$69.49	$11.49	$22.34	$0.00	$103.32
	08/01/2026	$71.69	$11.49	$22.34	$0.00	$105.52
	02/01/2027	$73.09	$11.49	$22.34	$0.00	$106.92

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 08/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$30.67	$11.49	$22.34	$0.00	$64.50
2	60	$36.80	$11.49	$22.34	$0.00	$70.63
3	70	$42.94	$11.49	$22.34	$0.00	$76.77
4	80	$49.07	$11.49	$22.34	$0.00	$82.90
5	90	$55.21	$11.49	$22.34	$0.00	$89.04

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.30	$11.49	$22.34	$0.00	$65.13
2	60	$37.55	$11.49	$22.34	$0.00	$71.38
3	70	$43.81	$11.49	$22.34	$0.00	$77.64
4	80	$50.07	$11.49	$22.34	$0.00	$83.90
5	90	$56.33	$11.49	$22.34	$0.00	$90.16

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$48.33	$9.65	$18.22	$0.00	$76.20
	06/01/2024	$49.81	$9.65	$18.22	$0.00	$77.68
	12/01/2024	$51.28	$9.65	$18.22	$0.00	$79.15
	06/01/2025	$52.78	$9.65	$18.22	$0.00	$80.65
	12/01/2025	$54.28	$9.65	$18.22	$0.00	$82.15
	06/01/2026	$55.83	$9.65	$18.22	$0.00	$83.70
	12/01/2026	$57.33	$9.65	$18.22	$0.00	$85.20
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.45	$9.65	$18.22	$0.00	$72.32
	06/01/2024	$45.93	$9.65	$18.22	$0.00	$73.80
	12/01/2024	$47.40	$9.65	$18.22	$0.00	$75.27
	06/01/2025	$48.90	$9.65	$18.22	$0.00	$76.77
	12/01/2025	$50.40	$9.65	$18.22	$0.00	$78.27
	06/01/2026	$51.95	$9.65	$18.22	$0.00	$79.82
	12/01/2026	$53.45	$9.65	$18.22	$0.00	$81.32
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2023	$44.33	$9.65	$18.22	$0.00	$72.20
	06/01/2024	$45.81	$9.65	$18.22	$0.00	$73.68
	12/01/2024	$47.28	$9.65	$18.22	$0.00	$75.15
	06/01/2025	$48.78	$9.65	$18.22	$0.00	$76.65
	12/01/2025	$50.28	$9.65	$18.22	$0.00	$78.15
	06/01/2026	$51.83	$9.65	$18.22	$0.00	$79.70
	12/01/2026	$53.33	$9.65	$18.22	$0.00	$81.20
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$54.43	$15.00	$16.40	$0.00	$85.83
	06/01/2024	$55.71	$15.00	$16.40	$0.00	$87.11
	12/01/2024	$57.15	$15.00	$16.40	$0.00	$88.55
	06/01/2025	$58.43	$15.00	$16.40	$0.00	$89.83
	12/01/2025	$59.87	$15.00	$16.40	$0.00	$91.27
	06/01/2026	$61.15	$15.00	$16.40	$0.00	$92.55
	12/01/2026	$62.59	$15.00	$16.40	$0.00	$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2023	$39.82	$14.57	$18.67	$0.00	$73.06
	01/01/2024	$39.82	$15.07	$18.67	$0.00	$73.56
	06/01/2024	$40.82	$15.07	$18.67	$0.00	$74.56
	12/01/2024	$40.82	$15.07	$20.17	$0.00	$76.06
	01/01/2025	$40.82	$15.57	$20.17	$0.00	$76.56
	06/01/2025	$41.82	$15.57	$20.17	$0.00	$77.56
	12/01/2025	$41.82	$15.57	$21.78	$0.00	$79.17
	01/01/2026	$41.82	$16.17	$21.78	$0.00	$79.77
	06/01/2026	$42.82	$16.17	$21.78	$0.00	$80.77
	12/01/2026	$42.82	$16.17	$23.52	$0.00	$82.51
	01/01/2027	$42.82	$16.77	$23.52	$0.00	$83.11
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2023	$56.56	$9.65	$18.67	$0.00	$84.88
	06/01/2024	$58.04	$9.65	$18.67	$0.00	$86.36
	12/01/2024	$59.51	$9.65	$18.67	$0.00	$87.83
	06/01/2025	$61.01	$9.65	$18.67	$0.00	$89.33
	12/01/2025	$62.51	$9.65	$18.67	$0.00	$90.83
	06/01/2026	$64.06	$9.65	$18.67	$0.00	$92.38
	12/01/2026	$65.56	$9.65	$18.67	$0.00	$93.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2023	$58.56	$9.65	$18.67	$0.00	$86.88
	06/01/2024	$60.04	$9.65	$18.67	$0.00	$88.36
	12/01/2024	$61.51	$9.65	$18.67	$0.00	$89.83
	06/01/2025	$63.01	$9.65	$18.67	$0.00	$91.33
	12/01/2025	$64.51	$9.65	$18.67	$0.00	$92.83
	06/01/2026	$66.06	$9.65	$18.67	$0.00	$94.38
	12/01/2026	$67.56	$9.65	$18.67	$0.00	$95.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2023	$48.63	$9.65	$18.67	$0.00	$76.95
	06/01/2024	$50.11	$9.65	$18.67	$0.00	$78.43
	12/01/2024	$51.58	$9.65	$18.67	$0.00	$79.90
	06/01/2025	$53.08	$9.65	$18.67	$0.00	$81.40
	12/01/2025	$54.58	$9.65	$18.67	$0.00	$82.90
	06/01/2026	$56.13	$9.65	$18.67	$0.00	$84.45
	12/01/2026	$57.63	$9.65	$18.67	$0.00	$85.95
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2023	$50.63	$9.65	$18.67	$0.00	$78.95
	06/01/2024	$52.11	$9.65	$18.67	$0.00	$80.43
	12/01/2024	$53.58	$9.65	$18.67	$0.00	$81.90
	06/01/2025	$55.08	$9.65	$18.67	$0.00	$83.40
	12/01/2025	$56.58	$9.65	$18.67	$0.00	$84.90
	06/01/2026	$58.13	$9.65	$18.67	$0.00	$86.45
	12/01/2026	$59.63	$9.65	$18.67	$0.00	$87.95
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	12/01/2023	$39.24	$14.57	$18.67	$0.00	$72.48
	01/01/2024	$39.24	$15.07	$18.67	$0.00	$72.98
	06/01/2024	$40.24	$15.07	$18.67	$0.00	$73.98
	12/01/2024	$40.24	$15.07	$20.17	$0.00	$75.48
	01/01/2025	$40.24	$15.57	$20.17	$0.00	$75.98
	06/01/2025	$41.24	$15.57	$20.17	$0.00	$76.98
	12/01/2025	$41.24	$15.57	$21.78	$0.00	$78.59
	01/01/2026	$41.24	$16.17	$21.78	$0.00	$79.19
	06/01/2026	$42.24	$16.17	$21.78	$0.00	$80.19
	12/01/2026	$42.24	$16.17	$23.52	$0.00	$81.93
	01/01/2027	$42.24	$16.77	$23.52	$0.00	$82.53
WAGON DRILL OPERATOR *LABORERS - ZONE 2*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2023	$38.11	$9.65	$17.14	$0.00	$64.90
	06/01/2024	$39.44	$9.65	$17.14	$0.00	$66.23
	12/01/2024	$40.77	$9.65	$17.14	$0.00	$67.56
	06/01/2025	$42.16	$9.65	$17.14	$0.00	$68.95
	12/01/2025	$43.54	$9.65	$17.14	$0.00	$70.33
	06/01/2026	$44.98	$9.65	$17.14	$0.00	$71.77
	12/01/2026	$46.42	$9.65	$17.14	$0.00	$73.21
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2023	$55.03	$15.00	$16.40	$0.00	$86.43
	06/01/2024	$56.33	$15.00	$16.40	$0.00	$87.73
	12/01/2024	$57.78	$15.00	$16.40	$0.00	$89.18
	06/01/2025	$59.08	$15.00	$16.40	$0.00	$90.48
	12/01/2025	$60.53	$15.00	$16.40	$0.00	$91.93
	06/01/2026	$61.83	$15.00	$16.40	$0.00	$93.23
	12/01/2026	$63.28	$15.00	$16.40	$0.00	$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & PIPEFITTERS LOCAL 51*	08/28/2023	$51.99	$10.15	$19.95	$0.00	$82.09
	08/26/2024	$54.74	$10.15	$19.95	$0.00	$84.84
	08/25/2025	$57.49	$10.15	$19.95	$0.00	$87.59
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$29.67	$9.25	$1.89	$0.00	$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$42.03	$9.25	$10.27	$0.00	$61.55

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$34.62	$9.25	$10.07	$0.00	$53.94
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$42.03	$9.25	$14.35	$0.00	$65.63
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$37.09	$9.25	$10.87	$0.00	$57.21
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$22.25	$9.25	$1.82	$0.00	$33.32
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$49.45	$9.25	$17.48	$0.00	$76.18

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 08/30/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$29.67	$9.25	$3.39	$0.00	$42.31
2	65	$32.14	$9.25	$3.46	$0.00	$44.85
3	70	$34.62	$9.25	$3.54	$0.00	$47.41
4	75	$37.09	$9.25	$5.11	$0.00	$51.45
5	80	$39.56	$9.25	$5.19	$0.00	$54.00
6	85	$42.03	$9.25	$5.26	$0.00	$56.54
7	90	$44.51	$9.25	$7.34	$0.00	$61.10

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$30.73	$4.70	$3.17	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

ATTACHMENT B

Excerpts from Chapters 30, 82 and 149 of the Massachusetts General Laws

NOTICE *- These are* ***NOT*** *the official versions of the Massachusetts General Laws (MGL). While reasonable efforts have been made to assure the accuracy of the excerpts provided, do not rely on this information without first checking an official edition of the MGL. If you are in need of legal advice or counsel, consult a lawyer. These excerpts include amendments to the General Laws passed through February 28, 2017. For laws enacted since that time, see the 2017 and 2018 Session Laws.*

Certain excerpts from the Massachusetts General Laws are applicable to Construction contracts. Attention is directed to the following Sections of Chapter 149 as amended.

Section 25. Lodging, board and trade of public employees; statute part of employment contract.

"Every employee in public work shall lodge, board, and trade where and with whom he elects; and no person or his agents or employees under contract with the commonwealth, a county, city or town, or with a department, board, commission or officer acting therefor, for the doing of public work shall directly or indirectly require, as a condition of employment therein, that the employee shall lodge, board or trade at a particular place or with a particular person. This section shall be made a part of the contract for such employment."

Section 26. Public works; preference to veterans and citizens; wages.

"In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works by the commonwealth, or by a county, town, authority or district, or by persons contracting or subcontracting for such works, preference shall first be given to citizens of the commonwealth who have been residents of the commonwealth for at least six months at the commencement of their employment who are veterans as defined in clause Forty-third of section 7 of chapter 4 and who are qualified to perform the work to which the employment relates and, within such preference, preference shall be given to service-disabled veterans; and secondly, to citizens of the commonwealth generally who have been residents of the commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, and every contract for such work shall contain a provision to this effect..."

Section 34. Public contracts; stipulation as to hours and days of work; void contracts.

"Every contract, except for the purchase of material or supplies, involving the employment of laborers, workmen, mechanics, foremen or inspectors, to which the commonwealth or any county or any town, subject to section thirty, is a party, shall contain a stipulation that no laborer, workman, mechanic, foreman or inspector working within the commonwealth, in the employ of the contractor, subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one-day or more than forty-eight hours in any one week, or more than six days in any one week,

except in cases of emergency, or, in case any town subject to section thirty-one is a party to such a contract, more than eight hours in any one-day, except as aforesaid..."

Section 34A. Contracts for public works; workers' compensation insurance; breach of contract; enforcement and violation of statute.

"Every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or other public works for the commonwealth or any political subdivision thereof shall contain stipulations requiring that the contractor shall, before commencing performance of such contract, provide by insurance for the payment of compensation and the furnishing of other benefits under chapter one hundred and fifty-two to all persons to be employed under the contract, and that the contractor shall continue such insurance in full force and effect during the term of the contract. No officer or agent contracting in behalf of the commonwealth or any political subdivision thereof shall award such a contract until he has been furnished with sufficient proof of compliance with the aforesaid stipulations. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the officer or agent who awarded the contract at least fifteen days prior to the intended effective date thereof, which date shall be expressed in said notice. Notice of cancellation sent by the party proposing cancellation by registered mail, postage prepaid, with a return receipt of the addressee requested, shall be a sufficient notice..."

Section 34B. Contracts for public works; wages for reserve police officer.

"Every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public works for the commonwealth or any political subdivision thereof shall contain stipulations requiring that the contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wage paid to regular police officers in such city or town."

Whenever general bids are invited for a contract subject to Section 44A, the following provision applies:

Section 44E. Filing of bids; forms; modular buildings. Second paragraph of subdivision (2), clause E.

"The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A."

For projects estimated to cost more than $25,000, the following provision applies to sub-bidders:

Section 44F. Plans and specifications; sub-bids; form; contents. First paragraph of clause I of subdivision (2) of section 44F.

"The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44F."

Section 44G. Allowances; alternates; weather protection devices.

"(A) "Allowance" as used herein means a sum of money covering one or more items of labor or labor and materials which is designated in bid documents and which general bidders are required to use in computing their bids. The use of such allowances shall be prohibited in the award of any contract subject to the provisions of section forty-four A. Whenever the designer is unable to supply specifications for any item prior to the solicitation of bids, such item shall not be included in any contract subject to the provisions of section forty-four A. The awarding authority shall solicit bids for every such item separately pursuant to the provisions of section forty-four A after specifications for that item are prepared.

(B) Every alternate contained in the form for general bids shall be listed in a numerical sequence in order of priority. When the awarding authority decides to consider alternates in determining the lowest eligible and responsible bidder, the awarding authority shall consider the alternates in descending numerical sequence, such that no single alternate shall be considered unless every alternate preceding it on the list has been added to or subtracted from the base bid price.

(C) The use of options other than alternates in bid documents or bid forms subject to section forty-four A shall be prohibited under all circumstances.

(D) Every contract subject to section forty-four A shall include specifications for the installation of weather protection and shall require that the contractor shall install the same and that he shall furnish adequate heat in the area so protected during the months of November through March. Standards for such specifications shall be established by the commissioner or his designee."

Section 44J. Invitations to bid; notice; contents; violations; penalty.

"(1) No public agency or authority of the commonwealth or any political subdivision thereof shall award any contract for which competitive bids are required pursuant to section forty-four A of this chapter or section thirty-nine M of chapter thirty, or for which competitive proposals are required pursuant to subsection (4) of section forty-four E of this chapter or section eleven C of chapter twenty-five A, unless a notice inviting bids or proposals therefor shall have been posted no less than one week prior to the time specified in such notice for the receipt of said bids or proposals in a conspicuous place in or near the offices of the awarding authority, and shall have remained posted until the time so specified, and unless such notice shall also have been published at least once not less than two weeks prior to the time so specified in the central register published by the secretary of state pursuant to section twenty A of chapter nine and in a newspaper of general circulation in the locality of the proposed project, and on the COMMBUYS system administered by the operational services division. Said notice shall also be published at such other times and in such other

newspapers or trade periodicals as the commissioner of capital asset management and maintenance may require, having regard to the locality of the work involved.

(2) Said notice shall specify the time and place where plans and specification of the proposed work may be had; the time and place of submission of general bids; and the time and place for opening of the general bids. For contracts subject to the provisions of section forty-four A to H, inclusive, of this chapter, said notice shall also specify the time and place for submission of filed sub-bids, where required pursuant to section forty-four F; and the time and place for opening of said filed sub-bids.

Said notice shall also provide sufficient facts concerning the nature and scope of such project, the type and elements of construction, and such other information as will assist applicants in deciding to bid on such contract.

(3) No contract or preliminary plans and specifications shall be split or divided for the purpose of evading the provisions of this section.

(4) General bids and filed sub-bids for any contract subject to this section shall be in writing and shall be opened in public at the time and place specified in the posted or published notice, and after being so opened shall be open to public inspection.

(5) The provisions of this section shall not apply to any transaction between the commonwealth and any public service corporation.

(6) The provisions of this section may be waived in cases of extreme emergency involving the health and safety of the people and their property, upon the written approval of said commissioner. The written approval shall contain a description of the circumstances and the reasons for the commissioner's determination.

(7) Whoever violates any provision of this section shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than three years or in a jail or house of correction for not more than two and one-half years, or by both said fine and imprisonment; and in the event of final conviction, said person shall be incapable of holding any office of honor, trust or profit under the commonwealth or under any county, district of municipal agency.

Each and every person who shall cause or conspire to cause any contract or preliminary plans and specifications to be split or divided for the purpose of evading the provisions of this section shall forfeit and pay to the commonwealth, a political subdivision thereof or other awarding authority subject to this section, the sum of not more than five thousand dollars and, in addition, such person or persons shall pay, apportioned among them, double the amount of damages which the commonwealth or political subdivision thereof or other awarding authority may have sustained by reason of the doing of such act, together with the costs of the action.

(8) If an awarding authority rejects all general bids or does not receive any general bids, and advertises for a second opening of general bids with the original filed sub-bids as set forth in subsection (1) of section forty-four E the notice for receipt of such general bids may be published in the central register and elsewhere as required not less than one week prior to the time specified for such second opening of general bids.

(9) No request for proposals or invitation for bids issued under sections 38A ½ to 38O, inclusive, of chapter 7, section 11C of chapter 25A, section 39M of chapter 30, this section and sections 44A to 44H, inclusive, shall be advertised if the awarding authority's cost estimate is greater than 1 year old."

Attention is directed to the following sections of Chapter 30 of the General Laws of Massachusetts as amended to date.

Section 38A. Price adjustment clause in contracts for road, bridge, water and sewer projects awarded under Sec. 39M

"Contracts for road and bridge projects awarded as a result of a proposal or invitation for bids under section 39M shall include a price adjustment clause for each of the following materials: fuel, both diesel and gasoline; asphalt; concrete; and steel. Contracts for water and sewer projects awarded as a result of a proposal or invitation for bids under said section 39M shall include a price adjustment clause for fuel, both diesel and gasoline; liquid asphalt; and portland cement contained in cast-in-place concrete. A base price for each material shall be set by the awarding authority or agency and shall be included in the bid documents at the time the project is advertised. The awarding authority or agency shall also identify in the bid documents the price index to be used for each material. The price adjustment clause shall provide for a contract adjustment to be made on a monthly basis when the monthly cost change exceeds plus or minus 5 per cent."

Section 39F. Construction contracts; assignment and subrogation; subcontractor defined; enforcement of claim for direct payment; deposit; reduction of disputed amounts.

"(1) Every contract awarded pursuant to sections forty-four A to L inclusive, of chapter one hundred and forty-nine shall contain the following subparagraphs (a) through (i) and every contract awarded pursuant to section thirty-nine M of chapter thirty shall contain the following subparagraphs (a) through (h) and in each case those subparagraphs shall be binding between the general contractor and each subcontractor.

(a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(b) Not later than the sixty-fifth-day after each subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the subcontract less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the awarding authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the awarding authority shall take reasonable steps to compel the general contractor to make each such payment to each such subcontractor. If the awarding authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be included in a payment to the general contractor for payment to the subcontractor as provided in subparagraphs (a) and (b), the awarding authority shall act upon the demand as provided in this section.

(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the general contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontractor has substantially completed the subcontract work. Within ten days after the subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the awarding authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general contractor against the subcontractor.

(e) Within fifteen days after receipt of the demand by the awarding authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided, that the awarding authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The awarding authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this subparagraph.

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (e) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor and shall notify the general

contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subparagraph (f) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the general contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a general contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.

(i) If the subcontractor does not receive payment as provided in subparagraph (a) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (a), the subcontractor may demand direct payment by following the procedure in subparagraph (d) and the general contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g), and (h).

(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the awarding authority or which are on deposit pursuant to subparagraph (f) of paragraph (1) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.

(3) "Subcontractor" as used in this section (i) for contracts awarded as provided in sections forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, (ii) for contracts awarded as provided in paragraph (a) of section thirty-nine M of chapter thirty shall mean a person approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, and (iii) for contracts with the commonwealth not awarded as provided in forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.

(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the awarding authority and the general contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any subcontractor with the petition of one or more subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the general contractor are available for direct payment shall have a right to file a petition in court of equity against the awarding authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the awarding authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1).

(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1) any amount held under a trustee writ or pursuant to a restraining order or injunction."

Section 39G. Completion of public works; semi-final and final estimates; payments; extra work; disputed items.

"Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond,

by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one-day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

Within sixty-five days after the effective date of a declaration of substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one percent retainage, if held by the awarding authority, on that work, including the quantity, price and all but one percent retainage, if held by the awarding authority, for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payment filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five-days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven-days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage, if held by the awarding authority, on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date

of payment therefor, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one percent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract."

Section 39I. Deviations from plans and specifications.

"Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No wilful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the

engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating: (1) if such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor; (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the contracting authority.

Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

Whoever violates any provision of this section wilfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both."

Section 39J. Public construction contracts; effect of decisions of contracting body or administrative board.

"Notwithstanding any contrary provision of any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, a decision, by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily is unsupported by substantial evidence, or is based upon error of law."

Section 39K. Public building construction contracts; payments.

"Every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, shall contain the following paragraph: Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the contractor has title or to which a

subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five-days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such a periodic estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.

All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by specifications and a column listing the amount paid to each subcontractor and sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for

herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.

A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.

Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149."

Section 39L. **Public construction work by foreign corporations; restrictions and reports.**

"The commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, request proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other public works (1) shall not enter into a contract for such work with, and shall not approve as a subcontractor furnishing labor and materials for a part of the work, a foreign corporation which has not filed with such awarding authority a certificate of the state secretary stating that the corporation has complied with requirements of section 15.03 of subdivision A of Part 15 of chapter 156D and the date of compliance, and further has filed all annual reports required by section 16.22 of subdivision B of Part 16 of said chapter 156D, and (2) shall report to the state secretary and to the department of corporations and taxation any foreign corporation performing work under such contract or subcontract, and any person, other than a corporation, performing work under such contract or subcontract, and residing or having a principal place of business outside the commonwealth."

Section 39M. **Contracts for construction and materials; manner of awarding.**

"(b) Specifications for such contracts, and specifications for contracts awarded pursuant to the provisions of said sections forty-four A to forty-four L of said chapter one hundred and forty-nine, shall be written to provide for full competition for each item of material to be furnished under the contract; except, however, that said specifications may be otherwise written for sound reasons in the public interest stated in writing in the public records of the awarding authority or promptly given in

writing by the awarding authority to anyone making a written request therefor, in either instance such writing to be prepared after reasonable investigation. Every such contract shall provide that an item equal to that named or described in the said specifications may be furnished; and an item shall be considered equal to the item so named or described if, in the opinion of the awarding authority: (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications.

For each item of material the specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said named or described materials."

For projects estimated to cost more than $10,000, the following provision, section 39M subsection c, applies:

"(c) The term "lowest responsible and eligible bidder" shall mean the bidder: (1) whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work; (2) who shall certify, that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (3) who shall certify that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; (4) who, where the provisions of section 8B of chapter 29 apply, shall have been determined to be qualified thereunder; and (5) who obtains within 10 days of the notification of contract award the security by bond required under section 29 of chapter 149; provided that for the purposes of this section the term "security by bond" shall mean the bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority; provided further, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable."

Section 39N. Construction contracts; equitable adjustment in contract price for differing subsurface or latent physical conditions.

"Every contract subject to section forty-four A of chapter one hundred and forty-nine or subject to section thirty-nine M of chapter thirty shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of such claims:

If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or

upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."

Section 39O. Contracts for construction and materials; suspension, delay or interruption due to order of awarding authority; adjustment in contract price; written claim.

"Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim."

Section 39P. Contracts for construction and materials; awarding authority's decisions on interpretation of specifications, etc.; time limit; notice.

"Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires

extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made."

Section 39Q. Contracts for capital facility construction; contents; annual claims report.

"(1) Every contract awarded by any state agency as defined by section thirty-nine A of chapter seven for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section thirty-nine A shall contain the following subparagraphs (a) through (d) in their entirety:

(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefor, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his designee shall be final and conclusive unless an appeal is taken as provided below.

(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has

been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive, and shall not be set aside except in cases of fraud.

(2) The commissioner of administration shall require the division of hearings officers to prepare annually a report concerning the construction contract claims submitted to the division during the preceding twelve months, in such form as the commissioner shall prescribe. The report shall contain, at a minimum, the following information: the number of claims submitted; the names of all parties to each such claim; a brief description of the claim: the date of submission and of disposition of the claim; its disposition, whether by settlement, withdrawal, default or written decision; and the number of claims currently pending. The original of the report shall be submitted to the commissioner of administration by January fifteenth, and a copy shall be filed with the state librarian and shall be a public document."

Section 39R. Keeping and maintaining of books, records and accounts; statement of management on internal accounting control; financial statements; enforcement.

"(a) The words defined herein shall have the meaning stated below whenever they appear in this section:

(1) "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.

(2) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.

(3) "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(4) "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

(5) "Audit," when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a *certified* opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(6) "Accountant's Report," when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(7) "Management," when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and

(3) if the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed

with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and

(4) if the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) if the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization;

(2) transactions are recorded as necessary:

i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. to maintain accountability for assets;

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to:

(1) whether the representations of management in response to this paragraph, and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the

date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner for capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b)."

Section 39S. Contracts for construction; requirements.

"(a) As used in this section the word "person" shall mean any natural person, joint venture, partnership corporation or other business or legal entity. Any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, alteration, remodeling or repair of any public work by the commonwealth, or political subdivision thereof, or by any county, city, town, district, or housing authority, and estimated by the awarding authority to cost more than $10,000, and any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency, estimated to cost more than $10,000, shall certify on the bid, or contract, under penalties of perjury, as follows:

(1) That he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and (3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration.

(b) Any employee found on a worksite subject to this section without documentation of successful completion of a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration shall be subject to immediate removal.

(c) The attorney general, or his designee, shall have the power to enforce this section including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts in all cases where, after investigation of the facts, he has made a finding that the award or performance has resulted in violation, directly or indirectly, of subsection

(b), and he shall not be required to pay to the clerk of the court an entry fee in connection with the institution of the proceeding."

Section 40. Discharge or release of bonds.

"Bonds given to the commonwealth, any county, city, town or political subdivision to secure the performance of contracts for the construction or repair of public buildings or other public works may be discharged or released by the awarding authority, upon such terms as it deems expedient, after the expiration of one year from the time of completion, subject to section thirty-nine K, of the work contracted to be done; provided that no claim filed under said bond is pending, and provided further, that no such bonds shall be discharged or released prior to the expiration of all special guarantees provided for in the contract unless new bonds in substitution therefor specifically relating to the unexpired guarantees shall be taken."

Attention is directed to the following sections of Chapter 82 (the Laying Out, Alteration, Relocation and Discontinuance of Public Ways, and Specific Repairs Thereon) of the General Laws of Massachusetts as amended to date.

Section 40. Definitions.

"The following words, as used in this section and sections 40A to 40E, inclusive, shall have the following meanings:

"**Company**", natural gas pipeline company, petroleum or petroleum products pipeline company, public utility company, cable television company, and municipal utility company or department that supply gas, electricity, telephone, communication or cable television services or private water companies within the city or town where such excavation is to be made.

"**Description of excavation location**", such description shall include the name of the city or town, street, way, or route number where appropriate, the name of the streets at the nearest intersection to the excavation, the number of the buildings closest to the excavation or any other description, including landmarks, utility pole numbers or other information which will accurately define the location of the excavation.

"**Emergency**", a condition in which the safety of the public is in imminent danger, such as a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.

"**Excavation**", an operation for the purpose of movement or removal of earth, rock or the materials in the ground including, but not limited to, digging, blasting, augering, backfilling, test boring, drilling, pile driving, grading, plowing in, hammering, pulling in, jacking in, trenching, tunneling and demolition of structures, excluding excavation by tools manipulated only by human power for gardening purposes and use of blasting for quarrying purposes.

"**Excavato**r", any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company or state or local government body which performs excavation operations.

"**Premark**", to delineate the general scope of the excavation or boring on the paved surface of the ground using white paint, or stakes or other suitable white markings on nonpaved surfaces. No premarking shall be acceptable if such marks can reasonably interfere with traffic or pedestrian control or are misleading to the general public. Premarking shall not be required of any continuous excavation that is over 500 feet in length.

"**Safety zone**", a zone designated on the surface by the use of standard color-coded markings which contains the width of the facilities plus not more than 18 inches on each side.

"**Standard color-coded markings**", red - electric power lines, cables, conduit or light cables; yellow - gas, oil, street petroleum, or other gaseous materials; orange - communications cables or conduit, alarm or signal lines; blue - water, irrigation and slurry lines; green - sewer and drain lines; white - premark of proposed excavation.

"**System**", the underground plant damage prevention system as defined in section 76D of chapter 164."

Section 40A. Excavations; notice.

"No excavator installing a new facility or an addition to an existing facility or the relay or repair of an existing facility shall, except in an emergency, make an excavation, in any public or private way, any company right-of-way or easement or any public or privately owned land or way, unless at least 72 hours, exclusive of Saturdays, Sundays and legal holidays but not more than 30 days before the proposed excavation is to be made, such excavator has premarked not more than 500 feet of the proposed excavation and given an initial notice to the system. Such initial notice shall set forth a description of the excavation location in the manner as herein defined. In addition, such initial notice shall indicate whether any such excavation will involve blasting and, if so, the date and the location at which such blasting is to occur.

The notice requirements shall be waived in an emergency as defined herein; provided, however, that before such excavation begins or during a life-threatening emergency, notification shall be given to the system and the initial point of boring or excavation shall be premarked. The excavator shall ensure that the underground facilities of the utilities in the area of such excavation shall not be damaged or jeopardized.

In no event shall any excavation by blasting take place unless notice thereof, either in the initial notice or a subsequent notice accurately specifying the date and location of such blasting shall have been given and received at least 72 hours in advance, except in the case of an unanticipated obstruction requiring blasting when such notice shall be not less than four hours prior to such blasting. If any such notice cannot be given as aforesaid because of an emergency requiring blasting, it shall be given as soon as may be practicable but before any explosives are discharged."

Section 40B. Designation of location of underground facilities.

"Within 72 hours, exclusive of Saturdays, Sundays and legal holidays, from the time the initial notice is received by the system or at such time as the company and the excavator agree, such company shall respond to the initial notice or subsequent notice by designating the location of the

underground facilities within 15 feet in any direction of the premarking so that the existing facilities are to be found within a safety zone. Such safety zone shall be so designated by the use of standard color-coded markings. The providing of such designation by the company shall constitute prima facie evidence of an exercise of reasonable precaution by the company as required by this section; provided, however, that in the event that the excavator has given notice as aforesaid at a location at which because of the length of excavation the company cannot reasonably designate the entire location of its facilities within such 72 hour period, then such excavator shall identify for the company that portion of the excavation which is to be first made and the company shall designate the location of its facilities in such portion within 72 hours and shall designate the location of its facilities in the remaining portion of the location within a reasonable time thereafter. When an emergency notification has been given to the system, the company shall make every attempt to designate its facilities as promptly as possible."

Section 40C. Excavator's responsibility to maintain designation markings; damage caused by excavator.

"After a company has designated the location of its facilities at the location in accordance with section 40B, the excavator shall be responsible for maintaining the designation markings at such locations, unless such excavator requests remarking at the location due to the obliteration, destruction or other removal of such markings. The company shall then remark such location within 24 hours following receipt of such request.

When excavating in close proximity to the underground facilities of any company when such facilities are to be exposed, non-mechanical means shall be employed, as necessary, to avoid damage in locating such facility and any further excavation shall be performed employing reasonable precautions to avoid damage to any underground facilities including, but not limited to, any substantial weakening of structural or lateral support of such facilities, penetration or destruction of any pipe, main, wire or conduit or the protective coating thereof, or damage to any pipe, main, wire or conduit.

If any damage to such pipe, main, wire or conduit or its protective coating occurs, the company shall be notified immediately by the excavator responsible for causing such damage.

The making of an excavation without providing the notice required by section 40A with respect to any proposed excavation which results in any damage to a pipe, main, wire or conduit, or its protective coating, shall be prima facie evidence in any legal or administrative proceeding that such damage was caused by the negligence of such person."

Section 40D. Local laws requiring excavation permits; public ways.

"Nothing in this section shall affect or impair local ordinances or by-laws requiring a permit to be obtained before excavation in a public way or on private property; but notwithstanding any general or special law, ordinance or by-law to the contrary, to the extent that any permit issued under the provisions of the state building code or state fire code requires excavation by an excavator on a public way or on private property, the permit shall not be valid unless the excavator notifies the system as required pursuant to sections 40 and 40A, before the commencement of the excavation, and has complied with the permitting requirements of chapter 82A."

Section 40E. Violations of Secs. 40A to 40E; punishment.

"Any person or company found by the department of telecommunications and energy, after a hearing, to have violated any provision of sections 40A to 40E, inclusive, shall be fined $1000 for the first offense and not less than $5,000 nor more than $10,000 for any subsequent offense within 12 consecutive months as set forth by the rules of said department; provided, however, that nothing herein shall be construed to require forfeiture of any penal sum by a state or local government body for violation of section 40A or 40C; and provided, further, that nothing herein shall be construed to require the forfeiture of any penal sum by a residential property owner for the failure to premark for an excavation on such person's residential property."

Attention is directed to the following sections of Chapter 30 (An Act Mobilizing Economic Recovery in the Commonwealth) of the Acts of 2009.

Section 33.

"(a) Notwithstanding any general or special law to the contrary, the following requirements shall apply to any public works project funded by the American Recovery and Reinvestment Act of 2009 where the amount of construction costs under any contract awarded is likely to exceed $1,000,000. For the purposes of this section, "public works" shall mean building or work the construction of which is carried on by authority of the commonwealth, or by a county, town, authority or district, or with funds of a federal agency or the commonwealth or a county, city, town, authority or district to serve the interest of the general public, regardless of whether title thereof is in the commonwealth or in a county, city, town, authority or district; provided, however, that for the purposes of this definition, "construction" shall have the meaning provided in section 27D of chapter 149 of the General Laws.

(b) For any public works project subject to subsection (a), the specifications set forth in any request for responses shall include a requirement that, on a per project basis, not less than 20 per cent of the total hours of employees receiving an hourly wage who are directly employed on the site of the project, employed by the contractor or a subcontractor and subject to the prevailing wage, shall be performed by apprentices in bona fide apprentice training programs as provided in sections 11H and 11I of chapter 23 of the General Laws which are approved by the division of apprentice training in the executive office of labor and workforce development.

(c) During the performance of a public works project subject to subsections (a) and (b), the contractor shall submit periodic reports to the awarding authority with records indicating the total hours worked by all journeymen and apprentices in positions subject to the apprentice requirement. In any instance in which the apprentice hours do not constitute 5 per cent of the total hours of employees subject to the apprentice requirement, the contractor shall submit a plan to the awarding authority describing how the contractor shall comply with the apprentice requirement.

(d) The attorney general shall have all the necessary powers to require compliance with the requirements of subsections (a), (b) and (c) therewith, including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts. Prior to award of the contract, an awarding authority may petition the attorney general for approval

to adjust the requirements set forth in said subsections (a), (b) and (c). The attorney general may adjust these requirements only if he determines that compliance with these requirements is not feasible or if application of the requirements would be preempted by federal law.

(e) An awarding authority serving a low-income population may require additional specifications that address the needs of its clients including, but not limited to, preferential hiring for residents of public housing authorities for available apprenticeship positions.

(f) Subject to appropriation, the division of apprentice training shall enhance its outreach efforts to underserved populations in order to increase and diversify the number of apprentices in the commonwealth."

Section 39.

"Any entity located in the commonwealth that receives federal funds through the American Recovery and Reinvestment Act of 2009 shall provide information as directed by the secretary of administration and finance regarding the use of the funds. The required information shall include, but not be limited to, the reporting information required by the federal government and any other information deemed necessary by the secretary to administer the American Recovery and Reinvestment Act of 2009 responsibly, efficiently and transparently. To the extent possible, the secretary shall work to streamline the reporting of this information, minimize duplication of data entry by recipients and ensure data consistency. The secretary may issue regulations to effectuate this reporting requirement."

Section 40.

"Employers and hiring agents on all projects funded in whole or in part by the American Recovery and Reinvestment Act of 2009 shall post notices of available employment opportunities to the commonwealth's job bank or the one-stop career centers closest to where the projects shall be located. The postings shall contain such information as directed by the secretary of labor and workforce development. The secretary may issue regulations to effectuate this job posting requirement."

END OF SECTION

SECTION 01 11 00

CONTROL OF WORK AND MATERIALS

PART 1 – GENERAL

Not Used.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 HAULING, HANDLING AND STORAGE OF MATERIALS:

A. The Contractor shall, at its own expense, handle and haul all materials furnished by it and shall remove any of its surplus materials at the completion of the work.

B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by it that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.

C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

D. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

3.02 EASEMENTS:

A. As indicated on the drawings, the work is located in easements obtained by the Owner. The Contractor has no rights outside of the easements unless they are obtained from the property owner.

B. Contractor shall schedule work so that it will cause minimum inconvenience and nuisance to abutting property owners, over the shortest possible time.

C. Easements shall be kept clean; no rubbish or discarded construction materials shall be allowed to accumulate. Storage of excess construction materials, including soil, ledge, equipment, or machinery on easements will not be allowed.

D. Restoration of fences, shrubs, trees and grass shall be completed promptly following completion of the work in an easement, to minimize disruption and inconvenience to property owners.

3.03 OPEN EXCAVATIONS:

A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at its own expense, provide suitable and safe means for completely covering all open excavations and for accommodating travel when work is not in progress.

B. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Owner's Representative.

C. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, then special construction procedures shall be taken, such as limiting the length of trench and prohibiting stocking excavated material in the street.

D. All street excavations shall be completely closed at the end of each work day. Backfilling or use of steel plates of adequate strength to carry traffic shall be used.

3.04 MAINTENANCE OF TRAFFIC:

A. Unless permission to close the street is received in writing from the proper authority, all excavated materials and equipment shall be placed so that vehicular and pedestrian traffic may be safely maintained at all times.

B. Should the Chief of Police deem it necessary, uniformed officers will be assigned to direct traffic. The Contractor shall make all arrangements in obtaining uniformed officers required.

C. The Contractor shall at its own expense, as directed by the Police Traffic Control/Safety Officer, provide and erect acceptable barricades, barrier fences, traffic signs, and all other traffic devices not specifically covered in a bid item, to protect the work from traffic, pedestrians, and animals. The Contractor shall provide sufficient temporary lighting such as lanterns/flashers (electric battery operated) or other approved illuminated traffic signs and devices to afford adequate protection to the traveling public, at no additional cost to the Owner. See Section 01 56 00 CONSTRUCTION ZONE SAFETY PLAN.

D. The Contractor shall furnish all construction signs that are deemed necessary by and in accordance with Part VI of the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation. In addition, the Contractor may be required to furnish up to 128 square feet of additional special construction warning

signs. Size and exact wording of signs shall be determined by the Owner's Representative during construction.

E. The intent of policing is to ensure public safety by direction of traffic. Police officers are not to serve as watchmen to protect the Contractor's equipment and materials.

F. Nothing contained herein shall be construed as relieving the Contractor of any of its responsibilities for protection of persons and property under the terms of the Contract.

3.05 CARE AND PROTECTION OF PROPERTY:

The Contractor shall be responsible for the preservation of all public and private property and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at its expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Owner's Representative.

3.06 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

A. All existing structures, utilities, pipes, poles, wires fences, curbings, property line markers and other structures which the Owner's Representative decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the contractor. Should such property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.

B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to structures shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.

C. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped so as to cut or otherwise damage such surfaces.

D. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun. Suitable materials and methods shall be used for such restoration.

E. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

3.07 MAINTENANCE OF FLOW:

A. The Contractor shall at its own cost, provide for the flow of sewers and drains interrupted during the progress of the work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Owner's Representative well in advance of the interruption of any flow.

B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the aforesaid drainage facilities, it shall repair the same within the same day.

C. At the conclusion of the work, the Contractor shall remove all silt in drainage structures caused by its operations as described in Section 01 74 13, CLEANING UP.

3.08 REJECTED MATERIALS AND DEFECTIVE WORK:

A. Materials furnished by the Contractor and condemned by the Owner's Representative as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work.

B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Owner's Representative.

C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or his employees, as determined by the Owner's Representative, occurring previous to the final payment.

3.09 SANITARY REGULATIONS:

Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within, on or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Owner's Representative. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

3.10 SAFETY AND HEALTH REGULATIONS:

This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et. seq.)." The Contractor shall be familiar with the requirements of these regulations.

3.11 SITE INVESTIGATION:

The Contractor acknowledges that it has satisfied itself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint itself with available information will not relieve it from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

3.12 HANGERS, PADS, AND SUPPORTS:

A. Unless otherwise indicated, hangers and supports shall be by the trade providing the supported item.

B. Except where detailed or specified, design of hangers and supports shall be the responsibility of the Contractor. All parts of such hangers or supports shall be designed in accordance with accepted engineering practice, using a factor of safety of at least 2½.

C. When proprietary hangers, etc., are supplied, satisfactory evidence of the strength of such items shall be furnished.

D. Hangers for items hung from steel and concrete shall be centered on the vertical center of gravity of the beam.

E. Locations and sizes of openings, sleeves, concrete pads, steel frames, and other equipment supports are indicated on the drawings for bidding purposes only. Final sizes and locations of such items shall be obtained from the shop drawings.

3.13 SLEEVES, HOLES, HANGERS, INSERTS, ETC.:

A. Except where holes and openings are dimensioned, and hangers, inserts, and supports are fully called for on the architectural drawings (or reference is made thereon to drawings containing such information) to accommodate electrical items, they shall be by the electrical trade concerned.

B. Sleeves, inserts, anchors, etc., supplied under the mechanical and electrical contracts in sufficient time to so permit, shall be set in concrete, masonry, etc., or fastened to steel deck, etc., by the respective architectural or structural trade. Where not supplied in sufficient time, installation of such items shall be the responsibility of the mechanical or electrical trade involved.

C. Nothing shall be suspended from roof decks and no fastenings made to it, except with the prior permission of the Owner's Representative. Request for permission shall be accompanied by full details of the hanger or fastener, including the weight of the item to be suspended.

D. Nailers and other wood members attached to steel or masonry, for which fasteners are not indicated on the design drawings or in the specification, shall be fastened with the equivalent of ½-inch diameter bolts at 3 feet o.c.

E. Openings for electrical items in finished areas of the Bandshell shall be closed off with near escutcheon plates or similar closures. These closures shall be by the mechanical or electrical trade involved.

3.15 WEATHER PROTECTION:

In conformance with Sections 44F and 44G of Chapter 149 of the General Laws of Massachusetts, the General Contractor shall install weather protection and shall furnish adequate heat in the area so protected during the months of November through March. Standards for such specifications shall be established by the Director of Building Construction in the Executive Office for Administration and Finance.

3.16 ELECTRIC SERVICE:

A. The Contractor shall make all necessary applications and arrangements and pay for all fees and charges for electrical energy for power and light necessary for the proper completion of this contract during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.

B. There shall be sufficient electric lighting so that all work may be done in a workmanlike manner where there is not sufficient daylight.

END OF SECTION

SECTION 01 12 16

SCOPE AND SEQUENCE OF WORK

PART 1 – GENERAL

1.01 WORK INCLUDED:

A. Improvements to Bayview Park at 186 Onset Avenue, Highland Avenue Sidewalk Improvements on Highland Avenue from Onset Avenue to 11th Street, and Improvements to the Lillian Gregerman Bandshell at 4 Union Avenue in Wareham, Massachusetts. The improvements contained within these Construction Documents include the following per site:

1. Improvements to Bayview Park
The scope of improvements for Improvements to Bayview Park include, but is not limited to, the following:

- Accessible walkways
- ADA-compliant ramps and stairs with handrails
- Widening of the sidewalk on Onset Avenue
- Metal guardrail and fencing modification and repair
- Relocation of existing benches and monuments
- Protection and pruning of existing trees for health and reinvigoration
- New tree plantings
- Removal of existing guardrail and replacement of new steel post and picket guardrail on existing retaining wall along Onset Avenue
- Modifying existing perimeter fence and gate along the memorial boulder
- Stormwater management and drainage
- Relocation of the flagpole and uplighting
- Removal of the wooden pole and streetlight and replacement with a pedestrian light pole (requires coordination with the utility company)
- New plantings for slope stabilization bioretention, and bank restoration. Rain gardens will be outfitted with area drains and piping for proper drainage.
- Other elements and work as required by the contract documents.

2. Highland Avenue Sidewalk Improvements, from Onset Avenue to 10th Street:
The scope of improvements for Highland Avenue Sidewalk Improvements includes, but is not limited to, the following:

- Replacement of concrete sidewalk and concrete driveway aprons
- Protection of existing trees
- Bituminous and gravel driveway repair
- Resetting of pavers and granite curbing
- Site feature protection

- Pavement marking installation
- Signage installation
- Loaming & seeding of disturbed areas
- Other elements and work as required by the contract documents.

The scope of improvements for **Add Alternate #1, on Highland Avenue from 10th Street to 11th Street,** include, but is not limited to, the following:

- Replacement of concrete sidewalk and concrete driveway aprons
- Bituminous and gravel driveway repair
- Removal of existing paver sidewalk
- Resetting of pavers and granite curbing
- Site feature protection
- Loaming & seeding of disturbed areas
- Other elements and work as required by the contract documents.

The scope of improvements for **Add Alternate #2 – Improvements to the Lillian Gregerman Bandshell** include, but is not limited to, the following:

- New cast-in-place concrete walkways
- Removal and replacement of bench seating, including accessible seating locations
- New ramp and handrail
- Removal, regrading and reinstallation of unit paver plaza
- New lighting bollards
- Protection of existing trees to remain
- Landscape restoration and other elements and work as required by the contract drawings

1.02 RELATED WORK:

A. SECTION 01 11 00 – CONTROL OF WORK AND MATERIALS

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 GENERAL:

A. The Contractor shall be responsible for scheduling its activities and the activities of any subcontractors involved, to meet the completion date, or milestones, established for the contract. Scheduling of the work shall be coordinated with the Owner and Owner's Representative.

B. The Construction Sequence Requirements shall be used by the Contractor to form a complete schedule for the project, which shall be coordinated with the Owner and Owner's Representative. Prior to performing any work at the site, the Contractor

shall submit a detailed plan to the Owner's Representative for review. The plan shall describe the proposed sequence, methods, and timing of the work.

END OF SECTION

SECTION 01 14 00

SPECIAL PROVISIONS

PART 1 - GENERAL

Not used

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.01 WATER FOR CONSTRUCTION PURPOSES:

A. In locations where water is in sufficient supply, the Contractor may be allowed to use water without charge for jetting backfill and other construction purposes. The express approval of the Owner shall be obtained before water is used. Waste of water by the Contractor shall be sufficient cause for withdrawing the privilege of unrestricted use.

B. If no water is available, the Contractor shall supply water at no additional cost to the Owner.

3.02 PIPE LOCATION:

Pipe shall be located substantially as indicated on drawings. The Owner reserves the right, acting through the Owner's Representative, to make such modifications as may be deemed desirable to avoid interference with existing structures or for other reasons.

3.03 DIMENSIONS OF EXISTING STRUCTURES:

Where the dimensions and locations of existing structures are of critical importance in the installation or connections of new work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment that is dependent on the correctness of such information.

3.04 OCCUPYING PRIVATE PROPERTY:

The Contractor shall not enter upon nor occupy with men, equipment or materials any property outside of the Owner's easements, except with the written consent of the property owner or property owner's agent.

3.05 EXISTING UTILITY LOCATIONS – CONTRACTOR'S RESPONSIBILITY:

A. The location of existing underground services and utilities shown on the drawings is based on available records. It is not warranted that all existing utilities and services are

shown, or that shown locations are correct. The Contractor shall be responsible for having the utility companies locate their respective utilities on the ground prior to excavating.

B. To satisfy the requirements of **Massachusetts law, Chapter 82, Section 40**, the Contractor shall, at least 72 hours, exclusive of Saturdays, Sundays and holidays, prior to excavation in the proximity of telephone, gas, cable television and electric utilities, notify the utilities concerned by calling "DIG SAFE" at telephone number: 1-888-344-7233.

C. The Contractor shall coordinate all work involving utilities and shall satisfy itself as to the existing conditions of the areas in which it is to perform his work. It shall conduct and arrange its work so as not to impede or interfere with the work of other contractors working in the same or adjacent areas.

3.06 COORDINATION OF WORK:

The General Contractor shall be responsible for coordinating its own work as well as that of any subcontractors. It shall be responsible for notification of the Owner's Representative when each phase of work is expected to begin and the approximate completion date.

3.07 TIME FOR COMPLETION OF CONTRACT:

The time for completion of this contract is stipulated in the Form of/for General Bid. The Bidder shall base his bid on completing the proposed work by the completion date stipulated in the FORM FOR GENERAL BID.

3.08 MAINTENANCE OF TRENCH SURFACE:

After backfilling and compacting trenches, the Contractor shall be responsible for keeping the ground surface dry and passable at all times until the surface has been restored to its finished condition.

3.09 DESIGN OF MATERIALS / FURNISHINGS:

Attention is directed to the fact that the layout of certain materials and site furnishings is based on that of one manufacturer. If other items are submitted for approval, the Contractor shall prepare and submit for approval at its expense, detailed structural or other drawings, equipment lists, maintenance requirements, and any other data required by the Owner's Representative, showing all necessary changes and embodying all special features of the equipment he proposes to furnish. Such changes, if approved, shall be made at the expense of the Contractor.

3.10 SERVICES OF MANUFACTURER'S REPRESENTATIVE:

A. The Contractor shall arrange for a qualified service representative, at a time suitable to the Owner's Representative, from the company manufacturing or supplying certain equipment as indicated on the detailed specifications, to perform the duties described herein.

B. After installation of the listed materials and items have been completed and the equipment is presumably ready for operation, but before others operate it the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include, but shall not be limited to, the following points as applicable:

1. Soundness (without cracks or otherwise damaged parts); completeness in all details, as specified; correctness in setting, alignment, and relative arrangement of various parts; adequacy and correctness of packing, sealing and lubricants.

2. The operation, testing, and adjustment shall be as required to prove that the materials are left in proper condition for satisfactory operation under the conditions specified.

3. On completion of its work, the Contractor shall submit in triplicate to the Owner's Representative the manufacturer's or supplier representative's complete signed report of the results of its inspection, operation, adjustments, and test. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report shall also include a certificate that the equipment conforms to the requirements of the contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.

4. After the Owner's Representative has reviewed the reports from the manufacturer's representative, the Contractor shall make arrangements to have the manufacturer's representative present when the field acceptance tests are made.

3.11 WETLANDS PROTECTION SIGN:

A sign not less than two square feet in size shall be displayed at the site. The sign shall bear the words "Massachusetts Department of Environmental Protection, Wetland Division, File Number SE 076-2782."

3.12 PROJECT SIGN:

A. Artwork for a project sign shall be provided by the Owner or Owner's Representative at contract award. The sign shall be erected within ten (10) days after the construction

contract is awarded. The sign shall be sized 8 feet by 4 feet, white 18oz exterior grade vinyl with finished edges. Metal grommets shall be included in each corner. A shop drawing indicating the materials and artwork proof shall be provided to the Owner's Representative for review and approval prior to fabrication. The sign shall be fabricated, erected, and maintained by the Contractor.

B. The Contractor shall provide adequate support for the sign as determined by the Owner's Representative. All supports, trim, and back of sign shall be painted with at least two coats of exterior paint.

C. The project sign shall be maintained by the Contractor in good condition at all times for the duration of construction. The Contractor shall remove the sign upon completion of construction.

3.13 COMPLIANCE WITH PERMITS:

A. The Contractor shall perform all work in conformance with requirements of the Permits, which appear in Section 00 31 43 – PERMITS.

3.14 CUTTING, FITTING AND PATCHING:

A. The Contractor shall do all cutting, fitting, or patching of its work that may be required to make its several parts come together properly and fit it to receive or be received by work of other Contractors, as shown upon or reasonably implied by the drawings and the specifications for the completed structure, including all existing work.

B. The Contractor shall not endanger any work by cutting, digging, or otherwise and shall not cut or alter the work of any other Contractor, save with the consent of the Owner's Representative.

C. All holes or openings required to be made in new or existing work, particularly at pipe, conduit, or other penetrations not covered by escutcheons or plates shall be neatly patched. All such holes shall be made completely watertight as approved by the Owner's Representative.

D. Size and locations of holes required in steel, concrete, or other structural or finish materials for piping, wiring, ducts, etc., which have not been located and detailed on the drawings shall be approved by the Owner's Representative prior to layout and cutting thereof. All holes shall be suitably reinforced as required by the Owner's Representative.

E. Workmanship and materials of patching and repair work shall match the adjacent similar work and shall conform to the applicable sections of the specification. Patches and joints with existing work shall provide, as applicable in each case, visual, structural, and waterproofing continuity.

3.15 CONNECTIONS TO EXISTING WATER SYSTEMS:

A. The Owner will, upon **72-hour** notice from the Contractor, assist the Contractor by locating and opening or closing any and all valves required for draining or admitting water to the various sections of the water main as required to perform the proposed work. No damages shall be claimed by the Contractor for delays in dewatering pipelines nor shall any damages be claimed because of water leaking through closed valves after dewatering is completed.

B. Connections to the existing distribution system shall be made with the mains under pressure unless the lines can be temporarily taken out of service as approved by the Owner.

C. The Contractor will be required to make test excavations to ascertain that the proposed position of the connections will be clear of joints, fittings, or other obstructions.

D. If any failure occurs in connection to existing mains, service shall be restored in the shortest possible time, the Contractor working around the clock, if necessary. The Contractor shall cooperate with the Owner in notifying the consumers or supplying emergency water. If required by Owner, the Contractor shall make connections to water mains during night hours, on Sunday or at other times of off-peak demand for water.

3.16 PROTECTION OF AQUIFER:

The Contractor's attention is directed to the fact that the construction area is located within the watershed of the existing water supply. The Contractor shall take extra precautions to ensure that no pollutants enter the groundwater table from the construction area. The Contractor shall not store fuels or other hazardous materials or potential contaminants on the construction site. In the event of a spill, the Contractor shall immediately notify the Owner's Representative.

3.17 CONTRACTOR'S REPRESENTATIVE:

The Contractor shall designate a representative who will be available to respond to emergency calls by the Owner at any time day and night and on weekends and holidays should such a situation arise.

3.18 HOURS OF CONSTRUCTION ACTIVITY:

A. The Contractor shall conduct all construction activity between 7:00 a.m. and 5:00 p.m., Monday through Friday. No construction work shall be allowed on Saturdays, Sundays or Holidays without written authorization from the Owner.

B. The Owner will provide personnel for assistance in locating and operating valves at no cost to the Contractor during the Owner's normal working hours (Monday through Friday 7:00 a.m. to 3:00 p.m.). When this assistance is required by the Contractor

outside of the Owner's normal working hours the cost will be incurred by the Contractor at the prevailing overtime rate of pay for the personnel providing the assistance. The Owner will bill the Contractor directly.

3.19 CONSTRUCTION CREWS:

The Contractor shall not increase the number of construction crews assigned to the work without providing one-week advance notice to the Owner's Representative.

3.20 MASSACHUSETTS DATA SECURITY REGULATIONS:

The Contractor is required to comply with data security regulations contained in 201 CMR 17.00 that have been established to safeguard personal information of Massachusetts residents contained in paper or electronic records. The Contractor shall not submit to the Owner's Representative or Owner documents in paper or electronic form that contain personal information (person's name combined with one or more of the following – Social Security Number, driver's license number or state-issued identification card number, financial institution account number, or credit or debit card number). Any document submitted to the Owner's Representative that violates this provision shall be returned to the Contractor and the Contractor shall remove personal information from the document prior to resubmitting it to the Owner's Representative. The Contractor shall require each Subcontractor to also comply with the MA data security regulations insofar as they involve submittal of personal information to the Owner's Representative and Owner.

END OF SECTION

SECTION 01 14 19.16

DUST CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION:

This section of the specification covers the control of dust via calcium chloride and water, complete.

PART 2 - PRODUCTS

2.01 CALCIUM CHLORIDE:

A. Calcium chloride shall conform to the requirements of AASHTO-M 144, Type I or Type II and Specification for Calcium Chloride, ASTM D98. The calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.

B. Calcium chloride failing to meet the requirements of the aforementioned specifications or that which has become caked or sticky in shipment, may be rejected by the Owner's Representative.

2.02 WATER:

A. Water shall not be brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

PART 3 - EXECUTION

3.01 APPLICATION:

A. Calcium chloride shall be applied when ordered by the Owner's Representative and only in areas which will not be adversely affected by the application. See Section 01 57 19, ENVIRONMENTAL PROTECTION.

B. Calcium chloride shall be uniformly applied at the rate of 1-1/2 pounds per square yard or at any other rate as required by the Owner's Representative. Application shall be by means of a mechanical spreader, or other approved methods. The number and frequency of applications shall be determined by the Owner's Representative.

C. Water may be sprinkler applied with equipment including a tank with gauge-equipped pressure pump and a nozzle-equipped spray bar.

D. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

END OF SECTION

SECTION 01 31 19.23

CONSTRUCTION MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. This Section specifies requirements for project meetings including but not limited to Pre-Construction Conference and Progress Meetings.

B. It shall be the responsibility of the Contractor to coordinate work between all subcontractors, sections, and trades required for the proper completion of the Work.

1.02 PRE-CONSTRUCTION CONFERENCE:

A. After the bids have been opened but prior to the start of the construction there will be a pre-construction conference to discuss the phasing and scheduling of the Project. The specific time and place of the conference shall be arranged by the Owner's Representative after the Contract has been awarded.

B. This pre-construction conference is intended to establish lines of communication between the parties involved, review responsibilities and personnel assignments, establish project schedules, discuss proposed performance methods, and coordinate Work to be performed by subcontractors.

C. Authorized representatives of the Owner, Owner's Representative and their consultants, the Contractor, its Superintendent and Site Foreman, and all others invited by the Contractor, shall attend the pre-construction conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

D. Discuss items of significance at the pre-construction conference that could affect progress including at least the following:

1. Tentative construction schedule
2. Critical Work sequencing
3. Designation of responsible personnel
4. Procedures for processing field decisions and Change Orders
5. Procedures for processing Applications for Payment
6. Review of Davis Bacon and other federal requirements
7. Distribution of Contract Documents

8. Submittal of Shop Drawings, Product Data and Samples
9. Preparation of record documents
10. Use of the premises
11. Office, work and storage, and laydown areas
12. Equipment deliveries
13. Construction safety procedures
14. Environmental health and safety procedures
15. First aid
16. Security
17. Housekeeping
18. Working hours
19. Traffic Control
20. Emergency Vehicle Access to and around work site
21. Environmental protection measures for construction site

1.03 PROGRESS MEETINGS:

A. During the course of the Project, the Contractor shall attend weekly progress meetings as scheduled by the Owner. The Owner, based on work progress and activities, may adjust the progress meetings to biweekly or other. The attendance of subcontractors may be required during the progress of the Work. The Contractor's delegate to the meeting shall be prepared and authorized to discuss the following items:

1. Progress of Work/Critical Work Sequencing in relation to Contract Schedule.
2. Proposed Work activities for forthcoming period.
3. Resources committed to Contract.
4. Coordination of Work with others.
5. Status of procurement of equipment and materials.
6. Status of Submittals.
7. Outstanding actions, decisions, or approvals that affect Work activities.
8. Site access and/or security issues
9. Hazards and risks
10. Housekeeping
11. Quality issues
12. Potential Claims
13. Change Orders
14. Costs, budget, and payment requests

B. The Contractor shall revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized and the revised schedule shall be submitted to the Owner’s Representative and Owner.

PART 2 - PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 01 32 16

CONSTRUCTION SCHEDULING

PART 1- GENERAL

1.01 PROGRAM DESCRIPTION:

A. A Critical Path Method (CPM) construction schedule shall be used to control the work of this Contract and to provide a definitive basis for determining job progress. The Contractor shall prepare the construction schedule. All work shall be done in accordance with the established CPM schedule and the Contractor and his subcontractors shall be responsible for cooperating fully with the Owner's Representative and the Owner in effectively utilizing the CPM schedule.

B. The CPM schedule to be prepared and submitted by the Contractor shall consist of a CPM network (diagram of activities) and a computer-generated schedule (print-out) as specified herein. The format shall be the activity-on-node precedence network.

C. The Contractor shall develop his own outline of the work and prepare his proposed CPM schedule. The computer-based schedule shall be the product of a recognized commercial computer software producer and shall meet all of the requirements defined herein.

1.02 QUALIFICATIONS:

A. The Contractor shall have the capability of preparing and utilizing the specified CPM scheduling technique. A statement of CPM capability shall be submitted by the Contractor in writing to the Owner's Representative within 10 days after the issuance of the Notice to Proceed to verify that either the Contractor's organization has in-house capability qualified to use the technique or that the Contractor employs a consultant who is so qualified. Capability shall be verified by description of the construction projects to which the Contractor or his consultant has successfully applied the CPM scheduling technique and which were controlled throughout the duration of the project by means of systematic use and updating of a computer-based CPM schedule. The submittal shall include the name of the individual on the Contractor's staff who will be responsible for the CPM schedule and for providing the required updating information.

1.03 SUBMITTALS:

A. Submit under provisions of Section 01 33 23 SUBMITTALS.

B. Within 10 days following the issuance of the Notice to Proceed, the Contractor shall submit the CPM Schedule to the Owner's Representative for review and acceptance. The Contractor shall submit to the Owner's Representative a preliminary network defining the planned operations during the first 60 calendar days after the issuance of the Notice to Proceed. The Contractor's general approach for the balance of the project shall be indicated. Cost of activities expected to be completed or partially completed before submission and approval of the complete network shall be included.

1.04 APPROVED CPM SCHEDULE:

A. Following review by the Owner's Representative, the Contractor shall incorporate the Owner's Representative's comments into the network and submit the revised network and computer-generated schedule. This final submittal shall be delivered to the Owner's Representative within 60 days after the issuance of the Notice to Proceed.

B. CPM schedules, which contain activities showing negative, float or which extend beyond the contract completion date in the computer-generated schedule will not be approved.

C. The approved network shall then be the approved CPM schedule to be used by the Contractor for planning, organizing and directing the work, and reporting progress.

D. Approval of the CPM activity network by the Owner's Representative is advisory only and shall not relieve the Contractor of responsibility for accomplishing the work within the contract completion date. Omissions and errors in the approved CPM schedule shall not excuse performance less than that required by the Contract. Approval by the Owner's Representative in no way makes the Owner's Representative an insurer of the CPM schedule's success or liable for time or cost overruns flowing from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of approval by its agent, the Owner's Representative, of the CPM schedule.

E. The CPM activity network shall be submitted on sheets 24-in by 36-in and may be divided into as many separate sheets as required. An electronic file in PDF format shall be submitted concurrent with the hard copy schedule.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 NETWORK REQUIREMENTS:

A. The network shall show the order and inter-dependence of activities and the sequence in which the work is to be accomplished as planned by the Contractor. The basic concept of a network analysis diagram shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.

B. Detailed network activities shall include: construction activities, the submittal and approval of shop drawings, the procurement of materials and equipment, fabrication of materials and equipment and their delivery, installation and testing, start-up and training. The Contractor shall break the work into activities with durations no longer than twenty working days each, except as to non-construction activities (such as procurement of materials and delivery of equipment) and any other activities for which

the Owner's Representative may approve the showing of longer duration. To the extent feasible, activities related to a specific physical area of the work should be grouped on the network for ease of understanding and simplification.

C. Separate activities shall be provided for each significant identifiable function in each trade area in each facility. Activities shall be so identified that there will be no reasonable doubt as to how much work remains on each. Specific activities which shall be included are: all subcontract work, all interface work between subcontractors and between the Contractor and subcontractors, leakage tests of pipelines, electrical connections to each item of equipment, supplier and manufacturer technical assistance, mechanical connections to each item of equipment, all tests, concrete finishing, each item of site work, (including restraints on other activities) and all utilities, fuels and chemicals.

D. Each activity on the network shall have the following indicated on the NODE representing it.

1. A single duration (i.e., the single best estimate of elapsed time considering the scope of the work involved in the activity and the resources planned for accomplishing the activity) expressed in working days.

2. A five character (or less) code indicative of the party responsible for accomplishing the activity.

3. A cost estimate for each activity which, when accumulated with the cost of all activities, equals the total contract cost. Estimated overhead and profit shall be prorated throughout all activities. Materials costs shall be assigned to delivery activities.

4. A brief description of the activity.

E. The selection and number of activities shall be subject to the Owner's Representative's approval. The detailed network need not be time scaled but shall be drafted to show a continuous flow from left to right with no flow from right to left. In addition to the brief description, the Contractor shall submit a separate list of all activities containing a detailed narrative of the scope of each activity, including the trades, subcontractors involved, and number of man-hours estimated.

F. To the extent that the network or any revision thereof shows anything not jointly agreed upon or fails to show anything jointly agreed upon, it shall not be deemed to have been approved by the Owner's Representative. Failure to include on a network any element of work required for the performance of this Contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding the review of the network by the Owner's Representative.

G. Except where earlier completions are specified, CPM schedules, which show completion of all work prior to the contract completion date, may be approved by the Owner's Representative but in no event shall they be acceptable as a basis for claim for delay against the Owner by the Contractor.

3.02 COMPUTER-GENERATED SCHEDULE REQUIREMENTS:

A. Each computer-generated schedule submittal from the CPM activity network shall include the following tabulations: a list of activities in numerical order, a list of activity precedence's, a schedule sequenced by Early Start Date and a schedule sequenced by Total Float. Each schedule shall include the following minimum items:

1. Activity numbers

2. Estimated duration

3. Activity description

4. Early start date (calendar dated)

5. Early finish date (calendar dated)

6. Latest allowable start date (calendar dated)

7. Latest allowable finish date (calendar dated)

8. Status (whether critical)

9. Estimated cost of the activity

10. Total float and free float

B. In addition, each schedule shall be prefaced with the following summary data:

1. Contract name and number

2. Contractor's Name

3. Contract duration

4. Contract schedule

5. The effective or starting date of the schedule.

C. The workday to calendar date correlation shall be based on an 8-hour day and 40-hour week with adequate allowance for holidays, adverse weather and all other special requirements of the work.

3.03 PROGRESS REPORTING:

A. Progress under the approved CPM schedule shall be evaluated monthly by the Contractor. Not less than seven days prior to each monthly progress meeting, The Contractor shall evaluate the status of each activity on which work has started or is due to start, based on the preceding CPM schedule; to show actual progress, to identify

those activities started and those completed during the previous period, to show the estimated time required to complete or the percent complete of each activity started but not yet completed and to reflect any changes indicated for the network. Activities shall not be considered complete until they are, in fact, 100 percent complete.

B. At each progress meeting the Contractor shall submit a narrative report based on the CPM schedule evaluation described above, in a format agreed upon by the Contractor and the Owner's Representative. The report shall include a description of the progress during the previous period in terms of completed activities, an explanation of each activity which is showing a delay, a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates and an explanation of corrective action taken or proposed. This report, as well as the CPM Status Report, will be discussed at each progress meeting.

3.04 RESPONSIBILITY FOR SCHEDULE COMPLIANCE:

A. Whenever it becomes apparent from the current CPM schedule and narrative report that delays to the critical path have resulted and the contract completion date will not be met, the Contractor shall take some or all of the following actions at no additional cost to the Owner. They shall submit to the Owner's Representative for approval, a written statement of the steps he intends to take to remove or arrest the delay to the critical path in the approved schedule.

3.05 ADJUSTMENT OF CONTRACT SCHEDULE AND COMPLETION TIME:

A. If the Contractor desires to make changes in his method of operating which affect the approved CPM schedule, he shall notify the Owner's Representative in writing stating what changes are proposed and the reason for the change. If the Owner's Representative approves these changes, the Contractor shall revise and submit for approval, without additional cost to the Owner, all of the affected portions of the CPM network. The Contractor shall adjust the CPM schedule only after prior approval of his proposed changes by the Owner's Representative.

B. If the completion of any activity, whether or not critical, falls more than 100 percent behind its approved duration, the Contractor shall submit for approval a schedule adjustment showing each such activity divided into two activities reflecting completed versus uncompleted work.

C. Shop drawings which are not approved on the first submittal or within the schedule time and equipment which do not pass the specified tests shall be immediately rescheduled.

D. The contract time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any contract completion date, he shall furnish such justification and supporting evidence as the Owner's Representative may deem necessary to determine whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Owner's Representative will, after receipt of such justification and supporting evidence, make findings of fact and will advise the

Contractor in writing thereof. If the Owner's Representative finds that the Contractor is entitled to any extension of any contract completion date, the Owner's Representative's determination as to the total number of day's extension shall be based upon the currently approved CPM schedule and on all data relevant to the extension. Such data shall be included in the next updating of the schedule. Actual delays in activities, which, according to the CPM schedule, do not affect any contract completion date shown by the critical path in the network, will not be the basis for a change therein.

E. Each request for change in any contract completion date shall be submitted by the Contractor to the Owner's Representative within 30 days after the beginning of the delay for which a time extension is requested but before the date of final payment under this Contract. No time extension will be granted for requests, which are not submitted within the foregoing time limit.

3.06 COORDINATING SCHEDULES WITH OTHER CONTRACT SCHEDULES:

A. Where work is to be performed under this Contract concurrently with or contingent upon work performed on the same facilities or area under other contracts, the Contractor's CPM Schedule shall be coordinated with the schedules of the other contracts. The Contractor shall obtain the schedules of the other appropriate contracts from the Owner for the preparation and updating of his CPM schedule and shall make the required changes in his schedule when indicated by changes in corresponding schedules.

B. In case of interference between the operations of different contractors, the Owner will determine the work priority of each Contractor and the sequence of work necessary to expedite the completion of the entire project. In all such cases, the decision of the Owner shall be accepted as final. The temporary delay of the Contractor's work due to such circumstances shall not be considered as justification for claims for additional compensation.

END OF SECTION

SECTION 01 32 33

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This section covers construction progress photographs to be furnished by the Contractor on the project.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHS:

A. Digital photographs shall be in .gif, .jpeg, .bmp or .tif format.

B. Photographs shall be taken using a digital camera before groundbreaking, weekly throughout the Work, and on final acceptance of the project.

C. Before the Contractor commences any work at the Site, and on the first work day of each week thereafter until Substantial Completion of the Work, the Contractor shall, at his/her expense, have digital photographs taken by a competent photographer from different viewpoints, as directed by the Owner or Owner's Representative. The Owner and Owner's Representative shall have the right to increase or decrease the number of photographs required at each period, maintaining an overall average number of exposures per period.

PART 3 - EXECUTION

3.01 ELECTRONIC MAIL DELIVERY:

A. A minimum of twenty-four views shall be delivered to the Owner's Representative within six days of photography taken. Transmittal via electronic mail is satisfactory.

B. If the Contractor fails to provide the photographs as required by the Contract Documents, the Town shall be entitled to a corresponding cost set-off against the Contractor's next Application for Payment, or may choose to have the photograph taken by another photographer, and correspondingly charge those associated costs to the Contractor.

END OF SECTION

SECTION 01 33 23

SUBMITTALS

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. The Contractor shall provide the Owner's Representative with submittals as required by the contract documents.

1.02 RELATED WORK:

A. Divisions 1 – 33 of these specifications that require submittals.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 GENERAL:

A. As required by the General Conditions, Contractor shall submit a schedule of shop and working drawing submittals.

B. The Contractor shall submit the shop and working drawing submittals either electronically or hard copy.

3.02 ELECTRONIC SUBMITTALS:

A. In accordance with the accepted schedule, the Contractor shall submit promptly to the Owner's Representative by email (bethoneyc@wseinc.com) one electronic copy in Portable Document Format (PDF) of shop or working drawings required as noted in the specifications, of equipment, structural details and materials fabricated especially for this Contract.

B. Each electronic copy of the shop or working drawing shall be accompanied by the Owner's Representative's standard shop drawing transmittal form, included as Exhibit 1 of this section (use only for electronic submittals), on which is a list of the drawings, descriptions and numbers and the names of the Owner, Project, Contractor and building, equipment or structure.

C. The Contractor shall receive a shop drawing memorandum with the Owner's Representative's approval or comments via email.

3.03 SHOP AND WORKING DRAWINGS:

A. Shop and working drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish of shop coat, grease fittings, etc., depending on the subject of the drawings. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this Contract.

B. All shop and working drawings shall be submitted to the Owner's Representative by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them. All shop and working drawings shall be prepared on standard size, 24-inch by 36-inch sheets, except those, which are made by changing existing standard shop or working drawings. All drawings shall be clearly marked with the names of the Owner, Project, Contractor and building, equipment or structure to which the drawing applies, and shall be suitably numbered. Each shipment of drawings shall be accompanied by the Owner's Representative's (if applicable) standard shop drawing transmittal form on which is a list of the drawings, descriptions and numbers and the names mentioned above.

C. Only drawings that have been prepared, checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Owner's Representative, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Contract Documents in all respects. Shop drawings shall be reviewed and marked with the date, checker's name and indication of the Contractor's approval, and only then shall be submitted to the Owner's Representative. Shop drawings unsatisfactory to the Contractor shall be returned directly to their source for correction, without submittal to the Owner's Representative. Shop drawings submitted to the Owner's Representative without the Contractor's approval stamp and signature will be rejected. Any deviation from the Contract Documents indicated on the shop drawings must be identified on the drawings and in a separate submittal to the Owner's Representative, as required in this section of the specifications and General Conditions.

D. The Contractor shall be responsible for the prompt submittal and resubmittal, as necessary, of all shop and working drawings so that there will be no delay in the work due to the absence of such drawings.

E. The Owner's Representative will review the shop and working drawings as to their general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections of comments made on the drawings during the review do not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is

responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner. The review of the shop drawings is general and shall not relieve the Contractor of the responsibility for details of design, dimensions, code compliance, etc., necessary for interfacing with other components, proper fitting and construction of the work required by the Contract and for achieving the specified performance. The Owner's Representative will review submittals two times: once upon original submission and a second time if the Owner's Representative requires a revision or corrections. The Contractor shall reimburse the Owner amounts charged to the Owner by the Owner's Representative for performing any review of a submittal for the third time or greater.

F. With few exceptions, shop drawings will be reviewed and returned to the Contractor within 30 days of submittal.

G. No material or equipment shall be purchased or fabricated especially for this Contract nor shall the Contractor proceed with any portion of the work, the design and details of which are dependent upon the design and details of equipment or other features for which review is required, until the required shop and working drawings have been submitted and reviewed by the Owner's Representative as to their general conformance and compliance with the project and its Contract Documents. All materials and work involved in the construction shall then be as represented by said drawings.

H. Two copies of the shop and working drawings and/or catalog cuts will be returned to the Contractor. The Contractor shall furnish additional copies of such drawings or catalog cuts when he needs more than two copies or when so requested.

3.04 SAMPLES:

A. Samples specified in individual Sections include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and units of work to be used by the Owner's Representative or Owner for independent inspection and testing, as applicable to the work.

B. The number of samples submitted shall be as specified. Submittal and processing of samples shall follow the procedures outlined for shop and working drawings unless the specifications call for a field submittal or mock-up.

C. Acceptance of samples will be acknowledged via a copy of the transmittal noting status. When samples are not acceptable, prompt resubmittal will be required.

3.05 OPERATING AND MAINTENANCE MANUALS AND SPARE PARTS LISTS:

A. Where reference is made in technical specification sections to operating and maintenance manuals and/or spare parts lists, the Contractor shall submit four copies to the Owner's Representative for review in accordance with the instructions furnished under "Shop and Working Drawings." If the submittal is complete and does not require any changes, an acknowledgement (copy of transmittal) will be returned noting status. If the submittal is incomplete or does require changes, corrections, additions, etc., two copies of the submittal will be returned with a copy of transmittal noting status. Four copies of the final operating and maintenance manuals and/or spare parts list shall be delivered to the Owner's Representative prior to or with the equipment when it is delivered to the job site. For systems requiring field adjustment and balancing, such as heating and ventilating, the Contractor shall submit separate test results and adjustment data on completion of the work, to be incorporated into the system manual.

B. The information included in the manual shall be as described in the specification sections, but as a minimum shall contain clear and concise instructions for operating, adjusting, lubricating and maintaining the equipment, an exploded assembly drawing identifying each part by number and a listing of all parts of the equipment, with part numbers and descriptions required for ordering spare parts. Spare parts lists shall include recommended quantity and price.

C. Operating and maintenance manuals shall be in durable loose-leaf binders, on 8½-inch by 11-inch paper, with diagrams and illustrations either on 8½-inch by 11 inch or multiple foldouts. The instructions shall be annotated to indicate only the specific equipment furnished. Reference to other sizes or models of similar requirement shall be deleted or neatly lined out.

END OF SECTION

SECTION 01 55 26.13

SIGNAGE (TRAFFIC CONTROL)

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers furnishing and installing traffic control signs and other devices.

1.02 SYSTEM DESCRIPTION:

The Contractor shall furnish and install all construction signs deemed necessary by and in accordance with the latest edition of Part VI of the Manual on Uniform Traffic Control Devices (MUTCD) as published by the U.S. Department of Transportation.

PART 2 - PRODUCTS

2.01 TRAFFIC WARNING AND REGULATING DEVICES:

Contractor shall provide warning signs, barricades and other devices in accordance with the specifications provided in the MUTCD. Size of signs, lettering, colors, method of support and other factors prescribed in the MUTCD shall be adhered to.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Contractor shall erect barricades, barrier fences, traffic signs, and other traffic control devices as required by the MUTCD, or as required by the Owner's Representative, to protect the work area from traffic, pedestrians, and animals.

B. Contractor shall relocate barricades, signs and other devices as necessary as the work progresses.

C. Unless extended protection is required for specific areas, when the work has been completed, all temporary warning and regulatory devices used by the Contractor shall be removed so that traffic can move unimpeded through the area.

END OF SECTION

SECTION 01 55 26.19

UNIFORMED OFFICERS FOR TEMPORARY TRAFFIC CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This Section covers the provisions for furnishing Uniformed Officers for Traffic Control and Maintenance of Traffic as described in Section 01 556 00, CONSTRUCTION ZONE SAFETY PLAN.

1.02 DESCRIPTION:

A. The Contractor shall coordinate with the local jurisdiction's Traffic Control Officer to determine the number of Officers deemed necessary to provide for public safety and to maintain a smooth flow of traffic through the construction area(s) affected.

1.03 RELATED WORK:

A. SECTION 01 55 26.13, SIGNAGE (TRAFFIC CONTROL)

B. SECTION 01 56 00, CONSTRUCTION ZONE SAFETY PLAN

PART 2 - PRODUCTS

2.01 UNIFORMED OFFICERS:

A. Contractor shall provide the Traffic Control Officer with a minimum of 24 hours notice indicating the time of day, street location and confirm number of officers required for traffic control.

B. Contractor shall give the Traffic Control Officer a minimum of 2 hours prior cancellation notice should Contractor determine that due to weather or conditions beyond its control it would not need the scheduled officers.

C. Contractor shall pay for officer(s) at the prevailing rate established by the local police department should officers not be needed and the Contractor fails to cancel the officers as noted in 2.01.B above.

D. Where the Owner is paying directly for Traffic Officers and the Contractor cancels scheduled officers, the Contractor shall be responsible for payment of the wages for cancellations if not cancelled in accordance with 2.01.B and 2.01.C above.

PART 3 - EXECUTION

3.01 OPERATION:

A. Contractor shall provide barricades, barrier fences, traffic signs, and other traffic control devices as required by the Owners Traffic Control Officer, or as required by the Engineer, to protect the work area from traffic, pedestrians, and animals.

B. Contractor shall relocate barricades, signs and other devices as necessary as the work progresses as required by the Owners Traffic Control Officer or the Engineer.

END OF SECTION

SECTION 01 56 00

CONSTRUCTION ZONE SAFETY PLAN

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This Section covers the provisions for complying with Commonwealth of Massachusetts requirements for construction zone safety plans on public works projects.

1.02 DESCRIPTION:

A. The Contractor shall implement traffic and pedestrian safety and control measures through the construction zone through road closures/detours and crosswalk closures/detours and mitigate impacts on traffic outside of the construction zone in accordance with these contract documents.

1.03 RELATED WORK:

A. SECTION 01 11 00, CONTROL OF WORK AND MATERIALS (MAINTENANCE OF TRAFFIC)

B. SECTION 01 55 26.13, SIGNAGE (TRAFFIC CONTROL)

C. SECTION 01 55 26.19, UNIFORMED OFFICERS FOR TEMPORARY TRAFFIC CONTROL

1.04 REFERENCES:

701 CMR 7.00 Use of Road Flaggers and Police Details on Public Works Projects

Massachusetts Department of Transportation Standard Specifications for Highways and Bridges – latest edition

PART 2 - PRODUCTS

2.01 Traffic control devices utilized by the Contractor shall meet the requirements of these contract documents and the latest Massachusetts Department of Transportation (MassDOT) Standard Specifications and Manual on Uniform Traffic Control Devices (MUTCD).

PART 3 - EXECUTION

3.01 OPERATION:

A. Contractor shall be responsible for providing all temporary traffic control devices including barricades, barrier fences, signs, drums, cones, impact attenuators and other

traffic control devices in accordance with typical traffic management plans and details shown on the drawings or as required by the Owner's Representative.

B. The Contractor shall prepare temporary traffic management plans and details that deviate significantly from the typical plans shown on the drawings and submit to the Owner's Representative for review and approval prior to start of the work.

C. Contractor shall relocate barricades, signs and other devices as necessary as the work progresses as required by the Owner's Traffic Control Officer or the Owner's Representative.

D. If police details fail to show up for work at the construction zone at the usual time for start of work, or otherwise leave the jobsite before work is completed for the day, the provisions of the Alternative Plan will be followed by the Contractor.

3.02 ALTERNATIVE PLAN:

A. In accordance with 701 CMR 7.06(6), whenever required police details do not arrive on time or fail to show up for work, the Alternative Plan will be implemented by the Contractor.

B. The Alternative Plan for this project is as follows:

1. Contact MassDOT District Area Construction Engineer, local police department and municipality to inform them the scheduled police detail has failed to show up at the project site and that road flaggers are being utilized.

2. If construction zone is within a low-speed area (< 40mph) the Contractor can use road flaggers who have been trained and certified in temporary roadway flagging.

3. Redeploy crew to work in areas not requiring temporary traffic control (if available).

END OF SECTION

SECTION 01 57 19

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 DESCRIPTION:

A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.

B. The requirements set forth in this section of the specifications apply to cross-country areas, river and stream crossings, and construction in and adjacent to coastal bank, unless otherwise specifically stated.

C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as any conditional requirements applied, all of which are attached to Section 00 31 43, PERMITS.

D. Prior to commencement of work, the Contractor shall meet with the Owner and the Owner's Representative to develop mutual understandings relative to compliance of the environmental protection program.

1.02 RELATED WORK:

A. Section 00 31 43, PERMITS

B. Section 01 14 19.16, DUST CONTROL

C. Section 01 33 23, SUBMITTALS

D. Section 31 00 00, EARTHWORK

E. Section 31 11 00, CLEARING AND GRUBBING

F. Section 31 23 19, DEWATERING

1.03 SUBMITTALS:

A. The Contractor shall submit details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of coastal bank or across areas designated as coastal bank.

PART 2 - PRODUCTS

2.01 SILT FENCE:

A. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a mesh backing, and stapled to preweathered oak posts installed as shown on the drawings. The oak posts shall be 1-1/4-inches by 1-1/4-inches (Minimum Dimension) by 48-inches and shall be tapered. The bottom edge of the silt fence shall be buried as shown on the drawings.

B. The silt fence shall be DOT Silt Fence PPDM3611, as manufactured by U.S. Silt & Site Supply/Getsco, Concord, NH, or approved equal.

C. Silt fence properties:

Physical Properties	**Test Method**	**Minimum Value**
Grab Strength, lbs.	ASTM-D-4632	124
Grab Elongation, %	ASTM-D-4632	15
Mullen burst, psi	ASTM-D-3786	300
Puncture, lbs.	ASTM-D-4833	65
Trapezoidal Tear, lbs.	ASTM-D-4533	65
UV Resistance2, %3	ASTM-D-4355	80@500 hrs.
AOS, US Sieve No.	ASTM-D-4751	30
Flow Rate, gal/min/sq ft	ASTM-D-4491	10
Permittivity,(1/sec)gal/min/sq ft	ASTM-D-4491	0.05 sec^{-1}

2.02 STRAW WATTLES:

Straw Wattles shall consist of a 100% biodegradable exterior jute or coir netting with 100% wheat straw interior filling as manufactured by GEI Works, Sebastian, Florida (Phone: 772-646-0597; website: www.erosionpollution.com), or approved equal.

2.03 CATCH BASIN PROTECTION:

A. To trap sediment and to prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Siltsack as manufactured by ACF Environmental, Inc. or approved equal) shall be provided as approved by the Owner's Representative.

PART 3- EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

A. The Owner's Representative will notify the Contractor in writing of any non-compliance with the provisions of the Order of Conditions. The Contractor shall,

after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Owner's Representative until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3.02 AREA OF CONSTRUCTION ACTIVITY:

A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.03 PROTECTION OF WATER RESOURCES:

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters.

3.04 CONSTRUCTION IN AREAS DESIGNATED AS COASTAL BANK ON THE DRAWINGS:

A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as coastal bank or within 100-feet of coastal bank resource areas. Total easement widths shall be limited to the widths shown.

B. In areas designated as coastal bank, the Contractor shall carefully remove and stockpile the top 24 inches of soil. This topsoil material shall be used as backfill.

C. The Contractor shall use a trench box, sheeting or bracing to support the excavation in areas designated as coastal bank.

D. Excavated materials shall not be permanently placed or temporarily stored in areas designated as coastal bank. Temporary storage areas for excavated material shall be as designated by the Owner's Representative.

E. The use of a temporary gravel roadway in the coastal bank area is not acceptable. The Contractor will be required to utilize timber or rubber matting to support their

equipment in these areas. The timber or rubber matting shall be constructed in such a way that it is capable of supporting all equipment necessary to perform the work. The timber or rubber matting shall be constructed of materials and placed in such a way that when removed the material below the matting will not be unduly disturbed, mixed or compacted so as to adversely affect recovery of the existing plant life.

3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to ensure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Owner's Representative.

3.06 LOCATION OF STORAGE AREAS:

A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project and shall require written approval of the Owner's Representative. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Owner's Representative.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of baled straw around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as coastal bank.

D. The Owner's Representative may designate a particular area or areas where the Contractor may store materials used in his operations.

E. Storage areas in cross-country locations shall be restored to pre-construction conditions with the planting of native species of trees and shrubs.

3.07 PROTECTION OF LANDSCAPE:

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Owner's Representative. Excavating machinery and cranes shall be

of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Owner's Representative. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Where, in the opinion of the Owner's Representative, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Owner's Representative may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Owner's Representative will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of under the provisions of Specification Section 31 11 00, CLEARING AND GRUBBING.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

3.08 DISCHARGE OF DEWATERING OPERATIONS:

A. Any water that is pumped and discharged from the trench and/or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to the areas designated as coastal bank. When constructing in a coastal bank area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.

C. The pumped water shall be filtered through filter fabric and baled hay, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

3.9 DUST CONTROL:

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Owner's Representative decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall be as specified under Specification Section 01 14 19.16, DUST CONTROL.

B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

3.10 SEPARATION AND REPLACEMENT OF TOPSOIL:

A. Topsoil shall be carefully removed from cross-country areas where excavations are to be made, and separately stored to be used again as required. The topsoil shall be stored in an area acceptable to the Owner's Representative and adequate measures shall be employed to prevent erosion of said material.

3.11 BALED STRAW:

A. To trap sediment and to prevent sediment from clogging drainage systems, baled straw shall be used where shown on the drawings. Care shall be taken to keep the bales from breaking apart. The bales should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically.

3.12 SURFACE RESTORATION OF CROSS COUNTRY AREAS:

A. Plantings detailed in Specification Section 32 93 00, TREES, SHRUBS, GROUNDCOVERS, AND LANDSCAPING shall be conducted when construction has been completed within the areas designated. A one-year guarantee of maintenance will be required on these plantings to ensure that they establish in the area.

3.13 CATCH BASIN PROTECTION:

A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Owner's Representative, to trap sediment and prevent it from clogging drainage systems and entering coastal bank. Siltation sack shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sack from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The Contractor shall properly dispose of all debris at no additional cost to the Owner.

B. All catch basin protection shall be removed by the Contractor after construction is complete.

3.14 STRAW WATTLES:

A. The wattles will be placed in a shallow trench (2-3 inches deep) and staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

B. The wattles shall be regularly inspected and before and after every forecasted major weather event. All deposited sediment shall be removed and not allowed to accumulate to the top of the wattles. Wattles damaged during construction shall be repaired or replaced as required by the Owner's Representative at no additional cost to the Owner.

C. The Contractor shall remove all wattles after construction is completed.

END OF SECTION

SECTION 01 73 29

CUTTING, CORING AND PATCHING

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers the cutting, coring, rough and finish patching of holes and openings in existing structures.

1.02 RELATED WORK:

A. SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 2 - PRODUCTS

2.01 SEALING MATERIALS:

A. Mechanical seals shall be modular, adjustable, bolted, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. The seal shall be rated by the manufacturer for 40 feet of head or 20 psig. Mechanical seals shall be Link-Seal, manufactured by Thunderline Corp., Wayne, MI., or approved equal.

B. Sealant shall be a two part foamed silicone elastomer as manufactured by Dow Corning Co., product No. 3-6548 silicone R.T.V.; 3M brand fire barrier products caulk C.P. 25 and 3M brand putty 303; Flame-Safe fire stop systems Fig. No. FS-500 by Thomas & Betts Corporation, or approved equal. Packing shall be a fire retardant pliable material, Fig. 310 by Sealtite Co.; White Oakum W.S.-600 by American Manufacturing Co., or approved equal. Sealant bead configuration, depth and width shall be in accordance with manufacturer's recommendations.

2.02 MISCELLANEOUS MATERIALS:

A. Bonding compound shall be Sikadur Hi-Mod epoxy by Sika Corporation, or equivalent by Euclid Chemical Corporation, Master Builders Company, or approved equal.

B. Non-shrink grout shall be Masterflow 713 by Master Builders Company; Euco N-S by Euclid Chemical Co.; Five Star Grout by U.S. Grout Corp. or approved equal.

C. Materials for finish patching shall be equal to those of adjacent construction.

PART 3 - EXECUTION

3.01 GENERAL:

A. The Contractor shall leave all chases or openings for the installation of his own or any other contractor's or subcontractor's work, or shall cut the same in existing work, and shall see that all sleeves or forms are at the work and properly set in ample time to prevent delays. He shall see that all such chases, openings, and sleeves are located accurately and are of proper size and shape and shall consult with the Engineer and the contractors and subcontractors concerned in reference to this work.

B. In case of his failure to leave or cut all such openings or have all such sleeves provided and set in proper time, Contractor shall cut them or set them afterwards at his own expense, but in so doing he shall confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the written consent of the Engineer.

C. The Contractor shall not cut or alter the work of any subcontractor or any other contractor, nor permit any of his subcontractors to cut or alter the work of any other contractor or subcontractor, except with the written consent of the contractor or subcontractor whose work is to be cut or altered or with the written consent of the Engineer. All cutting and patching or repairing made necessary by the negligence, carelessness, or incompetence of the Contractor or any of his subcontractors shall be done by or at the expense of the Contractor and shall be the responsibility of the Contractor.

D. All cutting and coring shall be performed in such a manner as to limit the extent of patching.

E. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. No structural members shall be cut without the approval of the Engineer and all such cutting shall be done in a manner required by him. No holes may be drilled in beams or other structural members without obtaining prior approval. All work shall be performed by mechanics skilled in this type of work.

3.02 CORING:

A. Coring shall be performed with an approved non-impact rotary tool with diamond core drills. Size of holes shall be suitable for pipe, conduit, sleeves, equipment or mechanical seals to be installed.

B. If holes are cored through floor slabs they shall be drilled from below.

C. All equipment shall conform to OSHA standards and specifications pertaining to plugs, noise and fume pollution, wiring and maintenance.

D. Provide protection for existing equipment, utilities and critical areas against water or

other damage caused by drilling operation.

E. Slurry or tailings resulting from coring operations shall be vacuumed or otherwise removed from the area following drilling.

3.03 CUTTING:

A. Cutting shall be performed with a concrete saw and diamond saw blades of proper size and application.

B. Provide for control of slurry generated by sawing operation on both sides of wall or slab.

C. When cutting a reinforced concrete wall, the cutting shall be done so as not to damage bond between the concrete and reinforcing steel left in the structure. Cut shall be made so that steel neither protrudes nor is recessed from the face of the cut.

D. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.

E. Provide equipment of adequate size to remove cut panel.

F. For cutting a trench in a floor slab, a full-depth cut shall be made using a concrete saw for the desired width of the trench. A partial-depth cut shall be made to expose the reinforcing bars. The width of the partial cut shall be to the required lap length of the reinforcing bars. Care shall be taken not to cut exposed reinforcing bars but if any are cut, dowel holes shall be drilled and dowels epoxied in. Reinforcing of the same size, as the existing shall be tied to the existing exposed reinforcing and/or dowels with the proper lap length.

3.04 PATCHING:

Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown. Finish patching shall match existing surfaces as approved.

Trenches in floor slabs shall be repaired as described in 3.03F above and concrete meeting the requirements of Section 03 30 00 CAST-IN-PLACE CONCRETE shall be poured and cured.

END OF SECTION

SECTION 01 74 13

CLEANING UP

PART 1 - GENERAL

1.01 DESCRIPTION:

The Contractor must employ at all times during the progress of its work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon request by the Owner's Representative provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Owner's Representative.

1.02 RELATED WORK:

A. Section 00 72 00 GENERAL CONDITIONS

B. Section 01 11 00 CONTROL OF WORK AND MATERIALS

C. Section 01 14 00 SPECIAL PROVISIONS

D. Section 01 57 19 ENVIRONMENTAL PROTECTION

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

3.01 DAILY CLEANUP:

A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.

B. Upon written notification by the Owner's Representative, the Contractor shall within 24 hours clean up those areas, which in the Owner's Representative's opinion are in violation of this section and the above referenced sections of the specifications.

C. If in the opinion of the Owner's Representative, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

3.02 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES:

A. Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

3.03 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

A. On or before completion of the work, the Contractor shall, unless otherwise specifically required or permitted in writing, tear down and remove all temporary buildings and structures it built; shall remove all temporary works, tools and machinery or other construction equipment it furnished; shall remove all rubbish from any grounds which it has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by its operations in a neat and satisfactory condition.

3.04 RESTORATION OF DAMAGED PROPERTY:

A. The Contractor shall restore or replace, when and as required, any property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Owner's Representative.

3.05 FINAL CLEANUP:

A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing all trash and debris off of the premises. Before acceptance, the Owner's Representative shall approve the condition of the site.

END OF SECTION

SECTION 01 78 00

PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This Section covers administrative and procedural requirements for closing out the project, including, but not limited to:

1. Project as-built documents

2. Checkout and Certification

3. Final Cleaning

4. Substantial Completion

5. Closeout Procedures

6. Final Completion

7. Correction/Warranty Period

B. Closeout checklist to be completed by the Owner's Representative.

1.02 RELATED WORK:

A. General Requirements in their entirety.

B. Section 01 74 13, CLEANING UP

C. Division 2 through Division 33.

1.03 AS-BUILT DOCUMENTS:

A. Contractor shall maintain on site, separate from the documents used for construction, one set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.

1. Contract Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other Modifications to the Contract.

5. Reviewed shop drawings, product data, and samples.

6. Written interpretations and clarifications.

7. Field Orders.

8. Field test reports properly verified.

B. The completed set of as-built documents shall be submitted to the Owner's Representative with the final Application for Payment.

1.04 CHECKOUT AND CERTIFICATIONS:

A. Prior to checkout and certifications the following tasks shall be completed:

1. Construction shall be complete. For this purpose, completion of construction is defined as follows:

a. The Contractor has completed construction and erection of the work in conformance with the Contract Drawings and Specifications.

b. The Contractor has installed and adjusted operating equipment, systems, or facilities, as applicable, as defined by the manufacturers' erection, installation, operation and maintenance instructions.

2. All shop drawings shall have final approval.

3. All shop tests shall be complete and approved test results submitted to the Owner's Representative.

1.05 FINAL CLEANING:

A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

1. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to smooth, even textured surfaces.

2. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the site, unless otherwise required by the Owner's Representative.

3. Comply with requirements of Section 01 74 13 CLEANING UP.

1.06 SUBSTANTIAL COMPLETION:

A. Substantial Completion is officially defined in the General and Supplementary Conditions. The date of substantial completion will be certified by the Owner's Representative. This date will not be certified until the following requirements have been satisfied by the Contractor:

1. All Contract requirements are coordinated into a fully operational system. All individual units of equipment and treatment are fully operative and performing at specified efficiencies. Where efficiencies are not specified, performance shall meet acceptable standards for the particular unit.

2. All field tests have been satisfactorily completed and reports forwarded to the Owner's Representative.

3. All final training has been completed by the manufacturers' representatives.

4. All spare parts and lubricants have been satisfactorily delivered to the Owner. Spare parts are for the exclusive use of the Owner when the facility has been turned over. Contractor is responsible for all maintenance and repair materials required until the facility is accepted by the Owner.

1.07 CLOSEOUT PROCEDURES:

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and is complete in accordance with Contract Documents and ready for Owner's Representative's and Owner's inspection.

B. Accompany Owner's Representative and Owner on inspection to verify conformance with the Contract Documents. Prepare a punch list of work items that have been determined by inspection to not conform to Contract Documents. Punch list items shall include work items that are missing, incomplete, damaged, incorrect items, or improperly installed or constructed. The Contractor shall correct the punch list deficiencies by re-work, modifications, or replacement, as appropriate, until the items conform to the Contract Documents. The initial punch list shall be produced by the Contractor, with copies to the Owner's Representative and Owner. When the Contractor has reduced the number of deficient items to a reasonable level, the Owner's Representative will develop a definitive punch list for the use of the Contractor.

C. Provide submittals to Owner's Representative that are required by governing or other authorities.

D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The Contractor shall submit the following documents with or prior to Final Application for Payment: Set of as-built documents, Contract Completion and Acceptance Certificate, Consent of Surety to Final Payment,

Release and Waiver of Liens and Claims (SECTION 01 78 00 – ATT. A), Affidavit of Payment of Debts and Claims, and remaining releases, waivers, warranties/guarantees, and all other data required by the Contract Documents.

1.08 FINAL COMPLETION:

A. Prior to final completion, the following tasks shall be completed:

1. All items in the punch list shall be completed.

2. All Contract closeout documentation shall be submitted to and accepted by the Owner's Representative.

1.09 CORRECTION/WARRANTY PERIOD:

A. During the correction period, the Contractor shall correct all deficiencies in equipment and materials.

B. During the warranty period, the Contractor shall perform all corrective work on warranty deficiencies.

C. Corrective work will be identified by the Owner's Representative or Owner, as appropriate. The Contractor will be notified of the item(s) requiring corrective work.

D. The Contractor shall begin work on all corrective work within ten days of being notified of the deficiency by the Owner's Representative and shall then work continuously until the deficiency is corrected. Upon completion of the corrective work, the Contractor shall submit a letter report to the Owner's Representative describing the deficiency and the corrective action that was taken.

E. The Contractor shall coordinate all corrective work with the Owner's Representative and/or the Owner.

1.09 COMPLETION CHECKLIST:

A. The Project Completion Checklist, which follows, *shall be modified as required for the project* and shall be completed as the project nears completion. When the project has been fully completed, Final Payment can be approved.

PROJECT COMPLETION CHECKLIST

Owner _____ Job No.

Project

As part of the project closeout, all items listed below must be checked off as being complete or otherwise accounted for. The person verifying completion of the item shall list the completion date and his/her initials.

Project Closeout Checklist		
	Date Completion Verified	Verified by
AS-BUILT DOCUMENTS HANDED OVER		
1. Contract Drawings		
2. Specifications		
3. Addenda		
4. Change Orders/Contract Modifications		
5. Reviewed Shop Drawings, Product Data and Samples		
6. Written Interpretations/Clarifications		
7. Field Orders		
8. Field Test Reports		
EQUIPMENT CHECKOUT AND CERTIFICATIONS		
1. Construction Complete per Drawings/Specifications		
2. Equipment Installed and Adjusted		
3. All Shop Drawings have Final Approval		
4. All Shop Tests Complete and Results Submitted		

Project Closeout Checklist		
	Date Completion Verified	Verified By
START-UP AND TESTING		
1. All Checkout and Certifications Complete		
2. All O&M Manuals Approved		
3. All Preliminary Training by Manufacturers Rep. Completed		
FINAL CLEANING		
1. All Construction Facilities Removed		
2. All Construction Debris Removed		
3. All Areas Swept/Cleared		
SUBSTANTIAL COMPLETION		
1. All Items Coordinated Into a Fully Operational System		
3. All Field Tests Completed and Reports Submitted		
4. All Final Training by Manufacturer's Rep. Completed		
5. All Spare Parts and Lubricants Provided		
CLOSEOUT PROCEDURES		
1. Written Certification Submitted that Work is Ready for Owner & Owner's Representative Inspector		
2. Inspection by Owner, Owner's Representative, Contractor completed		
3. Punch List of Nonconforming Items Prepared		
4. Documents Required by Governing or Other Authorities Submitted (List Them)		
5. Final Application for Payment Received		
6. Contract Completion and Acceptance Certificate Submittal		
7. Consent of Surety to Final Payment Submittal		
8. Release and Waiver of Liens and Claims Submitted		
9. Affidavit of Payment of Debts and Claims Submitted		
10. Warranties/Guarantees Submitted		
11. Other Required Releases and Waivers Submitted (List Them)		

Project Closeout Checklist		
	Date Completion Verified	Verified By
12. Permits Submitted (List Them)		
13. Weekly Payrolls Submitted as Required by Law		
FINAL COMPLETION		
1. All Items in Punch List Completed		
2. All Other Required Documentation Submitted (List It)		
CORRECTION/WARRANTY PERIOD		
1. Correction Period Start Date: _____ End Date: _____		
2. Specific Warranties Provided Item Warranty Duration		

Full name of persons signing their initials on this checklist:

_____

_____

_____

_____

_____

END OF SECTION

SECTION 01 78 39

PROJECT AS-BUILT RECORD DRAWINGS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers the Contractors As-Built Record drawings for the project. The As-Built Record drawings for the project shall include, but are not limited to:

A. The Contractors construction coordination drawings for all the project disciplines. The Contractors construction coordination drawings for the project disciplines shall be submitted to the Owner's Representative prior to Construction of the said discipline. The Contractors construction coordination drawings for the project disciplines shall include but are not limited to the following:

1. Landscape Architectural
2. Electrical

B. Draft Record Documents Review

Upon completion of the project construction the Contractor shall submit a complete copy of 24- by 36-inch Record Drawings to the Owner and the Owner's Representative for review. The Owner and the Owner's Representative shall jointly review the Record Drawings and provide comments to the Contractor. The Contractor shall modify the Record Drawings as necessary based on the comments provided by the Owner and the Owner's Representative.

C. Final Record Documents

Upon incorporation and acceptance of the Draft Record Drawings comments from the Owner and the Owner's Representative, the Contractor shall submit the Final Record Drawings and documentation. The Contactor shall submit two sets of 24- by 36-inch Record Drawings to the Owner and an additional two sets of 24- by 36-inch Record Drawings to the Owner's Representative for their records. The Contractor shall also submit to the Owner's Representative a minimum 20 gigabyte flash drive with the electronic Record Drawing files. The electronic Record Drawing files shall be obtained from the Owner (the Owner's Representative shall provide on behalf of the Owner if the Owner's Representative was the project designer) and developed in AutoCAD 2010/Revit 2017 (or later) and the submittal shall include the Final AutoCAD DWG/Revit RVT file documents, drawing line types, blocks, etc. The actual version of AutoCAD/Revit shall be coordinated with the Owner's Representative.

D. Pre- and Post-Construction Survey

The Contractor shall perform a pre- and post-construction survey of the entire project area. The topographic survey shall be performed by or under the supervision of and certified by a Registered Land Surveyor in the State of Massachusetts. The Contractor shall also submit to the Owner's Representative a minimum 20 gigabyte flash drive with the electronic pre- and post-construction survey files. The Contractor shall send the electronic pre- and post-construction survey files to the Owner's Representative which shall be developed in AutoCAD 2010/ Revit 2017 (or later) and the submittal shall include the Final AutoCAD DWG / Revit RVT file documents, drawing line types, blocks, etc. The actual version of AutoCAD / Revit shall be coordinated with the Owner's Representative. The Contractor shall notify the Owner and Owner's Representative at least 48-hours in advance of each survey.

1.02 RELATED WORK:

A. General Requirements in their entirety.

B. Division 02 through Division 33.

1.03 AS-BUILT DOCUMENTS:

A. Contractor shall maintain on site, separate from the documents used for construction, one complete set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other Modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Written interpretations and clarifications.
7. Field Orders.
8. Field test reports properly verified.

B. The completed set of documents shall include but are not limited to:

1. Significant deviations of any nature made during construction.

C. The completed set of as-built documents shall be submitted to the Owner's Representative with the final Application for Payment.

PART 2 - MATERIALS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 92 13

OPERATION AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.01 SCOPE OF WORK:

A. This section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project.

1.02 RELATED WORK:

A. General Requirements in their entirety (Section 00 72 00 through Section 01 78 00)

B. Individual Technical Specification Sections Specific for Operation and Maintenance Data.

C. Section 01 33 23, SUBMITTALS

1.03 FORMAT:

A. Prepare data in form of an instructional manual.

B. Binders: Commercial quality, 8 ½- x 11-inch three-ring binders with hardback, washable, plastic covers; two inch maximum ring size. When multiple binders are used, correlate data into related, consistent groupings. Provide a table of contents in each binder.

C. Cover: Identify each binder cover and spine with typed or printed title OPERATION AND MAINTENANCE INSTRUCTION; list title of Project facility; identify subject matter of contents.

D. Arrange contents by systems under section numbers and sequence of Table of Contents.

E. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer’s printed data, or typewritten date - on 20-pound paper.

G. Drawings: Provide with reinforced punched, binder tab. Bind in with text; fold larger drawings to size of text pages.

H. Submit certification that the data and drawings provided pertain exactly to the model, size, and series product and equipment installed in the work.

I. All documents will be electronically scannable.

J. All products, systems, and drawings must be cross-referenced with tag ID numbers.

K. The manual for each piece of equipment shall be a separate document with the following specific requirement:

1. Contents:

Table of Contents and Index

Brief description of each system and components

Starting and stopping procedures

Special operating instructions

Routine maintenance procedures

Manufacturer's printed operating and maintenance instructions, parts list, illustrations, and diagrams

One copy of each wiring diagram

One copy of each approved shop drawing and each Contractor's coordination and layout drawing

List of spare parts, manufacturer's price, and recommended quantity

Name, address and telephone number of local service representatives.

2. Material

Loose leaf on 60 pound, punched paper

Holes reinforced with plastic cloth or metal

Page size, 8 ½- x 11-inches

Diagrams, illustrations and attached foldouts as required, of original quality, reproduced by dry copy method

Covers: oil, moisture and wear resistant 9 x 12 size

1.04 QUALITY ASSURANCE:

A. Prepare instructions and data by personnel experienced in maintenance and operations of described products.

1.05 CONTENTS, EACH VOLUME (BINDER):

A. Table of Contents: Provide title of Contract, schedule of products and systems, indexed to content of the volume. A listing of all relevant tag ID numbers for each volume shall be placed immediately after the Table of Contents.

B. For each product or systems: List names, addresses, and telephone numbers of subcontractors and suppliers, including local source of suppliers and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

E. Text: As required to supplement product data, provide logical sequence of instructions for each procedure incorporating manufacturer' s instructions.

F. Warranties, Guarantees, and Bonds: Bind copy of each

G. See O&M Manual Review Checklist at end of this specification section.

1.06 MANUAL FOR MATERIALS AND FINISHES:

A. Building Products, Applied Materials, and Finishes: Include product data with catalog number, size composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As specified in individual product specification sections.

1.07 MANUAL FOR EQUIPMENT AND SYSTEMS:

A. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

B. Data submitted on all equipment shall include complete maintenance instructions (including preventive and corrective maintenance) and parts lists in sufficient detail

to facilitate ordering replacements.

C. All products, systems, equipment, electrical wiring, instrumentation wiring, personnel protection systems wiring, presented in this manual will have tag numbers corresponding to contract drawings and specifications. In the event, numbers do not exist; the Engineer will specify a series of numbers.

D. Panelboard Circuit Directories: Provide electrical service characteristics, controls and communications.

E. Include color-coded wiring diagrams as installed.

F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequence. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter and any special operating instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required. Cross-reference lubricants to products offered by at least three major lubricant suppliers.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color-coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports, calibration data, alignment records, and other information.

P. Additional Requirements: as specified in individual product specification sections.

Q. Provide a listing in table of Contents for design data with tabbed flysheet and space for insertion of data.

R. Incorporation of all Physical Checkout information obtained through the field-testing and correction phases of the Work. Input must be specific to the actions and

information obtained during those phases.

1.08 SUBMITTALS:

A. Submit draft and final copies of operation and maintenance manuals as described in Section 01 33 23.13 SUBMITTAL OF OPERATION AND MAINTENANCE MANUALS.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

OPERATION AND MAINTENANCE MANUAL
REVIEW CHECKLIST

1. Name, address, telephone/fax number of the manufacturer ☐
2. Name, address, contact name, telephone/fax of local representative ☐
3. Name, address, telephone/fax number of the contractor ☐
4. Exploded view/general arrangement of materials of construction ☐
5. Description of operation/operating principal ☐
6. Project specific Operating parameters ☐
7. Wiring Diagrams (If Applicable) ☐
8. Troubleshooting checklist ☐
9. Recommended spare parts list with prices, and ordering instructions ☐
10. Model number and the serial number of the model provided ☐
11. Performance curves or tabulated data ☐
12. Routine Maintenance instructions/service instructions with recommended Intervals ☐
13. Assembly and disassembly instructions ☐
14. Recommended lubricates and lubrication schedule. ☐
15. Approved copies of Shop Drawings are to be included in the manual ☐
16. Startup/break-in and adjustment instructions ☐
17. Warranty information ☐

Reviewed By: _____ Date: _____
Weston & Sampson Engineers

Document8

END OF SECTION

SECTION 02 41 13

SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.01 SCOPE OF WORK:

A. Work under this Section shall consist of the careful removal, storage for reuse, transportation off-site, or demolition, of all structures and site features encountered or noted to be removed or abandoned to a minimum of three feet below finished grade, and the removal and disposal of all materials not called for to be reused or salvaged, in accordance with the contract drawings, these specifications, and Owner's Representative's requirements. Provide all labor, equipment, materials and transportation necessary to complete the work.

B. Items plan referenced to be removed and stored shall be carefully removed and stored on site in a manner and location designated by the Owner's Representative for reinstallation later as shown on the plans or as indicated by the Owner's Representative.

C. Items plan referenced, or as indicated by the Owner's Representative to be removed and disposed of shall be removed from the site and properly and legally disposed of by the Contractor.

D. Items indicated on the contract drawings or in the specifications to be removed and salvaged, or other items required to be removed by the Owner's Representative, shall be transported to a municipal storage facility, located within the City confines, and unloaded and stacked as required by the Owner's Representative.

E. Items indicated on the contract drawings or in the specification to be removed and reset shall be carefully removed and reset in the same location as existing according to the specification and details.

F. The following scope describes the general demolition requirements of this Section

BY TOWN – FOR REFERENCE ONLY

At Bayview Park, 186 Onset Avenue:

1. Removal and disposal of surfacing materials including asphalt pavement, pavers, concrete pavement, and others as shown on the Contract Documents
2. Removal and disposal of stairs and handrails, complete
3. Removal and disposal of mow curb and picket fence
4. Removal and disposal of bench pads and curbing
5. Removal and disposal of cobble stone edging

6. Removal and disposal of the flagpole

BY CONTACTOR

At Bayview Park, 186 Onset Avenue:

1. Staging and stockpiling areas
2. Protection of existing elements to remain, including the Memorial Rock, gazebo, water lines and other elements as noted on the Contract Documents
3. Erosion and sediment controls, including inlet protection for catch basins
4. Balling and burlapping an existing Norway Spruce for Town pickup
5. Removal of existing guardrail; epoxy grouting of the post holes in the existing wall

At the Highland Avenue Sidewalk Improvements, from Onset Avenue to 11th Street (Base Bid and **Add Alternate #1**):

1. Protection of existing curb, where noted on the Contract Documents
2. Removal and resetting of existing curb, where noted on the Contract Documents
3. Removal and disposal of existing paver sidewalk, where noted on the Contract Documents
4. Removal and resetting of the existing paver sidewalk, where noted on the Contract Documents
5. Removal and disposal of timbers as required

At the Lillian Gregerman Bandshell, 4 Union Avenue **(Add Alternate #2)**:

1. Removal and disposal of benches
2. Removal and disposal of split rail fence and trunk collars
3. Removal and disposal of pavement of various types
4. Erosion and sediment controls, including inlet protection for catch basins
5. Protection of existing elements to remain

1.02 PROTECTION (BY CONTRACTOR):

A. The Contractor shall assume complete responsibility and liability for the safety and structural integrity of all work and utilities to remain during demolition that is completed by the Contractor.

B. Provide safeguards including, but not limited to, warning signs, barricades, temporary fences, warning lights and other items required for protection of personnel and the general public during performance of all work.

C. All features related to protection shall be maintained until that work has been completed to the point when such safeguards are no longer required.

1.03 SPECIAL REQUIREMENTS:

A.

A. Contractor to install erosion controls to protect adjacent areas from eroded materials likely to enter wetlands, resource areas, or drainage ways/systems, downstream of areas disturbed by work activities.

B. Where items to be demolished are located within or adjacent to pavements to remain, the Town shall make provisions to protect that pavement to remain. Cut concrete pavement back to score line and cut bituminous concrete pavement back far enough so as not to allow disturbance to base course materials. Pavements damaged as a result of Town activities shall be replaced to the extent determined by the Owner's Representative at no additional cost to the Owner.

1.04 REFERENCES:

A. Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges – latest edition.

PART 2 - PRODUCTS

2.01 BACKFILL:

A. The Contractor shall provide suitable backfill as specified under Section 31 00 00 of these Specifications, to fill voids left by removal or abandonment of site features, and shall provide all pipe cap ends, mortar, brick and other material needed to cap off or plug pipes of various sizes and kinds.

B. Suitable materials shall be used as base course fill and topsoil to the depth as specified herein. Restore disturbed areas with similar materials blended to match the line and grades of adjacent surfaces.

PART 3 - EXECUTION

3.01 SALVAGEABLE MATERIAL (BY TOWN – FOR REFERENCE ONLY):

A. Salvageable material noted in the drawings shall be carefully removed to minimize damage and stored for later reuse, transport, or removal from site.

3.02 ABANDONED STRUCTURES:

A. All inlets and outlets shall be plugged with at least eight (8) inches of brick and mortar masonry. Upper portions of masonry structures shall be removed to a depth of three feet. The bottoms of all structures shall be broken to allow drainage, and the structure shall be filled with suitable backfill material placed in six (6) inch

layers and thoroughly compacted at each level.

B. The Owner's Representative shall review work related to abandoned structures before backfilling. Those items not reviewed before backfilling shall be uncovered and backfill procedures observed, at no expense to the Owner.

3.03 ABANDONED PIPES OR CONDUITS:

A. Plug previously abandoned drainpipes encountered with masonry brick at least eight (8) inches in thickness.

B. Abandon discontinued water supplies that are encountered during the execution of this contract in accordance with Owner requirements.

C. Electrical conduits encountered and previously abandoned shall be capped or plugged.

END OF SECTION

SECTION 03 05 00

FIELD CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This Section covers concrete and all related items necessary to place and finish the concrete work.

1.02 RELATED WORK:

A. Section 31 00 00, EARTHWORK

1.03 REFERENCES:

A. The following standards form a part of this specification:

American Concrete Institute (ACI)

ACI 304	Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
ACI 305	Recommended Practice for Hot Weather Concreting
ACI 306	Recommended Practice for Cold Weather Concreting
ACI SP-66 ACI	Detailing Manual
ACI 318	Building Code Requirements for Reinforced Concrete

American Society for Testing and Materials (ASTM)

ASTM A615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C33	Concrete Aggregates
ASTM C94	Ready-Mixed Concrete
ASTM C143	Test for Slump of Portland Cement Concrete
ASTM C150	Portland Cement
ASTM C260	Air Entraining Admixtures for Concrete

ASTM C494 Chemical Admixtures for Concrete

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

Statement of materials constituting the design of mixes for each size aggregate as required by ASTM C94 shall be submitted to the Owner's Representative within one week following award of the Contract.

PART 2 - PRODUCTS

2.01 CONCRETE:

A. All concrete, reinforced or non-reinforced shall have a 28 day compressive strength of 3000 psi unless otherwise noted on the design drawings. A minimum of 5.5 sacks of cement per cubic yard and a maximum water cement ratio of 6.9 gallons per sack shall be used.

B. Concrete shall conform to ASTM C94. The Contractor shall be responsible for the design of the concrete mixtures. Slump shall be a maximum of 4-inches and a minimum of 2-inches, determined in accordance with ASTM C143.

C. Admixtures shall be as specified in subsection 2.05. No additional admixtures shall be used unless approved by the Owner's Representative.

D. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Owner's Representative.

2.03 CEMENT:

The cement shall be an approved brand of American manufactured Portland Cement, Type II conforming to the applicable requirements of ASTM C150.

2.04 AGGREGATES

A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.

B. Maximum size aggregate shall be 3/4-inch.

2.05 ADMIXTURES:

A. All concrete (unless otherwise directed) shall contain an air entraining agent. Air entrained concrete shall have air content by volume of 4 to 8 percent for 3/4-inch aggregate.

B. Air entraining agent shall be in accordance with ASTM C260 and shall be Darex AEA, as manufactured by W.R. Grace & Company; Placewel (air entraining Type), as manufactured by Johns Manville; Sika AER as manufactured by Sika Chemical Company; or an approved equal product.

C. Water reducing agent shall be WRDA, as manufactured by W.R Grace & Company; Placewel (non-air entraining Type), as manufactured by Johns Manville; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

D. Water reducing agent-retarder shall be "Daratard," as manufactured by W.R. Grace & Company; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

2.06 WATER:

A. Water for concrete shall be potable, free of deleterious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.07 CONCRETE FORMS:

A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Owner's Representative.

B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.

C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic Kote" by Symons Corp., Des Plaines, IL or approved equal.

D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete

PART 3 - EXECUTION

3.01 PREPARATION:

A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or the material which would tend to reduce the bond.

B. Earth, concrete, masonry, or other water permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed.

C. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Owner's Representative.

3.02 THRUST AND ANCHOR BLOCKS:

A. Minimum bearing areas for thrust blocks and dimensions of anchor blocks shall be as shown on the drawings.

B. Concrete for thrust and anchor blocks shall be placed against undisturbed earth, and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints.

3.03 FILL CONCRETE:

A. Fill concrete shall be placed in those locations as indicated on the design drawings. Fill concrete shall consist of materials as previously specified, with a minimum 28-day compressive strength of 3000 psi.

B. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set.

C. Fill concrete shall be brought to lines and grades as shown on the design drawings.

3.04 CONCRETE PLACING DURING COLD WEATHER:

A. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when temperature is below 40^{o}F, or is expected to fall to below 40^{o}F, within 73 hours, and the concrete after placing shall be protected by covering, heat, or both.

B. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval of the Owner's Representative. All procedures shall be in accordance with provisions of ACI 306.

3.05 CONCRETE PLACING DURING HOT WEATHER:

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing, shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays, which will result in excessive mixing of the concrete after arrival on the job.

B. During periods of excessively hot weather (90ºF or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90ºF, when ready for placement, will not be acceptable, and will be rejected.

3.06 FIELD QUALITY CONTROL:

A. Concrete inspection and testing shall be performed by the Owner's Representative or by an inspection laboratory, designated by the Owner's Representative, engaged and paid for by the Owner. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.

B. At least 4 standard compression test cylinders shall be made and tested and 1 slump test from each day's placement of concrete. A minimum of four compression test cylinders shall be made and tested for each 100 cubic yards of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. If the average compressive strength of the two 28 day cylinders do not achieve the required level, the Owner's Representative may elect to test the fourth cylinder immediately or test it after 56 days. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.

C. The Owner's Representative shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Owner's Representative as to whether substandard concrete is to be accepted or rejected shall be final.

END OF SECTION

SECTION 03 11 00

CONCRETE FORMWORK

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specifications covers the furnishing and installation of forms for cast-in-place concrete.

1.02 RELATED WORK:

A. Section 03 21 00, CONCRETE REINFORCEMENT

B. Section 03 30 00, CAST-IN-PLACE CONCRETE

1.03 REFERENCES:

The following standards form a part of this specification:

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301 Standard Specifications for Structural Concrete

ACI 347 Recommended Practices for Concrete Formwork

U.S. ARMY CORPS OF ENGINEERS (CE)

CE 03300 Cast-in-Place Concrete

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Owner's Representative.

B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.

C. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic

Kote" by Symons Corp., Des Plaines, IL or approved equal.

D. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete.

PART 3 - EXECUTION

3.01 PREPARATION:

Surfaces of forms to be in contact with concrete shall be greased with nonstaining form release compound. Wetting will not be accepted as a substitute. Approval of the Engineer shall be obtained before use of coated materials or liners in lieu of form release compound, except as modified herein.

3.02 CONSTRUCTION:

A. For concrete surfaces which will be visible after completion of the structure, painted or unpainted, the type and the precise location of form ties, nails joints between form members, and any other features which will leave a visible trace in the finished concrete, will be subject to the approval of the Owner's Representative.

B. Formwork shall be so constructed, braced, or tied that the formed surfaces of the concrete will be perfectly true, smooth, and to the dimensions shown on the drawings. All forms used for circular sections shall be true arcs as indicated on the drawings. Short chords will not be acceptable. Form line shall present an uninterrupted surface conforming to radii indicated on the drawings.

C. Forms shall be sufficiently tight to prevent leakage of mortar, and when necessary shall have temporary openings as required for thorough cleaning, and as required for introduction of concrete to avoid excessive free fall. Panels damaged in stripping or otherwise shall not be reused.

D. Unless otherwise noted on the design drawings, forms shall be filleted and chamfered at all sharp corners, and exposed edges with a 3/4-inch chamfer. Chamfer shall not be used where masonry or other material will subsequently be installed flush with one of the adjacent surfaces of the concrete. Where a wash or slope is indicated on the drawings no additional chamfer is required.

3.03 REMOVAL OF FORMS

A. Except as otherwise specifically authorized by the Owner's Representative, forms shall not be removed before the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design and not before reaching the following number of day-degrees [whichever is the longer]:

Forms for	Day-Degree*
Beams and Slabs	500
Walls and vertical surfaces	200

* Day-Degree: Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60 deg F equals 300 day-degrees. Temperatures below 50 deg F are not to be considered in determining Day-Degree.

B. Where beams, girder, columns, walls and similar vertical forms are adequately supported on shores, the side forms may be removed after 24 hours of cumulative curing time provided the side forms support no loads other than the lateral pressure of the plastic concrete. Cumulative curing time represents the sum of time intervals, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 deg. F in accordance with American Concrete Institute standards.

C. Shoring shall not be removed until the concrete has attained at least 70 percent of the specified strength and sufficient strength to support safely its own weight and the construction live loads upon it.

D. Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by the removal operation.

END OF SECTION

SECTION 03 21 00

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specification covers the furnishing and installation of reinforcement for cast-in-place concrete.

1.02 RELATED WORK:

A. Section 03 11 00, CONCRETE FORMWORK

C. Section 03 30 00, CAST-IN-PLACE CONCRETE

1.03 SYSTEM DESCRIPTION:

Materials and construction shall conform to ACI 318 and ACI 350 unless otherwise noted on the design drawings or modified herein.

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. The Contractor shall furnish to the Owner's Representative with complete checked, reinforcing steel shop drawings and bar lists. Shop drawing shall include grade of steel used as well as splice lengths.

B. Mill test reports shall accompany drawings. Fabrication shall not commence until the drawings and mill test reports have been released by the Owner's Representative.

C. When fiber reinforcement is used, contractor shall submit manufacturer's data confirming that material meets the specification.

1.05 REFERENCES:

A. The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI 318 Building Code Requirements for Concrete

ACI 347 Recommended Practice for Concrete Formwork

ACI 350 Environmental Engineering Concrete Structures

ACI SP-66 ACI Detailing Manual

American Society for Testing and Materials (ASTM)

ASTM A185 Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement

ASTM A497 Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement

ASTM A6l5 Deformed Billet-Steel Bars for Concrete Reinforcement

ASTM A775 Epoxy-coated Reinforcing Steel Bars

ASTM A884 Epoxy-coated Welded Wire Fabric

American Welding Society (AWS)

AWS 12.1 Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Steel reinforcing bars shall conform to ASTM A6l5, Grade 60, and A775 if epoxy-coated bars are specified.

B. Welded steel wire fabric shall conform to ASTM A185 or ASTM A497 and ASTM A884 if epoxy-coated fabric is specified. Gauge and spacing of wires shall be as indicated on the drawings.

C. Reinforcing steel shall be detailed in accordance with ACI SP-66 modified as applicable to conform to ACI 350.

D. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Bars shall be shipped to the site with bars of the same size and shape, fastened in bundles with securely wired-on metal identification tags listing both size and mark.

E. Any bar showing cracks after bending shall be discarded.

F. Steel failing to meet the requirements of this specification or the drawings will be rejected and shall be removed from the site immediately.

PART 3 - EXECUTION

3.01 STEEL INSTALLATION:

A. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings (including ice), that reduce or destroy bond. When there is a delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned as necessary.

B. After forms have been oiled, but before concrete is placed, all steel shall be securely wired in the exact position called for, and shall be maintained in that position until all concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Owner's Representative.

C. Concrete blocks having a minimum bearing area of 2-inches by 2-inches and equal in quality to that specified for the slab, shall be used for supporting reinforcing bars for slabs on grade. Wood blocks, stones, brick chips, etc., shall not be used to support reinforcement.

D. Metal supports shall be of types that will not penetrate the surface of formwork or slab and which will not show through or stain surfaces that are to be exposed to view, painted or unpainted.

E. Welding of reinforcing bars will be permitted only where permission of the Owner's Representative has been obtained in advance. Such welding shall be performed only under conditions established by the Owner's Representative, and in accordance with AWS 12.1.

F. Reinforcement, which is to be exposed for a considerable length of time after having been placed, shall be painted with a heavy coat of cement grout, if required by the Owner's Representative.

3.02 FIBER INSTALLATION:

A. Fibermesh fibers shall be used in concrete as indicated on the drawings or as specified and in strict accordance with the manufacturer's recommendations as to type and amount. The fiber manufacturer or approved distributor shall provide the services of a qualified employee for pre-job meeting and initial job start up.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers all concrete and all related items necessary to place and finish the concrete work.

1.02 RELATED WORK:

A. Section 03 11 00, CONCRETE FORMWORK

B. Section 03 21 00, CONCRETE REINFORCEMENT

C. Section 31 00 00, EARTHWORK

D. Items furnished under other Sections and installed under this Section include, but are not limited to: Items embedded in concrete, including anchors, sleeves, floor drains, castings, frames for hatches, angles, nosings, and other miscellaneous metals.

1.03 REFERENCES:

A. The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI 30l Structural Concrete for Buildings

ACI 302 Recommended Practice for Concrete Floor and Slab Construction

ACI 304 Recommended Practice for Measuring, Mixing, Transporting, and Replacing Concrete

ACI 305 Recommended Practice for Hot Weather Concreting

ACI 306 Recommended Practice for Cold Weather Concreting

ACI 318 Building Code Requirements for Reinforced Concrete

ACI 347 Recommended Practice for Concrete Formwork

ACI 350 Code Requirements for Environmental Engineering Concrete Structures

American Society for Testing and Materials (ASTM)

ASTM C33 Concrete Aggregates

ASTM C39 Compressive Strength of Cylindrical Concrete Specimens

ASTM C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C87 Effect of Organic Impurities in Fine Aggregate on Strength of Mortar

ASTM C94 Ready-Mixed Concrete

ASTM C143 Standard Method for Slumps of Portland Cement Concrete

ASTM C150 Portland Cement

ASTM C171 Sheet Materials for Curing Concrete

ASTM C231 Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C260 Air-Entraining Admixtures for Concrete

ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C494 Chemical Admixtures for Concrete

ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Shop drawings of the materials specified herein.

B. Statement of materials constituting the design of mixes which satisfy the specified strength for each size aggregate as required by ASTM C94 shall be submitted to the Owner’s Representative within one week following award of the contract.

C. Provide one copy of the "Certificate of Delivery" for each load of concrete as it arrives on the site, under the provisions of ASTM C94.

PART 2 - PRODUCTS

2.01 CONCRETE:

A. Concrete conforming to the requirements listed below shall be used where indicated on the drawings. Unless otherwise indicated, concrete used as fill under foundations, and elsewhere approved by the Owner's Representative, shall be the 3,000 psi mix.

TABLE

Minimum Comp. Strength at 28 days (psi)	Maximum Water/Cement ratio (gallons per bag of cement)*	Cement Factor: 94 lb. Bags per cubic yard minimum**
3000	0.59 (6.9)	5.5
4000	0.48 (5.6)	6.5
5000	0.40 (4.7)	7.4

* Based on air-entrained concrete. If non-air-entrained concrete is called for, the listed maximum water/cement ratios may be increased slightly, as approved by the Owner's Representative. The water is the total water in the mix, including free water on the aggregate.

** These are minimum amounts; increase as necessary to meet mix requirements.

B. Concrete shall conform to ASTM C94. One copy of the Certificate of Delivery required by ASTM C94 shall be delivered to the Owner's Representative immediately upon arrival of each load of concrete at the site. The Contractor shall be responsible for the design of the concrete mixtures.

C. Standard compression tests of all proposed mixes shall be made by the testing laboratory or other satisfactory evidence shall be presented that the design mixes will attain the minimum strengths listed on the design drawings or called for herein, within the limitations of the ACI Code. No concrete shall be delivered to the job site until the Owner's Representative has approved the design mixes.

D. All concrete (unless otherwise directed) shall contain an air-entraining agent. Air entrained concrete shall have an air content by volume of 3 to 6 percent for l-l/2-inch aggregate and 4 to 8 percent for 3/4-inch aggregate. The air content shall be the responsibility of the testing laboratory and in accordance with ASTM C23l.

E. All concrete shall contain a mid-range water reducer to minimize cement and water content of the mix, at the specified slump, in accordance with ASTM C494.

F. Slump for all concrete shall be from 3-inch to 4-inch, except for concrete using a superplasticizer, when the maximum slump shall be 8-inches. Any concrete having a slump greater than 4-inches (8-inches with superplasticizer) shall be promptly removed

from the site.

G. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixture other than those specified shall be used in concrete without the specific written permission of the Owner's Representative in each case.

H. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Owner's Representative.

H. All concrete shall contain 2 lbs. of lamp black per cubic yard.

2.02 CEMENT:

A. The cement shall be an approved brand of American manufactured Portland Cement, Type IIA conforming to ASTM Cl50. The brand name and type of cement proposed for use shall be submitted to the Owner's Representative for approval immediately following award of contract. Only one color of cement, all of the same manufacture, shall be used for the work.

B. When the use of high-early-strength Portland cement (Type IIIA) is permitted by the Owner's Representative the same strength requirements shall apply, but the indicated strengths shall be attained in 7 days instead of 28 days.

2.03 ADMIXTURES:

A. Air entraining agent shall be in accordance with ASTM C260.

B. Water reducing agent shall be a mid-range water reducer meeting ASTM C494, Type A.

C. Water reducing agent-retarder shall be in accordance with ASTM C494, Type D.

D. Superplasticizer agent shall be in accordance with ASTM C494, Type F or Type G and contain no more than 0.1% chloride ions. Product may be plant added or field added based on the best application considering distance, temperature and time.

2.04 AGGREGATES:

A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.

B. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33.

C. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33.

D. The following designated sizes of aggregate shall be the maximum employed in concrete.

2-inch for mass concrete
1½-inch for reinforced sections 18-inch and over in thickness
3/4-inch for reinforced and unreinforced sections less than 18-inch thickness.

2.05 WATER:

Water for concrete shall be potable, free from injurious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.06 GROUT:

Grout shall be mixed in the proportions of one part Portland Cement to 2 parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Aggregate for grout shall conform to the requirements of the reference specification for concrete. Prior approval of the Owner's Representative shall be obtained for the use of proprietary grouts, and the instructions of the Owner's Representative shall be followed in their use.

2.07 CURING MATERIALS:

A. Curing compound shall be a curing/hardener compound such as Acurion by AntiHydro, Sikaguard Cure/Hard by Sika, Super Diamond Clear by Euclid or approved equal.

B. Curing paper shall be a fiber-reinforced laminated Kraft bituminous product conforming to the requirements of ASTM Cl7l.

2.08 JOINT FILLER:

1. Preformed joint filler strip shall conform to ASTM Dl75l or Dl752, having a thickness as indicated on the drawings.

2. Fillers shall be provided in pieces of the full thickness required. Use of multiple layers of thin pieces to make-up the full thickness will not be permitted.

2.09 JOINT SEALANT:

1. Joint sealant for construction and control joints shall be a two-part polysulfide base sealant conforming to Thiokol's Building Trade Performance Specification, Class A (self-leveling), Type II (hardness: 35-45 Shore A).

PART 3 - EXECUTION

3.01 GENERAL:

Under no circumstances shall concrete that has set or partially set before placing be used; and no retempering of concrete or grout will be permitted.

3.02 PREPARATION:

A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or other material which would tend to reduce the bond.

B. Unless otherwise indicated, a moisture barrier shall be used under all slabs placed on the ground in accordance with ACI 302.1R. The moisture barrier shall be fungi-resistant and shall have a vapor permeance rating not exceeding 0.01 perms (Perms [grains/ft^2*hr*in. Hg]) per ASTM F1249 or ASTM E96) and 10 mils thickness (49 lbs/MSF). The moisture barrier shall be a high-performance underslab vapor retarder made from polyethylene resins that exceed ASTM E1745, Class A. Sheets shall be lapped 6-inches at joints and sealed with 2-inch wide tape or as recommended by the manufacturer. The vapor barrier should have all laps, seams, penetrations and terminations sealed and should carry across footings.

C. When no moisture barrier is used, the earth, concrete, masonry, or other water-permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Owner's Representative.

D. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping and washing off all dirt and scum and laitance. It then shall be moistened prior to placing new concrete.

E. Concrete surfaces that act as a seat for structural members (other than those resting on grout) shall be troweled to an extremely flat and level surface. If necessary, such surfaces shall be ground off to achieve the required flatness and level.

F. Fill concrete on top of concrete shall be placed in the locations indicated on the drawings or designated by the Owner's Representative. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set. Fill concrete shall be brought to the lines and grades shown on the drawings or approved by the Owner's Representative.

G. Concrete for thrust and anchor blocks shall be placed against undisturbed earth and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints. Minimum bearing areas and dimensions shall be as shown on the drawings.

3.03 MIXING:

A. Concrete shall be ready-mixed, or transit-mixed, as produced by equipment acceptable to the Owner's Representative. No hand-mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of, and in the presence of the Owner's Representative.

B. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the nameplate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.

C. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready-Mixed Concrete Association, as well as ACI 304 and ASTM C94.

D. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

3.04 INSTALLATION/APPLICATION/ERECTION:

A. Placing

1. No concrete shall be placed by pumping methods without the prior written approval of the Owner's Representative. Should the Contractor be allowed to place concrete by pumping methods, procedures, mix design of concrete, and all other precautions shall be in accordance with ACI 304.2R and as approved by the Owner's Representative.

2. Concrete shall be placed in alternate areas, as defined by the construction and control joints indicated on the design drawings. A minimum of 3 days shall elapse between placement of adjacent sections.

3. Segregation of the concrete shall be prevented during handling; should any segregation occur, the concrete shall be remixed before it is placed. Concrete shall be placed in the forms in horizontal layers not over l to 2 feet thick. Concrete shall not be allowed to drop freely more than 4 feet. If the free drop to the point of placement must exceed 4 feet, the Contractor shall obtain the approval of the Owner's Representative for the proposed method of depositing the concrete. The concrete shall not be required to flow over distances greater than 3 feet in any

direction in the forms or on the ground, unless otherwise permitted by the Owner's Representative.

4. Unless otherwise noted, the work begun on any day shall be completed in daylight of the same day.

5. "Cold Joints" are to be avoided, but if they occur, they are to be treated as bonded construction joints.

6. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal-lined, and each section shall have approximately the same slope. The slope shall not be less than 25 nor more than 45 degrees and shall be such as to prevent segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally more than 5 feet.

7. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cubic yards of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.

8. Concrete slabs on the ground shall be well-tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.

9. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Owner's Representative.

10. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run, and the water and debris shall not be discharged inside the form.

B. Concrete Placing During Cold Weather

1. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F, or is expected to fall to below 40°F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both. No accelerant shall be used to prevent freezing.

2. The temperature of concrete surfaces shall not be permitted to drop below 50ºF. for at least 7 days after placement of the concrete.

3. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Owner's Representative. All procedures shall be in accordance with provisions of ACI 306.

C. Concrete Placing During Hot Weather

1. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays that will result in excessive mixing of the concrete after arrival on the job.

2. During periods of excessively hot weather (90°F, or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement will not be acceptable, and will be rejected.

3. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. The record shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

D. Pipes And Embedded Metals

1. Special care shall be taken to bring the concrete into solid contact with pipes and iron work embedded in the walls and floors, particularly underneath and around all pipes where a head of water exists, making watertight joints.

2. In general, such embedded items are not shown on the structural design drawings. Design drawings of the other trades shall be consulted for their location and details.

3. Anchor bolt location, size and details shall be verified with the equipment manufacturer's certified drawings before installation.

4. Anchor bolts, reglets, sleeves, edge angles and similar embedded items will be provided, delivered to the site under other Sections of the specification, for installation under this Section.

5. Where edge angles, etc., have nuts welded on to receive machine screws, the threads of the nuts shall be protected from concrete, and the concrete shall be excluded from the space to be occupied by the screw, by the use of wood plugs or other effective means.

6. Inserts required for hanging mechanical and electrical items shall be provided and installed in the forms under the mechanical and electrical sections of the specification.

7. Should the Contractor be allowed to leave openings in the concrete for pipes or ironwork, to await the arrival of items that would delay the prosecution of the work, the openings shall be subject to the approval of the Owner's Representative. Appropriate construction joints shall be provided. In filling any such openings with concrete, a mixture of l: l-l/2 : 3 shall be used and a watertight bond shall be secured between the old and new concrete.

8. In bolting miscellaneous items to concrete after the concrete has set, expansion bolts of an approved pattern and type shall be used. The Contractor shall submit to the Owner's Representative, for approval, the types of expansion bolts. Expansion bolts shall not be used until they are approved.

E. Curing

1. Concrete curing shall be performed as specified in ACI 30l and as stated herein. All curing procedures shall have prior approval of the Owner's Representative.

2. Concrete Floors

Concrete floors which are to receive paint, concrete fill, mortar setting beds, grout fill, or any other subsequent finish shall be cured by one of the following procedures immediately after completion of placement and finishing:

a. Ponding or continuous sprinkling.

b. Application of absorptive mats or fabric kept continuously wet.

c. Application of sand kept continuously wet.

d. Application of waterproof sheet materials conforming to ASTM Cl7l.

e. Application of curing compounds conforming to ASTM C309, if it can be demonstrated to the Owner's Representative's satisfaction that the compound

is applicable and that it will not prevent bonding of the subsequent finish to be received. Compound shall be placed at a rate of 200 square feet per gallon, in two applications perpendicular to each other.

3. Curing procedure shall be continued for at least 7 days.

   a. Moisture loss from surface placed against metal or wood forms shall be minimized by keeping forms wet until removal.

   b. Curing shall be continued for at least 7 days. When forms are removed during the curing period, surfaces shall be cured by spraying or by the use of a curing compound as previously specified.

   c. Surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, 1/2-inch thick plywood sheets shall be used to protect the exposed surface.

F. Bracing And Supports

1. All concrete members shall be adequately and safely supported and braced until the permanent supports and braces are installed.

2. Backfilling against exterior walls shall not be done until supporting slabs are in place and have attained 70 percent of design strength, otherwise walls shall be braced against earth lateral pressure, using a system approved by the Owner's Representative.

3. Backfilling against retaining walls shall not commence until the wall concrete has reached its 28-day strength.

G. Removing Forms And Supports

1. Removal of forms shall take place in accordance with ACI 347, Section 3.6. Except as otherwise specifically authorized by the Owner's Representative, forms shall not be removed until the concrete has aged for the following number of day-degrees or attained 50 percent strength. (Day-degrees equals the total of number of days times the average daily air temperature at the surface of concrete. For example, 5 days at a daily average temperature of 60°F. equals 300 day-degrees.)

Location	Day-Degrees
Beams and Slabs	500
Walls and Vertical Surfaces	200

2. Shores under beams and slabs shall not be removed until the concrete has attained at least 70 percent of the specified cylinder strength and also sufficient strength to support safely its own weight and the construction loads upon it.

H. Patching

1. Defective concrete and honeycombed areas as determined by the Owner's Representative shall be chipped down reasonably square and at least one-inch deep to sound concrete by means of hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly imbedded in the parent concrete, subject to Owner's Representative's final inspection. If honeycomb exists around reinforcement, chip to provide a clear space at least 1-inch wide all around the steel. For areas less than 1-1/2 inches deep, the patch may be made following the procedure for filling form tie holes, described in the subsection below, using adequately dry (non-trowelable) mixtures to avoid sagging. Thicker repairs will require build-up in 1-inch layers on successive days. Unless otherwise indicated, thicker repairs shall be made with Vertipatch mortar mixture blended with Acryl-Set, both by Master Builders, Inc., Cleveland, Ohio, or approved equal.

2. For concrete areas exposed to serious abrasion and/or impact forces, the Owner's Representative may order the use of grout with a non-shrink metallic aggregate (Embeco by Master Builders, Inc.; Ironite by Fox Industries, Madison, IL; or approved equal) as an additive in the proportions listed below:

	Small Patches		Large Formed Patches	
Material	Volumes	Weights	Volumes	Weights
Cement	1.0	1.0	1.0	1.0
Metal Aggregate	0.15	0.25	0.2	0.33
Sand	1.5	1.5	1.5	1.0
Pea Gravel	--	--	1.5	1.5

I. Finishing Of Formed Surfaces

1. All concrete that is to be left exposed to view shall be scraped to remove projecting imperfections left by voids in the forms.

2. In addition to scraping, exterior exposed concrete shall be covered with a cement-base plaster mix. The mix shall consist of Thoroseal Plastic Mix and Acryl 60, as manufactured by Standard Drywall Products, Miami, FL, or approved equal. It shall be mixed and applied in accordance with the manufacturer's recommendations.

3. In addition to scraping, interior concrete surfaces which will be exposed to view and concrete surfaces which are to be prepared and painted as specified in Section 09 90 00, PAINTING, shall receive a smooth rubbed finish, in accordance with ACI 301 and as described below.

4. To permit satisfactory finishing, forms shall be removed from the vertical faces of the concrete as early as is possible without damaging the surface. Immediately after

stripping forms, any fins or projections left by the forms shall be chipped off, and the surfaces rubbed smooth.

5. Form tie holes and other voids and faults shall be patched. Voids shall be cleaned out, roughened, thoroughly wetted, coated with neat cement paste, and filled with mortar of cement and sand in the same proportions, materials, and color as used in the concrete. The surface of the patch shall be flush with the surrounding surface after finishing operations are complete. Surface shall be kept continuously damp until patches are firm enough to be rubbed without damage.

6. Rubbing shall be performed while the surface is wet using a carborundum or cement sand brick, to achieve a smooth uniform, even textured finish. Patched and chipped areas shall be blended to match as closely as possible the appearance of the rest of the surface. No cement wash or plastering will be permitted, and no mortar shall be used except as required above.

7. Where finishing is performed before the end of the curing period, concrete shall under no circumstances be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

J. Concrete Floor Finishing Requirements

Unless designated otherwise, concrete floors shall have a troweled finish as specified in Section ll.7 of ACI 30l. Troweled finishes shall conform to the requirements of "Class A Tolerances," Section ll.9 as specified in ACI 30l.

L. Testing

1. The Contractor shall provide all field testing and inspection services, and shall pay for all such services. The Owner's Representative shall approve the testing laboratory and shall inform the Contractor when samples are to be taken for testing. The Contractor shall forward all test results to the Owner's Representative as soon as they are available.

   a. The Testing Laboratory shall conform to the requirements of ASTM E-329 as modified in 780 CMR R1 in the MA State Building Code. The State Board of Building Regulations and Standards shall license them.

2. At least one slump test shall be performed from each truckload of concrete. The sample for slump shall be taken from the middle third of a truckload. Air content tests shall be made at the discretion of the Owner's Representative. If the measured slump or air content falls outside the specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed the requirements of the specification and shall be immediately removed from the jobsite to be discarded.

3. The Contractor shall advise the Owner's Representative of his readiness to proceed with concrete placement at least one working day prior to each placement. The Owner's Representative will inspect the preparations for concrete, including the preparation of previously placed concrete, the reinforcing, and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Owner's Representative.

4. A minimum of four standard compression test cylinders shall be made and tested for **each 100 cubic yards or fraction thereof** for each type and design strength of concrete from each day's placement of concrete. One cylinder shall be tested at 7 days and two cylinders at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. The Owner's Representative reserves the right to require test cylinders to be made for each truckload of concrete if the nature of the project or project experience indicates such additional tests are required for proper control of concrete quality**.**

5. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength f'c, and no individual strength test (average of two cylinders) result falls below the specified strength f'c by more than 500 psi.

6. In the event the average compressive strength of the two 28 day cylinders do not achieve the required level, the Owner's Representative may elect to test the fourth cylinder immediately or test it after 56 days.

M. Failure To Meet Requirements

1. The Owner's Representative shall have the right to reject concrete represented by low strength tests or to agree to further testing of the concrete. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Owner's Representative as to whether substandard concrete is to be accepted or rejected or additional tests shall be conducted shall be final. All direct and indirect costs associated with further curing and testing of the concrete shall be at the Contractor's expense. All costs associated with removing rejected concrete, placing new concrete, and conducting tests on new concrete shall be at the Contractor's expense.

2. If the Owner's Representative agrees to consider further curing and/or testing of the concrete before making a final decision, the Contractor shall submit a detailed plan to the Owner's Representative, including proposed criteria for acceptance of the concrete. The plan may include additional curing of the concrete, drilling and testing of cores, load testing of the structure, or a combination.

3. If additional curing is permitted before further inspection and testing, the Contractor shall provide any necessary materials and labor to further cure the suspect concrete.

4. If drilling and testing of cores is permitted, the Contractor shall be responsible for obtaining the cores, including provision of ladders, scaffolding, and such incidental equipment as may be required. If additional curing is permitted, cores shall be drilled after the curing period, and shall be in accordance with ASTM Methods C39 and C42. The Contractor shall repair all core holes to the satisfaction of the Owner's Representative.

5. The burden of proof, including, but not limited to the work of cutting and testing the cores, inspection, evaluation, engineering, repair of the holes, or removal and replacement of the concrete in question, and all associated costs therefor, shall be at the expense of the Contractor.

6. If load testing of the concrete is permitted, and if not otherwise indicated, slabs or beams under load test shall be loaded with their own weights plus a superimposed load of 2 times the design live load. The load shall be applied uniformly over the portion being tested in the approved manner and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period, does not exceed the following value:

   D equals 0.001 (L x L)/t

   in which "L" is span in feet, "t" is depth of slab, or beam in inches. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, the slab, or beam under test recovers at least 75 percent of the observed deflection.

7. If the suspect concrete still fails to meet specification requirements, the Owner's Representative shall have the right to reject the concrete, have it removed and replaced, in accordance with paragraph 5 above, or to require mechanical strengthening of the concrete to satisfy project requirements. The Contractor shall submit a removal and replacement plan for review by the Owner's Representative.

N. Test For Watertightness

1. All concrete shall be watertight against leakage or groundwater infiltration. Special care shall be taken in the construction joints and any noticeable leakage or seepage causing wet spots on the concrete walls or slabs shall be repaired by and at the expense of the Contractor and by methods approved by the Owner's Representative.

2. All liquid holding concrete structures shall be tested for leakage before backfilling and after the concrete has attained the specified minimum 28-day design strength, as indicated by test cylinders.

3. The structure shall be filled with water to the overflow level, allowed to stand for at least 24-hours, and refilled to overflow to begin the test. After 72 hours, the

liquid loss per 24 hour period shall be determined, either by measuring the amount required to refill the tank to overflow, by measuring the drop in water level, or by an equivalent procedure approved by the Owner's Representative. Evaporative losses shall be calculated and deducted from the measured loss to determine net liquid loss (leakage). If the leakage per 24-hour period exceeds the allowable, the structure shall be repaired and retested until the leakage falls within the allowable limit.

4. For structures designed to hold water, one twentieth of one percent leakage will be allowed during a 24-hour period. No leakage (zero leakage) will be permitted for structures designed to hold liquid chemicals or fuels.

5. The Contractor shall pay all costs (including water) incurred in the testing for watertightness.

6. The Owner's Representative shall be given a minimum notice of 48 hours prior to commencement of the leakage test.

END OF SECTION

SECTION 03 35 19

INTEGRALLY COLORED STAMPED CONCRETE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section of the specifications covers the furnishing and installation of integrally colored stamped concrete.

1.02 RELATED WORK:

A. Section 03 30 00, CAST-IN-PLACE CONCRETE

1.03 REFERENCES:

A. American Concrete Institute (ACI):

1. ACI 301 "Specification for Structural Concrete."
2. ACI 302 IR "Recommended Practice for Concrete Floor and Slab Construction."
3. ACI 303.1 "Standard Specification for Cast-In-Place Architectural Concrete."
4. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing of Concrete."
5. ACI 305R "Recommended Practice for Hot Weather Concreting."
6. ACI 306R "Recommended Practice for Cold Weather Concreting."

B. ASTM International (ASTM):

1. ASTM C309 "Liquid Membrane-Forming Compounds for Curing Concrete."
2. ASTM C494 "Standard Specification for Chemical Admixtures for Concrete."
3. ASTM C979 "Standard Specification for Pigments for Integrally Colored Concrete."

C. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO M194 "Chemical Admixtures."

D. Portland Cement Association

1. PCA PA124 - Finishing Concrete Slabs with Color and Texture.
2. PCA SP021 - Color and Texture in Architectural Concrete.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer’s complete technical data sheets for the following:

1. Colored admixture.
2. Curing compound.
3. Stamps, including installation procedures.

B. Design Mixes: For integrally colored concrete.

C. Samples for Initial Selection: Manufacturer's color charts showing full range of colors available.

D. Qualification Data: For firms indicated in the “Quality Assurance" Article, including list of completed projects.

1.05 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Manufacturer with 10-years of experience in the production of specified products.

B. Installer Qualifications: An installer with 5 years of experience with work of similar scope and quality.

C. Comply with the requirements of ACI 301.

D. Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.

E. Notification of manufacturer's authorized representative shall be given at least 1-week before start of Work.

F. Integrally Colored Stamped Concrete Mockups:

1. Provide under provisions of Division 1 Section "Quality Control."
2. At location on Project selected by the Owner’s Representative, place and finish 10 feet by 10 feet area.
3. For accurate color, the quantity of concrete mixed to produce the sample should not be less than 3 cubic yards or not less than 1/3 the capacity of the mixing drum on the ready-mix truck and should always be in full cubic yard increments. Excess material shall be discarded according to local regulations.
4. Construct mockup using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control,

construction, and expansion joints in sample panels. Mockup shall be produced by the individual workers who will perform the work for the Project.

5. Retain samples of cement, sands, aggregates and color additives used in mockup for comparison with materials used in remaining work.
6. Accepted mockup provides visual standard for work of Section.
7. Mockup shall remain through completion of work for use as a quality standard for finished work.
8. Remove mockup when directed.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Colored Admixture: Comply with manufacturer's instructions. Deliver colored admixtures in original, unopened packaging. Store in dry conditions.

1.07 PROJECT CONDITIONS:

A. Integrally Colored Stamped Concrete Environmental Requirements:

1. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.
2. Avoid placing concrete if rain, snow, or frost is forecast within 24-hours. Protect fresh concrete from moisture and freezing.
3. Comply with professional practices described in ACI 305R and ACI 306R.

B. Schedule delivery of concrete to provide consistent mix times from batching until discharge. Mix times shall meet manufacturer’s written recommendations.

1.08 PRE-JOB CONFERENCE:

A. One week prior to placement of integrally colored stamped concrete a meeting will be held to discuss the Project and application materials.

B. It is suggested that the Owner’s Representative, General Contractor, Construction Manager, Subcontractor, Ready-Mix Concrete Representative, and a Manufacturer's Representative be present.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Integrally Colored Concrete:

1. L. M. Scofield Company, Douglasville, Georgia and Los Angeles, California

Phone (800) 800-9900

Local contact: John Glover telephone number (508) 353-0709

2. Davis Colors 3700 East Olympic Blvd, Los Angeles, CA 90023

   Phone: 800-356-4848 or 323-269-7311.

3. Butterfield Color: 625 West Illinois Avenue, Aurora, IL 60506

   Phone: (800) 282-3388

4. Approved equal.

B. Stamp:

1. Expressions - LID 1971 Holton Road, Talent OR 97540
   Phone: (541) 735-5800

2. Approved equal.

2.02 MATERIALS:

A. Colored Admixture for Integrally ColoredConcrete:

1. Chromix P® Admixture and Chromix ML®; L. M. Scofield Company;
2. Davis Colors – Powder Pigment or Mix Ready.
3. Butterfield Color: Uni-Mix® Integral Concrete Colorant.
4. Admixture shall be a colored, water-reducing, admixture containing no calcium chloride with coloring agents that are limeproof and ultra-violet resistant.
5. Colored admixture shall conform to the requirements of ACI 303.1, ASTM C979, ASTM C494 and ASSHTO M194.

B. Stamp:

1. Concrete Seamless Stamp Mats – Sea Shell Ocean Floor. Contractor to determine quantity of stamps required and submit to Owner's Representative for approval.

C. Curing Compound for Integrally Colored Concrete: Curing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.

1. Exterior Integrally Colored Concrete: Lithochrome® Colorwax; L. M. Scofield Company. Use to cure exterior flatwork that will be allowed to cure naturally with only occasional maintenance.
2. Curing Compound for Flatwork: Davis Colors [W-1000 Clear Cure & Seal]

[Color Seal II, tinted to match integrally colored concrete]; complying with ASTM C309 and designed for use on integrally colored concrete.

3. Butterfield Curing & Sealing compound: Clear Guard® Cure and Seal
4. Moist Curing Blankets: Disposable curing blankets specially designed for use on colored or decorative concrete and to keep the surface of concrete moist for seven days.

D. Curing and Sealing Compound: Cureseal-W™ Semi-gloss; L. M. Scofield Company. Curing and sealing compound shall comply with ASTM C309 and be of same manufacturer as colored admixture, for use with integrally colored concrete.

E. Substitutions: The use of products other than those specified will be considered providing that the Contractor requests its use in writing within 14-days prior to bid date. This request shall be accompanied by the following:

1. A certificate of compliance from the material manufacturer stating that proposed products meet or exceed requirements of this Section, including standards ACI 303.1, ASTM C979, ASTM C494 and AASHTO M194.
2. Documented proof that proposed materials have a 10-year proven record of performance, confirmed by at least 5 local projects that the Owner's Representative can examine.

2.03 COLORS:

A. Concrete Color[s]:

1. Cement: Color shall be gray or white.
2. Sand: Color shall [be locally available natural sand or be manufactured white sand to match Owner's Representative's sample.
3. Aggregate: Concrete producer's standard aggregate complying with specifications
4. Colored Admixture: As selected by the Owner's Representative from manufacturer's Color Chart.

B. Curing Compound: Color to match integrally colored concrete.

2.04 CONCRETE MIX DESIGN:

A. Provide cement content required to achieve 4,000 psi concrete strength.

1. Refer to SECTION 03 30 00 CAST IN PLACE CONCRETE.

B. Slump of concrete shall be consistent throughout Project at 4-inches or less. At no

time shall slump exceed 5-inches.

C. Do not add calcium chloride to mix as it causes mottling and surface discoloration.

D. Supplemental admixtures shall not be used unless approved by the manufacturer.

E. Do not add water to the mix in the field.

F. Add colored admixture to concrete mix according to manufacturer's written instructions.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Install concrete according to requirements of 03 30 00, CAST-IN-PLACE CONCRETE.

B. Do not add water to concrete mix in the field.

C. Surfaces shall be finished with the following finish as required by the Owner's Representative:

1. Integrally colored concrete shall be stamped. Apply stamp per manufacturer's instructions.
2. Broadcast a Release Agent over the concrete, and then place the stamp on the concrete and press into the surface.
3. Do not press the edges of the stamps into the concrete.
4. Store stamps flat and away from sunlight. Wash off cement and release residue from stamp immediately after use.

3.02 CURING:

A. Integrally Colored Concrete: Apply curing and sealing compound for integrally colored concrete according to manufacturer's instructions using manufacturer's recommended application techniques. Apply curing and sealing compound at consistent time for each pour to maintain close color consistency.

B. Curing compound shall be same color as the colored concrete and supplied by same manufacturer of the colored admixture.

C. Precautions shall be taken in hot weather to prevent plastic cracking resulting from excessively rapid drying at surface as described in CIP 5 *Plastic Shrinkage Cracking* published by the National Ready Mixed Concrete Association.

D. Do not cover concrete with plastic sheeting.

3.03 TOLERANCES:

A. Minor variations in appearance of integrally colored concrete, which are similar to natural variations in color and appearance of uncolored concrete, are acceptable.

3.04 APPLICATORS:

A. For a list of qualified contractors, contact a Scofield representative, John Glover telephone number (508) 353-0709; Davis Colors (800) 356-4848; Butterfield Color (800) 282-3388.

END OF SECTION

SECTION 04 41 00

GRANITE BLOCKS AND BOULDERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this trade.

1.02 SCOPE OF WORK

A. The work of this Section shall consist of placing new granite blocks and boulders, and placing new granite blocks for an engraved park sign, as shown on the Drawings and as directed by the Owner's Representative.

The work includes, but is not limited to, the following boulder types:

1. Granite Blocks
2. Granite Boulders
3. Masonry Wall Engraved Lettering

1.03 RELATED WORK

A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 03 05 00, FIELD CONCRETE
2. Section 31 00 00, EARTHWORK

1.04 EXAMINATION OF CONDITIONS

A. The Contractor shall fully inform himself of existing conditions of the site before submitting his bid, and shall be fully responsible for carrying out all site work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed.

B. Plans, surveys, measurements and dimensions under which the work is to be performed are believed to be correct to the best of the Owner's Representative's knowledge, but the Contractor shall have examined them for himself during the bidding period, as no allowance will be made for any errors or inaccuracies that may be found therein.

1.05 SCHEDULING

A. The Contractor shall submit to the Owner's Representative, for approval by the Owner, a progress schedule for all work as specified herein.

1.06 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards:

1. ASTM: American Society for Testing and Materials
2. AASHTO - American Association of State Highway and Transportation Officials (tests or specifications). AASHTO or AASHO
3. Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.

B. Qualifications of Workers: Use adequate numbers of skilled workers who are trained in the necessary crafts and who are completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

C. Layout: After staking out the work, and before beginning final construction, obtain the Owner's Representative's approval for layout. Contractor shall adjust as determined by the Owner's Representative. The Owner's Representative may make adjustments to layout as is required to meet existing and proposed conditions without additional cost to the contract price.

1.07 SUBMITTALS

A. Contractor shall submit six (6) samples of granite blocks samples, minimum size of 6-inch x 6-inch x 6-inch of all proposed granite blocks shall be submitted to the Owner's Representative for review. Samples shall represent the full range of the color variation, texture and finish that can be expected in the finish work to be approved by the Owner's Representative. Identify the quarry and fabricator (if different) for all the granite features specified herein.

B. Shop Drawings shall show all granite block dimensions and identify the individual blocks required to complete the work as designated on the drawings. No final sizing or finishing of granite blocks shall be done until the shop drawings for that part of the work have been approved.

PART 2 - MATERIALS

2.01 GRANITE BLOCKS AND GRANITE BOULDERS

A. All granite used for granite blocks, granite boulders, and the granite block sign wall shall be of standard architectural grade, free of cracks, seams, or starts that may impair its structural integrity or function. Color or other visual characteristics indigenous to the

particular material and adequately demonstrated in the sampling/submittal process will be accepted provided they do not compromise the structural or durability capabilities of the material. Texture and finish shall be within the range of samples approved by the Engineer.

B. The Contractor shall furnish granite as supplied by United Stone & Site Inc. 26 Farm St. Canton, MA (781-575-1776) and 169 Munyan Rd. E. Putnam, CT (860-928-6559) or approved equal. The basic parameters of the granite blocks shall be as summarized below:

1. Granite blocks are to be quarried, manufactured and installed, consistent with these specifications and all relevant details.

2. Granite block dimensions shall conform to the dimensions included on the drawings.

3. As a general description, the granite blocks shall be generally rectangular in shape allowing for normal irregularities associated with the split/rock or quarry face surfaces described below, and on the Contract Drawings:

   i. All engraved faces of the block are to receive a honed finish.

   ii. All non-engraved faces of the block are to exhibit a rock point or split face finish.

4. Blocks are to be set vertically on top of a dense grade crushed stone subbase as specified and detailed elsewhere.

5. Blocks shall contain no sharp corners or angular projections, to a fifteen (15) degree angle maximum, and shall be field approved by the Owner's Representative.

C. Approximately two (2) weeks prior to anticipated installation, the Contractor shall notify the Owner's Representative to field select each boulder to be placed. The Contractor shall coordinate with the Owner's Representative such that she/he is present while blocks are set. Granite blocks shall be of an approved size and shape with dimensions as noted below in the amounts shown on the drawings:

Length:	36-inch to 96-inch
Width:	12-inch
Height:	12-inch to 18-inch

D. The Contractor shall notify the Owner's Representative when site preparation is complete. Spacing and location of the boulders shall be as shown on the plans or as required by the Owner's Representative. Preliminary placement of boulders shall be "dry" (without visible mortar). The Contractor shall make adjustments in the block

placement as required by the Owner's Representative. After the arrangement of boulders is approved by the Owner's Representative, the Contractor shall set the blocks into grade on a compacted dense graded crushed stone base as necessary to set the boulders in a stable position and to prevent future removal or displacement of the boulders. The Contractor should expect to handle each stone a minimum of two times:

1. To mock-up in final location to ensure fit

2. To install in final location.

2.02 ENGRAVED LETTERING FOR THE GRANITE BLOCK SIGN WALL

A. All engraving shall be done by skilled Stone Carvers in a correct and artistic manner, in strict accordance with the spirit and intent of the approved shop drawing, or from models furnished or approved by the Owner's Representative.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor is responsible for installing them in their final location in accordance with the Contract Drawings.

B. The installer shall examine all work and conditions under which this work is to be performed and notify the Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means installer accepts substrates, subgrades, previous work, and conditions.

END OF SECTION

SECTION 05 50 00

MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This section of the specification covers all miscellaneous metal items required for the work, except as specified elsewhere.

B. All miscellaneous metalwork shall be fabricated as detailed or approved and shall be installed complete with all necessary anchors, anchor bolts, eye bolts, guides, bolts and other accessories.

C. In general, site and shop fabricated items are included under this section, and factory fabricated items excluded. This section includes but is not limited to: handrails, guardrails, fencing, gates, fasteners, plates and all other site or shop fabricated metal items.

1.02 RELATED WORK:

A. SECTION 03 05 00, FIELD CONCRETE

B. SECTION 03 30 00, CAST-IN-PLACE CONCRETE

C. SECTION 09 90 00, PAINTING

1.03 QUALITY ASSURANCE:

A. The drawings show the character and extent of the work required, but do not attempt to show all methods, materials, and details of construction, fastening, etc. Supplementary parts customarily necessary to complete an item, though such parts are not definitely shown or specified, shall be included as part of the item.

B. Details of construction of the various items shall be submitted on the shop drawings. High quality construction with a neat, finished, and workmanlike appearance will be required.

C. The size and spacing of screws, connectors, anchors, and similar items, and the size and dimensions of metal items stated herein shall apply in general; specific sizes and spacing of fasteners and dimensions of metal items listed on the drawings shall take precedence.

D. Items supplied hereunder which are required to be built into the concrete, masonry, etc., shall be delivered to the site at locations as required by the Owner’s Representative, and as required by the overall construction schedule.

E. Manufacturers of other products comparable in quality and type to those specified will be acceptable if satisfactory data on past performance and other required information is furnished by the Contractor, and if approved by the Owner's Representative.

F. Color galvanized system shall be guaranteed by manufacturer for 20 years.

G. Contractor shall submit an affidavit to Owner's Representative that materials used are protected from or will not be subject to galvanic action.

1.04 REFERENCES:

A. The following standards from a part of these specifications, and indicate the minimum standards required:

American Institute of Steel Construction (AISC)

AISC	Specification for Structural Steel Buildings

American Society for Testing and Materials (ASTM)

ASTM	A36	Structural Steel
ASTM	A53	Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless
ASTM	A123	Zinc (Hot-Dip-Galvanized) Coatings on Iron and Steel Products
ASTM	A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM	A239	Test for Uniformity of Coating by the Preece Test (Copper Sulfate Dip) on Zinc-Coated (Galvanized) Iron or Steel Articles
ASTM	A307	Carbon Steel Externally and Internally Threaded Standard Fasteners
ASTM	A366	Steel, Carbon, Cold-Rolled Sheet, Commercial Quality
ASTM	A525	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements
ASTM	A569	Steel Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality
ASTM	B221	Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubes
ASTM	B308	Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded

ASTM C478 Precast Reinforced Concrete Manhole Sections

American Welding Society (AWS)

AWS D1.1 Structural Welding Code Steel

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Before fabricating or assembling any aluminum or stainless steel items, samples indicating full range of finish, color, and texture to be supplied shall be submitted to the Owner's Representative for review.

B. Shop drawings for all metalwork included in this section shall be submitted to the Owner's Representative for review.

C. The shop drawings for handrails, guardrails, fencing, gates, and other shop fabricated items shall be complete and checked, showing sizes, layout, method of assembly, fastenings, anchorage or connection with other work, finish, and coatings, etc. Shop drawings for aluminum work shall indicate alloys, temper and finish to be used.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Arrange for installation of handrails, railings and guardrails specified in this Section by the same firm that fabricated it.

B. Fabricator Qualifications: A firm with at least ten (10) years' experience and at least five (5) projects in producing ornamental steel guardrails, like that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. References shall be provided to the Owner's Representative upon request.

1.07 GUARANTEE

A. The Contractor shall furnish and deliver standard written manufacturer's guarantee in the City of Framingham's name covering all materials and workmanship under this Section, in addition to other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

B. Supplier shall pay for repairs of any damage to any part of the project caused by defects in his work and for any repair to the materials or equipment caused by replacement. All repairs are to be done to the satisfaction of the Owner's Representative.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. STEEL:

1. Materials, fabrication, and erection of miscellaneous steel sections shall conform to the applicable requirements of the AISC Specification.

2. Steel shapes, plates and bars shall conform to ASTM A36.

3. Sheet steel shall be cold-rolled or hot-rolled carbon sheet steel conforming to ASTM A366 or ASTM A569 as appropriate.

4. Steel pipe shall conform to ASTM A53.

5. Stainless steel shall be Type 304 unless otherwise indicated or specified.

B. FASTENERS:

1. Metalwork shall be complete, with all bolts, anchors, plates, washers, clamps, screws, studs and other such devices for proper securing and anchoring. Where positions of anchorages can be predetermined, they shall be shop-installed on the item; otherwise the material or equipment to be fastened shall be expansion bolted, toggle bolted, screwed, or otherwise fastened as shown on the drawings or called for herein.

2. Bolts and nuts for general anchorage and for miscellaneous ferrous metal assemblies and fasteners shall be galvanized, unfinished bolts conforming to ASTM A307 unless otherwise noted on the drawings.

3. Expansion bolts for use in concrete and masonry shall be of one manufacturer and shall be approved. Bolts shall be Kwik Bolt concrete anchors manufactured by Hilti Corp.; Trubolt+ manufactured by Red Head Concrete Anchoring Specialists; Wej-it manufactured by Wej-it Fastening Systems; or an approved equal product.

4. The centerline of expansion shields shall not be closer than 3-inches to the edge of any concrete in which they are placed.

5. Material for fasteners shall match or be galvanically compatible with the materials fastened. Washers, nuts and other accessories shall match the bolts.

6. Where the specific type, material, size and spacing of fasteners has not been called for on the drawings or in specifications, the fasteners proposed by the Contractor shall be reviewed by the Owner's Representative. If, in the opinion of the Owner's Representative, they are not in accordance with good safety practices, the contractor shall revise and resubmit appropriate fasteners.

C. STAINLESS STEEL HANDRAILS:

1. Railings shall be in accordance with OSHA and the Commonwealth of Massachusetts Architectural Access Board (MAAB) standards and be capable of withstanding a load of 200 pounds applied at any point, in any direction on the top rail. Unless otherwise indicated on the drawings, pipe rail posts shall be 1-1/2-inch OD type 304 welded steel pipe. Interior reinforcement shall be provided in posts and/or rails as required to resist the 200-pound load.

2. Bends in pipe shall be made with manufactured elbows. Rail ends which are not continuous with posts or bolted to the wall shall have self-return to the post and ground surface. Mid-rail posts shall be approximately 6 feet on centers, or as noted on the drawings.

3. Connections shall be welded, with welds ground smooth. Railings shall be fabricated in panels, which are as long as can be conveniently handled, to eliminate as much field welding as possible.

4. Submit certification by a Professional Engineer licensed in the state where the project is located, stating load capacity.

D. METAL PICKET RAILINGS:

1. Metal Picket Railings shall be industrial grade, in-ground mounted with picket / baluster panel configuration as shown, galvanized.

2. Rails, pickets/panel, posts, and anchor bolts shall be fabricated to withstand at minimum the loads specified in IBC 2015 at or below allowed stresses. Anchor bolts shall be finished with the same system used for the metal picket railings. Bolts shall be installed into epoxy resin coated hold (5/8”x7” min.) or threaded rod, nuts, washers, installed into epoxy resin with 4” minimum embedment into the existing retaining wall on Onset Avenue. Rail post mounting shall be as shown, using hot dip galvanized lag bolts with stainless steel washers.

3. Guardrail design shall match the details included in the Contract Drawings.

4. Steel pipe shall conform to ASTM A53.

5. Steel shapes, plates and bars shall conform to ASTM A36.

6. Dimensions shall be as shown on the drawings.

7. All steel elements shall be color galvanized with compatible color finish, using the ColorGalf15 system by Duncan Galvanizing of Everett, MA, or approved equal (with equivalent warranty). Color shall be approved by the Owner’s Representative.

PART 3 - EXECUTION

3.01 GALVANIZING:

A. Hot-Dip Galvanizing:

1. Provide a coating for iron and steel fabrication applied by the hot-dip process. The galvanizing bath shall contain .05-.09% nickel. Immediately before galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The use of the wet kettle process is prohibited. Comply with ASTM A-123 for fabricated products and ASTM A-153 for hardware. Provide thickness of galvanizing specified in referenced standards. Provide coating by Duncan galvanizing or approved equal.

B. Factory-Applied Primer Over Hot-Dip Galvanizing:

1. Provide a factory-applied polyamide epoxy coating primer, 2.0 mils dry film thickness minimum. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations or mechanically abrade to create a uniform surface profile of 1.0 – 2.0 mils, and as recommended by coating manufacturer. Provide primer coating by Duncan Galvanizing, Tnemec Co. or approved equal.

C. Factory – Or Field-Applied Architectural Finish Over Primer And Hot-Dip Galvanizing:

1. Provide a factory- or field-applied polyurethane color coating, 2.5 mils dry film thickness minimum. Apply coating at the galvanizer's plant or coating shop, immediately after application of the prime coat, in a controlled environment meeting applicable regulations, and as recommended by the coating manufacturer. Provide finish coating by Duncan Galvanizing, Tnemec Co. or approved equal.

D. Items noted as "color galvanized" shall have an architecturally compatible factory finish formulated to be applied over galvanized members, suitable for use in harsh environments, and applied by the galvanizer at the factory or coating shop.

D. The Contractor shall be responsible for determining if any fabricated items are not suitable to be hot-dip galvanized and shall notify the Owner's Representative in writing.

E. Surfaces of metal to be galvanized shall be free from all dirt, grease, rust and moisture. Burrs and sharp projections shall be removed from edges, holes, etc., before galvanizing. Fabricated items shall be galvanized after fabrication.

3.02 WELDING OF STEEL:

Welding of steel shall be done in accordance with the AWS Code. Welds shall be continuous along entire line of contact, except where plug or tack welding is noted. Exposed welds shall be ground smooth.

3.03 FABRICATION AND ERECTION:

A. Metalwork shall be complete, with all necessary bolts, nuts, washers, anchors, plates, fastenings, and other fittings. To the extent possible, holes for attachment of blocking, clip angles, etc. shall be shop punched. Where shop punching is impracticable, holes shall be field drilled. Burned holes will not be permitted.

B. Material shall be straight, accurately fabricated with joints neatly framed, square, and welded.

C. Metalwork to receive hardware shall have all cutouts and attachments accurately made using the hardware itself or templates where necessary.

D. Metalwork shall be accurately set and secured in position, with lines plumb and level and surfaces flush and square, or as otherwise required to conform to the structure as shown on the drawings.

E. Wherever possible, all metalwork shall be built into the cast in place concrete work and shall have sufficient anchors, well- fastened.

3.04 WORK PROTECTION:

A. Aluminum surfaces, which after erection are to be in contact with wood or treated wood, shall be given a heavy brush coat of aluminum-pigmented bituminous paint or two (2) coats of aluminum metal paint.

B. Aluminum surfaces, which after erection are to be in contact with concrete, shall be given a heavy brush coat of alkali-resistant bituminous paint.

C. Aluminum surfaces which after erection are to be in contact with dissimilar metals, other than zinc or stainless steel, shall receive a heavy brush coat of zinc chromate primer, followed by two (2) coats of aluminum metal and masonry paint, or shall receive a heavy brush coat of alkali-resistant bituminous paint.

D. Aluminum surfaces which are to be exposed to the weather, including anodized surfaces, shall receive two sprayed-on shop coats of water-white methacrylate lacquer, capable of withstanding the action of lime mortar for at least one week in an atmosphere of 100 percent humidity at room temperature. Surfaces shall be perfectly clean and dry before lacquering.

E. Prior to the application of any of the above coatings, any and all areas where the paint has been damaged by abrasion or other cause shall be cleaned and repainted as required so that the aluminum will have a complete protective paint film when brought into contact with the material against which it is being protected.

F. Before application of any coating, the surface shall be cleaned of all dirt, heavy deposits of grease or oil, and other foreign substances such as paint, lacquer, tape, moisture, or other material, which might interfere with the adhesion of the coating to be applied. All metals shall be left in a clean condition. Cleaning methods shall employ steam, mild soaps, mild detergents, or solvents such as kerosene, or naphtha. Lacquered surfaces may be cleaned with a mineral solvent or turpentine. Thorough rinsing with clean water and drying with clean, soft cloths shall follow any of the above cleaning methods. No other cleaning method may be used without the specific permission of the Owner's Representative.

G. After suitable cleaning, all metalwork shall be given an approved shop coating of methacrylate lacquer to protect the surface from stain. The protective coating of lacquer on all metalwork worn off due to handling or erection shall be replaced by a new coating of lacquer of the same type.

H. During construction, precautions shall be taken to prevent damage to the metal work from splashing or the accumulation of paint, concrete, mortar, or other similar materials, or from staining adjacent surfaces during cleaning operations. Any staining or damage that does occur shall be immediately and completely removed.

I. Each piece of metal in transit and in storage shall be individually wrapped with a non-scratching material, with the joints securely sealed. Wrapping shall completely cover and protect each item. Storage shall be out of the weather, protected from moisture, and with adequate ventilation.

3.05 PAINTING:

A. Ferrous metals of this section, except for galvanized or stainless steel shall be shop primed in accordance with the following:

1. Submerged service components shall be sandblasted clean in accordance with SSPC-SP-10, Near White, immediately prior to priming.

2. Non-submerged service components shall be sandblasted clean in accordance with SSPC-SP-6, Commercial Grade, immediately prior to priming.

3. Shop primer, except as otherwise noted, shall be one spray applied coat with dry film thickness of 3.5 to 4.5 mils of Tnemec 66 Boston Gray Primer by Tnemec Co.; or Aquapun by PPG, Inc; or approved equal.

4. Portions of ferrous metals to be embedded in concrete or masonry shall be given a heavy brush coat of alkali resistant bituminous paint.

5. Scratches or abrasions in the shop coat and areas at field welds, bolts, nuts and other unpainted areas shall be touched up after erection with the paint specified for the shop coat. Cold galvanized paint shall be used for touch up of galvanized surfaces. Paint shall be one of the following; Sealube Co., ZRC; Galvicon Corp., Galvicon;

Stanley Chemical Div., Zinc Shield; Duncan Galvanizing Corp., ZIRP; or an approved equal.

6. Shop and field prime paint systems shall be compatible with finish coat.

3.06 RAILING/HANDAIL INSTALLATION

A. Install handrails and railings in accordance with approved shop drawings. Do not begin installation and erection before final grading is established.

B. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil as indicated on approved Shop Drawings.

C. Setting Posts in Earth: Center and align posts in holes, space as required by manufacturer. Brace terminal post against structure as required.

1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.

a. Unless otherwise indicated, set top of concrete footings 4 inches below finish grade.

D. Assembly: Install fully assembled railing and handrail sections as indicated on Drawings.

3.07 CLEANING AND PROTECTING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work.

END OF SECTION

SECTION 06 10 00

CARPENTRY

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This Section covers tools, equipment, labor, and materials necessary to perform rough carpentry work complete and miscellaneous carpentry items not specified elsewhere including fasteners and supports.

B. Nails, screws, bolts, anchors, brackets, and other hardware for fastening and securing items provided under this section of the specification shall be furnished under this section.

1.02 RELATED WORK:

A. Section 03 30 00, CAST-IN-PLACE CONCRETE

D. Section 31 50 00, SUPPORT OF EXCAVATION

1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23, SUBMITTALS, SUBMIT THE FOLLOWING:

A. Framing lumber product data and certifications from the appropriate grading agency
B. Three sets of certificates of wood treatment upon delivery of treated wood product. Treated wood product shall bear appropriate American Wood Preservers Bureau (AWPB) quality mark.
C. Fastener and connector product data.

D. Color samples:
   a. Three (3) sets of samples of wood shall be submitted to the Owner's Representative for selection of colors.
   b. Color samples of the non-slip deck tread.

E. Field Measurements: Take accurate field measurements before preparation of shop drawings and fabrication. Do not delay job progress. Allow for field cutting and fitting where taking field measurements before fabrication is not possible.

F. Mock-Up:
   a. Decking: Contractor shall provide at least one (1) fully finished representative samples that maybe installed in the finished condition at the Contractor's option. Showing full range of cuts, fasteners, and variations expected. The sample shall be a minimum of twenty-five (25) square feet.

1.04 DELIVERY:

Lumber, plywood, and other wood material shall be delivered to the job dry, and shall be protected from injury, dirt, dampness, and extreme changes of temperature and humidity at all times.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. LUMBER:

1. The grades of all materials under this section shall be defined by the rules of the recognized associations of lumber manufacturers producing the material specified, but the maximum defects and blemishes permissible in any specified grades shall not exceed the limitations of the American Lumber Standards.

2. Lumber shall bear the grade and trademark of the association under whose rules it is produced, and a mark of mill identification. Lumber shall be of sound stock, thoroughly seasoned, kiln dried to a moisture content not exceeding 15 percent.

3. Exposed surfaces of wood which are to be painted shall be free from defects or blemishes that will show after the second coat of paint is applied.

4. Framing Lumber for joists, rafters, plates, headers, stair stringers and carriages, and sleepers shall be Southern Pine Select Structural Grade with the following minimum properties:

Size Classification 12” Wide, 2” -4” Thick	Size Classification 5” x 5” or Larger
$E = 1.8 \times 10^6$ PSI Specific Gravity, G = 0.55 Fb = 1600 PSI Fv = 175 PSI Fc, perp. = 565 PSI Ft = 1100 PSI	$E = 1.5 \times 10^6$ PSI Specific Gravity, G = 0.55 Fb = 1500 PSI Fv = 165 PSI Fc, perp. = 375 PSI Ft = 950 PSI

5. Engineered wood products shall be preservative treated conforming to Trus Joist Pressure Treated Plus PSL or approved equal.

6. Materials not specifically listed shall be of an accepted grade dictated by good practice.

B. WOOD DECKING

1. Wood decking shall be pressure treated Southern Pine with a minimum allowable extreme fiber stress of 1350 PSI and minimum modules of elasticity of 1,400,000 PSI.

2. Wood decking shall be No. 1/Dense Select grade lumber.

3. Wood decking to be fastened with stainless steel screws or better. All screws will be recessed a minimum of ½" below deck surface. At time of installation, planks are to be placed tight together with a maximum 1/8-inch gap between planks.

C. WOOD PRESERVATION TREATMENT:

1. Decking, joists, and beams shall be preservative treated to meet AWPA Use Category 4B. Framing below the deck shall be preservative treated to meet AWPA Use Category 5A. Use of pentachlorophenol is not permitted.

2. Before the preservative treatment is applied, the lumber to be treated shall be sawed to exact lengths required, and bored ready for use in the work so far as practicable, in order to reduce to a minimum cutting or boring of lumber after treatment. Only lumber of the same kind and approximately the same size and seasoning shall be treated in any one charge. All surfaces of treated lumber cut after treatment shall receive two heavy brush coats of preservative solution before the lumber is placed in the work. Framing shall not be incised.

D. HARDWARE

1. Brackets, spikes, bolts, washers, nuts, joist hangers and all related hardware shall be comprised of steel and shall be hot dipped galvanized in accordance with ASTM A123 or A153, unless noted otherwise on the plans.

2. Prefabricated fasteners (i.e. Simpson/USP Hardware) shall include ZMAX (Simpson G185 galvanized finish) finish or approved equivalent.

3. Bolts shall be ASTM A-307. All bolt holes shall be 1/16" larger than bolt. Furnish bolts of the proper length for each connection (use the plan length of bolts given for estimating purposes only). Furnish square or hexagonal bolt heads and nuts where the washers bear on wood and hexagonal bolt heads where the washers bear on metal.

4. Provide washers on each end of bolts, except with high strength bolts where only one washer is required. Provide standard cut washers for ½ inch bolts or smaller that are bearing on wood or metal. For bolts larger than ½ inch diameter, furnish cast ogee or approved equivalent malleable castings where washers bear on wood. Furnish cast ogee washers with a diameter of four times the bolt and a thickness at least equal to the diameter of the bolt. Furnish malleable washers with a diameter of four times the bolt and a thickness at least half of the diameter of the bolt.

5. All nails shall be stainless steel.

6. All screws shall be 316 stainless steel unless noted otherwise.

7. Deck screws for securing deck boards shall be stainless steel Torx star head deck

screws or approved equal, unless otherwise noted on the plans.

PART 3 - EXECUTION

3.01 CONSTRUCTION:

A. Work shall be erected plumb, true and square.

B. Coordinate delivery and erection of prefabricated components. Field applied items shall be installed in accordance with good trade practices. Cutting and carpentry for other trades shall be performed. Cut ends of lumber previously treated with preservative specified shall be brushcoated with the same material.

C. Examine cable work for railing to determine which cables will be anchored or will penetrate. Coordinate with responsible entity to perform corrective work as necessary. Verify post size and cable spacing are in accordance with the manufacturer's recommendations. Take field measurements and compare installation conditions with construction drawings/plans. Notify manufacturer and owner if field measurements vary from the construction drawings/plans.

D. Except as otherwise indicated on the design drawings, fasteners for nailers and for other wood members used as nailers or anchorage material shall be the equivalent of 1/2-inch diameter bolts at 2'-6" o.c. for 2-inch material, and 3/8-inch diameter bolts at 2'-0" o.c. for 1-inch material.

E. Minimum length of nails shall be twice the thickness of wood being fastened and in accordance with the Massachusetts code requirements for wood frame construction.

F. Furring, blocking, nailers, and similar items shall be provided wherever required for the support, proper erection, fastening, or installation of carpentry or other materials, and as shown on the drawings.

G. Wood decking shall be pre-drilled and attached with galvanized self-tapping screws. Every plank must be attached with at least two fasteners at each end. Decking shall be tied down such that there is no uplift or lateral movement (in direction of bridge span). All fasteners to be zinc plated. Planks are to be pre-drilled prior to installation of bolts and/or screws. Screw patterns shall be straight, consistent, and evenly spaced throughout and marked by chalk line prior to installation. Decking shall be designed such that deflection is limited to L/300 (where L is the distance between supports. Decking shall have a 1/16-inch gap between adjacent planks.

H. All lumber shall be installed such that all stamps, barcodes, logos, brands, lettering/numbering, or other markings are hidden from view.

I. Re-treat drill (bolt) holes with preservative prior to installation.

J. All shavings and wood cuttings of treated lumber shall be captured and removed. No shavings, cuttings, or scrap treated lumber shall enter the watercourse.

K. Non-slip deck treads shall be installed per manufacturer's recommendations.

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This Section covers field painting and coating of surfaces, complete. Shop painting of metal items is specified under the applicable item.

B. A schedule listing the various types of surfaces to be painted and the types of paints to be applied is included herein.

C. Unless otherwise indicated, the following items shall not be painted:

1. Labels on equipment, such as Underwriters' Laboratories and Factory Mutual, equipment identification, performance rating, and name or nomenclature plates.

2. Moving parts of operating units, exposed bolt threads, mechanical and electrical parts.

3. Electrical conduit.

4. Stainless steel.

5. Concrete.

6. Plumbing fixtures.

7. Uninsulated PVC piping (to be banded only)

1.02 RELATED WORK:

A. Section 05 50 00, MISCELLANEOUS METALS

1.03 SYSTEM DESCRIPTION:

A. The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether used as prime, intermediate, or finish coats.

B. The Contractor shall do a complete painting job throughout the work in accordance with generally approved modern practices for work of high quality. Unless otherwise specified, all materials and surfaces customarily painted shall be given not less than one

shop coat and two field coats or one prime coat and two finish coats, regardless of whether or not the surface to be painted is specifically mentioned.

C. Paints containing lead shall not be used.

D. To ensure a satisfactory painting job it is essential that the paints applied in the shop and in the field be mutually compatible. The Contractor shall determine what shop paints have been used and shall verify that field applied paints are compatible therewith.

E. The colors of finish coatings shall be selected by the Owner's Representative from color chips submitted by the Contractor for review. The color selection shall be in the form of a schedule indicating the colors to be used on the various surfaces. The colors used in the final work shall be in accordance with the color schedule and shall match the selected color chips.

F. All coating systems used for potable water applications shall be previously approved by the National Sanitation Foundation (N.S.F.) in accordance with Standard 61. Evidence of such approval shall be an approval letter from N.S.F. listing the submitted materials.

G. Paints submitted shall meet all Federal and State E.P.A. regulations pertaining to volatile organic compounds (VOC) compliance.

1.04 REFERENCES:

A. The following standards form a part of these specifications, and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM	F1869	Moisture Vapor Emission Rate Using Anhydrous Calcium Chloride

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Manufacturer's literature of proposed paints.

B. Painting schedule.

C. Three (3) sets of color chips for selection of colors.

1.06 DELIVERY AND STORAGE:

A. Paint shall be delivered to the site in the manufacturer's sealed containers. Each container shall bear the manufacturer's label, listing the brand name, type and color of paint, and instructions for thinning. Thinning shall be done only in accordance with directions of

the manufacturer. Job mixing or job tinting may be done when approved by the Owner's Representative and for preparing sample colors.

B. Painting materials shall be stored and mixed in a single location designated by the Owner's Representative for this purpose. The Contractor shall not use any plumbing fixture or pipe for mixing or for disposal of any refuse. It shall carry all necessary water to its mixing room, and shall dispose of all waste outside of the building in a suitable receptacle. The Contractor will be held responsible for any damage done due to failure to observe these precautions.

C. The paint storage area shall be kept clean at all times, and any damage thereto or to its surroundings shall be repaired. Any oily rags, waste, etc., shall be removed from the building every night, and every precaution shall be taken to avoid danger of fire.

D. Heat must be provided in the storage area if paints are to be stored during winter months. The temperature shall be maintained above 40 degrees F. at all times.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. PAINT SCHEDULE:

Except as otherwise indicated, all paint used shall be of the type listed in the schedule below, by Tnemec Company, Inc., or equivalent paints by Sherwin-Williams Company, International Paints, or other approved paint fully equal to paint manufactured by the above named companies. No brand other than those named will be considered for approval unless the brand and type of paint proposed for each item in the following painting schedule are submitted in writing to the Owner's Representative, along with sufficient data supported by certified tests.

PAINT SCHEDULE

Key		Tnemec	Note 1
AGE	Acryli Gloss Enamel	1029 Enduratone	3.5
APE	Acrylic Polyurethane	73 Endura-Shield Enamel	3.0
ABF	Cementitious Block Filler	130 Envirofill	80-100 s.f./gal
BO	Bleaching Oil	Note 5	
CEE	Catalyzed Epoxy	L69F Epoxoline II	4.0
CEM	Catalyzed Epoxy Mastic	27 WB Typoxy	Note 3

Key		Tnemec	Note 1
CEP	Catalyzed Epoxy Primer	L69F Epoxoline	3.0
EMC	Epoxy Modified Cement	218 Mortar-Clad	Fill/Surface
EP	Epoxy-Polyamide (thinned 30% #4 thinner)	FC 22 Pota-pox	25-30
EPW	Water-based Epoxy Primer	151 Elasto-Grip	1.0-1.5
HGV	High Gloss Varnish		Note 2
HSE	High Solids Epoxy (Minimum 69%)	L69 Epoxy	6.0
MA	Modified Acrylic	115 Uni-bond	3.0
MAE	Modified Acrylic Elastomer	156 Envirocrete	6.0-8.0
MCU	Moisture Cured Urethane	Series 1 - Omnithane	2.5-3.0
MPE	Modified Polyamine Epoxy	Series 435 - Permaglaze	15-20 mils
NE	Novolac Epoxy	282 Tneme-Glaze	7.5
PEF	Polyamine Epoxy Finish	280 Tneme-Glaze	6.0-8.0
PEP	Polyamine Epoxy Primer	201 Epoxoprime	6.0-8.0
PVA	PVA Sealer	151 Elasto Grip	0.75-1.5
PWC	Potable Water Coating	Series FC 22 Pota Pox	25-30
SA	Silicone Aluminum	39-1261 (Note 4)	1.5
VB	Vapor Barrier	262 Elasto Shield	50-100
WP	Wood Primer	151 Elasto-Grip	1.0-1.5
WS	Wood Sealer	Note 2	-
Z	Zinc-Rich Primer	90G-1K97 Tneme-Zinc	2.5

Notes
1: Minimum Dry Film Thickness/Coat (mils)
2: Furnished by reputable manufacturer and acceptable to the Owner's Representative.
3: Shall be used as a tie-coat between incompatible paints @ 3.0-4.0 mils.
4: This paint is suitable for temperatures up to 1200ºF and must be final cured at 400ºF for one hour.
5: Bleaching oil is a translucent gray paint stain with a chemical additive to enhance the natural bleaching tendencies of cedar shingles.

B. PAINTING SCHEDULE:

Paint shall be applied in accordance with the paint key listed on the following schedule and defined in the preceding Paint Schedule:

Item	Field Coats		
	1st	2nd	3rd
Walls:			
Exterior concrete masonry units (if sprayed, backroll first coat)***	MAE	MAE	--
Metals:			
Exterior miscellaneous galvanized and non ferrous metals and piping (SP7 required)	CEE	APE	--
Exposed electrical conduit, conduit fittings, outlet boxes	Same as adjacent wall or ceiling		
Hot ferrous metal surface	SA	SA	--
Wood and Carpentry Items:			
Wood trim (natural finish)	WS	HGV	HGV
Wood trim (unprimed)	WP	AGE	AGE
Piping:			
PVC Piping designated to be painted (SP7 or hand sand)	CEE	CEE	--
Pipe insulation (plastic or metal sheathed paint as scheduled for plastic or metal surface)	PVA	CEE	CEE
Other piping (see metals)			

***For existing, painted masonry walls, use EPW primer, followed by two coats of MAE.

^ If galvanized metal is provided with a light top coat sealer, light brush blast surface preparation is required prior to first field coat

B. SPARE PAINT:

1. Furnish to the Owner one unopened gallon of each type and color of paint used on the work.

2. Furnish both components for each type and color of epoxy paints used on the work.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION:

A. Before any surface is painted, it shall be cleaned carefully of all dust, dirt, grease, loose rust, mill scale, old weathered paint, efflorescence, etc. All necessary special preparatory treatment shall then be applied. Where required, imperfections and holes in surfaces to be painted shall be filled in an approved manner.

B. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surfaces which have been cleaned, pretreated, or otherwise prepared for painting, shall be painted with the first field coat as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surface.

D. Wood shall be sanded to a smooth and even surface and then dusted off. Before priming wood that is to be painted, shellac shall be applied to all knots, pitch and sapwood. After priming or stain coat has been applied, nail holes and cracks shall be thoroughly filled with plastic wood or putty. For natural finish work, putty shall be colored to be imperceptible in the finished work.

E. Exposed nails and other ferrous metal or surfaces to be painted with water-thinned paint shall be spot primed with aluminum.

F. Surfaces shall be clean and dry before painting. All efflorescence, grease, oil, etc., shall be removed before painting, and all loose, crumbling material shall be removed by vigorous wire brushing over entire surface, followed by removal of all dust.

G. All holes in plaster shall be filled with plaster of paris and all cracks shall be cut out and filled. No sandpaper shall be used on plastered surfaces. Prior to painting, surfaces shall be tested with a moisture detecting device, such as Kaydel Plaster Tester, Type CP-48, as manufactured by Hard Moisture Gauges, Inc. No sealer or paint shall be applied when the moisture content of the plaster exceeds 8 percent, as determined by the test. Testing shall be done in the presence of the Owner's Representative, and in as many locations as directed. Plaster shall be thoroughly dry-brushed before painting or sealing.

H. All nonferrous metal surfaces to be painted shall be cleaned of all dirt, grease, oil and other foreign substances uniformly profiled per SSPC SP 7.

I. All galvanized surfaces to be painted shall be brush blasted to create a uniform surface profile per SSPC SP7.

J. Before application of the first full field coat, abraded areas of all non-galvanized ferrous metal items having shop coats shall be touched up with paint of the type indicated on the Painting Schedule.

K. All items of equipment such as motors, pumps, instrumentation panels, electrical

switchgear, and similar items, that have been given shop coats, paint filler, enamel or other treatment customary with the manufacturer, shall have, after installation, all scratches and blemishes touch up prior to application of the first field coat. Factory prefinished items not to be field painted shall be touched up with matching paint to repair any areas damaged during installation.

L. All submerged concrete surfaces that are to receive an epoxy coating shall be brush blasted to remove surface laitance and provide a uniform surface profile, reference SSPC SP #13. Surface preparation may commence one week after the concrete has been pronounced cured. The curing period is defined as that length of time during which the concrete is fully hydrated (28 day cure). Patch holes and voids with specified modified epoxy cement prior to coating.

M. Concrete floors that are to receive epoxy coating shall be brush blasted or shot blasted per SSPC SP #13 and ICRI Surface Profile requirements per the coating manufacturer (Blastrack). Check for excessive moisture migration per ASTM F1869, Moisture Vapor Emission Rate Using Anhydrous Calcium Chloride. Test results not to exceed 3 lbs per 1,000 square feet in one 24-hour period.

N. Hardware accessories, machine surfaces, plates, lighting fixtures, and similar items in place prior to cleaning and painting, and not intended to be painted, shall be removed during painting operations and repositioned upon completion of each area or shall otherwise be protected.

O. All PVC pipe to be painted shall be brush blasted per SSPC SP7 or shall be sanded to provide a uniform surface profile.

3.02 APPLICATION:

A. Paint shall be used and applied as recommended by the manufacturer without being extended or modified, and with particular attention to the correct preparation and condition of surfaces to be painted.

B. Paint shall be applied only within the temperature range recommended by the manufacturer. Painting of surfaces when they are exposed to the sun shall be avoided.

C. Paint shall not be applied to wet or damp surfaces and shall not be applied in rain, snow, fog, or mist, or when the relative humidity exceeds 85 percent.

D. No paint shall be applied when it is expected that the relative humidity will exceed 85 percent or that the air temperature will drop below 40ºF within 18 hours after the application of paint. Dew or moisture condensation should be anticipated and if such conditions are prevalent, painting shall be delayed until midmorning to be certain that the surfaces are dry. Further, the days painting should be completed well in advance of the probable time of day when condensation will occur, in order to permit the film an appreciable drying time prior to the formation of moisture.

E. All paint shall be applied under favorable conditions by skilled painters and shall be brushed out carefully to a smooth, even coating without run or sags. Enamel shall be applied evenly and smoothly. Each coat of paint shall be allowed to dry thoroughly, not only on the surface but also throughout the thickness of the paint film before the next coat is applied. Finish surfaces shall be uniform in finish and color, and free from flash spots and brush marks. In all cases, the paint film produced shall be satisfactory in all respects to the Owner's Representative.

F. Exposed nails and other ferrous metal or surfaces to be painted with water-thinned paints shall be spot primed with aluminum paints.

G. In order to provide contrast between successive coats, each coat shall be of such tint as will distinguish it from preceding coats.

H. The Contractor shall not only protect its work at all times, but shall also protect all adjacent work and materials by the use of sufficient drop cloths during the progress of the work. Upon completion of the work, it shall clean up all paint, spots, oil, and stains from floors, glass, hardware, and similar finished items.

I. Paint shall be applied so as to obtain coverage per gallon and the dry film thickness recommended by the manufacturer. Dry film thickness readings shall be taken to insure that required thicknesses have been achieved. The Contractor shall record in a manner satisfactory to the Owner's Representative, the quantities of paint used for successive coats on the various parts of the work.

J. Spraying with adequate apparatus may be substituted for brush application of those paints and in those locations for which spraying is suitable.

K. If paints are thinned for spraying, the film thickness after application shall be the same as though the unthinned paint were applied by brush. That is, the addition of a thinner shall not be used as a means of extending the coverage of the paint, but the area covered shall be no greater than the area that would have been covered with the same quantity of unthinned paint.

L. Blast cleaned metal surfaces shall be coated immediately after cleaning, before any rusting or other deterioration or contamination of the surface occurs. Blast cleaned surfaces shall be coated not later than 8 hours after cleaning under ideal conditions or sooner if conditions are not ideal.

M. The use of carbon dioxide or carbon monoxide emitting heaters is not permitted during the painting operation. Only indirect hot-air systems shall be permitted.

3.03 PIPING COLOR CODE:

The following Tnemec colors shall be utilized to facilitate identification of piping. Only

insulation is to be painted on chemical feed lines.

1. Water Lines

Raw	Olive Green	110GN
Settled or Clarified	Aqua	10GN
Finished or Potable	Dark Blue	11SF

2. Wastewater or Potable Waste Lines

Sewer (sanitary or drain)	Dark Gray	34GR
Backwash Waste	Light Brown	68BR
Sludge	Dark Brown	84BR
Sewage Plant Effluent	Clay	07RD

3. Other

Compressed Air	Dark Green	91GN
Gas or Oil	Red	28RD
Other Lines	Light Gray	32GR

B. In situations where two colors do not have sufficient contrast to easily differentiate between them, a 6-inch band of contrasting color shall be painted on one of the pipes at approximately 30-inch intervals.

C. Piping which is not painted shall be color coded with bands placed at each change in direction and no more than 5 feet apart on straight runs.

3.04 PIPING IDENTIFICATION:

A. After painting, piping shall be identified by stenciling using the same specified paint as used on the pipes. Stenciling shall be of wording and color selected by the Owner's Representative and sized as follows:

Outside Diameter of Pipe or Covering	Size of Legend Letters
3/4-inch to 1-1/4-inch	2-inch
1-1/2-inch to 2-inch	3/4-inch
2-1/2-inch to 6-inch	1-1/4-inch
8-inch to 10-inch	2-1/2-inch
Over 10-inch	3-1/2-inch

B. Arrows shall indicate direction of flows. Where "a" is equal to 3/4 of outside diameter of pipe or covering, the arrow shaft shall be 2 "a" long by 3/8 "a" wide. The arrow head shall be an equilateral triangle with sides equal to "a." Maximum "a" dimension shall be 6-inches.

C. Where pipe passes through a wall, use pipe markers and directional arrows on each side of the wall.

D. Use pipe markers and directional arrows every 50 feet along continuous pipe lines.

E. Use a pipe marker and directional arrow at each rise and "T" joint.

F. When using directional arrows, point arrowhead away from pipe markers and in direction of flow. If flow can be in both directions, use a double-headed directional arrow.

G. The Owner's Representative will assist in determining pipe content and direction of flows.

3.05 CLEANUP:

A. The Contractor shall at all times keep the premises free from accumulation of waste material and rubbish caused by its employees or work. At the completion of the painting, it shall remove all tools, scaffolding, surplus materials, and rubbish from and about the buildings and shall leave the work "broom clean" unless more exactly specified.

B. The Contractor shall also, upon completion, remove all paint where it has been spilled, splashed, or splattered on all surfaces, including floors, fixtures, equipment, furniture, glass, hardware, etc., leaving the work ready for inspection.

END OF SECTION

SECTION 12 40 00

SITE FURNISHINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 WORK INCLUDED:

A. Provide site improvements in the locations shown or as described herein, complete with anchorages and associated site work, as indicated on the Drawings and/or as specified herein and includes, but is not limited to, the following:

1. Bike Rack
2. Flagpole
3. ADA Detectable Warning Mat

1.03 RELATED SECTIONS:

A. Section 03 30 00, CAST-IN-PLACE CONCRETE

B. Section 31 00 00, EARTHWORK

1.04 SUBMITTALS:

A. Contractor shall submit catalog information on site improvements for review by Owner's Representative.

PART 2 - PRODUCTS

2.01 BIKE RACK

The bike racks shall be Model BFRE-161 (single arch with cross bar), color black, manufactured by Victor Stanley, or an approved equal. Bike Racks shall be all steel members with zinc rich epoxy and finished with a powder coat. Bike Racks shall be surface mounted. All hardware shall be marine-grade steel conforming to AISI Type 304 and ASTM A193 latest requirements. Color shall be selected by Owner's Representative.

2.02 FLAGPOLE

A. Flagpole shall be the following or Owner's Representative approved equal:

a. Titan Series – IWW Flagpole as manufactured by Concord American Flagpole 4155 Patriot Drive., Suite 100, Grapevine, TX 76051.

C. Provide finish samples for review by Owner's Representative.

D. Internal Halyard with stainless steel cable.

E. Flash Collar: Provide and install decorative spun aluminum collar and ground sleeve as required for height of pole specified.

F. Lightning Protection: 3/4 inch diameter steel lightning protector ground spike welded to base plate and to support plate.

G. Shim blocks shall be pressure treated hardwood wedges at top of foundation tube to adjust pole and maintain true vertical position.

H. Submit complete and detailed shop drawings indicating entire flagpole, installation, foundation and all accessories.

2.03 ADA DETECTABLE WARNING MAT

ADA detectable warning mat shall be the 'Cast-in-place Replaceable Tactile Warning Surface Panel' by ADA Solutions, Inc., 323 Andover Street, Suite 3, Wilmington, MA 01887, (800) 372-0519, www.adatile.com, or approved equal. Color shall be Seattle Yellow (SY). Both rectangular and radial pieces shall be supplied to satisfy the locations shown on the Contract Drawings.

PART 3 - EXECUTION

3.01 Equipment shall be permanently installed in concrete anchorages unless otherwise indicated by manufacturer specifications. See SECTION 03 30 00, CAST IN PLACE CONCRETE.

3.02 Any site improvement materials which are constructed of steel and not galvanized, or factory coated with a finish system shall be painted in the field in accordance with Specification SECTION 09 90 00, PAINTING. Colors by Owner's Representative.

END OF SECTION

SECTION 26 00 50

ELECTRICAL WORK - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. The Contractor shall furnish all labor, materials, equipment and incidentals required to make ready for use the complete electrical systems as shown on the Drawings and as specified hereinafter.

B. In conjunction with other sections of Division 26, the work shall include but not be limited to furnishing and installing the following:

1. Underground Primary and Secondary Services
2. Transformers
3. Lighting Fixtures
4. Grounding System
5. Handholes
6. Bonding materials
7. Cabinets
8. Panelboards
9. Raceways
10. Feeder and Branch Circuit Conductors
11. Hangers and Supports
12. Solderless Lugs and Connectors

C. Make all necessary connections at "packaged" equipment furnished under other sections and Divisions of these specifications.

D. Make all connections to equipment and devices furnished under Division 26 and other sections of these specifications except as otherwise specified.

E. Connect process and instrumentation cables furnished with field-mounted

equipment under other sections and Divisions of these specifications.

F. It is the intent of these specifications that the electrical system shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this section shall be furnished at no extra cost to the Owner.

1.02 RELATED WORK:

A. The Contractor's attention is directed to the General Conditions, Supplementary Conditions.

B. Excavation and backfilling required for underground electrical work is included under Division 2.

C. Concrete work and reinforcing for electrical equipment pads is included under Division 3.

1.03 CODES, INSPECTIONS, PERMITS AND FEES:

A. All material and installations shall be in accordance with the latest edition of the Massachusetts Electrical Code (527 CMR 12.00) and all applicable local codes and ordinances.

B. Obtain all necessary permits and pay all fees for permits and inspections.

1.04 INTERPRETATION OF DRAWINGS:

A. The Drawings are not intended to show exact locations of conduit runs.

B. Each three-phase circuit shall be run in a separate conduit unless otherwise shown on the Drawings.

C. Unless otherwise noted and/or approved by the Engineer all conduits shall be installed concealed.

D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation.

E. Any work installed contrary to or without review by the Engineer shall be subject to change as required by the Engineer, and no extra compensation will be allowed for making these changes.

F. The locations of equipment, shown on the drawings are approximate only. Exact locations shall be as determined by the Engineer during construction. Obtain in

the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as required by the Engineer and furnish all labor and materials necessary to complete the work in an acceptable manner.

G. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.

H. All connections to equipment shall be made as required and in accordance with the approved shop and setting drawings.

1.05 SUBMITTALS:

In accordance with requirements of general specifications, submit the following:

A. Complete shop drawings shall be submitted for but not limited to the following equipment: panelboards, service cabinets, load centers, conduit and wire.

B. The manufacturer's name, product designation or catalog number, descriptive literature and data shall be submitted for the following material and equipment:

1. Conduit
2. Boxes and fittings
3. Wires, cables and appurtenances
4. Service cabinets
5. Wiring devices and appurtenances
6. Circuit breakers
7. Panelboards
8. Grounding Equipment
9. Control devices and stations

C. Prior to submittal, all shop drawings shall be checked for accuracy and conformance to contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to the specifications and drawings. This statement shall also list all discrepancies with the specifications and drawings. Shop drawings not so checked and noted shall be returned.

D. The Engineer's review shall be only for conformance with the design concept of the project and compliance with the specifications and drawings. The responsibility of, and the necessity of, furnishing materials and workmanship required by the specifications and drawings which may not be indicated on the shop drawings is included under the work of this section.

E. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this section.

1.06 MANUFACTURER'S SERVICES:

Furnish manufacturer's services for testing and start-up when required.

1.07 ELECTRIC SERVICES:

A. The electric utility serving this project is Eversource.

B. Service to cabinet will be as shown on the drawings.

C. The electric utility will furnish and install the primary cables, transformer, and meter.

D. Make all arrangements with the electric utility for obtaining services and pay all fees and charges by the electric utility for the service installation.

E. All work and material for the service shall be in accordance with the requirements of the electric utility.

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PART 2 - PRODUCTS

2.01 MATERIALS:

A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials, where not specified, shall be of the very best of their respective kinds. Samples of materials or manufacturer's specifications shall be submitted for review as required by the Engineer.

B. Materials and equipment used shall be Underwriters' Laboratories, Inc. listed.

C. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of- doors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired at no additional cost. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as required by the Engineer or shall be replaced at no additional cost to the Owner.

D. The Contractor's attention is directed to the requirements of the various sections of

division 26 for additional product specifications in addition to BOSTON STREET LIGHTING STANDARDS MADE PART OF THESE SPECIFICATIONS AS APPENDIX A.

2.02 MANUFACTURER'S NAMEPLATES:

A. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information may be die-stamped into the surface of the equipment or may be marked on durable nameplates permanently fastened to the equipment.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Provide and place all sleeves for conduit penetrations through floors, walls, partitions, etc. Locate all necessary slots and inserts for electrical work and place in form before concrete is poured.

B. Equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably, to insure that the tilting does not impair the functional integrity of the equipment.

3.02 RECORD DRAWINGS:

As the work progresses, legibly record (red line) all field changes on a set of project contract drawings. Prior to Substantial Completion of the project, submit the red lined prints to the Engineer for use in preparation of the record drawings.

3.03 TESTS AND ADJUSTMENTS:

A. Test all systems furnished under Division 26 and repair or replace all defective work. Make all necessary adjustments to the systems and equipment and instruct the Owner's personnel in the proper operation of the systems and equipment

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Copper wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.01 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Okonite Company (The).
5. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:

1. Type RHH and Type RHW-2: Comply with UL 44.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. Type XHHW-2: Comply with UL 44.
4. Type XLP: Comply with UL 44. (all underground Lighting wiring)

2.02 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M Electrical Products.
2. AFC Cable Systems; a part of Atkore International.
3. Hubbell Power Systems, Inc.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. Thomas & Betts Corporation; A Member of the ABB Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW, USE single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway

C. Exposed Branch Circuit: Type THHN-THWN, single conductors in raceway.

D. Underground Feeders and Branch Circuits: Type UF multiconductor cable.

E. Underground Feeders for pedestrian lighting: Type XLP, Single Conductors in raceway

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12-inches of slack.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables.

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes grounding and bonding systems and equipment.

B. Section includes grounding and bonding systems and equipment, plus the following special applications:

1. Underground distribution grounding.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.03 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.

B. Qualification Data: For testing agency and testing agency's field supervisor.

C. Field quality-control reports

1.04 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
   a. Ground rods.
   b. Grounding arrangements and connections for separately derived systems.

2. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.

a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
b. Include recommended testing intervals.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.02 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Burndy; Part of Hubbell Electrical Systems.
2. ERICO International Corporation.
3. Harger Lightning & Grounding.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. SIEMENS Industry, Inc.; Energy Management Division.
6. Thomas & Betts Corporation; A Member of the ABB Group.

2.03 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kc mil, 14 strands of No. 17 AWG conductor, ¼-inch in diameter.

5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/-inches wide and 1/16-inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4-inches in cross section, with 9/32-inch holes spaced 1-1/8-inches apart.

2.04 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.

F. Conduit Hubs: Mechanical type, terminal with threaded hub.

G. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

H. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.

I. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

J. Straps: Solid copper, copper lugs. Rated for 600 A.

PART 3 - EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor.

1. Bury at least 24-inches below grade.

C. Grounding Bus: Install in electrical equipment enclosure and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2-inches minimum from wall, 6-inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except as otherwise indicated.

3.02 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.03 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.

3.04 INSTALLATION

C. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.05 FIELD QUALITY CONTROL

A. "Perform tests and inspections" Paragraph below to require Contractor to perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.01 METAL CONDUITS AND FITTINGS

A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Allied Tube & Conduit; a part of Atkore International.
    c. Anamet Electrical, Inc.
    d. Opti-Com Manufacturing Network, Inc (OMNI).
    e. O-Z/Gedney; a brand of Emerson Industrial Automation.

2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. GRC: Comply with ANSI C80.1 and UL 6.
4. ARC: Comply with ANSI C80.5 and UL 6A.
5. IMC: Comply with ANSI C80.6 and UL 1242.
6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

    a. Comply with NEMA RN 1.
    b. Coating Thickness: 0.040-inch, minimum.

7. EMT: Comply with ANSI C80.3 and UL 797.
8. FMC: Comply with UL 1; zinc-coated steel or aluminum.
9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Allied Tube & Conduit; a part of Atkore International.
    c. Anamet Electrical, Inc.
    d. FSR Inc.
    e. O-Z/Gedney; a brand of Emerson Industrial Automation.

2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:

    a. Material: Steel.
    b. Type: Setscrew.

6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040-inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.02 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Anamet Electrical, Inc.
    c. FRE Composites.
    d. RACO; Hubbell.
    e. Thomas & Betts Corporation; A Member of the ABB Group.

B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1. ENT: Comply with NEMA TC 13 and UL 1653.
2. RNC: Type EPC-80-PVC as noted complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3. LFNC: Comply with UL 1660.

C. Nonmetallic Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. AFC Cable Systems; a part of Atkore International.
    b. Anamet Electrical, Inc.
    c. Arnco Corporation.
    d. FRE Composites.
    e. RACO; Hubbell.

2. Fittings, General: Listed and labeled for type of conduit, location, and use.

3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
4. Fittings for LFNC: Comply with UL 514B.
5. Solvents and Adhesives: As recommended by conduit manufacturer.

2.03 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Crouse-Hinds, an Eaton business.
2. Erickson Electrical Equipment Company.
3. Hoffman; a brand of Pentair Equipment Protection.
4. Hubbell Incorporated.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Device Box Dimensions: as required for the use.

G. Gangable boxes are prohibited.

H. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

I. Cabinets:

1. NEMA 250, Type 1 or Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.04 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Armorcast Products Company.
    b. NewBasis.
    c. Oldcastle Enclosure Solutions.
    d. Oldcastle Precast, Inc.
    e. Quazite: Hubbell Power Systems, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC." or per appropriate system.
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Underground Conduit: RNC, Type EPC-80-PVC, direct buried or concrete encased as indicated on plans.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Minimum Raceway Size: 3/4-inch trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting

manufacturer and apply in thickness and number of coats recommended by manufacturer.

3. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

E. Install surface raceways only where indicated on Drawings.

F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.02 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Arrange stub-ups so curved portions of bends are not visible above finished slab.

C. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12-inches of changes in direction.

D. Support conduit within 12-inches of enclosures to which attached.

E. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

F. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

H. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12-inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

J. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.

K. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

L. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

M. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041-inch per foot of length of straight run per degree F of temperature change for PVC conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

N. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72-inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

O. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

P. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Q. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Earth Moving" for pipe less than 6-inches in nominal diameter.
2. Install backfill as specified in Section 31 20 00 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12-inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3-inches of concrete for a minimum of 12-inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60-inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Retain this article if Project includes small amounts of exterior underground wiring 600 V and less.

B. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

C. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

D. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1-inch above finished grade.

E. Install handholes with bottom below frost line.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.06 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50-inches and with no side larger than 16-inches, thickness shall be 0.052-inch.

b. For sleeve cross-section rectangle perimeter 50-inches or more and one or more sides larger than 16-inches, thickness shall be 0.138-inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Advance Products & Systems, Inc.
b. Metraflex Company (The).
c. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, water-stop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber water-stop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. HOLDRITE.

2.4 GROUT

A. Description: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2-inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position water stop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1.

B. Comply with NFPA 70.

C. Comply with ANSI Z535.4 for safety signs and labels.

D. Comply with NFPA 70E requirements for arc-flash warning labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage.

B. Color-Coding for Phase-Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit] conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Black.
    b. Phase B: Orange.
    c. Phase C: Yellow.

4. Colors for 240-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.

5. Color for Neutral: White or gray.
6. Color for Equipment Grounds: Green.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36-INCHES."

E. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Self-Adhesive Labels: Polyester or Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Brother International Corporation.
c. Ideal Industries, Inc.
d. Panduit Corp.

2. Minimum Nominal Size:

a. 1-1/2 by 6-inches for raceway and conductors.
b. 3-1/2 by 5-inches for equipment.
c. As required by authorities having jurisdiction.

2.4 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Champion America.
b. Ideal Industries, Inc.
c. Panduit Corp.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2-inches wide; compounded for outdoor use.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Emedco.
c. Marking Services, Inc.

C. Underground-Line Warning Tape:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Ideal Industries, Inc.
c. Marking Services, Inc.

2. Tape:

a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
b. Printing on tape shall be permanent and shall not be damaged by burial operations.
c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE".
c. Inscriptions for Orange-Colored Tapes: "TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE".

2.5 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Brady Corporation.
b. Carlton Industries, LP.
c. Emedco.

2. Engraved legend.

3. Thickness:

a. For signs up to 20 sq. in., minimum 1/16-inch thick.
b. For signs larger than 20 sq. in., 1/8-inch thick.
c. Engraved legend with black letters on white face.
d. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Hellermann Tyton.
2. Ideal Industries, Inc.
3. Marking Services, Inc.
4. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16-inch.
2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior) in conformance with section 09 90 00.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and

operation and maintenance manual. Use consistent designations throughout Project.

B. Verify identity of each item before installing identification products.

C. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

D. Apply identification devices to surfaces that require finish after completing finish work.

E. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

F. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

H. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

I. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6-inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

J. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

K. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8-inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

L. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2-inches high.

M. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage.

B. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

C. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive equipment labels.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
   a. Controls with external control power connections.

E. Arc Flash Warning Labeling: Self-adhesive labels.

F. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.

G. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.02 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. SPD: Surge protective device.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for SPD as installed in panelboard.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.

1.04 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.05 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.06 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

1.07 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PANELBOARDS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

E. Enclosures: Surface -mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.
c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Height: 84-inches maximum.

3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

F. Incoming Mains Location: Top or Bottom.

G. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.

I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.02 PERFORMANCE REQUIREMENTS

A. Retain "Seismic Performance" Paragraph for projects requiring seismic design. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Verify requirements of authorities having jurisdiction.

B. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

C. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

2.03 POWER PANELBOARDS

D. Power panelboards, as specified in this article, fall under requirements of "Distribution Panelboards" in NEMA PB 1.

E. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. Square D; by Schneider Electric.

F. Panelboards: NEMA PB 1, distribution type.

G. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36-inches high, provide two latches, keyed alike.

H. Mains: Circuit breaker.

I. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers or Bolt-on circuit breakers.

J. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 A: Bolt-on circuit breakers.

2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards, as specified in this article, comply with requirements of "Lighting and Appliance Branch-Circuit Panelboards" in NEMA PB 1.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. SIEMENS Industry, Inc.; Energy Management Division.
4. Square D; by Schneider Electric.

C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices: Plug-in or Bolt-on circuit breakers, replaceable without disturbing adjacent units.

F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Eaton.
2. General Electric Company; GE Energy Management - Electrical Distribution.
3. SIEMENS Industry, Inc.; Energy Management Division.
4. Square D; by Schneider Electric.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

a. Inverse time-current element for low-level overloads.
b. Instantaneous magnetic trip element for short circuits.
c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2.06 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1.

B. Install panelboards and accessories according to NECA 407.

C. Mount panelboard cabinet plumb and rigid without distortion of box.

D. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

E. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

F. Install filler plates in unused spaces.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.02 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components.

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification.

D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 27 13

ELECTRICITY METERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes electricity metering work to accommodate utility company revenue meter.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For electricity-metering equipment.

1. Include elevation views of front panels of control and indicating devices and control stations.
2. Include diagrams for power, signal, and control wiring.
3. Metering equipment shall meet the requirements of Eversource Electric Co.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Submit evidence that meters are compatible and conform to Eversource requirements.

B. Field quality-control reports.

C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1.6 COORDINATION

A. Electrical Service Connections: Coordinate with utility companies and utility-furnished components.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 916.

2.2 UTILITY METERING INFRASTRUCTURE

A. Install metering accessories furnished by the utility company, complying with its requirements.

B. Current-Transformer Cabinets: Comply with requirements of electrical-power utility company.

C. Meter Sockets:

1. Comply with requirements of electrical-power utility company.

D. Arc-Flash Warning Labels:

1. Labels: Comply with requirements for "Self-Adhesive Equipment Labels" and "Signs" in Section 26 05 53 "IDENTIFICATION FOR ELECTRICAL SYSTEMS." Apply a properly sized self-adhesive label for each work location included in the analysis. Labels shall be machine printed, with no field-applied markings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with equipment installation requirements in NECA 1.

B. Install meters furnished by utility company. Install raceways and equipment ac-

cording to utility company's written instructions. Provide empty conduits for metering leads and extend grounding connections as required by utility company.

C. Install arc-flash labels as required by NFPA 70.

D. Wiring Method:

1. Comply with requirements in Section 26 05 19 "LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES."

E. Comply with requirements for identification specified in Section 26 05 53 "IDENTIFICATION FOR ELECTRICAL SYSTEMS."

3.2 FIELD QUALITY CONTROL

A. Testing: By Contractor.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. GFCI receptacles.
   2. Toggle switches.
   3. Wall plates.

1.02 DEFINITIONS

A. Abbreviations of Manufacturers' Names:

   1. Cooper: Copper Wiring Devices; Division of Cooper Industries, Inc.
   2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
   3. Leviton: Leviton Mfg. Company, Inc.
   4. Pass & Seymour: Pass& Seymour/Legrand.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.05 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.01 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

E. Devices for Owner-Furnished Equipment:

1. Receptacles: Match plug configurations

2.02 GFCI RECEPTACLES

A. Non-feed-through-type GFCI unit shall be selected where no protection of downstream receptacles is required.

B. General Description:

1. 125 V, 20 A, straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

C. Duplex GFCI Convenience Receptacles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Eaton (Arrow Hart).
b. Hubbell Incorporated; Wiring Device-Kellems.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour/Legrand (Pass & Seymour).

2.03 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Eaton (Arrow Hart).
2) Hubbell Incorporated; Wiring Device-Kellems.
3) Leviton Manufacturing Co., Inc.
4) Pass & Seymour/Legrand (Pass & Seymour).

2.04 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: High-impact thermoplastic in finished spaces.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.05 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pig tailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6-inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. GFCI Receptacles: Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.02 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:

1. Tests for Convenience Receptacles:

a. Line Voltage: Acceptable range is 105 to 132 V.
b. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
c. Using the test plug, verify that the device and its outlet box are se-

curely mounted.

d. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

SECTION 26 43 13

SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY:

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.2 ACTION SUBMITTALS:

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB USA.
2. Eaton.
3. General Electric Company.
4. Leviton Manufacturing Co., Inc.

B. SPDs: Comply with UL 1449, Type 2.

1. SPDs with the following features and accessories:

a. Integral disconnect switch.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
c. Indicator light display for protection status.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V or 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
1. Line to Neutral: 1200 V for 480Y/277 V,700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
3. Line to Line: 2000 V for 480Y/277 V, 1000 V for 208Y/120 V.

E. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V.

2. Line to Ground: 700 V.
3. Line to Line: 1000 V.

F. SCCR: Equal or exceed 100 kA.

G. Inominal Rating: 20 kA.

2.3 PANEL SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advanced Protection Technologies Inc. (APT).
2. Current Technology Inc.
3. Eaton.
4. General Electric Company.

B. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 100 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V or 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:
1. Line to Neutral: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
3. Neutral to Ground: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
4. Line to Line: 2000 V for 480Y/277 V, 1200 V for 208Y/120 V.

E. SCCR: Equal or exceed 100 kA.

F. Inominal Rating: 20 kA.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Complete startup checks according to manufacturer's written instructions. Energize SPDs after power system has been energized, stabilized, and tested.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior luminaires with lamps.
2. Poles and accessories.

1.3 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Luminaire: Complete lighting fixture, including ballast housing if provided.

G. Pole: Luminaire support structure, including tower used for large area illumination.

H. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.

C. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, cal-

culated and applied as stated in AASHTO LTS-4-M.

1. Basic wind speed for calculating wind load for poles 50 feet high or less is 120 mph.

    a. Wind Importance Factor: 1.0.
    b. Minimum Design Life: 25 years.
    c. Velocity Conversion Factors: 1.0.

1.5 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, ballasts, and accessories.

    a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

6. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
7. Materials, dimensions, and finishes of poles.
8. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
9. Anchor bolts for poles.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.
3. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: For products designated for sample submission in the Exterior Lighting Device Schedule. Each Sample shall include lamps and ballasts.

1.6 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations by a professional engineer.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Field quality-control reports.

D. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and poles.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Furnish at least one of each type.
2. Glass and Plastic Lenses, Covers, and Other Optical Parts: Furnish at least one of each type.
3. Globes and Guards: Furnish at least one of each type.

1.9 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with IEEE C2, "National Electrical Safety Code."

D. Comply with NFPA 70.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegeta-

tion. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on metal poles until right before pole installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
4. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products indicated in Luminaire Schedule on Drawings.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
2. LER Tests Fluorescent Fixtures: Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
3. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

K. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.
   1. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

      a. Color: As selected by Architect from manufacturer's full range.

L. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

   1. Label shall include the following lamp and ballast characteristics:

      a. "USES ONLY" and include specific lamp type.
      b. Lamp diameter code (T-4, T-5, T-8, T-12), tube configuration (twin, quad, triple), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
      c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
      d. Start type (preheat, rapid start, instant start) for fluorescent and compact fluorescent luminaires.

e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
f. CCT and CRI for all luminaires.

2.3 DRIVERS FOR LED LAMPS

A. Description: Electronic driver designed for applicable fixture(s) and load indicated by LED lamps. Driver shall be designed for full light output unless dimmer or bi-level control is indicated.

1. Input Voltage Range: 120 – 277 +/-10%.
2. Output Current: 0.35A dc.
3. Input Frequency: 50/60 Hz.
4. Power Factor: >90% at full load.
5. THD: <20% at full load.
6. Case Temperature: Rated for -40 deg C through +80 deg C.
7. Overheat protection, self-limited short circuit protection and overload protected.
8. Primary fused.

2.4 LED LAMPS

A. LED Lamps: Minimum CRI of 70 and color temperature of 3000 K +/-500 K.

2.5 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming. Adjust photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 POLE INSTALLATION

A. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
3. Trees: 15 feet from tree trunk.

B. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

C. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

D. Raise and set poles using web fabric slings (not chain or cable).

3.3 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 30 00 "Cast-in-Place Concrete."

3.4 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 05 33 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.5 GROUNDING

A. Ground metal poles and support structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.6 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

1. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
   a. IESNA LM-64, "Photometric Measurements of Parking Areas."
   b. IESNA LM-72, "Directional Positioning of Photometric Data."

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION

SECTION 31 00 00

EARTHWORK

PART 1 - GENERAL

1.01 WORK INCLUDED:

The Contractor shall make excavations of normal depth in earth for trenches and structures, shall backfill and compact such excavations to the extent necessary, shall furnish the necessary material and construct embankments and fills, and shall make miscellaneous earth excavations and do miscellaneous grading.

1.02 RELATED WORK:

A. Section 00 31 43, PERMITS

B. Section 01 11 00, CONTROL OF WORK AND MATERIALS

C. Section 01 57 19, ENVIRONMENTAL PROTECTION

D. Section 31 05 19.13, GEOTEXTILE FABRICS

E. Section 31 11 00, CLEARING AND GRUBBING

F. Section 31 23 19, DEWATERING

G. Section 31 50 00, SUPPORT OF EXCAVATION

H. Section 32 14 13, PRECAST CONCRETE UNIT PAVING

I. Section 32 91 19, LOAMING AND SEEDING

1.03 REFERENCES:

ASTM International (ASTM)

ASTM	C131	Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
ASTM	D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3))
ASTM	D6938	Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth).

ASTM D6913 Standard Test Method Particle Size Analysis of Soils

Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.

Code of Massachusetts Regulations (CMR) 310.40.0032 Contaminated Media and Contaminated Debris

Code of Massachusetts Regulations (CMR) 520 CMR 14.00 Excavation & Trench Safety Regulation

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Material Test Reports: From a qualified independent testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
   1. Classification according to ASTM D 2487 and moisture content according to ASTM D 2216 of each on-site and borrow soil and/or fill material proposed for fill and backfill.
   2. Laboratory compaction curve according to ASTM D 1557 for each onsite and borrow soil and/or fill material proposed for fill and backfill.

1.05 PROTECTION OF EXISTING PROPERTY:

A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, benchmarks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.

B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at its own cost, existing benchmarks, observation wells, monuments, and other reference points, which are disturbed or destroyed.

C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment and shall be maintained at all times until completion of project.

1.06 DRAINAGE:

A. The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures or cause excessive disturbance of underlying natural ground or abutting properties.

1.07 FROST PROTECTION AND SNOW REMOVAL:

A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.

B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

1.08 GEOTECHNICAL FIELD AND LABORATORY TESTING:

The Contractor shall retain the services of a geotechnical testing laboratory to conduct the laboratory analyses and field testing of soil materials required by this specification. Coordinate locations and types of field tests to be performed with the Owner's Representative and cooperate in every way with the Owner's Representative and testing laboratory during field testing and with collection of soil samples for laboratory testing.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. GRAVEL BORROW:

Gravel Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.03.0, Type b.

B. CRUSHED STONE:

Crushed stone shall satisfy the requirements listed in MassDOT Specification Section M2.01.4 (3/4-inch crushed stone) unless otherwise required.

C. SAND BORROW:

Sand Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.04.0.

D. PEASTONE:

Peastone shall be smooth, hard, naturally occurring, rounded stone meeting the following gradation requirements:

Passing 5/8 inch square sieve opening	-	100%
Passing No. 8 sieve opening	-	0%

E. BACKFILL MATERIALS:

1. Class B Backfill:

   Class B backfill shall be granular, well graded friable soil; free of rubbish, ice, snow, tree stumps, roots, clay and organic matter; with 30 percent or less passing the No. 200 sieve; no stone greater than two-third (2/3) loose lift thickness, or six inches, whichever is smaller.

2. Select Backfill:

   Select backfill shall be granular, well graded friable soil, free of rubbish, ice, snow, tree stumps, roots, clay and organic matter, and other deleterious or organic material; graded within the following limits:

Sieve Size	Percent Finer by Weight
3"	100
No. 10	30-95
No. 40	10-70
No. 200	0-10

F. PROCESSED GRAVEL:

1. Processed gravel shall satisfy the requirements listed in MassDOT Specification Section M1.03.1.

2. Processed gravel shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.

3. The gradation shall meet the following requirements:

Sieve Designation	Percentage Passing
3-in.	100
1 ½-in.	70-100
¾-in.	50-85
No. 4	30-60
No. 200	0-10

4. The approved source of bank-run gravel material shall be processed by mechanical means. The equipment for producing crushed gravel shall be of adequate size with sufficient adjustments to produce the desired materials. The processed material

shall be stockpiled in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

PART 3 - EXECUTION

3.01 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION:

A. Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures.

B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven filter fabric. Costs of removal and replacement shall be borne by the Contractor.

C. The Contractor shall place a minimum of 12-inch layer of special bedding materials and crushed stone wrapped in filter fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

3.02 EXCAVATION:

A. GENERAL:

1. The Contractor shall perform all work of any nature and description required to accomplish the work as shown on the Drawings and as specified.

2. Excavations, unless otherwise required by the Owner’s Representative, shall be carried only to the depths and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled with gravel borrow and compacted at the Contractor's expense as specified below, except as otherwise indicated. Excavations shall be kept in dry and good conditions at all times, and all voids shall be filled to the satisfaction of the Owner’s Representative.

3. In all excavation areas, the Contractor shall strip the surficial topsoil layer and underlying subsoil layer separate from underlying soils. In paved areas, the Contractor shall first cut pavement as specified in paragraph 3.02 B.1 of this specification, strip pavement and pavement subbase separately from underlying soils. All excavated materials shall be stockpiled separately from each other within the limits of work.

4. The Contractor shall follow a construction procedure, which permits visual identification of stable natural ground. Where groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the Contractor's chosen method of dewatering, and which will allow visual observation of the bottom and backfill in the dry.

5. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as required by the Owner's Representative. Unsuitable material includes topsoil, loam, peat, other organic materials, snow, ice, and trash. Unless specified elsewhere or otherwise required by the Owner's Representative, areas where unsuitable materials have been excavated to stable ground shall be backfilled with compacted special bedding materials or crushed stone wrapped all around in non-woven filter fabric.

B. TRENCHES:

1. Prior to excavation, trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these cuts. Excavation support shall be provided as required to avoid undermining of pavement. Cutting operations shall not be done by ripping equipment.

2. The Contractor shall satisfy all dewatering requirements specified in Section 31 23 19 DEWATERING, before performing trench excavations.

3. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, and depths of cover indicated on the Drawings. Trench widths shall be as shown on the Drawings or as specified.

4. Where pipe is to be laid in bedding material, the trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is not disturbed.

5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least 12-inches above the top of the pipe before excavation.

6. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed.

7. If, in the opinion of the Owner's Representative, the subgrade, during trench excavation, has been disturbed as a result of rain, surface water runoff or groundwater seepage pressures, the Contractor shall remove such disturbed subgrade to a minimum of 12 inches and replace with crushed stone wrapped in filter fabric. The cost of removal and replacement shall be borne by the Contractor.

8. The Contractor shall obtain a trench permit from the municipality where the trench is located prior to making any excavations of trenches (any subsurface excavation greater than three (3) feet in depth and fifteen (15) feet or less between soil walls as measured from the bottom).

9. All trenches required to be permitted must be attended, covered, barricaded, or backfilled. Covers must be road plates at least ¾-inch thick or equivalent, barricades must be fences at least 6-feet high with no openings greater than 4-inches between vertical supports and all horizontal supports required to be located on the trench-side of the fencing.

C. BUILDING AND FOUNDATION EXCAVATION:

1. Excavations shall not be wider than required to set, brace, and remove forms for concrete, or perform other necessary work.

2. After the excavation has been made, and before forms are set for footings, mats, slabs, or other structures, and before reinforcing is placed, all loose or disturbed material shall be removed from the subgrade. The bearing surface shall then be compacted to meet the requirements of this specification.

3. If, in the opinion of the Owner's Representative, the existing material at subgrade elevation is unsuitable for structural support, the Contractor shall excavate and dispose of the unsuitable material to the required width and depth as required by the Owner's Representative. If, in the opinion of the Owner's Representative, filter fabric is required; the Contractor shall place filter fabric, approved by the Owner's Representative, as per manufacturer's recommendations. Crushed stone shall then be placed in lifts and compacted to required densities. Backfill shall be placed to the bottom of the proposed excavation.

D. EXCAVATION NEAR EXISTING STRUCTURES:

1. Attention is directed to the fact that there are pipes, manholes, drains, and other utilities in certain locations. An attempt has been made to locate all utilities on the drawings, but the completeness or accuracy of the given information is not guaranteed.

2. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and excavation shall be done by means of hand tools, as required. Such manual excavation, when incidental to normal excavation, shall be included in the work to be done under items involving normal excavation.

3. Where determination of the exact location of a pipe or other underground structure is necessary for properly performing the work, the Contractor shall excavate test pits to determine the locations.

3.03 BACKFILL PLACEMENT AND COMPACTION:

A. GENERAL:

1. Prior to backfilling, the Contractor shall compact the exposed subgrade to a firm and unyielding condition with at least 4 passes of fully loaded, ten cubic yard dump truck over the subgrade or other acceptable compaction equipment subject to the approval of the Owner's Representative.

2. After approval of subgrade by the Owner's Representative, the Contractor shall backfill areas to required contours and elevations with specified materials.

3. The Contractor shall place and compact materials to the specified density in continuous horizontal layers, not to exceed nine (9) inches in uncompacted lifts. The degree of compaction shall be based on maximum dry density as determined by ASTM Test D1557, Method C. The minimum degree of compaction for fill placed shall be as follows:

Location	Percent of Maximum Density
Below pipe centerline	95
Above pipe centerline	92
Below pavement (upper 3 ft.)	95
Embankments	95
Below pipe in embankments	95
Adjacent to structures	92
Below structures	95

4. The Owner's Representative reserves the right to test backfill for conformance to the specifications and the Contractor shall assist as required to obtain the information. Compaction testing will be performed by the Owner's Representative or by an inspection laboratory designated by the Owner's Representative, engaged and paid for by the Contractor. If test results indicate work does not conform to specification requirements, the Contractor shall remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Owner's Representative, to bring the work into compliance, at no additional cost to the Owner. All backfilled materials under structures and buildings shall be field tested for compliance with the requirements of this specification.

5. Where horizontal layers meet a rising slope, the Contractor shall key each layer by benching into the slope.

6. If the material removed from the excavation is suitable for backfill with the exception that it contains stones larger than permitted, the Contractor has the option to remove the oversized stones and use the material for backfill or to provide replacement backfill at no additional cost to the Owner.

7. The Contractor shall remove loam and topsoil, loose vegetation, stumps, large roots, etc., from areas upon which embankments will be built or areas where material will be placed for grading. The subgrade shall be shaped as indicated on the Drawings and shall be prepared by forking, furrowing, or plowing so that the first layer of the fill material placed on the subgrade will be well bonded to the subgrade.

B. TRENCHES:

1. Bedding as detailed and specified shall be furnished and installed beneath the pipeline prior to placement of the pipeline. A minimum bedding thickness shall be maintained between the pipe and undisturbed material, as shown on the Drawings.

2. As soon as practicable after the pipes have been laid, backfilling shall be started.

3. Unless otherwise indicated on the Drawings, select backfill shall be placed by hand shovel in 6-inch thick lifts up to a minimum level of 12-inches above the top of pipe. This area of backfill is considered the zone around the pipe and shall be thoroughly compacted before the remainder of the trench is backfilled. Compaction of each lift in the zone around the pipe shall be done by use of power-driven tampers weighing at least 20 pounds or by vibratory compactors. Care shall be taken that material close to the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.

4. Class B backfill shall be placed from the top of the select backfill to the specified material at grade (loam, pavement subbase, etc.). Fill compaction shall meet the density requirements of this specification.

5. If the materials above the trench bottom are unsuitable for backfill, the Contractor shall furnish and place backfill materials meeting the requirements for trench backfill, as shown on the drawings or specified herein.

6. Should the Owner's Representative order crushed stone for utility support or for other purposes, the Contractor shall furnish and install the crushed stone as directed.

7. In shoulders of streets and road, the top 12-inch layer of trench backfill shall consist of processed gravel for sub-base, satisfying the requirements listed in MassDOT standard specification M1.03.1.

C. BACKFILLING UNDER BUILDINGS AND FOUNDATIONS:

1. Material to be used as structural fill under structures shall be special bedding material or gravel borrow, as shown on the Drawings or as required by the Owner's Representative. Where gravel borrow fill is required to support proposed footings, walls, slabs, and other structures, the material shall be placed in a manner accepted by the Owner's Representative. Compaction of each lift shall meet the density requirements of this specification.

D. BACKFILLING ADJACENT TO STRUCTURES:

1. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads to which they will be subjected. Excavated material approved by the Owner's Representative may be used in backfilling around structures. Backfill material shall be thoroughly compacted to meet the requirements of this specification.

2. Contractor shall use extra care when compacting adjacent to pipes and drainage structures. Backfill and compaction shall proceed along sides of drainage structures so that the difference in top of fill level on any side of the structure shall not exceed two feet (2') at any stage of construction.

3. Where backfill is to be placed on only one side of a structural wall, only hand-operated roller or plate compactors shall be used within a lateral distance of five feet (5') of the wall for walls less than fifteen feet (15') high and within ten feet (10') of the wall for walls more than fifteen feet (15') high.

3.04 DISPOSAL OF SURPLUS MATERIALS:

A. Surplus excavated materials, which are acceptable to the Owner's Representative, shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill. Upon written approval of the Owner's Representative, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.

B. Surplus excavated material not needed as specified above shall be hauled away and disposed of by the Contractor at no additional cost to the Owner, at appropriate locations, and in accordance with arrangements made by it. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.

C. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Owner's Representative.

D. The Contractor shall comply with Massachusetts regulations (310 CMR 40.0032) that govern the removal and disposal of surplus excavated materials. Materials, including

contaminated soils, having concentrations of oil or hazardous materials less than an otherwise Reportable Concentration and that are not a hazardous waste, may not be disposed of at locations where concentrations of oil and/or hazardous material at the receiving site are significantly lower than the levels of those oil and /or hazardous materials present in the soil being disposed or reused.

END OF SECTION

SECTION 31 05 19.13

GEOTEXTILE FABRICS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers furnishing of all labor, materials, and equipment necessary to install specified geotextile fabrics in locations shown on the drawings and as required by the Owner's Representative.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

Shop drawings or working drawings and material specifications shall be submitted to the Owner's Representative for review for each type of geotextile fabric furnished. General installation practices and installation schedule shall be included.

PART 2 - PRODUCTS

2.01 FILTER/DRAINAGE FABRIC:

A. The filter/drainage fabric shall be composed of continuous-filament fibers bonded together to form a sheet. The fabric shall be an average of 20 mils thick and possess the characteristics of Tencate Mirafi 140N.

B. The filter/drainage fabric shall be Tencate Mirafi 140N as manufactured by Tencate Geosynthetics, Pendergrass, GA; Foss-65 by Foss Manufacturing Co., Hampton, NH; US 120NW, as manufactured by US Fabrics, Cincinnati, OH, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. GENERAL:

Installation of geotextile fabrics shall be strictly in accordance with manufacturer's instructions and specific layout plans and details reviewed by the Owner's Representative.

F. FILTER/DRAINAGE FABRIC:

The filter/drainage fabric shall be installed in the final graded trench bottom prior to placement of the crushed stone bedding and at other locations shown on the drawings or designated by the Owner's Representative. The drainage fabric in place shall cover the entire trench bottom and trench sides as shown on the drawings. Each width of

drainage fabric shall be overlapped in accordance with manufacturer's recommendations, but not less than 2 feet, to prevent intrusion of soil fines into the bedding.

3.02 FINAL INSPECTION AND ACCEPTANCE:

A. The Contractor shall, at his expense, have a manufacturer's representative inspect the work at completion of the installation. Any work found to be unsatisfactory shall be corrected at the Contractor's expense.

B. The Owner's Representative, at the Contractor's expense, reserves the right to have a manufacturer's representative inspect the installation process at any time during construction.

END OF SECTION

SECTION 31 11 00

CLEARING AND GRUBBING
(BY TOWN, FOR REFERENCE ONLY)

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. The Town shall do all required clearing and grubbing as indicated on the drawings or herein specified in the area required for construction operations on the Owner's land or in the Owner's permanent or temporary easements and shall remove all debris resulting therefrom.

B. Unless otherwise noted, all areas to be cleared shall also be grubbed.

C. The Town shall not clear and grub outside of the area required for construction operations.

1.02 RELATED WORK:

Any trees and shrubs specifically designated by the Owner not to be cut, removed, destroyed, or trimmed shall be saved from harm and injury in accordance with Section 01 57 19, ENVIRONMENTAL PROTECTION.

PART 2 - PRODUCTS: NOT APPLICABLE

PART 3 - EXECUTION

3.01 RIGHT TO WOOD AND LOGS:

The Owner shall have the right to cut and remove logs and other wood of value in advance of the Town's operations. All remaining logs and other wood to be removed in the course of clearing shall become the property of the Contractor.

3.02 CLEARING:

A. Unless otherwise indicated, the Town shall cut or otherwise remove all trees, saplings, brush and vines, windfalls, logs and trees lying on the ground, dead trees and stubs more than 1-foot high above the ground surface (but not their stumps), trees which have been partially uprooted by natural or other causes (including their stumps), and other vegetable matter such as shags, sawdust, bark, refuse, and similar materials.

B. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operations, trees, stumps, and stubs to be cleared shall be cut as close to the ground as practicable but not more than 6-inches above the ground surface in the case of small trees, and 12-inches in the case of large trees. Saplings, brush and vines shall be cut close to the ground.

3.03 GRUBBING:

A. Unless otherwise indicated, the Town shall completely remove all stumps and roots to a depth of 18-inches, or if the Town elects to grind the stumps, they shall be ground to a minimum depth of 6-inches.

B. Any depression remaining from the removal of a stump and not filled in by backfilling shall be filled with gravel borrow and/or loam, whichever is appropriate to the proposed ground surface.

3.04 DISPOSAL:

All material collected in the course of the clearing and grubbing, which is not to remain, shall be disposed of in a satisfactory manner away from the site or as otherwise approved. Such disposal shall be carried on as promptly as possible and shall not be left until the final clean-up period.

END OF SECTION

SECTION 31 13 13

TREE PRUNING AND TREE AND STUMP REMOVALS
(BY TOWN – FOR REFERENCE ONLY)

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. The work of this Section includes the following:

1. Pruning - Class II, including the removal of all limbs necessary to execute the field, playground and fence work required under this contract.

2. Removal of trees and stumps.

B. Refer to the Contract Drawings for general location of trees along the site perimeter. In general, all trees are to remain and be pruned in conformance with this Specification. Tree removals shall be limited to the area denoted on the plans and shall include the removal of individual trees that would impede the construction of proposed facilities.

1.02 QUALIFICATIONS:

A. This work shall be limited to individuals, partnerships and corporations who are actively engaged in the field of Arboriculture, and who demonstrate competence, experience and financial capability to carry out the terms of this project. The Owner may require proof of these qualifications.

B. All work shall be conducted by qualified and trained personnel under the direct supervision of a Massachusetts Certified Arborist (MCA) in the Contractor's employ.

1.03 PERSONNEL:

A. The Town shall submit each employee's name and title prior to the commencement of work. The Town shall advise the Owner of any changes in personnel assigned to this Contract.

B. The crew foreman shall have a minimum of five (5) years climbing/pruning experience. At least one (1) crew person shall be an MCA and shall be certified in CPR.

C. Each trimmer shall be experienced and highly qualified with the necessary tree worker skills to successfully complete the work of this Section, including the ability and training to perform aerial rescue. Said skill shall also include worker safety and

ability in compliance with current OSHA and ANSI Z-133.1 Standards.

1.04 SPECIAL REQUIREMENTS:

A. Dutch Elm diseased wood shall be disposed of in accordance with provisions of General Laws, Chapter 87, Section 5, and Chapter 132, Sections 8 and 11 as amended; and in accordance with any additional local regulations. All wood shall be removed from the site and be properly disposed of in accordance with state and local regulations.

B. No burning shall be permitted on the project site.

C. Prior to commencing work, the Town shall submit a plan to the Owner for legal disposal of removed materials, in conformance with State and Federal regulations.

1.05 STANDARDS AND DEFINITIONS:

A. All pruning work shall be performed in accordance with the following:

1. The ANSI A300 'Standard Practices for Trees, Shrubs, and Other Wood Plant Materials' of the Secretariat: National Arborist Association, Post Office Box 1094, Amherst, New Hampshire 03031.

2. American National Standards Institute (ANSI) Standard Z-133.1.

3. The standards and practices of the International Society of Arborists.

4. The standards and practices of the Massachusetts Arborist Association.

5. The standards and practices of the American Association of Nurserymen.

B. The term 'Owner' shall mean the Owner's designated representative charged with carrying out the requirements of this Project, Owner's Representative, Planner, or Tree Warden as referenced herein, rendering approvals for the Owner.

1.06 EXAMINATION OF SITE AND DOCUMENTS:

A. The Town shall be responsible for having a clear understanding of the existing site conditions and shall be responsible for fully carrying out the work of this Section, regardless of actual site conditions encountered.

1.07 ORDER OF WORK:

A. Based on the site conference, the Town shall submit a schedule of work for the Owner's review and approval prior to beginning work. Unless otherwise authorized

by the Owner, failure of the Town to comply with the approved removal schedule shall be sufficient cause to give notice that the Contractor is in default of the contract.

1.08 PROTECTION OF THE VEGETATION TO BE PRESERVED:

A. The Contractor shall protect all existing trees, shrubs, lawns to remain. The placement of protection devices, such as snow fence enclosures, shall, however, be at the Town's discretion.

B. Damage no plant to remain by burning, pumping water, cutting of live roots or branches, or any other means. Neither vehicles nor equipment shall be parked within the dripline of trees to remain, or where ever damage may result to trees to be saved. Construction material shall not be stored beneath trees to be saved.

C. The Town shall be liable for any damage to any trees, shrub, lawn to remain, and shall immediately report to the Owner. Damaged shrubs or lawns shall be restored or replaced to match existing to remain to the satisfaction of the Owner.

D. The Town shall compensate the Owner for damages by installing replacement tree(s) of the size and species approved by the Owner and of sufficient quantity such that the sum of the Diameter at Breast Height (DBH) inches for replacement trees equals the total DBH inches of the damaged tree(s). Damaged shrubs shall be replaced with shrubs(s) of the same size, species, and quantity, unless determined otherwise by the Owner.

1.09 USE AND CARE OF THE SITE:

A. The Town shall leave the work site at the end of each working period in a condition satisfactory to the Owner.

B. Pavements shall be swept and lawns or other surfaces raked and/or otherwise cleaned of all material related to the work operation. Degree of clean-up required will be described by the Owner and will be based upon the character of the work area.

C. All trimmings or any other form of debris (except diseased materials or trimmings from Elms) shall be collected and chipped. The Town shall remove all materials and shall dispose of such materials off site in a legal manner.

D. No vehicles are to be stored on site. The Town shall be fully and solely responsible for any damage to equipment or vehicles left at the site of the work. All necessary permits shall be obtained by the Town.

PART 2 - PRODUCTS

2.01 EQUIPMENT:

A. Equipment necessary for this Contract shall be properly maintained and in good operating condition to the City's satisfaction. The Town shall promptly remove and replace any equipment which the Owner deems to be in unsatisfactory condition or otherwise unsuitable.

B. Cutting tools shall be kept well sharpened to provide clean smooth cuts. Any tools utilized on any tree suspected to have cankers or other fungal, bacterial or viral diseases shall be sterilized or not used on any other specimen.

C. A disc chipper shall be used which will process material up to twelve (12) inches in diameter.

PART 3 - EXECUTION

3.01 PRUNING:

A. Under this Section, the Town shall furnish all labor, materials, equipment and transportation required to complete all aspects of the work in accordance with all local, state and federal regulations in force at the same time of this Contract and in accordance with tree pruning as specified herein.

B. The work of this Section consists of all pruning work and related items as specified herein and includes, but is not limited to:

1. Pruning - Class II throughout the designated areas and limb removal required to allow for the proper installation of all fields, play equipment and new fencing.

   Class II pruning is defined as medium pruning and shall consist of the removal of dead, dying, diseased, interfering, objectionable and weak branches on the main trunks as well as those within the leaf area. An occasional branch one (1) inch or less in diameter may remain within the main leaf area where it is not practical to remove it.

3.02 DESCRIPTION OF PRUNING WORK:

A. Pruning and trimming are generally described as the removal and disposal of limbs, branches and stubs which are either dead, potentially detrimental to the health of the tree or dangerous to pedestrians, visually deficient, interfering or otherwise objectionable as determined by the Owner.

B. The limits of all trees to be pruned have been identified on the plans or referenced

elsewhere in this specification section.

C. Vehicle access shall be controlled and approved by the Owner.

D. If the Town discovers tree(s) which have not been marked for pruning, but whose condition is such that removal is warranted, whether due to death, disease, decay, or structural weakness, such tree(s) shall not be pruned and the Contractor shall immediately report these findings in writing to the Owner and await the Owner's direction before proceeding with work on the particular tree(s) in question.

E. All pruning shall be performed in a manner that maintains the natural aesthetic characteristics of the species and variety of trees. No topping or dehorning of trees or stubbing back of branches shall be permitted. All cuts shall be made to a lateral branch that is a minimum of one third (1/3) the size of the branch being removed, unless otherwise instructed by the Owner.

F. The use of climbing spurs or spiked shoes shall not be permitted and their use will result in the immediate cancellation of the contract.

G. All cuts shall be made sufficiently close to the parent stem so that wound closure can be readily started under normal conditions. Cuts shall, however, never be made through the branch collar. Slab cuts and rip cuts will result in cancellation of the contract.

H. All limbs over two (2) inches in diameter to be removed shall be precut to prevent splitting. Any branches that by falling would injure existing trees to remain or other objects shall be lowered to the ground by proper ropes.

I. On trees known to be diseased and where there is known to be danger of transmitting the disease on tools, tools shall be disinfected with alcohol or bleach after each cut between trees.

J. Lateral branches as well as occasional branch suckers ("water sprouts") may be retained. Complete removal of secondary laterals and branch suckers resulting in the stripping of major limbs, ("lion tailing") will not be permitted.

K. Tree paint to seal pruning cuts shall not be used.

L. All branches and limbs shall be manually lowered to the ground via rope and pulley. This practice must be consistent with the National Arborist Association Standards for Pruning. All grade-level artifacts and landscaping must be protected from damage.

3.03 REMOVALS:

A. The Town shall furnish all labor, materials, equipment and transportation required to

complete all aspects of the removals work in accordance with all local, state, and federal regulations in force at the time of this contract and in accordance with tree and stump removals as specified herein.

3.04 DESCRIPTION OF REMOVAL WORK:

A. Removal is generally described as the removal of groups and individual trees and shrubs which interfere with the growth of more desirable types of trees; the clearing away of lesser growth that may obscure outstanding trees; and thinning out to provide space for healthy growth by the elimination of thinner, weaker trees.

B. The Town shall adhere to the specifications and provide suitable facilities for inspecting the work. Failure of the Owner to immediately reject unsatisfactory work or to notify the Town of deviations from the specification shall not relieve the Town of responsibility to correct or remedy unsatisfactory work.

C. The Town shall only work on trees designated by the Owner. No compensation will be made for work performed on any other tree or trees.

D. Trees designated to be removed shall be taken down and all leaves, branches and trunks of trees properly disposed of by chipping and removal from the premises.

E. Fell trees in a manner that allows all site features and those trees to be saved undamaged.

F. Removal of all the parts of each tree shall be completed on the same day that the tree is cut.

G. Stumps shall be ground to eighteen (18) inches below grade by grinding or other means acceptable to the Owner. The void from the stump removal operations shall be filled with ordinary borrow soil to within six (6) inches of finished grade. The top six (6) inches shall be filled with screened loam, moderately tamped to prevent future settling. In grass areas the disturbed area shall be sown with grass seed of a mix appropriate to the location, as required by the Owner.

H. Excavation or grading within the branch spread of trees to be saved shall be performed as required by the Owner. Removal of pavement such as bituminous concrete in these zones shall be by hand tools and/or air spade to ensure root health for trees to remain.

I. All equipment to be used and all work to be performed must be in full compliance with all standards as promulgated by OSHA at the time of bidding, including but not limited to those regulations concerning noise levels, protective devices and operator safety.

J. The Town shall be solely responsible for pedestrian and vehicular safety and control

within the work site and shall protect the public and its property from injury or damage that could be caused by the progress of the work. To this end the Contractor shall provide, erect, and maintain protective devices acceptable to the Owner, including but not limited to barricades, lights and warning signs.

K. Any practice employed by the Town that is obviously hazardous as determined by the Owner shall be immediately discontinued by the Contractor upon receipt of either written or oral notice from the Owner to discontinue such practice.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section specifies designing, furnishing, installing, maintaining, operating and removing temporary dewatering systems as required to lower and control water levels and hydrostatic pressures during construction; disposing of pumped water; constructing, maintaining, observing and, except where indicated or required to remain in place, removing of equipment and instrumentation for control of the system.

1.02 RELATED WORK:

A. Section 00 31 43, PERMITS

B. Section 01 57 19, ENVIRONMENTAL PROTECTION

C. Section 31 50 00, SUPPORT OF EXCAVATION

1.03 SYSTEM DESCRIPTION:

A. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of sandy soil; preventing rupture or heaving of the bottom of any excavation; and disposing of pumped water.

1.04 QUALITY ASSURANCE:

A. The Contractor is responsible for the adequacy of the dewatering systems.

B. The dewatering systems shall be capable of effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation bottom, unless otherwise required by the Owner's Representative, so that all excavation bottoms are firm and dry.

C. The dewatering system shall be capable of maintaining a dry and stable subgrade until the structures, pipes and appurtenances to be built therein have been completed to the extent that they will not be floated or otherwise damaged.

D. The dewatering system and excavation support (see Section 31 50 00, SUPPORT OF EXCAVATION) shall be designed so that lowering of the groundwater level outside the excavation does not adversely affect adjacent structures, utilities or wells.

1.05 SUBMITTALS:

A. In accordance with Section 01 33 23, Contractor shall submit a plan indicating how it intends to control the discharge from any dewatering operations on the project, whether it is discharge of groundwater from excavations or stormwater runoff during the life of the project.

PART 2 - PRODUCTS: NOT APPLICABLE

PART 3 - EXECUTION

3.01 DEWATERING OPERATIONS:

A. All water pumped or drained from the work shall be disposed of in a manner that will not result in undue interference with other work or damage to adjacent properties, pavements and other surfaces, buildings, structures and utilities. Suitable temporary pipes, flumes or channels shall be provided for water that may flow along or across the site of the work. All disposal of pumped water shall conform to the provisions of Section 01 57 19 ENVIRONMENTAL PROTECTION and Section 00 31 43 PERMITS.

B. Dewatering facilities shall be located where they will not interfere with utilities and construction work to be done by others.

C. Dewatering procedures to be used shall be as described below:

1. Crushed stone shall encapsulate the suction end of the pump to aid in minimizing the amount of silt discharged.

2. For dewatering operations with relatively minor flows, pump discharges shall be directed into straw bale sedimentation traps lined with filter fabric. Water is to be filtered through the straw bales and filter fabric prior to being allowed to seep out into its natural watercourse.

3. For dewatering operations with larger flows, pump discharges shall be into a steel dewatering basin. Steel baffle plates shall be used to slow water velocities to increase the contact time and allow adequate settlement of sediment prior to discharge into waterways.

4. Where indicated on the contract drawings or in conditions of excess silt suspended in the discharge water, silt control bags shall be utilized in catch basins.

D. The Contractor shall be responsible for repair of any damage caused by its dewatering operations, at no cost to the Owner.

END OF SECTION

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK:

A. Furnish all labor, materials, tools and equipment, and perform all operations necessary for erosion and sedimentation control work indicated on contract drawings and as specified herein.

1.02 RELATED WORK:

A. Section 01 14 19.16, DUST CONTROL

B. Section 01 57 19, ENVIRONMENTAL PROTECTION

C. Section 31 05 19.13, GEOTEXTILE FABRICS

1.03 PROJECT CONDITIONS:

A. Earthmoving activities in the project area shall be conducted in such a manner as to prevent accelerated erosion and the resulting sedimentation.

B. The Contractor shall implement erosion and sedimentation control measures as shown on the contract drawings to effectively prevent accelerated erosion and sedimentation.

C. The Contractor shall maintain erosion and sedimentation control measures as shown on the contract drawings or as required by the Owner or Owner's Representative from the start of construction until provisional acceptance of seeded areas, to effectively prevent accelerated erosion and sedimentation.

1.04 SUBMITTALS IN ACCORDANCE WITH SECTION 01330, SUBMITTALS:

A. The Contractor shall submit to the Owner's Representative certification that the materials used for silt fence and straw wattle construction meet the specifications.

1.05 GENERAL METHODOLOGY:

A. Erosion and sedimentation control methods shall consider all factors which contribute to erosion and sedimentation including, but not limited to, the following:

1. Topographic features of the Project area.

2. Types, depth, slope and areal extent of the soils.

3. Proposed alteration of the area.

4. Amount of run-off from the Project area and the upgradient watershed areas.

5. Staging of earthmoving activities.

6. Temporary control measures and facilities for use during earthmoving.

PART 2 – PRODUCTS

2.01 EROSION CONTROL BLANKET

A. Slope erosion protection, to protect hydroseed from erosion, shall be fully biodegradable, high performance-flexible growth medium composed of 100% recycled and thermally refined wood fibers, crimped interlocking biodegradable fibers, micro-pore granules, naturally derived cross-linked biopolymers and water absorbants. The high performance-flexible growth medium shall be phytosanitized, free from weed seeks, free from plastic netting, and shall require no curing period. The slope erosion protection shall be Flexterra HP-FGM by Profile Products, 750 Lake Cook Road, Ste. 440, Buffalo Grove, IL 60089, (800) 508-8681, www.profileproducts.com, or approved equal.

2.02 STRAW WATTLE

A. Straw wattle shall conform to the Specification Section 01 57 19, ENVIRONMENTAL PROTECTION.

PART 3 - EXECUTION

3.01 CONSTRUCTION SEQUENCE:

A. Construction of erosion control measures as depicted on drawings will be completed prior to any site work.

B. Sediment barriers shall be used at locations shown on the drawings. Sediment barriers are temporary berms, diversions, or other barriers that are constructed to retain sediment on-site by retarding and filtering stormwater runoff.

C. All temporary erosion control measures will be maintained by the

Contractor throughout the course of site construction activities until provisional acceptance of the site vegetation by the Owner's Representative or Owner, at which time the Contractor shall remove all remaining temporary erosion control structures, and properly dispose of accumulated sediment on-site in areas approved by the Owner.

D. The Contractor shall inspect all erosion control measures after any storm event to ensure they are in proper working order.

3.02 CONSTRUCTION METHODS:

A. Silt fences and/or straw wattles shall be installed at the site downgradient of work areas as indicated by Owner or Owner's Representative in the field. The silt fence shall be installed in accordance with manufacturer's instructions. Straw wattles shall be placed at locations shown on the contract drawings or approved by the Owner's Representative. The base of all straw wattles and silt fencing shall be embedded to the depths shown on the contract drawings.

B. On slopes, the Contractor shall provide protection against washouts by an approved method. Any washout, which occurs either in the Contractor's work area or in areas topographically below his work, shall be regraded and reseeded at the Contractor's expense until an accepted vegetative stand is established.

3.03 INSTALLATION OF EROSION CONTROL BLANKET:

A. Mating rolls should be stored in their original, unopened packaging. The designated storage area should be level, dry, well-drained, stable, and should protect the product from precipitation, chemicals, standing water, excessive heat, ultraviolet radiation, vandalism, and animals.

B. It is recommended that weed affected areas are sprayed with herbicide prior to mat installation. Excavate and trim slope to smooth profile, removing obstructions such as tree stumps or rubble and filling in any voids. Excavate anchor trenches along the top edge of the slope. Top soil is required to successfully grow grass and plants. Evenly spread top soil across the surface to required depth. All pre-seeding of the soil to be carried out prior to laying mat.

C. Dig a trench at the top of the slope, minimum depth of six (6) inches. Pin the end of the roll into the bottom of the trench. Back-fill the trench and roll the matting down the slope with a minimum overlap of four (4) inches.

D. See contract drawings for additional detail.

END OF SECTION

SECTION 31 50 00

SUPPORT OF EXCAVATION

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. This section of the specification covers wood sheeting and bracing for support of excavations. The requirements of this section shall also apply, as appropriate, to other methods of excavation support and underpinning which the Contractor elects to use to complete the work.

B. The Contractor shall furnish and place timber sheeting of the kinds and dimensions required, complying with these specifications, where indicated on the drawings or required by the Engineer.

1.02 RELATED WORK:

A. Section 31 23 19, DEWATERING.

B. Section 31 00 00, EARTHWORK.

1.03 QUALITY ASSURANCE:

A. This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Safety and Department of Labor, Division of Occupational Safety "Excavation & Trench Safety Regulation (520 CMR 14.00)" and "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et seq.)." Contractors shall be familiar with the requirements of these regulations.

B. The excavation support system shall be of sufficient strength and be provided with adequate bracing to support all loads to which it will be subjected. The excavation support system shall be designed to prevent any movement of earth that would diminish the width of the excavation or damage or endanger adjacent structures.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Timber sheeting shall be sound spruce, pine, or hemlock, planed on one side and either tongue and grooved or splined. Timber sheeting shall not be less than nominal 2-inches thick.

B. Timber and steel used for bracing shall be of such size and strength as required in the

excavation support design. Timber or steel used for bracing shall be new or undamaged used material which does not contain splices, cutouts, patches, or other alterations which would impair its integrity or strength.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Work shall not be started until all materials and equipment necessary for their construction are either on the site of the work or satisfactorily available for immediate use as required.

B. The sheeting shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected and be sufficiently tight to minimize lowering of the groundwater level outside the excavation, as required in Section 31 23 19, DEWATERING.

C. The sheeting shall be driven by approved means to the design elevation. No sheeting may be left so as to create a possible hazard to safety of the public or a hindrance to traffic of any kind.

D. If boulders or very dense soils are encountered, making it impractical to drive a section to the desired depth, the section shall, as required, be cut off.

E. The sheeting shall be left in place where indicated on the drawings or required by the Owner's Representative in writing. At all other locations, the sheeting may be left in place or salvaged at the option of the Contractor. Steel or wood sheeting permanently left in place shall be cut off at a depth of not less than two feet below finish grade unless otherwise required.

F. All cut-off will become the property of the Contractor and shall be removed by him from the site.

G. Responsibility for the satisfactory construction and maintenance of the excavation support system, complete in place, shall rest with the Contractor. Any work done, including incidental construction, which is not acceptable for the intended purpose shall be either repaired or removed and reconstructed by the Contractor at his expense.

H. The Contractor shall be solely responsible for repairing all damage associated with installation, performance, and removal of the excavation support system.

END OF SECTION

SECTION 33 05 26.13

TRACER TAPE

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers the furnishing, handling and installation of tracer tape, as called for on the drawings.

1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Manufacturer's literature on the materials, colors and printing specified herein, shall be submitted to the Engineer for review.

B. Tape samples shall also be submitted to the Engineer for review.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

Tracer tape shall be by Reef Industries, Houston, TX; Empire Level, Mukwonago, WI; Pro-Line Safety Products Co., W. Chicago, IL; or approved equal.

2.02 TRACER TAPE:

A. Tracer tape shall be at least 3-inches wide.

B. Tracer tape for non-ferrous pipe or conduit shall be constructed of a metallic core bonded to plastic layers. The metallic tracer tape shall be a minimum 5-mil thick and must be locatable at a depth of 18-inches with ordinary pipe locaters.

C. Tracer tape for ferrous pipe or conduit shall consist of multiple bonded plastic layers. The non-metallic tracer tape shall elongate at least 500% before breaking.

D. The tape shall bear the wording: "BURIED DRAIN LINE BELOW" (with "DRAIN" replaced by "WATER, "SEWER", "ELECTRICAL", "GAS", "TELEPHONE", or "CHEMICAL" as appropriate), continuously repeated every 30-inches to identify the pipe.

E. Tape colors shall be as follows, as recommended by the American Public Works Association (APWA):

Electric	Red
Gas & Oil	Yellow

Communications	Orange
Water	Blue
Sewer & Drain	Green
Chemical	Red (not APWA)

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Tracer tape shall be installed directly above the pipe or conduit it is to identify, approximately 12-inches below the proposed ground surface.

B. The Contractor shall follow the manufacturer's recommendations for installation of the tape, as approved by the Engineer.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. TRACER TAPE shall not be separately measured for payment, but shall be considered incidental to installation of all utility improvements for the project.

4.02 PAYMENT (NOT APPICABLE)

4.03 PAYMENT ITEMS (NOT APPLICABLE)

END OF SECTION

SECTION 33 11 13.31

POLYVINYL CHLORIDE PRESSURE PIPE AND FITTINGS (SCHEDULE 80)

PART 1 - GENERAL

1.01 WORK INCLUDED:

This section covers polyvinyl chloride (PVC) Schedule 80 pressure pipe and fittings as shown on the drawings and as specified herein.

1.02 RELATED WORK:

A. Section 31 50 00, SUPPORT OF EXCAVATION

B. Section 31 00 00, EARTHWORK

C. Section 33 05 26.13, TRACER TAPE

D. Section 33 39 13, PRECAST MANHOLES

1.03 QUALITY ASSURANCE:

A. All pipe and fittings shall be inspected and tested at the factory as required by the standard specifications to which the material is manufactured. The Contractor shall furnish in duplicate to the Owner’s Representative sworn certificates of such tests.

B. In addition, the Owner reserves the right to have any or all pipe, fittings, and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Owner's expense.

1.04 REFERENCES:

A. The following standards form a part of this work as referenced:

ASTM International (ASTM)

ASTM	D1784	Specification for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
ASTM	D1785	Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM	D2321	Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

ASTM	D2464	Specification for Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM	D2467	Specification for Socket-Type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM	D2564	Specification for Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM	D2855	Recommended Practice for Making Solvent-Cemented Joints with Polyvinyl Chloride (PVC) Plastic Pipe and Fittings

American Water Works Association (AWWA)

AWWA	C651	Disinfecting Water Mains

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Shop drawings shall consist of manufacturer's scale drawings, cut, or catalogs including descriptive literature and complete characteristics and specifications, and code requirements. Shop drawings shall be submitted for the PVC pressure pipe, type of joints, fittings, and couplings in accordance with specifications.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS:

A. Unless specifically designated otherwise, PVC pipe and fittings shall be Schedule 80 with solvent weld joints as specified herein.

B. PVC Schedule 80 pipe shall conform to ASTM D1785.

C. PVC Schedule 80 socket fittings shall conform to ASTM D2467 and PVC Schedule 80 threaded fittings to ASTM D2464.

D. Rigid PVC used in the extrusion of the pipe and fittings shall be Type 1, Grade 1 compound as stated in ASTM D1784 with a cell classification of 12454B.

E. Both pipe and fittings shall be the product of one manufacturer.

F. Solvent cements shall conform to ASTM D2564.

PART 3 - EXECUTION

3.01 HANDLING AND CUTTING PIPE:

A. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring surfaces, and abrasion of the pipe coating.

B. Any fittings showing a crack and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work site.

C. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used will be perfectly sound. The cut shall be made in the sound barrel at a point at least 12-inches from the visible limits of the crack.

D. Except as otherwise approved, all cutting shall be done with a machine suitable for cutting PVC pipes.

3.02 INSTALLING PIPE AND FITTINGS:

A. Unless specifically otherwise required by the Owner's Representative, all piping shall have not less than 5-feet of cover.

B. Pipes and fittings shall be subjected to a careful inspection just before being laid or installed.

C. No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.

D. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work.

E. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required. Care shall be taken to ensure good alignment both horizontally and vertically.

F. In buried pipelines, each pipe shall have firm bearing along its entire length.

G. The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as recommended by the manufacturer.

H. Pipe shall be installed underground in a manner that will ensure that external loads will not subsequently cause a decrease of more than 5 percent in the vertical cross-section dimension (deflection). When installing the pipes, they shall be rotated 180º in order that

the upper quadrant of the pipe which was exposed to direct sunlight will not be backfilled upon.

I. Except as specifically designated otherwise, installation shall be in accordance with ASTM D2321.

J. At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary water-tight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

3.03 JOINTING OF PIPE:

A. Jointing of pipe shall conform to ASTM D2855.

B. Except where threaded fittings are required to adapt to metallic pipe, all fittings and pipe shall be solvent welded.

C. Cementing operations shall not be attempted where the temperature of the pipe, fittings or ambient exceed 100ºF. Cementing operations should be done out of direct sunlight.

D. The following procedures shall be followed:

1. Inspect fitting sockets and pipe ends to make sure there is no chipping, gouging or scratching.

2. Clean pipe ends and fitting sockets carefully, using clean cotton wiping rags.

3. Try fitting sockets on pipe to make sure the pipe will penetrate at least one third of the socket depth.

4. Cut pipe to length required. Pipe must be cut at a right angle to linear section, deburred on the I.D. and deburred and slightly beveled on the O.D.

5. Apply a coat of primer to fitting socket using a scrubbing motion to ensure penetration. Repeated applications may be necessary.

6. Apply a liberal coating of primer to the end of the pipe, using a scrubbing motion to ensure penetration. Extend this coating slightly beyond fitting socket depth. Be sure the entire surface is well softened.

7. Apply a second coat of primer to the fitting socket and without delay apply a coat of cement to pipe end using a scrubbing motion to achieve an even coating.

8. Without delay, apply a uniform, light coating of cement to the fitting socket making sure that cement does not penetrate fitting portion of socket.

9. Without delay, apply a second coating of cement to the pipe end and immediately insert pipe in fitting. Turn the pipe or fitting 1/4 turn during assembly to distribute the cement evenly, but not after the pipe is bottomed in the socket. Remove all excess cement from around pipe and fitting with clean dry rag. Assembly should be completed within 20 seconds after the last application of cement. Do not hammer or pound fittings or pipe during the assembly process. Socket and pipe surfaces must be soft and wet at time of assembly.

10. Hold socket and pipe in fully bottomed position until cement "sets up." Hold tightly for 30 seconds on sizes up to 4-inches.

11. Assemblies should not be handled excessively until set- up. Allow the following times:

30 minutes	at 60º to 100ºF
1 hour	at 40º to 60ºF
2 hours	at 20º to 40ºF
4 hours	at 0º to 20ºF

3.04 PRESSURE AND LEAKAGE TESTS:

A. Prior to the pressure and leakage tests, the piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to the pipe.

B. Except as otherwise required, all pipelines shall be given combined pressure and leakage tests in sections of approved length. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment; and all labor required. The Owner/Owner's Representative reserves the right to provide separate gages.

C. Subject to Owner's Representative approval, the Contractor may schedule the time to make the tests when it desires.

D. The section of pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. The Contractor shall follow established procedures for filling the pipe and expelling trapped air to avoid exposing the piping system to water hammer. If blowoffs are not available at high points for releasing air, the Contractor shall make the necessary excavations and install the necessary taps. If required by the Owner's Representative, the Contractor shall plug said holes after completion of the test and do the necessary backfilling.

E. The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.

F. The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test corrected to the gage location)

to the pressure rating of the pipe. If the Contractor cannot achieve the specified pressure and maintain it for a period of one hour, the section shall be considered as having failed to pass the pressure test.

G. Following or during the pressure test, the Contractor shall make a leakage test by metering the flow of water into the pipe, while maintaining a pressure of 150 pounds per square inch in the section being tested. If the average leakage during a two hour period exceeds l gallon per hour per l,000 feet of pipe or 50 joints, the section shall be considered as having failed the leakage test.

H. If the section fails to pass the pressure and leakage test, the Contractor shall locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at its own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified test.

I. If in the judgement of the Owner's Representative, it is impracticable to follow the foregoing procedure exactly for any reason, modifications in the procedure shall be made as required and approved, but in any event the Contractor shall be responsible for the ultimate tightness of the line within the above leakage and pressure requirements.

3.05 DISINFECTION AND FLUSHING:

A. The Contractor shall disinfect the lines carrying potable water.

B. The Contractor shall furnish all equipment and materials necessary to do the work of disinfecting and shall perform the work in accordance with the procedure outlined in AWWA C651 and all amendments thereto.

C. In general, the procedure of disinfecting the main shall be to apply the chlorine through a tap in one end of the section and bleed it off through a tap at the other end.

D. The applied dosage shall be such as to produce a chlorine concentration of not less than 10 mg/l after a contact time of not less than 24 hours.

E. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains.

F. Any temporary connection to the mains or other facilities required to accomplish the disinfection of the mains shall be at the Contractor's expense.

G. After treatment, the main shall be flushed with clean water until the residual chlorine concentration is less than 0.2 mg/l.

H. The Contractor shall dispose of the water used in disinfecting and flushing in an approved manner.

I. Bacteriological sampling and testing shall be done in accordance with AWWA C651 for each main and each branch. Sampling shall be accomplished with sterile bottles treated with sodium thiosulfate, as required by Standard Methods. No hose or fire hydrants shall be used in collection of samples. A corporation stop installed on the main, with a removable copper tube gooseneck assembly, is the recommended method.

J. Testing shall be done by a laboratory approved by the Owner's Representative, in accordance with Standard Methods, and shall confirm the absence of coliform organisms. A standard plate count may be required at the option of the Owner's Representative.

END OF SECTION

SECTION 33 11 16

WATER SYSTEMS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 WORK INCLUDED

A. Under this Section, the Contractor shall furnish all material, labor, tools and equipment required to provide all water service pipe, fittings, valves, hose bibs, backflow preventors, retainer glands and tie rods for the water lines and systems, as shown on the drawings, as herein specified, or as directed. The Contractor shall also be responsible for all permitting and coordination with the governing water department.

PART 2 – PRODUCTS

2.01 VALVE BOXES

A. Cast iron two-piece slide type valve box, as manufactured by Tyler Pipe (Series 6855, Item 664-A), Sigma (Item VB466), or Central Foundry Company (No. 5664-S).

B. Cover must be standard drop 5-1/4" lid, as manufactured by Tyler Pipe, Sigma, or Central Foundry Company, and be clearly marked "Water".

2.02 VALVE BOX EXTENSIONS

A. All valve box extensions shall be the bottom section of a cast iron two-piece valve box, as manufactured by Tyler Pipe (Series 6855), Sigma (Item VB466), or Central Foundry Company (No. 5664-S).

2.03 COPPER PIPE: Type K "soft" copper tubing conforming to the requirements of AWWA C800. (If required)

2.04 CORPORATION STOPS: Mueller Style H-15008, diameter per plans or equivalent.

2.05 CURB STOPS: Shall be standard water works ground key Type T-handle, without drain, with coupling for copper tubing on the inlet and outlet. B25-209 by Mueller or McDonald 6100T or approved and shall be installed flush with final grade.

2.06 CURB BOXES: Style H-10314 by Mueller or McDonald equivalent for 5 feet to 6 feet burial or equal.

2.07 TAPPING VALVES AND SLEEVES: Tapping valves and sleeves shall be mechanical joint ductile iron conforming with State and Local requirements. Size per plan.

2.08 HOSE BIBS: Hose bib shall have 3/4” minimum valve opening and 3/4” hose nozzle. Hose bib shall be designed for 150 psi working pressure and 300 psi test pressure. All passages through bib shall have easy well-rounded curves. Provide one set of outlet nozzle caps, tapped and fitted for a 3/4" hose connection. Hose bib to be stainless steel, model M71QTSS by American Valve or approved equal.

2.09 BACKFLOW PREVENTION DEVICE

A. Available Manufacturers:

1. Apollo Flow Controls; Conbraco Industries, Inc.
2. Watts
3. Zurn Industries, LLC
4. Or approved equal

B. Standard: ASSE 1013.

C. Operation: Continuous-pressure applications.

D. Pressure Loss: 12 psig maximum, through middle third of flow range.

E. Size: As shown on drawings.

F. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.

G. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

H. Configuration: Designed for horizontal, straight-through flow.

I. Accessories:

1. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
2. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
3. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
4. Valves NPS 2-1/2 and Larger: Provide with Anti-Flood Valve similar to Watts model number LFF113RFP.

2.10 DRINKING FOUNTAIN: Drinking Fountain shall be model number 4420BF1U with single ADA accessible bubbler and single bottle filler as manufactured by Halsey Taylor, Oak Brook, IL (800.223.5529). Drinking Fountain shall be freeze-resistant and tamper-resistant, tubular steel construction with weather-resistant internal and external coating. Color to be black.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION

A. Alignment and Grade: As shown on the Plans. Five (5) feet minimum depth to centerline of pipe unless otherwise approved.

B. Wherever obstructions not shown on the Plans are encountered during the progress of the work and interfere to such an extent that an alteration in the Plan is required, the Owner's Representative shall have the authority to change the Plans and order a deviation from the line and grade or arrange with the Owners of the structures for the removal, relocation or reconstruction of the obstructions.

3.02 CONNECT TO EXISTING WATER MAIN

A. Installation shall be performed by the use of modern equipment, designed especially for this purpose and under the direction of a skilled operator. This sleeve shall accurately fit the existing pipeline. The Contractor must determine the outside diameter and material of the existing pipeline. The Contractor shall be responsible for all coordination and permitting with regulatory authorities.

3.03 INSTALLATION OF WATER LINES IN RELATIONSHIP TO SANITARY SEWERS

A. Parallel Installation: Water mains shall be laid at least 10 feet horizontally from any existing or proposed gravity sanitary or storm sewer, septic tank, or subsoil treatment system. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the reviewing authority may allow deviation on a case-by-case basis, if supported by data from the design engineer.

B. Crossings: Water mains crossing sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer with preference to the water main located above the sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

C. Force Mains: There shall be at least a 10 foot horizontal separation between water mains and sanitary sewer force mains. There shall be an 18 inch vertical separation at crossings as required in Section 8.8.3.

D. Sewer Manholes: No water pipe shall pass through or come in contact with any part of a sewer manhole. Water main should be located at least 10 feet from sewer manholes.

3.04 TRENCH: No pipe shall be laid in water or when, in the opinion of the Owner's Representative, trench conditions are unsuitable.

3.05 LAYING PIPE: All lumps, blisters and excess coat-tar coating shall be removed from the bell-and-spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wire-brushed and wiped clean and dry and free from oil and grease before the pipe is laid.

The pipe and fittings shall be inspected for defects and, while suspended above grade, be

rung with a light hammer to detect cracks.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the Owner's Representative may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe.

After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. Precautions shall be taken to prevent dirt from entering the joint space.

Pipe shall be laid with bell ends facing in the direction of laying, unless directed otherwise by the Owner's Representative.

At time when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Owner's Representative. If water is in the trench, the plug shall remain in place until the trench is pumped completely dry.

The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or cement lining and so as to leave a smooth end at right angles to the axis of the pipe.

When machine cutting is not available for cutting pipe 20 inches in diameter or larger, the electric-arc cutting method will be permitted using a carbon or steel rod. Only qualified and experienced workmen shall be used on this work.

The flame cutting of pipe by means of an oxyacetylene torch shall not be allowed.

3.06 PIPE JOINTS: The types of joints to be used, subject to the approval of the Owner's Representative, shall generally be the rubber ring push-on type or mechanical type joint. All joints, regardless of type, shall be installed in strict accordance with the pipe manufacturer's published instructions and procedures.

3.07 PIPE ANCHORAGE: All plugs, caps, tees and bends shall be provided with a reaction backing, or movement shall be prevented by attaching suitable metal rods or clamps as shown or specified.

Reaction backing shall be concrete of a mix not leaner than 1 cement; 2½ sand; 5 stone; and having a compressive strength of not less than 2,000 psi at 28 days. Backing shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground in each instance shall be that shown or directed by the Owner's Representative. The backing shall, unless otherwise shown or directed, be so placed that the pipe and fitting joints will be accessible for repair. Where mechanical thrust restraints

are placed, solid blocks may be installed from the fitting back to bear against undisturbed soils.

Metal harness of tie rods or clamps of adequate strength to prevent movement may be used instead of concrete backing, as directed by the Owner's Representative. Steel rods or clamps shall be galvanized or otherwise rustproof treated, or shall be painted as shown or directed by the Owner's Representative.

3.08 FLUSHING: Flush new water lines thoroughly at line pressure. Do not allow water to travel through undisinfected lines back into the system. Suitable arrangements shall be made so as not to cause flooding problems when flushing.

3.09 HYDROSTATIC TESTING

A. Hydrostatically test all pipe in accordance with the State and Local regulations with the following conditions:

1. Pressure - 1½ times the working pressure, minimum of 150 psi.

2. Test pressure ±5 psi during test.

3. Duration - Two hours.

B. Pressurization: Each valved section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connection to the pipe in a manner satisfactory to the Owner's Representative. The pump, pipe connection and all necessary apparatus shall be furnished by the Contractor. The Contractor shall furnish all necessary assistance for conducting the tests.

C. Removal: Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants or blow-offs are not available at high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert the plugs after the test has been completed.

D. Examination: All exposed pipes, fittings, valves, hydrants and joints will be carefully examined during the open trench test. When the joints are made with lead, all such joints showing visible leaks shall be recaulked until tight. Any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material in the manner provided under Part 3, and the test shall be repeated until satisfactory to the Owner's Representative.

E. Leakage Test: A leakage test shall be conducted after the pressure test has been satisfactorily completed. The Contractor shall furnish the pump, pipe, connections and all other necessary apparatus, and shall furnish all necessary assistance to conduct the test. The duration of each leakage test shall be two hours, and during the test the main shall be subjected to not less than the maximum working pressure.

Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any

valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

in which L equals the allowable leakage, in gallons per hour; S is the length of pipe line tested, in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge.

F. Variation from Permissible Leakage: Should any test of pipe laid disclose leakage greater than that specified, the Contractor shall at his own expense locate and repair the defective joints until the leakage is within the specified allowance.

G. Time for Making Test: Pipe may be subjected to hydrostatic pressure and inspected and tested for leakage at any convenient time after the trench has been partially backfilled. Where any section of a main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five days have elapsed after the concrete reaction backing was installed. If high, early strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least two days have elapsed.

H. Pressure and Leakage Tests After Backfilling: After the trench has been backfilled, the test connections made and the main filled with water, the test sections shall be subjected to water pressure normal to the area. After examination of exposed parts of the system, the test pressure will be increased to the hydrostatic pressure specified and exposed parts again examined.

If defects are found, the Contractor shall immediately make the necessary repairs at his own expense. The Contractor will then repeat the pressure test until no defects are found.

The duration of the final pressure test shall be at least one hour.

The leakage test shall be conducted after satisfactory completion of the pressure test, in accordance with Section 3.11.5. Should any test section fail to meet the leakage test, the Contractor shall make the necessary repairs at his own expense.

3.10 DISINFECTION: Upon completion of the work and before final acceptance, the water lines construction under this contract shall be chlorinated. Prior to chlorination, all dirt and foreign matter shall be removed by a thorough flushing through the hydrants, or by other approved means. Each valved section shall be flushed independently.

The method of disinfection shall consist of introducing a solution of hypochlorite or chlorine gas and water in controlled quantities into the piping system in such proportion that the chlorine water mixture entering the piping shall contain sufficient chlorine solution so that there shall be a chlorine residual throughout the entire system of not less than 50 ppm. If the residual at any point in the system is less than 25 ppm after the 24-hour period, the disinfection procedure shall be repeated until such a residual is obtained at the pipe extremities.

Other methods of disinfection than that stated above will not be allowed unless approved by the Owner's Representative. To request approval of an alternate method, submit in detail a written description of the proposed method for review by the Owner's Representative. The alternate method will also have to be approved by the local Health Department following the Owner's Representative's review.

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe lines (also see 3.14) at their extremities until the replacement water throughout its length shall, upon testing both chemically and bacteriologically, be satisfactory to the Owner's Representative. Should the initial treatment, in the opinion of the Owner's Representative, prove ineffective, the chlorination procedure shall be repeated until conformed tests show that the water samples from the newly laid pipe conform to the requirements of the Owner's Representative.

Any section of main, including capping of mains, that cannot be disinfected as specified above shall be disinfected by swabbing the interior of pipe and fittings with a 5% hypochlorite solution immediately before construction:

A. Dissolve one ounce 70% calcium hypochlorite (HTH or perchloron) as a paste in each 26 gallons of clean water, or

B. Add 4 fluid ounces of 5% liquid bleach to each 8 gallons of clean water, or

C. Add 4 fluid ounces of 14% liquid bleach to each 24 gallons of clean water.

Each of these solutions has about a 200 mg/l concentration of available chlorine.

3.11 DISCHARGE: Chlorinated water discharged from the main(s) shall not be discharged to surface waters unless the chlorine residual is less than 0.1 PPM. Chlorinated water shall be treated by the Contractor to neutralize the chlorine solution to meet the above noted residual.

Chlorinated water discharged from the main(s) and onto the ground shall be done in such a manner so as not to damage lawns, other surfaces, and property.

3.12 BACTERIOLOGICAL TESTS OF WATER MAIN

A. Standard Conditions: After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected form the new main. (NOTE: The pipe, the water loaded into the pipe, and any debris exert a chlorine demand that can interfere with disinfection.) At least one set of samples shall be collected from every 1,200 feet of the new water main, plus one set from the end of the line and at least one set from each branch. Samples shall be tested for bacteriological (chemical and physical) quality in accordance with *Standard Methods for the Examination of Water and Wastewater*, and shall show the absence of coliform organisms and, if required, the presence of a chlorine residual. A standard heterotrophic plate count (HPC) test is required because new material does not typically contain coliforms but does typically contain HPC bacteria.

B. Sampling Procedure: Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulphate, as required by *Standard Methods for the Examination of Water and Wastewater*. No hose or fire hydrant shall be used in the collection of samples. (NOTE: For pipe repairs, if no other sampling port is available, well flushed fire hydrants may be used with the understanding that they do not represent optimum sampling conditions.) A suggested combination blowoff and sampling tap used for mains up to and including 8-inch diameter is shown in Figure 2 of the Standard. There should be no water in the trench up to the connection for sampling. The sampling pipe must be dedicated and clean and disinfected and flushed prior to sampling. A corporation cock may be installed in the main with a copper-tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

C. Sample Results: If sample results from a lab, approved by the New York State Health Department, indicate any coliform organism or measured HPC greater than 500 colony-forming units (cfu) per mL, flushing should be resumed and another coliform and HPC set of samples should be taken until no coliforms are present and the HPS is less than 500 cfu/mL.

D. Record of Compliance: The record of compliance shall be the bacteriological test results certifying that the water sampled from the new water main is free of coliform bacteria contamination and is equal to or better than the bacteriologic water quality in the distribution system.

E. Re-disinfection: If the initial disinfection fails to produce satisfactory bacteriological results or if other water quality is affected, the new main may be re-flushed and shall be re-sampled. If check samples also fail to produce acceptable results, the main shall be re-chlorinated by the continuous feed or slug method until satisfactory results are obtained - that being two consecutive sets of acceptable samples taken 24 hours apart.

NOTE: High velocities in the existing system, resulting from flushing the new main, may disturb sediment that has accumulated in the existing mains. When check samples are taken, it is advisable to sample water entering the new main to determine the source of turbidity.

3.13 Install retainer glands in accordance with the manufacturer's instructions in the locations shown on the Plans or as directed by the Owner’s Representative.

3.14 Install all valves, valve boxes, and hydrants in a plumb position. Valve boxes shall be set flush to finished grade on well tamped backfill to avoid settlement.

3.15 Install valves in strict accordance with applicable AWWA specifications for mechanical joint resilient wedge valves.

3.16 Installation of the tapping valve and sleeve shall be performed by the use of modern equipment, designed especially for this purpose and under the direction of a skilled operator. The sleeve shall accurately fit the existing pipeline. The Contractor must determine the outside diameter and material of the existing pipeline.

3.17 Install mechanical joint retainer glands on the hydrant lateral connecting pieces.

3.18 When any hydrants are not in service, they shall be covered with bags to indicate that they are out of service. The Contractor shall notify the local firehouse when hydrants are out of service.

3.19 Install all elements for Drinking Fountain with Bottle Filling Station per manufacturer's recommendations and requirements and per City of Boston requirements.

END OF SECTION

SECTION 33 39 13

PRECAST MANHOLES AND LEACHING BASINS

PART 1 - GENERAL

1.01 WORK INCLUDED:

This Section covers all precast manholes and leaching basins complete, including, but not limited to, bases, walls, cones, mortar, inverts, frames and covers.

1.02 RELATED WORK:

A. Section 31 00 00, EARTHWORK

B. Section 03 05 00, FIELD CONCRETE

1.03 SYSTEM DESCRIPTION:

A. Precast sections shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings or as required by the Owner's Representative.

B. All manholes shall have concrete bases. Concrete bases shall be precast unless otherwise specified. Invert channels shall be formed of brick and mortar upon the base.

C. Riser and cone sections shall be precast concrete.

D. Leaching basins shall have a bottom opening as shown on the drawings.

1.04 REFERENCES:

A. The following standards form a part of this specification as referenced:

American Society for Testing and Materials (ASTM)

ASTM	A48	Gray Iron Castings
ASTM	C32	Sewer and Manhole Brick
ASTM	C144	Aggregate for Masonry Mortar
ASTM	C207	Hydrated Lime for Masonry Purposes
ASTM	C478	Precast Reinforced Concrete Manhole Sections
ASTM	C923	Specification for Resilient

Connectors Between Reinforced
Concrete Manhole Structures and Pipes

ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

Occupational Safety and Health Administration

OSHA 29 CFR 1910.27 Fall Prevention Protection

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

A. Six sets of manufacturer literature of the materials of this section shall be submitted to the Owner's Representative for review.

B. Test reports as required shall be submitted to the Owner's Representative.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE SECTIONS:

A. All precast concrete sections shall conform to ASTM C478 with the following exceptions and additional requirements:

1. The wall thickness of precast sections shall be as designated on the drawings, meeting the following minimum requirements:

Section Diameter (Inches)	Minimum Wall Thickness (Inches)
48	5
60	6
72	7
84	8

2. Type II cement shall be used except as otherwise approved.

3. Sections shall be steam cured and shall not be shipped until at least five days after having been cast.

4. Minimum compressive strength of concrete shall be 4000 psi at 28 days.

5. No more than two lift holes may be cast or drilled in each section.

6. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.

7. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.

8. Circumferential steel reinforcement in walls and bases shall be a minimum of 0.12 sq. in./lin. ft. for 4-foot diameter sections and 0.15 sq. in./lin. ft. for 5- and 6-foot diameter sections. Reinforcing shall extend into tongue and groove.

B. Conical reducing sections shall have a wall thickness not less than 5-inches at the bottom and wall thickness of 8-inches at the top. Conical sections shall taper from a minimum of 48-inches diameter to 24 or 30-inches diameter at the top, as shown on the drawings.

C. Except where insufficient depth of cover dictates the use of a shorter base, bases shall be a minimum of 4 feet in height.

D. Slab top sections and flat riser sections (Grade Rings) shall conform to the contract drawings, with particular attention focused upon the reinforcing steel and be designed to meet or exceed an HS-20 Loading requirement.

E. The tops of the bases shall be suitably shaped by means of accurate ring forms to receive the riser sections.

F. Precast sections shall be manufactured to contain wall openings of the minimum size to receive the ends of the pipes, such openings being accurately set to conform with line and grade of the sewer or drain. Subsequent cutting or tampering in the field, for the purpose of creating new openings or altering existing openings, will not be permitted except as required by the Owner’s Representative.

G. "Drop-over" manholes shall be placed where indicated on the drawings. The Contractor shall accurately measure the diameter of the existing outlet pipe and inform the manufacturer of its size, so that the "Drop-over" type opening can be cut into the precast manhole base. The bottom shall be cast in place by the Contractor in accordance with Section 03 05 00, FIELD CONCRETE. The invert channel shall be formed of brick and mortar, as specified in this specifications section. The sub-base shall be a compacted, level foundation of crushed stone, at least 6-inches thick, as specified in Section 02300 EARTHWORK, but shall vary to the depth necessary to reach sound undisturbed earth.

H. The exterior surfaces of all precast manhole bases, walls, and cones shall be given a minimum of one shop coat of bituminous dampproofing.

I. The Owner's Representative reserves the right to reject any unsatisfactory precast section and the rejected unit shall be tagged and removed from the job site immediately.

J. The Owner's Representative may also require the testing of concrete sections as outlined under Physical Requirements in ASTM C478 with the Contractor bearing all testing costs.

2.02 BRICK MATERIALS:

A. Brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Owner's Representative. Bricks shall comply with ASTM C32, for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight.

B. Rejected brick shall be immediately removed from the work and brick satisfactory to the Owner's Representative substituted.

C. Mortar shall be composed of portland cement, hydrated lime, and sand in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as required by the Owner's Representative and may vary from l:l/4 for dense hard-burned brick to l:3/4 for softer brick. In general, mortar for Grade SS Brick shall be mixed in the volume proportions of 1:1/2:4-1/2; portland cement to hydrated lime to sand.

D. Cement shall be Type II portland cement as specified for concrete masonry.

E. Hydrated lime shall be Type S conforming to ASTM C207.

F. The sand shall comply with ASTM C144 specifications for "Fine Aggregate," except that all of the sand shall pass a No. 8 sieve.

2.03 FRAMES, GRATES, COVERS AND STEPS:

A. Castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.

B. All castings shall be thoroughly cleaned and may be subject to a careful hammer inspection at the Owner's Representative's discretion.

C. Castings shall be ASTM A48 Class 30B or better.

D. The surface of the manhole covers shall have a diamond pattern with the cast words "WATER," "DRAIN" or "SEWER," whichever is appropriate.

E. Manhole frames with 32-inch covers for 30-inch openings shall be 500 pounds minimum by EJ, No. V-1419; Quality Water Products, Style 47; Neenah Foundry Co., R1740B or approved equal.

F. Watertight type manhole frames with 32-inch diameter covers (bolted and gasketed) shall be EJ, No. 2006APT 2008ZPT; Quality Water Products, Style C47WT; Neenah Foundry Co., R-1916-H or approved equal.

G. Manhole frames with 26-inch covers for 24-inch openings shall be 475 pounds minimum by EJ No. 2110 (formerly LK110A); Neenah Foundry Co. R1720; Quality Water Products, Style 40; or approved equal.

H. Watertight type manhole frames with 26-inch diameter covers (bolted and gasketed) shall be EJ No. 1268; Mechanics Iron Foundry Type A2073; Quality Water Products, Style 40WT; or approved equal.

I. Frostproof manhole frames, with 30-inch diameter covers and inner lids, shall be R-1755 series by Neenah Foundry Co., Neenah, WI; 2006A1 2009Z by EJ, Brockton, MA; B-3045 (or similar) by Mechanics Iron Foundry, Boston, MA; or approved equal.

J. 2-inch thick polystyrene insulation shall be firmly adhered to all frostproof inner lids.

2.04 SEWER MANHOLE ACCESSORIES:

A. Gasket materials shall be top grade (100% solids, vulcanized) butyl rubber and shall meet or exceed AASHTO M-198.

B. Couplings at the manhole-pipe interface shall be made with a rubber seal system (with or without stainless steel straps) meeting the requirements of ASTM C923 and recommended for this type of connection.

C. Stubs installed as specified and indicated on the drawings shall be short pieces of the same class pipe as that entering the manhole and shall have either stoppers or end caps as shown on the drawings. Stoppers or end caps shall be especially designed for that application.

2.05 LEACHING BASINS:

A. Leaching basins shall be precast concrete with dimensions and details as shown on the contract plans. Leaching basins shall be constructed using 4,000 psi concrete and ASTM GR.60 steel reinforcement and shall be manufactured to support AASHTO HS20 load.

B. All holes shall be cored and connections shall be made in accordance with the specifications for manholes.

C. Frames and covers shall be 26-inch cast iron frame and cover, H-20 load rated. The cover shall read DRAIN.

2.06 PLASTIC AREA DRAINS:

A. Inline drain/drain basin designed for AASHTO H20 loading, with cast iron grate, as manufactured by Nyloplast America, Inc., or approved equal. Grates shall be lockable. Basin size to be 30" dia.

B. Couplings at the manhole-pipe interface shall be made with a rubber seal system (with or without stainless steel straps) meeting the requirements of ASTM C923 and recommended for this type of connection.

C. Stubs installed as specified and indicated on the drawings shall be short pieces of the same class pipe as that entering the manhole and shall have either stoppers or end caps as shown on the drawings. Stoppers or end caps shall be especially designed for that application.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. PRECAST SECTIONS:

1. Precast bases shall be supported on a compacted level foundation of crushed stone, as specified in Section 31 00 00 EARTHWORK, at least 6-inches thick, but shall vary to the depth necessary to reach sound undisturbed earth.

2. Precast reinforced concrete sections shall be set vertical and with sections in true alignment.

3. Butyl rubber joint sealant shall be installed between each concrete section.

4. All holes in sections used for handling the sections shall be thoroughly plugged with mortar. Mortar shall be one part cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

B. BRICK WORK:

1. Bricks shall be moistened by suitable means, as required by the Owner's Representative, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.

2. Each brick shall be laid as a header in a full bed and joint of mortar without requiring subsequent grouting, flushing or filling, and shall be thoroughly bonded as directed.

3. The brick inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipe.

C. LEACHING BASINS

1. Leaching basins shall be set in an excavation lined with a geotextile non-woven filter fabric, such as Mirafi 140N or approved equal. The basin shall be placed on a pad of free draining crushed ston, with the excavation around the basin back-filled with similar material.

D. CASTINGS:

1. Cast iron frames, grates and covers shall be as specified. The frames and covers shall be set by the Contractor to conform accurately to the grade of the finished pavement, existing ground surface, or as indicated on the drawings. Frames shall be adjusted to meet the street surface.

2. Cast iron manhole frames and covers not located in paved areas shall be set 6-inches above finished grade, at a height as required by the Owner's Representative, or as indicated on the drawings. The top of the cone shall be built up with a minimum of 1 course and a maximum of 5 courses of brick and mortar used as headers for adjustment to final grade.

3. Frames shall be set concentric with the top of the concrete section and in a full bed of mortar so that the space between the top of the concrete section or brick headers and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the concrete shall be placed all around the bottom flange. The mortar shall be smoothly finished to be flush with the top of the flange and have a slight slope to shed water away from the frame.

4. Covers and/or grates shall be left in place in the frames, for safety reasons, except while work is being performed.

E. ACCESSORIES:

1. Accessories shall be installed in accordance with manufacturer's instructions.

2. Stubs shall be set accurately to the dimensions indicated on the drawings. Stubs shall be sealed with suitable watertight plugs.

F. MANHOLE FALL PREVENTION SYSTEM:

Carrier rail shall extend from the manhole invert shelf to within 18-inches of finish grade. The rail and manhole rung clamp assembly shall be rigidly connected utilizing 3/8-inch stainless steel bolts. Assembly shall be clamped to manhole steps at 2-foot centers or as recommended by the manufacturer.

3.02 LEAKAGE TESTS:

A. Leakage tests shall be made by the Contractor and observed by the Owner's Representative on each manhole. The test shall be by vacuum or by water exfiltration as described below:

B. VACUUM TEST:

1. The vacuum test shall be conducted in accordance with ASTM C1244. Test results will be judged by the length of time it takes for the applied vacuum to drop from 10 inches of mercury to 9 inches. If the time is less than that listed in Table 1 of ASTM C1244, the manhole will have failed the test. Test times from Table 1 are excerpted below.

TABLE 1
Minimum Test Times for Various Manhole Diameters

	Diameter (Inches)		
Depth (Feet)	48	60	72
	Times (Seconds)		
0-12	30	39	49
12-16	40	52	67
16-20	50	65	81
20-24	59	78	97
26-30	74	98	121

2. If the manhole fails the initial test, the Contractor shall locate the leaks and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material. If the manhole should again fail the vacuum test, additional repairs shall be made, and the manhole water tested as specified below.

C. WATER EXFILTRATION TEST:

1. After the manhole has been assembled in place, all lifting holes shall be filled and pointed with an approved non-shrinking mortar. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out. The test shall be made prior to placing the shelf and invert. If the groundwater table has

been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test.

2. The manhole shall be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above, is unsatisfactory as determined by the Owner's Representative or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption by the manhole. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and a measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour loss rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as required by the Owner's Representative to bring the leakage within the allowable rate of one gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day, shall be cause for rejection of the manhole. It shall be the Contractor's responsibility to uncover the rejected manhole as necessary and to disassemble, reconstruct or replace it as required by the Owner's Representative. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

3. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It shall be assumed that all loss of water during the test is a result of leaks through joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Owner's Representative that the water table is below the bottom of the manhole throughout the test.

4. If the groundwater table is above the highest joint in the manhole, and there is no leakage into the manhole, as determined by the Owner's Representative, such a test can serve to evaluate water-tightness of the manhole. However, if the Owner's Representative is not satisfied with the results, the Contractor shall lower the water table and carry out the test as described hereinbefore.

3.03 CLEANING:

All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION

SECTION 33 41 13.22

CORRUGATED POLYETHYLENE [HDPE] DRAINAGE PIPE

PART 1 – GENERAL

1.01 WORK INCLUDED:

A. This section includes furnishing all materials, labor and equipment and installing corrugated polyethylene [HDPE] drainage pipe and fittings as shown on the drawings and as specified herein.

1.02 RELATED WORK:

A. Section 31 00 00 – EARTHWORK

B. Section 31 50 00 – SUPPORT OF EXCAVATION

1.03 REFERENCES:

A. The following standards form a part of this specification, as referenced:

American Society for Testing and Materials (ASTM

ASTM D2321	Standard for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
ASTM F405	Standard Specification for Corrugated Polyethylene Pipe and Fittings
ASTM F667	Standard Specification for Large Diameter Corrugated Polyethylene Pipe and fittings

American Association Of State Highway and Transportation Officials

AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe
AASHTO MP6	Standard Specification for Corrugated Polyethylene Pipe 42” and 48” Diameter

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF SECTION 01 33 23 SUBMITTALS, SUBMIT THE FOLLOWING:

A. Manufacturer’s literature on the materials of this Section.

B. Manufacturer’s certification that the product was manufactured, tested, and supplied in accordance with this specification.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Pipe shall be packaged to withstand shipment without damage and handled carefully on the jobsite. Pipe shall be stored so that it is not exposed to sunlight.

PART 2 – PRODUCTS:

2.01 MATERIALS:

A. This Section applies to corrugated polyethylene pipe with an integrally formed smooth interior.

B. The nominal size for the pipe and fittings is based on the nominal inside diameter of the pipe.

C. The pipe and fittings shall be free of foreign inclusions and visible defects. Fittings may be either molded or fabricated. Fittings supplied by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the Owner's Representative. The ends of the pipe shall be cut squarely and cleanly so as not to adversely affect joining.

2.02 MANUFACTURERS:

A. Pipe and fittings shall be manufactured by Ipex, Inc.; Plexco, Division of Chevron Chemical Co.; J-M Pipe Co.; Advanced Drainage Systems, Inc. (ADS) or approved equal.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. Pipe interiors, fitting interiors, and joint surfaces shall be thoroughly cleaned before installation. Pipes and fittings shall be maintained clean.

B. Pipes shall be installed in the locations and to the required lines and grades shown on the drawings and provided in these Specifications, using an approved method of control.

C. Excavations shall be maintained free of water during the progress of the Work. No pipes shall be laid in water, nor shall there by any joints made up in water.

D. If any defective pipe is discovered after being placed, removal and replacement with sound pipe will be required at no additional cost to the Owner.

END OF SECTION

SECTION 33 42 31

STORMWATER AREA DRAINS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work to be done under this section shall include the installation of standard drainage structures as shown on the plans and specified under this item. The Contractor shall provide all material, labor, tools, equipment and transportation to complete these items. A grate shall be provided for each structure.

B. Drainage structures shall be installed in the quantities and locations identified on the Contract Drawings. Contact the Owner's Representative if obstructions or conflicts are encountered.

1.02 REFERENCE STANDARDS AND SPECIFICATIONS

A. Reference to the standards, specifications and tests of technical societies, organizations, and governmental bodies is made in the Contract Documents.

1. AASHTO - American Association of State Highway and Transportation Officials (tests or specifications).

2. ASTM - American Society for Testing and Materials.

3. Mass. Standard Specs. - Latest edition of the Standard Specifications for Highways and Bridges, the Massachusetts Highway Department, hereinafter referred to as "the Massachusetts Standard Specifications", Sections 2.01, M2.01 and M4.05 AND Plate #203.1.0 of the 1977 MDPW Construction standards.

4. Municipal Standard Specifications and Procedures, as applicable.

5. MAAB – Massachusetts Architectural Access Board

6. ADA – Americans with Disabilities Act

1.03 CODES, ORDINANCES AND PERMITS

A. All work shall be performed in strict accordance with local and state codes and regulations.

1. Site utility work shall be done in strict accordance with the Commonwealth of Massachusetts State Plumbing Code, dated September 1976, and all

revisions thereto.

2. The Contractor shall secure all permits deemed necessary in connection with the installation of this equipment and pay fees required for same. He shall include the cost and back charge of installing any portion of the work where performed by municipal departments or utility companies.

1.04 SUBMITTALS/SHOP DRAWINGS

A. Shop drawings shall be submitted to the Owner's Representative for all equipment. Copies shall be submitted and shall include cuts, scale drawings, installation details, manufacturer's specifications, certified performance characteristics and capacity ratings.

A. No material or equipment may be purchased or installed before the submission and written approval of the shop drawings.

PART 2 - PRODUCTS

2.04 CASTINGS

B. Dome Grates for installation with catch basins in planted stormwater swales shall be 'Dome Light-Duty' as manufactured by Nyloplast, a division of Advanced Drainage Systems, Inc., or approved equal.

2.05 DRAINAGE STRUCTURES AND DRAIN INLETS

A. Drain inlets, manholes and catch basins shall conform to the following specification:

PVC drainage structures shall be of the inline drain type as indicated on the contract drawings and referenced within the contract specification. Ductile iron grates for each of these fittings are to be used. The surface drainage inlets shall be as manufactured by Nyloplast a division of Advanced Drainage Systems, Inc., or approved equal. The drainage manholes and catch basins required for this contract shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the furnished configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. The joint tightness shall conform to ASTM D3212 for joints or drain and sewer plastic pipe using flexible elastomeric seals. The pipe bell spigot shall be joined to the inline drain body by use of the swage mechanical joint. The pipe stock used to manufacture the inline drain body and pipe bell spigot of the surface drainage inlets shall meet the mechanical property requirements for fabricated fittings as described by ASTM D3034, Standard for Sewer PVC Pipe and Fittings; ASTM F1336, Standard for PVC Gasketed Sewer Fittings.

The grates furnished for all surface drainage inlets shall be ductile iron. Grates and covers for drains shall be capable of supporting H-25 wheel loading for heavy-duty traffic. Metal used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05 for ductile iron.

PART 3 - EXECUTION

3.01 Structures shall be constructed to the line, grades, dimensions and design shown on the plans and as directed and furnished with the necessary frames, grates, covers, aluminum steps, etc., in accordance with these Specifications. Verify inverts of all utilities to remain.

3.02 Connections will be carefully made to all existing and proposed lines to the grades and elevations shown on the contract drawing.

3.03 Suitable materials obtained from the excavation or from borrow shall be placed between the outside of the structure and the limits of the excavation, uniformly distributed in successive layers not exceeding 6 inches in depth and thoroughly compacted by tamping with mechanical rammers or tampers. When required, the backfill material shall be moistened during the compacting. Compaction with iron hand tampers having a tamping face not exceeding twenty-five (25) square inches may be allowed, but only after permission has been given by the Owner's Representative.

3.04 All materials removed in the excavation for area drains, etc. and remaining after the filling about the finished structure has been made shall be used wherever possible within the project or removed and satisfactorily disposed of outside of the project limits without additional compensation.

3.05 Where directed, the castings shall be temporarily set at such grades as to provide drainage during the construction.

END OF SECTION

APPENDIX A
ORDER OF CONDITIONS

APPENDIX A
ORDER OF CONDITIONS

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

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

Provided by MassDEP:
SE76-2782
MassDEP File #

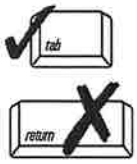
eDEP Transaction #

Wareham
City/Town

A. General Information

Please note: this form has been modified with added space to accommodate the Registry of Deeds Requirements

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



1. From: Wareham
   Conservation Commission

2. This issuance is for (check one): a. ☒ Order of Conditions b. ☐ Amended Order of Conditions

3. To: Applicant:

Derek	Sullivan
a. First Name	b. Last Name

Town of Wareham
c. Organization

54 Marion Road
d. Mailing Address

Wareham	MA	02571
e. City/Town	f. State	g. Zip Code

4. Property Owner (if different from applicant):

a. First Name	b. Last Name

c. Organization

d. Mailing Address

e. City/Town	f. State	g. Zip Code

5. Project Location:

186 Onset Avenue	Wareham
a. Street Address	b. City/Town
Map 1	Lots 1052/B and 1048
c. Assessors Map/Plat Number	d. Parcel/Lot Number

Latitude and Longitude, if known: d m s (d. Latitude) d m s (e. Longitude)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #

Wareham
City/Town

A. General Information (cont.)

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

Plymouth
a. County

b. Certificate Number (if registered land)

1914
c. Book

0228
d. Page

7. Dates: February 15, 2023 (a. Date Notice of Intent Filed) | March 1, 2023 (b. Date Public Hearing Closed) | March 1, 2023 (c. Date of Issuance)

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):

Improvements to Bayview Park
a. Plan Title

Weston and Sampson Engineers
b. Prepared By

Brandon Kunkel
c. Signed and Stamped by

December 16, 2022
d. Final Revision Date

1"=20'
e. Scale

f. Additional Plan or Document Title

g. Date

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

a. ☐ Public Water Supply b. ☐ Land Containing Shellfish c. ☒ Prevention of Pollution

d. ☐ Private Water Supply e. ☐ Fisheries f. ☐ Protection of Wildlife Habitat

g. ☐ Groundwater Supply h. ☒ Storm Damage Prevention i. ☒ Flood Control

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

a. ☒ the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #

Wareham
City/Town

B. Findings (cont.)

Denied because:

b. ☐ the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. ☐ the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

3. ☐ Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) _____ a. linear feet

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. ☐ Bank	a. linear feet	b. linear feet	c. linear feet	d. linear feet
5. ☐ Bordering Vegetated Wetland	a. square feet	b. square feet	c. square feet	d. square feet
6. ☐ Land Under Waterbodies and Waterways	a. square feet	b. square feet	c. square feet	d. square feet
	e. c/y dredged	f. c/y dredged		
7. ☐ Bordering Land Subject to Flooding	a. square feet	b. square feet	c. square feet	d. square feet
Cubic Feet Flood Storage	e. cubic feet	f. cubic feet	g. cubic feet	h. cubic feet
8. ☐ Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. ☐ Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #

Wareham
City/Town

B. Findings (cont.)

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. ☐ Land Under the Ocean	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
12. ☐ Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. ☐ Coastal Beaches	a. square feet	b. square feet	c. nourishment (cu yd)	d. nourishment (cu yd)
14. ☐ Coastal Dunes	a. square feet	b. square feet	c. nourishment (cu yd)	d. nourishment (cu yd)
15. ☒ Coastal Banks	379 a. linear feet	379 b. linear feet		
16. ☐ Rocky Intertidal Shores	a. square feet	b. square feet		
17. ☐ Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18. ☐ Land Under Salt Ponds	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. ☐ Land Containing Shellfish	a. square feet	b. square feet	c. square feet	d. square feet
20. ☐ Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	a. c/y dredged	b. c/y dredged		
21. ☒ Land Subject to Coastal Storm Flowage	17,416 a. square feet	17,416 b. square feet		
22. ☐ Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #

Wareham
City/Town

B. Findings (cont.)

* **#23.** If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23. ☐ Restoration/Enhancement *:

a. square feet of BVW | b. square feet of salt marsh

24. ☐ Stream Crossing(s):

a. number of new stream crossings | b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects.

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
   a. The work is a maintenance dredging project as provided for in the Act; or
   b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
   c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on _____ unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #
Wareham
City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.

9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.

10. A sign shall be displayed at the site not less then two square feet or more than three square feet in size bearing the words,

    "Massachusetts Department of Environmental Protection" [or, "MassDEP"]

    "File Number SE76-2782 "

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.

12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.

13. The work shall conform to the plans and special conditions referenced in this order.

14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.

15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #
Wareham
City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.

18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

19. The work associated with this Order (the "Project")
    (1) ☐ is subject to the Massachusetts Stormwater Standards
    (2) ☐ is NOT subject to the Massachusetts Stormwater Standards

    If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:

    a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.

    b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:
    i. all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;
    ii. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;
    iii. any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #
Wareham
City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;

v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.

c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement) for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:

i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and

ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.

d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.

e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.

f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #
Wareham
City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.

h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.

i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.

j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.

k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.

l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #

Wareham
City/Town

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? ☒ Yes ☐ No

2. The Wareham hereby finds (check one that applies):
   Conservation Commission

   a. ☐ that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:

   1. Municipal Ordinance or Bylaw | 2. Citation

   Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

   b. ☒ that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:

   Wareham Wetland Protective By-law | Div VI
   1. Municipal Ordinance or Bylaw | 2. Citation

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.
   The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):

STANDARD CONDITIONS

1. The Wareham Conservation Commission is to be notified in writing not less than three (3) working days prior to the start of construction. At the time of notification, all pre-construction conditions shall have been complied with, including General Conditions 8 & 9.

2. Members, agents, and representatives of the Wareham Conservation Commission and/or the D.E.P. shall have the right to enter and inspect the property to insure compliance with the Conditions contained in this Order, and may require the submittal of any data necessary for such evaluation.

3. It is the responsibility of the applicant to see that construction personnel are aware of and adhere to all Conditions contained in this Order. A copy of this Order of Conditions shall be kept available on-site during all phases of the project.

4. Construction may proceed according to the plans submitted to the Commission and D.E.P. For any proposed change to the plans submitted, the applicant shall file a new Notice of Intent, or shall inquire, in writing from the Commission, as to whether the change is significant enough to warrant a new Notice. **Failure to construct the project according to the approved site plan may result in the issuance of an Enforcement Order and/or fines of up to $300.00/day that the unauthorized deviations continue to exist. This shall be a continuing condition.**

5. Prior to the commencement of any earth moving activity, a straw bale barrier shall be placed between the limits of the work and the B.V.W. The straw bales shall be firmly anchored with stakes end-to-end. The straw bales shall be inspected daily and those showing signs of deterioration shall be replaced immediately. The straw bale barrier shall remain in proper functioning condition until all disturbed areas have been stabilized.

6. Any construction in the flood plain shall conform to 780 CMR Section 2102.0, requirements for flood resistant construction.

7. All final earth grading shall be permanently stabilized by the application of loam and seed or sod, except for the designated replication area and any designed paved area (driveway, sidewalk).

8. All debris, fill, and excavated material, shall be stockpiled far enough away from designated resource areas, and at a location to prevent sediment from surface runoff entering wetlands. At no time shall any debris or other material be stockpiled, buried, or disposed of within wetland resource areas, other than that fill which is allowed by this Order and is shown on the above referenced plans.

9. **Upon completion of the project, or at the expiration date of the Order of Conditions, the applicant shall either submit a Request for a Certificate of Compliance accompanied by an "As-Built" Plan prepared by a professional engineer or land surveyor registered in the Commonwealth of Massachusetts showing deviations from the original submitted plans, if any, and showing the site has been developed according to the requirements of the Order of Conditions, or a request for an extension to the Order. Failure to comply with this condition may result in the issuance of fines and/or other legal actions.**

10. This Order shall apply to any successor in control or successor in interest of the property described in the Notice of Intent and accompanying plans.

11. If the proposed project involves construction of a replacement area, the replacement area shall meet or exceed those General performance standards outlines in sections 10.55 (4) (b) 1-7 of the Wetlands Protection Act Regulations. Should the replacement area fail to meet any of these standards, the Commission may require those measures necessary to achieve compliance.

12. **The applicant shall contact the Conservation Administrator to inspect the installed haybale/silt fence barrier. Both haybales and silt fence shall be used for this project. This is to be done prior to the commencement of the project, which includes tree cutting or the removal of vegetation.**

13. **The applicant shall arrange a preconstruction meeting to include the project contractor, the Conservation Administrator, and the project Engineer, to discuss the schedule and details of the project. This shall be done prior to the commencement of the project, which includes tree cutting or the removal of vegetation.**

14. **The name and phone number of the contact person for the project contractor shall be submitted to the Conservation Office. This shall be done prior to the commencement of the project.**

15. **Only organic slow release nitrogen fertilizer shall be used at the site, in accordance with the manufacturer's specifications. This shall be a continuing condition.**

SPECIAL CONDITIONS

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #

Wareham
City/Town

E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

03/01/2023
1. Date of Issuance

Please indicate the number of members who will sign this form.
This Order must be signed by a majority of the Conservation Commission.

4
2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Signature	Printed Name
Carol S. Malonson	Sandy Slavin
Carol S. Malonson	Carol Malonson
Kwame S. Bartie	Kwame Bartie
Michael F. Mercier	Michael Mercier
Denise Schulz	Denise Schulz
	Nichole Locurto

☐ by hand delivery on

Date

☒ by certified mail, return receipt requested, on

03/06/2023
Date

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #
Wareham
City/Town

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
SE76-2782
MassDEP File #

eDEP Transaction #

Wareham
City/Town

G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

Project Location | MassDEP File Number

Has been recorded at the Registry of Deeds of:

County | Book | Page

for: Property Owner

and has been noted in the chain of title of the affected property in:

Book | Page

In accordance with the Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Request for Departmental Action Fee Transmittal Form

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

DEP File Number:

Provided by DEP

A. Request Information

1. Location of Project

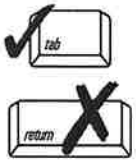
a. Street Address

b. City/Town, Zip

c. Check number

d. Fee amount

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



2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

4. DEP File Number:

B. Instructions

1. When the Departmental action request is for (check one):

☐ Superseding Order of Conditions – Fee: $120.00 (single family house projects) or $245 (all other projects)

☐ Superseding Determination of Applicability – Fee: $120

☐ Superseding Order of Resource Area Delineation – Fee: $120

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Request for Departmental Action Fee Transmittal Form

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

DEP File Number:

Provided by DEP

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts,* to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community).

4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

APPENDIX B
MANUFACTURER CUTSHEETS

APPENDIX B
MANUFACTURER CUTSHEETS

Titan Series - IWW

Internal With Winch - Wire Halyard

The **Titan Series** from Concord American Flagpole offers commercial grade flagpoles with the security of an Internal Halyard Winch and Wire Cable system. Ranging in heights from **20' to 80'**, the concealed halyard and lockable flush mount hinged door delivers project owners the peace of mind provided

Standard Flagpole Accessories - 6" to 8" Butt Diameters

Standard Specifications

- Patented, Heavy-Duty Gold Anodized Aluminum Ball
- Cast Aluminum Revolving Truck with Dual SEALED Stainless Steel Bearing Assemblies, Aluminum Spindle, Cast Brass Exit Bushing and Removable Hood
- Complete Internal Halyard Assembly
  - Wire Halyard Cable Assembly
  - Flag Arrangement (8' x 12' and Larger Flags Include Heavy-Duty Shock Spring Assembly)
  - Two (2) Stainless Steel Swivel Flagsnaps
  - Two (2) Neoprene Flagsnap Covers
  - Patented, Plastic Coated Counterweight
  - Beaded Retainer Ring Assembly
- Stainless Steel Winch Assembly with Removable Hand Crank
- Flush Mount Access Door with Lock and Keys
- Spun Aluminum FC-11 Flash Collar
- Galvanized 16-Gauge Corrugated Steel Ground Sleeve with Steel Grounding Spike

Standard Upgrades – 10" and 12" Butt Diameters

- Heavy-Duty, Large Cast Aluminum Revolving Truck with Dual SEALED Stainless Steel Bearing Assemblies, Aluminum Spindle, Cast Brass Exit Bushing and Removable Hood
- Two (2) Heavy-Duty Stainless Steel Flagsnaps
- Heavy-Duty Cast Aluminum FC-11 Flash Collar
- Heavy-Duty 5/8" Ball Stem

Flush Mount Hinged Door Design

Titan Flagpoles unite the simplicity of efficient engineering with the aesthetics of a precision cut, rectangular flush mount door design, providing an internal halyard Winch system that is ideal for low to moderate wind speed areas.

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Create a timeless moment.®

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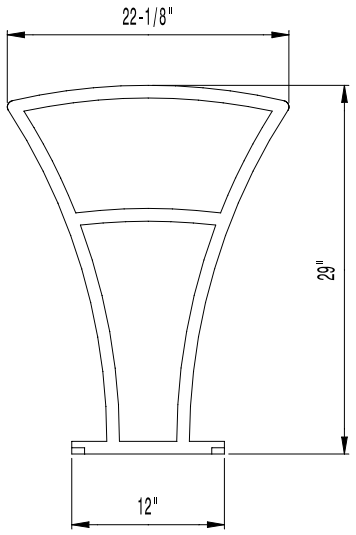
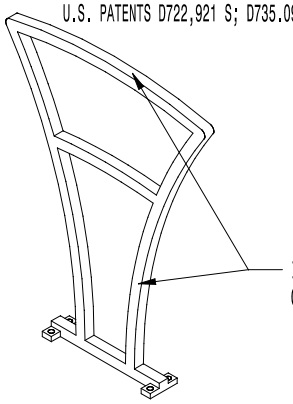
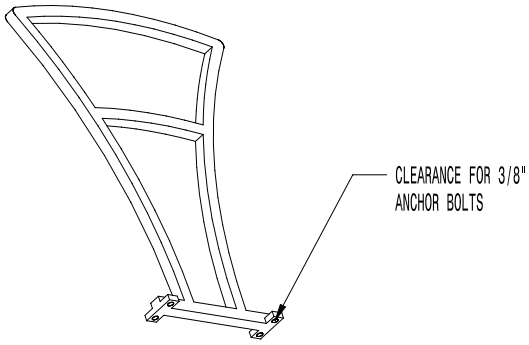
WEB SITE: HTTP://WWW.VICTORSTANLEY.COM

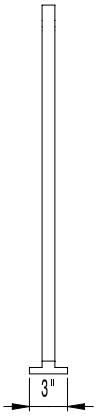
* ALL DIMENSIONS ARE IN INCHES *

THIS PRODUCT IS COVERED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS D722,921 S; D735.091 S









AVAILABLE OPTIONS:

POWDER COATING

10 STANDARD COLORS, 2 OPTIONAL METALLIC COLORS, CUSTOM COLORS (INCLUDING THE RAL RANGE)

MOUNTING

STANDARD SURFACE (AS SHOWN) AND IN-GROUND

NOTES:

1. DRAWINGS NOT TO SCALE. DO NOT SCALE DRAWINGS.
2. ALL FABRICATED METAL COMPONENTS ARE STEEL SHOTBLASTED, ETCHED, PHOSPHATIZED, PREHEATED, AND ELECTROSTATICALLY POWDER-COATED WITH T.G.I.C. POLYESTER POWDER COATINGS. PRODUCTS ARE FULLY CLEANED AND PRETREATED, PREHEATED AND COATED WHILE HOT TO FILL CREVICES AND BUILD COATING FILM. COATED PARTS ARE THEN FULLY CURED TO COATING MANUFACTURER'S SPECIFICATIONS. THE THICKNESS OF THE RESULTING FINISH AVERAGES 8-10 MILS (200-250 MICRONS).
3. IT IS NOT RECOMMENDED TO LOCATE ANCHOR BOLTS UNTIL BIKE RACK IS IN PLACE. THIS VICTOR STANLEY, INC. PRODUCT MUST BE PERMANENTLY AFFIXED TO THE GROUND. CONSULT YOUR LOCAL CODES FOR REGULATIONS.
4. ANCHOR BOLTS NOT PROVIDED BY VICTOR STANLEY, INC.
5. FOR HIGH SALT ABUSIVE CLIMATES, HOT-DIP GALVANIZING BEFORE POWDER COATING IS AVAILABLE. HOT-DIP GALVANIZING IS PERFORMED FOR VICTOR STANLEY, INC. BY AN EXPERIENCED QUALIFIED FIRM TO WHICH PRODUCTS ARE SHIPPED FOR GALVANIZING. HOT-DIP GALVANIZING INCLUDES AN AGGRESSIVE PRE-TREATMENT AND IMMERSION IN A TANK OF CHARGED LIQUID ZINC AT OR AROUND 860°F (460°C). THE RESULTING SURFACE IS RESISTANT TO RUST BUT HAS SOME UNEVENNESS RESULTING FROM THE BONDING OF THE ZINC TO THE STEEL SURFACE. AS A RESULT, THE POWDER-COATING SURFACE FINISH OVER THAT GALVANIZED SURFACE MAY EXHIBIT BUMPS, UNEVENNESS, AND MAY NOT BE AS SMOOTH AS THE STANDARD FINISH; THIS UNEVEN AND INCONSISTENT FINISH IS NORMAL FOR GALVANIZING. CONTACT MANUFACTURER FOR DETAILS.
6. ALL SPECIFICATIONS ARE SUBJECT TO CHANGE. CONTACT MANUFACTURER FOR DETAILS.
7. THIS PRODUCT IS SHIPPED FULLY ASSEMBLED.

BFRE-161

PERENNE

FREESIA BIKE RACK
SHOWN: STANDARD SURFACE MOUNT

REV. 1/15/16 DRAWN L.D.L. 2015-861

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PennAVATE PennSTAR PennTROL

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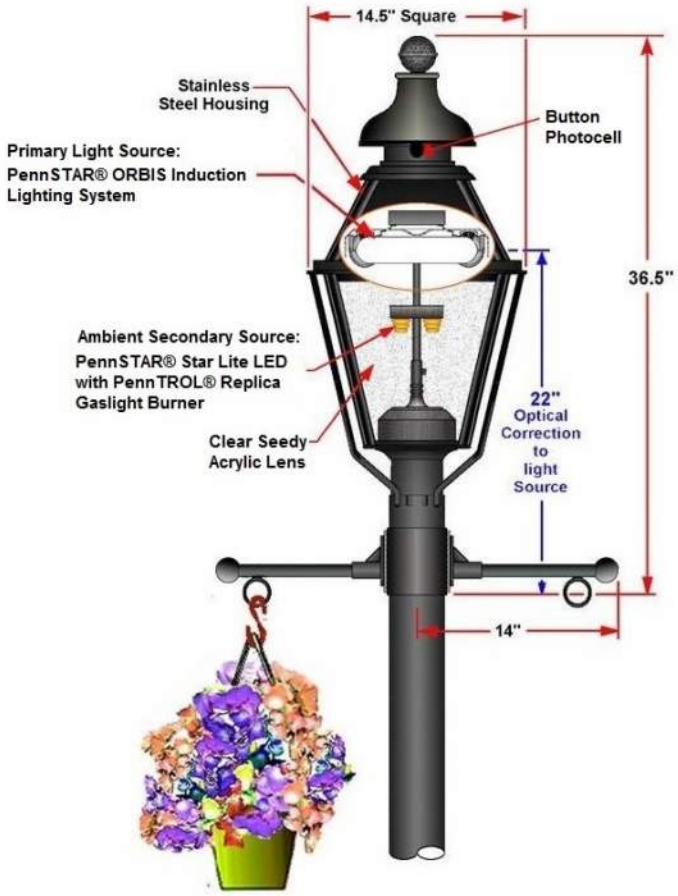
www.pennglobe.com

SPECIFICATION DWG# 010-12134-FC28

PROJECT: WAREHAM—ONSET—STREETSCAPE PHASE 2 PROJECT# 010-12134 DATE: 01/12134/18



PRIMARY LIGHT SOURCE—CONFIGURATION:
PennSTAR® INDUCTION - ORBIS

SECONDARY LIGHT SOURCE—AMBIENT:
PennSTAR® LED—PennTROL® REPLICA GASLIGHT BURNER - WARM WHITE STAR LITE

WATTAGE - TEMPERATURE:
70W 2700K

VOLTAGE: AUTOSENSE
100 ~ 277VAC

LENS:
CLEAR SEEDY ACRYLIC

SPECIAL NOTES & OPTIONS:
BUTTON PHOTOCELL ILOCATED IN VENT
PennTROL® REPLICA GASLIGHT BURNER WITH AMBER
INJJECTION MOLDED ACRYLIC MANTLES—C/O

ALLOY MATERIAL:
SUSTAINABLE SST FRAME HOUSING
CAST ALUMINUM #15 FITTER
ALUMINUM BRACKET ARM ASSEMBLY

FINISH:
BLACK TEXTURED 1003XLT

QUANTITY:
(10)

MODEL NUMBER	DESCRIPTION
F2C8-LX294-ON939	PHILADELPHIA 755 LUMINAIRE

APPROVED BY: _____

DEPT: _____

DATE: _____

Connecticut Made

Prepared By: M. Stonier

From: ALLOY CASTINGS CO., INC.
Quality Aluminum Castings Since 1948

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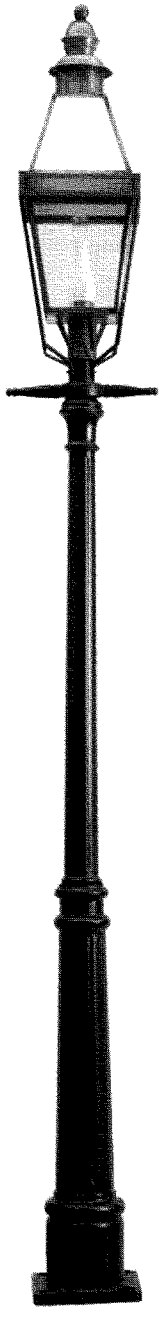
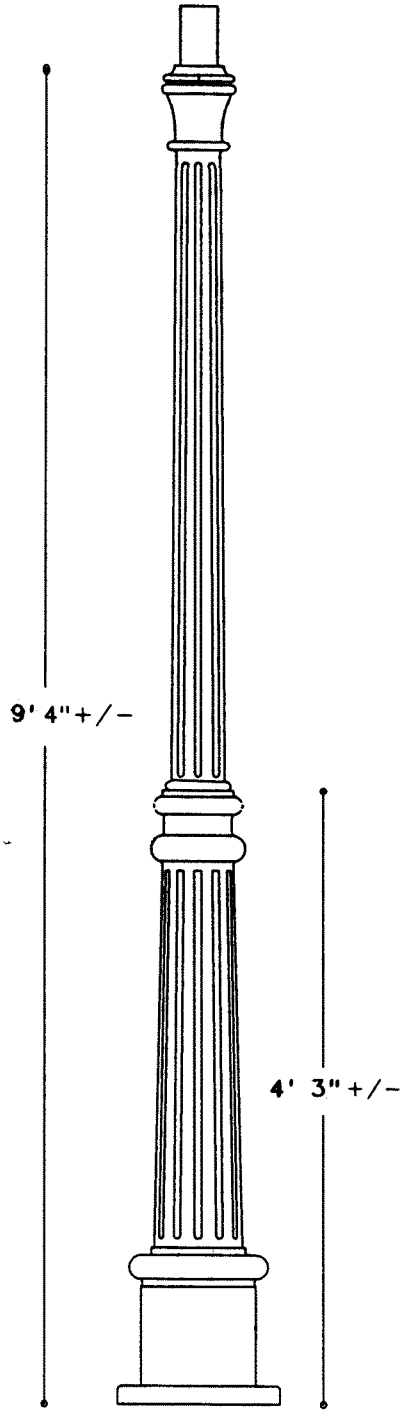
Plymouth Style Decorative Pole



ACDP-P-9'4"

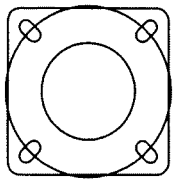


SCALE: 3/4" = 1 FOOT

LAMP POST SPECIFICATIONS

Style:	*Plymouth*
Height:	*9'4" ± and 11" ±*
Base:	*13-1/2 ± Square*
Tenon:	*4 3/4" x 2 7/8" Diameter Optional Tenon Heights and diameters available*
Material:	*Heavy Wall Cast - Aluminum 356 Alloy*
Finish:	*Primed and Finish Painted to your Specifications*
Access Door:	*Located in Base*
Anchor Bolts:	*(4) 3/4" x 24" plus 3" Hook including 1 lock washer 2 flat washers and two nuts. Fully Galvanized.*
Bolt Projection:	*3" Above Foundation*
Bolt Circle:	*14-1/8 ± Diameter*
Features:	*Post Heights Available as 9'4" ± 11' 3" ± in Cast Aluminum Variety of Heights Are Available Using Spun Aluminum Shafts.*
Luminaire Options:	*There is a wide variety of luminaires available. Consult factory for options.*
Finish Options:	*A wide variety of colors are available using the finest quality paints. Thermostat powder coating is available upon request.*
Accessory Options:	*Ladder rest, decorative brackets available.*

ANCHOR BOLT DETAIL



14 1/8" DIA. BOLT CIRCLE FOR 3/4" ANCHOR BOLTS

5/98

CONCRETE SEAMLESS STAMP MATS - SEA SHELL OCEAN FLOOR

$704.00

Size:

SIZE

2'x2' Stamp3'x3' StampContractor 4 Pack (3x 3'x3' & 1 x 2'x2')Contractor 6 Pack (5x 3'x3' & 1 x 2'x2')

Contractor 6 Pack (5x 3'x3' & 1 x 2'x2')

Quantity:

1

Ships from Illinois (Click for average Ground delivery map )
Shipping: This Product can take 5 to 10 business days to ship out.
Ships via FedEx/UPS only

ADD TO CART

Share Share

DESCRIPTION

Seamless Concrete Stamp Mats: SEASCAPE OCEAN FLOOR

Sea Shell Ocean Floor Seascape stamp is a great way to add some fun to a concrete surface. Whether a pool deck, patio, or aquarium theme, there is a lot of detail in this stamp that will have an authentic look that will last for decades.

Stamping concrete with seamless stamps can't be any easier. Nothing to align perfectly each time. Just broadcast a Release Agent over the concrete, and then place the stamp on the concrete and press into the surface. Pick the stamp straight up, turn 90 degrees, and set back down and press into the surface again, repeating until finished! Tip: Don't press the edges of the stamps into the concrete- try to stay away from the last few inches on the stamps, so you don't create a noticeable 'line' in the concrete from the stamps' edge.

- Made of industrial grade polyurehane rubber
- Available in 36" x 36" with handle straps, and 24" x 24" without handles.
- Contractor Packs include 3 of the 3'x3' stamps, and 1 of the 2'x2' stamp
- Care: keep stamps stored flat, out of sunlight. Wash off any cement and release residue from stamping right after use.

APPENDIX C
STORMWATER REPORT

APPENDIX C
STORMWATER REPORT

Weston & Sampson

westonandsampson.com

100 Foxborough Boulevard, Suite 250
Foxborough, MA 02035
tel: 508.698.3034

STORMWATER REPORT

January 2023

Wareham
MASSACHUSETTS

Onset Village
Improvements to Bayview Park

PREPARED FOR

Town of Wareham
95 Charge Pond Road, Wareham, MA

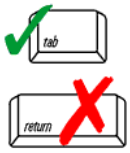
TABLE OF CONTENTS

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.

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[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☒ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☒ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

X

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

---

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Applicant/Project Name: Town of Wareham / Improvements to Bayview Park

Project Address: 186 Onset Avenue, Wareham, MA 02558

Application Prepared by:

Firm: Weston & Sampson, Inc.

Registered PE: Alyssa Peck, PE

NARRATIVE

Project Description

The project consists of accessibility and general park improvements at Bayview Park in Wareham, MA. Bayview Park is located at the corner of Onset Avenue and South Boulevard and is adjacent to Onset Beach in the Town of Wareham, MA. A locus map of the site, as well as other site mapping, is included in Appendix A.

The proposed improvements to the park include redesigning many of the pathways throughout the park to improve ADA accessibility by reducing steep slopes and adding ADA accessible ramps with railings and stairs, redesigning of the park entrances, widening and reconstructing of the sidewalk on Onset Avenue, replacement of park lighting, installing stormwater management and drainage improvements, as well as other minor improvements related to site restoration and landscaping.

The stormwater management design will utilize strategically placed leaching catch basins and rain gardens to capture stormwater runoff and infiltrate it into the ground, promoting peak rate and volume attenuation, groundwater recharge, and water quality treatment.

Debris from the site preparation will be transported in covered container vehicles for off-site disposal or recycling. Erosion control measures, including the use of compost filter tubes will be used to mitigate sediment migration outside the limits of work. Catch basin protection will be implemented for all catch basins affected by the work area to minimize sediment loading into each catch basin.

Environmental protection measures will also include dust control to ensure that generation of on-site dust during work activities will be minimized. Dust control activities will not add to any additional stormwater runoff at the site, as dust control will not be used during storm events. Wet suppression shall be used to provide temporary control of dust. At a minimum, wet suppression shall be applied to demolition debris, excavated material, aggregate piles, and exposed soils and dirt. Dust suppression wetting agents shall be water soluble, non-toxic, non-reactive, non-volatile, and non-foaming and will not result in ponding of water.

As detailed herein, this Stormwater Management Report:

- Demonstrates compliance with the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards;
- Details construction-phase erosion and sedimentation controls, inspection requirements, and maintenance requirements to protect downstream receiving waters; and,

- Presents a detailed long-term operation and maintenance plan for the stormwater management and the site.

Stormwater Management:

Existing Stormwater Management:

The project area is approximately 58,140 square feet and includes approximately 8,700 square feet of impervious surface consisting of sidewalks along South Boulevard and Bayview Park, pathways throughout the park, and an existing gazebo structure, located in the center of the park. Topographically, the high point is located in the central area of the park with the ground surface sloping toward the perimeter of the park with moderate to high slopes. Based on this topography, the project area can be delineated into four distinct drainage areas with four corresponding points of analysis (POA). These areas are described below and are shown graphically on the Existing Drainage Map in Appendix B.

Drainage Area 1 consists of the northwestern portion of the park and is approximately 14,130 square feet. This area includes the main park entrance at the intersection of Onset Avenue and South Boulevard and the sidewalks along Onset Avenue. Stormwater runoff from this area sheet flows toward Onset Avenue where it is collected into the municipal drainage system via existing catch basins.

Drainage Area 2 consists of the southwestern portion of the park and approximately 22,380 square feet. This area consists mainly of lawn areas and some internal pathways, as well as the existing stair down to Onset Beach. Stormwater runoff from this area sheet flows in the southerly direction and discharges overland directly towards Onset Beach.

Drainage Area 3 is an area of approximately 1,400 square feet that includes a small portion of walkway and adjacent lawn area that slopes down towards the McFadden Center building. The runoff from this area is intercepted by an existing trench drain, located along the McFadden Center, that discharges into the existing leaching infiltration chambers located south of the project area.

Drainage Area 4 is approximately 20,270 square feet and consists of the eastern area of the park. This area contains the central gazebo, internal park pathways, and paved area along the entrance driveway to Onset Pier. The runoff from this area sheet flows toward the southeastern corner of the site, where it is captured in a catch basin in the Onset Pier parking lot that is a part of the Onset Pier closed municipal drainage system.

Proposed Stormwater Management:

In the proposed condition the impervious area will increase to approximately 12,350 square feet. The increase in impervious area is due to the widening of the sidewalk along Onset Avenue and the increase in the overall length of walkway paths throughout the park, necessary to achieve flatter ADA accessible slopes. To mitigate the increase in runoff from additional impervious areas, leaching catch basins and rain gardens will be constructed near the discharge point for each drainage area. These BMP's will allow for groundwater recharge, attenuation of peak flows, and water quality treatment. The drainage areas are described below and are graphically shown on the Proposed Drainage Map in the Appendix B .

Drainage Area 1 will be subdivided into three sub-areas (DA-1-1, DA-1-2, and DA-1-3). The runoff form DA-1-1 will flow toward proposed rain garden (RAIN-1) located near the South Boulevard and Onset

Avenue intersection. DA-1-2 remains virtually unchanged from the existing condition and includes the sidewalk along South Boulevard and the main park entry located at the South Boulevard and Onset Avenue intersection. The runoff from this area will continue to flow toward the existing catch basin at the intersection. The runoff from DA-1-3 will follow topography in the easterly direction along Onset Avenue and will be collected in a leaching catch basin (LCB-3).

Drainage Area 2 will be subdivided into two sub-areas (DA-2-1 and DA 2-2). The runoff from DA-2-1, which is the majority of Drainage Area 2, will sheet flow overland to the low point at the southwestern corner of the site and towards the proposed rain garden (RAIN-2). DA-2-2 includes the area located downslope of the proposed rain garden, which mainly consists of steep slope bank and the existing stairway connection to Onset Beach. The runoff from this area will overflow toward Onset Beach as it presently does.

Drainage Area 3 is virtually unchanged from the existing condition in overall size and surface composition. The runoff from this area will continue to sheet flow toward the McFadden Center and be captured by an existing trench drain discharging into existing leaching chambers.

Drainage Area 4 will be subdivided into four sub-areas (DA-4-1, DA-4-2, DA4-3, and DA4-4). The runoff from DA4-1 and DA-4-2 will sheet flow to two proposed leaching catch basins, DW-1 and DW-2, respectively. The runoff from DA-4-3 will sheet flow into a proposed rain garden (RAIN-3) located on the eastern portion of the site, near the Onset Pier. DA-4-4 represents a portion of the drainage area that lies adjacent to the Onset Pier driveway and the runoff from this sub-area will sheet flow toward the pier as it presently does. The runoff from this sub-area, along with overflow from the leaching catch basins and the rain garden, will be discharged into the existing catch basin located on the Pier, just east of Bayview Park.

Stormwater Design:

Weston & Sampson utilized HydroCAD computer software to model the stormwater runoff for the 2-year, 10-year, and 100-year 24-hour storm events. Based on NOAA Atlas 14, Volume 10, the rainfall depths were 3.44 inches, 5.04 inches, and 7.57 inches, for the 2-, 10-, and 100-year storms respectively. To properly simulate the existing and proposed stormwater conditions at the project site, specific data was obtained and/or considered, including topography, site layout, soil composition, and groundwater.

Soil information was obtained from the Natural Resources Conservation Service (NRCS) Plymouth County Web Soil Survey. The soil survey indicates Plymouth – Carver complex, 8 to 15 percent slopes within the limits of the project, a Hydrologic Soil Group A soil. The soil map and descriptions are included in Appendix A.

Additionally, three test pits were performed on site, in the general vicinity of the proposed rain gardens. The test pits indicated a mixture of sandy loam and loamy sand ranging from 2½ - 3 feet underlain by fine sand. Because of the reviewed soil survey and the test pit data, a Rawl's rate of 8.27 inches/hour was used in stormwater design. The test pit logs and test pit location map is included in Appendix A.

REGULATORY COMPLIANCE

This project was designed in compliance with Massachusetts Department of Environmental Protection (MassDEP) – Stormwater Management standards. Below is an explanation of MassDEP Stormwater Standards 1-10 as they apply to the project:

MassDEP STANDARD 1 – NO NEW UNTREATED DISCHARGES

The proposed project will create no new untreated discharges. The proposed project was designed to mimic existing conditions as much as possible and improve the condition to the maximum extent practicable.

As part of the proposed project, surface runoff from the pathways and paved areas will be directed to proposed rain gardens and leaching catch basins. The overflow from the rain gardens and leaching catch basins will be discharge to the municipal closed drainage system in Onset Avenue and Onset Pier, similarly to the existing condition.

Although the land is subject to coastal storm flowage,

MassDEP STANDARD 2 – PEAK RATE ATTENUATION

Post construction peak runoff rates and total volume of runoff will not increase for the 2-, 10-, and 100-year storms. Supporting documentation is included with this report. A summary table is provided in Appendix B to illustrate that post-construction peak discharge rates will reduce pre-construction rates and volumes. To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction. These measures will include compost filter tubes and catch basin sediment controls, as depicted on the plans.

MassDEP STANDARD 3 – RECHARGE

The impervious area within the proposed project limits will increase at the completion of construction, but with the designed improvements, recharge will be provided in the proposed leaching catch basins and rain gardens. The recharge requirement calculation is included in Appendix C and illustrates compliance with the current DEP Stormwater policy.

MassDEP STANDARD 4 – WATER QUALITY

The project has been designed to comply with Standard 4. The proposed stormwater management system implements a treatment train of BMP's that has been designed to provide 80% TSS removal of stormwater runoff from the proposed impervious surface. Water quality treatment is achieved by utilizing leaching catch basins and rain gardens to treat stormwater runoff. To achieve pre-treatment prior to infiltration, leaching catch basins will be constructed off-line, with runoff collected in a deep sump hooded catch basin upstream of the leaching catch basin. Pre-treatment for the runoff directed to rain gardens will be achieved via a vegetative strip. Computations and supporting information are included in Appendix C.

MassDEP STANDARD 5 – LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (LUHPPLs)

Not applicable. This project does not have the potential for higher potential pollutant loads.

MassDEP STANDARD 6 – CRITICAL AREAS

The project is located near Onset Beach, a bathing beach, which is considered a critical area as defined in Standard 6 of the MassDEP Stormwater Regulations. While the project area itself is not considered a critical area, the stormwater from the site discharges into the critical area, either overland or through the municipal drainage system. To comply with Standard 6, the treatment BMP's have been designed to treat the water quality volume, which is specified as one-inch times the total impervious surfaces at the post development site. The compliance with this requirement is demonstrated in Appendix C.

MassDEP STANDARD 7 – REDEVELOPMENTS AND OTHER PROJECTS SUBJECT TO THE STANDARDS ONLY TO THE MAXIMUM EXTENT PRACTICABLE

Since there is an increase in impervious area in the proposed condition, this project is not considered a redevelopment, and therefore was designed to comply with the Stormwater Management Standards as noted above and below.

MassDEP STANDARD 8 – CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL

A detailed Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Appendix D of this report. To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction. These measures include compost filter tubes and catch basin protection as depicted on the site plans. In addition, the contractor will be required to produce the SWPPP prior to any land disturbance.

MassDEP STANDARD 9 – OPERATION AND MAINTENANCE PLAN

An Operations and Maintenance Plan is provided in Appendix D of this report.

MassDEP STANDARD 10 – PROHIBITION OF ILLICIT DISCHARGES

Illicit discharges will be prevented on the site through the use of spill/discharge prevention measures, along with good housekeeping and BMPs, and in accordance with the Long-Term Pollution Prevention Plan and O&M plan. An Illicit Discharge Compliance Statement has been developed for this site and is included in Appendix D.

REGISTERED PROFESSIONAL ENGINEER'S CERTIFICATION

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-Term Pollution Prevention Plan, Construction Period Erosion and Sedimentation Control Plan, Post-Construction Operation and Maintenance Plan, Illicit Discharge Compliance Statement, 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

Appendix A

N W E S

0 375 750 1,500 Feet

1:24,000

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

Limit of Work

USA Topo Maps

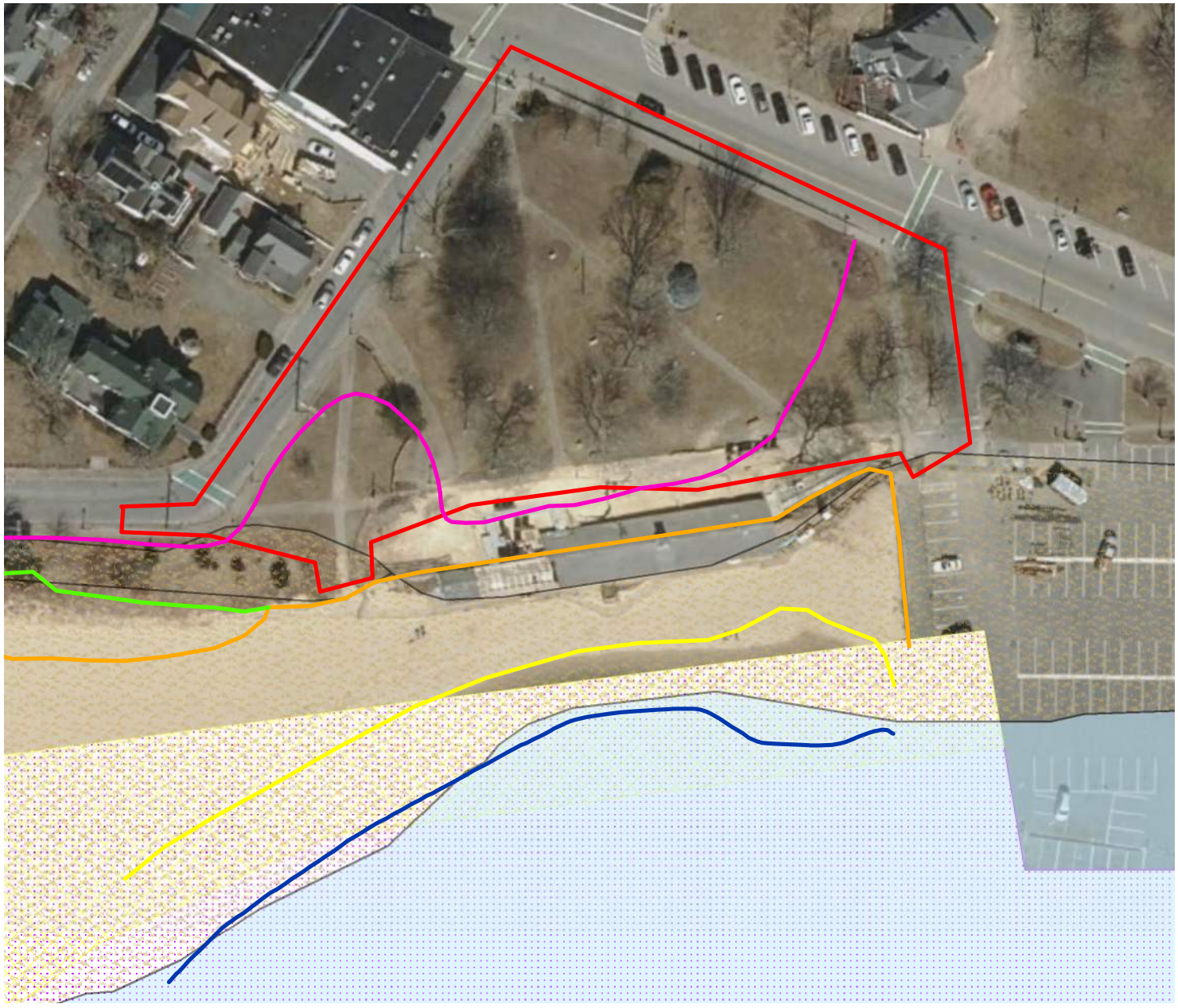
FIGURE 1

Bayview Park/Onset Bluffs
Wareham, MA

USGS Map

Weston & Sampson

Path: P:\MA\Wareham MA\Bayview Park - Onset\Permitting\Wetland Delineation\GIS\Maps\Environmental Constraints Map.mxd **User:** Kearns.Megan **Saved:** 1/16/2023 3:04:46 PM **Opened:** 1/16/2023 3:05:29 PM



N
W E
S

100 50 0 100
Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Coastal Bank
- Vegetated Coastal Dune
- Coastal Dune
- Approx. Highest High Tide Line
- Approx. Land Under Ocean
- Investigation Area
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune

Shellfish Suitability Areas

- <all other values>

HABITAT

- American Oyster
- Blue Mussel
- Bay Scallop
- European Oyster
- Ocean Quahog
- Quahog
- Razor Clam
- Surf Clam
- Sea Scallop
- Soft-Shelled Clam

FIGURE 2

BAYVIEW PARK
WAREHAM MA

Environmental
Constraints Map

Weston & Sampson

1DWLRQDO)ORRG+D]DUG'DWD)6WWH

FEMA

)HHW

%DVHG RQ 1DWLRQDO)ORRG ,QVXUDQFH 3URJUDP '$5

/HJHQG

6)+$ 5HYLVLRQ (1(5(5

L:KHQ %DVH)ORRG (OHYDWLRQ %)(
=RQH$ 9 $
L:LWK %)(RU HSWK =RQH$ $2 $+ $9 9($
5LVN 'DWXP \)HHW
6WUXFWXUH &RQWHQWV $QQXDO &KDQFH)ORRG (YHQWV
R DQQXDO FKDQFH IORRG ZLWK DYHUDJH
G HSWKV WKDW PD\ KDYH UR ZLWK GUDLQDJH
DUHDV R OHVV WKDQ VTXDUH PLOH =RQH;
)WXUH &RQGLWLRQV $QQXDO
&KDQFH)ORRG (YHQW =RQH;
$UHDV ZLWK 5HGXFHG)ORRG 5LVN GXH WR
/HYHH 6HH 1RWHV =RQH;
$UHDV ZLWK)ORRG 5LVN GXH WR /HYHH =RQH'
$UHD R 1RW LBO)ORRG (YHQW =RQH;
(IIHFWLYH /HYHH
$UHD 8QGHWHUPLQHG)ORRG (YHQW =RQH'
&KDQQHO &XOYHUW RU 6WUXFWXUH
/HYHH L'NH RU)ORRGZDOO
&URVV 6HFWLRQV ZLWK $QQXDO &KDQFH
DWHU 6XUIDFH (OHYDWLRQ
&RDVWDO 7UDQVHFW
%DVH)ORRG (OHYDWLRQ /LQH %(
/LPW R 6WUXFWXUH
-XULVGLFWLRQ %RXQGDU\
&RDVWDO 7UDQVHFW %DVHOLQH
3URILOH %DVHOLQH
+GURUDXOLF)DFWXUH
L'LWDO DWD $YDLODEOH
1R'LWDO DWD $YDLODEOH
8QSSHG

7KHSLQGLVSODHGRQWKHSLVDQDSSURLPDWH
SRLQW VHOHFWHG E\WKHXVHU DQG GRHV QRW UHSUH\
DQDWKRUL WDWLYH SURSHUW\ORFDWLRQ

7KLV PSFRROLHV ZLWK \RXU VWDQGDUG IRU WKHXVHR
GL.LWDO IORRGPS/LI LW LV QRW YRLGLV GHVFULEHGEHORZ
7KHDMHPS\VKRZQ FRROLHV ZLWK \RXV EDMHPS
DFFXUDWH VWDQGDUG/

7KHIORRGKDUGLQRUPDWLQLV GHULYHGLUHFWO\IURPWKH
DWKRUL WDWLYH HZEVHUYLFHV SURYLGHGE\ 7KLV PS
ZV HSRUWHGRQ DW DQGGRHV QW
UHOHFW FKDQHV RU DPGPQWV VXEVHXHQW WR WKLV GDWH DQG
WLFI 7KH\DQGHIHFWLYH QRUPDWLQRPEFKDQHRU
EHFRPXSUVHGE\QHZGDWDRYHU WLFI

7KLV PSLBHLV YRLGLI WKHRQHRU RHR WKHIOORZLQJPS
HOHPQWV GR QW DSSHDU, EDMHPSLBHU\ IORRGRQHODEHOV
OHHQG VFDOHEDU PSFRHDWLQRQGDWH FRRL W\LGHQWLILHUV
)5$ QHO QXEHU DQG)5$IIHFWLYHGDWH DSLBHV IRU
XQPSSHG DQGXQRGHUQL}HGUHDV FDQQW EHXVHGIRU
UHDOWDWRU\SUSRVHV

Hydrologic Soil Group—Plymouth County, Massachusetts
(Bayview Park - Onset)

Map Scale: 1:793 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

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 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Plymouth County, Massachusetts
Survey Area Data: Version 14, Sep 2, 2021

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

Date(s) aerial images were photographed: Jul 10, 2018—Nov 17, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
481C	Plymouth - Carver complex, 8 to 15 percent slopes, bouldery	A	1.5	88.5%
602B	Urban land, 0 to 8 percent slopes		0.0	0.5%
610	Beaches, sand		0.2	11.1%
Totals for Area of Interest			**1.6**	**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.

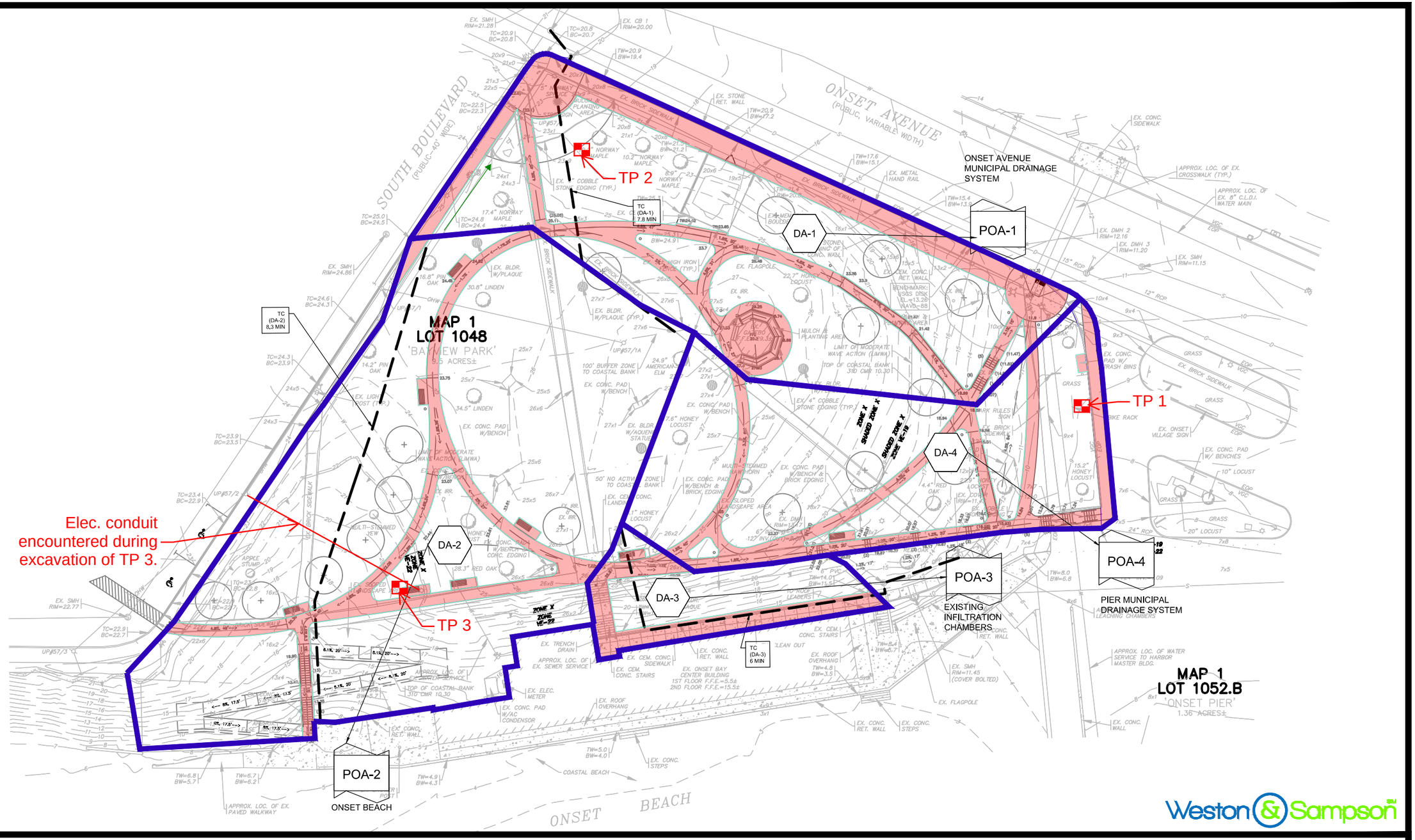
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



WAREHAM, MA
BAYVIEW PARK IMPROVEMENTS

TEST PIT LOCATION MAP

SCALE: 1"=40'

0 40 80

Weston & Sampson

\\wse03.local\WSE\Projects\MA\Wareham MA\Bayview Park - Onset\Stormwater\CAD Figures\Proposed Drainage Map.dwg

Rev: 1.7 Date: 08/12/2019

TEST PIT LOG

PROJECT NAME/NO.	Bayview Park Improvements / ENG21-1048			**TEST PIT NUMBER**	
LOCATION	Wareham, MA			TP-1	
CLIENT	Town of Wareham, MA			GROUND SURFACE	
CONTRACTOR	DPW	FOREMAN:		ELEVATION	9.0±
OBSERVED BY	Alyssa Peck	DATE	5/17/22	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	92" b.g.s. (standing)

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
8"	Dark brown sandy loam (FILL)
16"	Medium brown loamy sand (FILL)
21"	Possible hardpan. VERY dense-in-place. Breaks apart in large chunks with force.
27"	Medium brown loamy sand (FILL)
33"	Coarse sand (FILL)
40"	Medium/light brown loamy sand (FILL)
48"	Medium brown coarse sand (FILL)
57"	Dark brown sandy loam
92"	Coarse sand
	- End of Exploration -

NOTES:

1. Standing water at 92 inches b.g.s.
2. No evidence of SHGW

TEST PIT NUMBER
TP-1

WESTON & SAMPSON ENGINEERS, INC.

P:\MA\Wareham MA\Bayview Park - Onset\Stormwater\Test pits\[Test pit logs.xlsx]TP 3 pic

TEST PIT LOG

PROJECT NAME/NO.	Bayview Park Improvements / ENG21-1048			**TEST PIT NUMBER**	
LOCATION	Wareham, MA			TP-1	
CLIENT	Town of Wareham, MA			GROUND SURFACE	
CONTRACTOR	DPW	FOREMAN:		ELEVATION	9.0±
OBSERVED BY	Alyssa Peck	DATE	5/17/22	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	92" b.g.s. (standing)

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION

NOTES:

1. Standing water at 92 inches b.g.s.
2. No evidence of SHGW

TEST PIT NUMBER

TP-1

WESTON & SAMPSON ENGINEERS, INC.

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TEST PIT LOG

PROJECT NAME/NO.	Bayview Park Improvements / ENG21-1048			**TEST PIT NUMBER**	
LOCATION	Wareham, MA			TP-2	
CLIENT	Town of Wareham, MA			GROUND SURFACE	
CONTRACTOR	DPW	FOREMAN:		ELEVATION	24.0±
OBSERVED BY	Alyssa Peck	DATE	5/17/22	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	> 84" b.g.s.

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
12"	Dark brown sandy loam
30"	Medium brown loamy sand
84"	Fine sand
	- End of Exploration -

NOTES:

1. No evidence of SHGW or standing water.

TEST PIT NUMBER
TP-2

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Bayview Park Improvements / ENG21-1048			**TEST PIT NUMBER**	
LOCATION	Wareham, MA			TP-2	
CLIENT	Town of Wareham, MA			GROUND SURFACE	
CONTRACTOR	DPW	FOREMAN:		ELEVATION	24.0±
OBSERVED BY	Alyssa Peck	DATE	5/17/22	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	> 84" b.g.s.

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION

NOTES:

1. No evidence of SHGW or standing water.

TEST PIT NUMBER

TP-2

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Bayview Park Improvements / ENG21-1048			**TEST PIT NUMBER**	
LOCATION	Wareham, MA			TP-3	
CLIENT	Town of Wareham, MA			GROUND SURFACE	
CONTRACTOR	DPW	FOREMAN:		ELEVATION	20.5±
OBSERVED BY	Alyssa Peck	DATE	5/17/22	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	> 96" b.g.s.

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
12"	Dark brown sandy loam
40"	Medium brown loamy sand
96"	Fine sand
	- End of Exploration -

NOTES:

1. No evidence of SHGW or standing water.

TEST PIT NUMBER
TP-3

WESTON & SAMPSON
ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Bayview Park Improvements / ENG21-1048			**TEST PIT NUMBER**	
LOCATION	Wareham, MA			TP-3	
CLIENT	Town of Wareham, MA			GROUND SURFACE	
CONTRACTOR	DPW	FOREMAN:		ELEVATION	20.5±
OBSERVED BY	Alyssa Peck	DATE	5/17/22	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	> 96" b.g.s.

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION

NOTES:

1. No evidence of SHGW or standing water.

TEST PIT NUMBER

TP-3

WESTON & SAMPSON ENGINEERS, INC.

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APPENDIX B

Improvements at Bayview Park
Wareham, MA

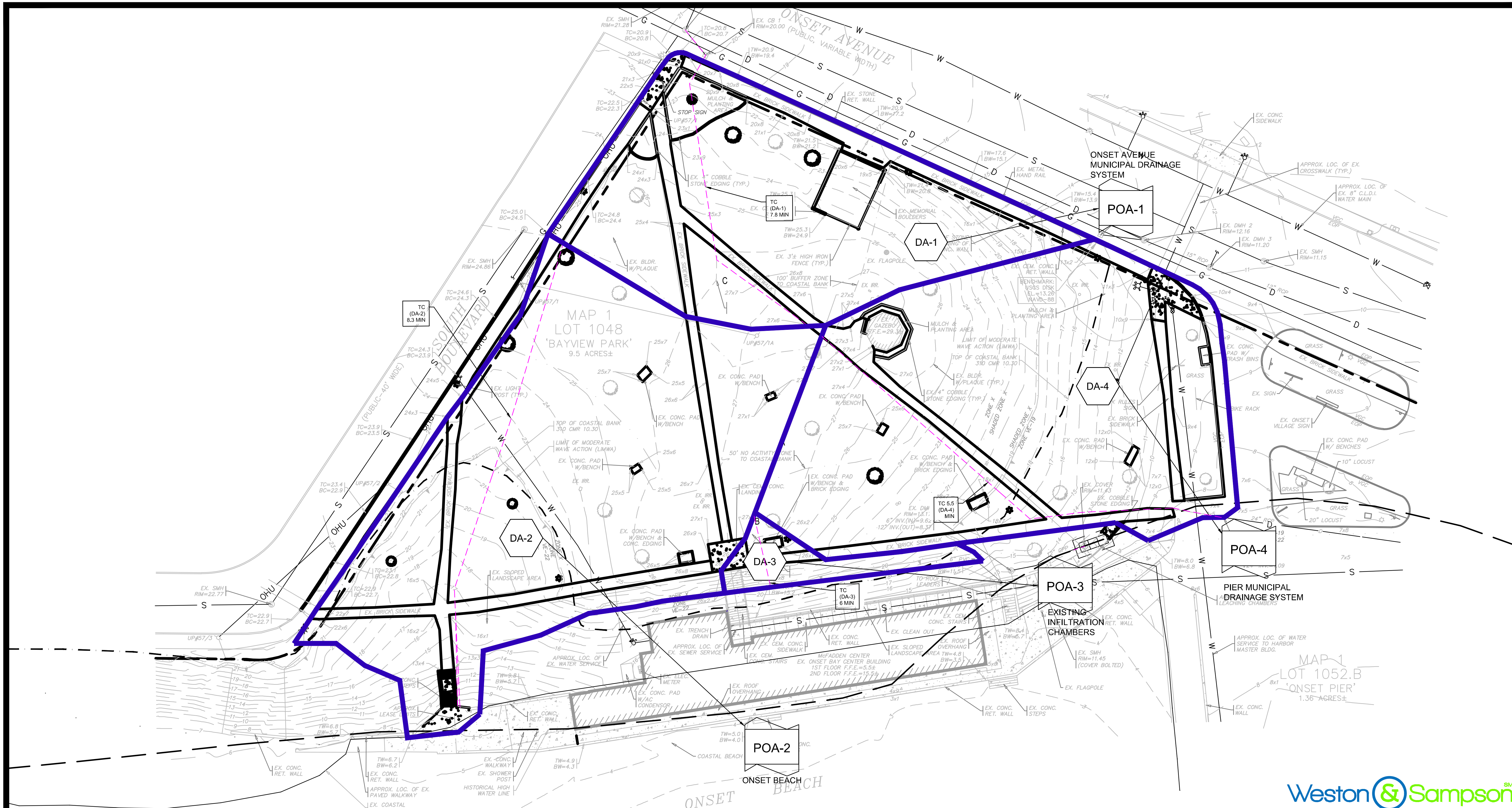
Pre-Development Conditions vs. Post-Development Conditions

TABLE 1.0 – PRE-AND POST- DEVELOPMENT FLOWS COMPARISON			
Existing Condition	2-Year Storm (cfs)	10-Year Storm (cfs)	100-Year Storm (cfs)
POA-1 - Onset Ave Municipal Drainage System	0.02	0.18	0.66
POA-2 - Oneset Beach	0.01	0.10	0.67
POA-3 - Existign Infiltration Chambers	0.00	0.02	0.08
POA-4 - Pier Municipal Drainage System	0.02	0.21	0.93
Total	0.05	0.51	2.34
Proposed Condition	2-Year Storm (cfs)	10-Year Storm (cfs)	100-Year Storm (cfs)
POA-1 - Onset Ave Municipal Drainage System	0.02	0.07	0.60
POA-2 - Oneset Beach	0.00	0.02	0.12
POA-3 - Existign Infiltration Chambers	0.00	0.02	0.07
POA-4 - Pier Municipal Drainage System	0.02	0.08	0.75
Total	0.04	0.19	1.54

Improvements at Bayview Park
Wareham, MA

Pre-Development Conditions vs. Post-Development Conditions

TABLE 1.0 – PRE-AND POST- DEVELOPMENT VOLUME COMPARISON			
Existing Condition	2-Year Storm (cubic feet)	10-Year Storm (cubic feet)	100-Year Storm (cubic feet)
POA-1 - Onset Ave Municipal Drainage System	200	789	2,226
POA-2 - Oneset Beach	101	717	2,510
POA-3 - Existign Infiltration Chambers	23	84	232
POA-4 - Pier Municipal Drainage System	212	962	2,884
Total	536	2,552	7,852
Proposed Condition	2-Year Storm (cubic feet)	10-Year Storm (cubic feet)	100-Year Storm (cubic feet)
POA-1 - Onset Ave Municipal Drainage System	91	233	1,398
POA-2 - Oneset Beach	16	114	400
POA-3 - Existign Infiltration Chambers	18	78	226
POA-4 - Pier Municipal Drainage System	112	438	2,085
Total	237	863	4,109



WAREHAM, MA
BAYVIEW PARK IMPROVEMENTS

EXISTING DRAINAGE MAP

SCALE: 1"=40'

0 100 200

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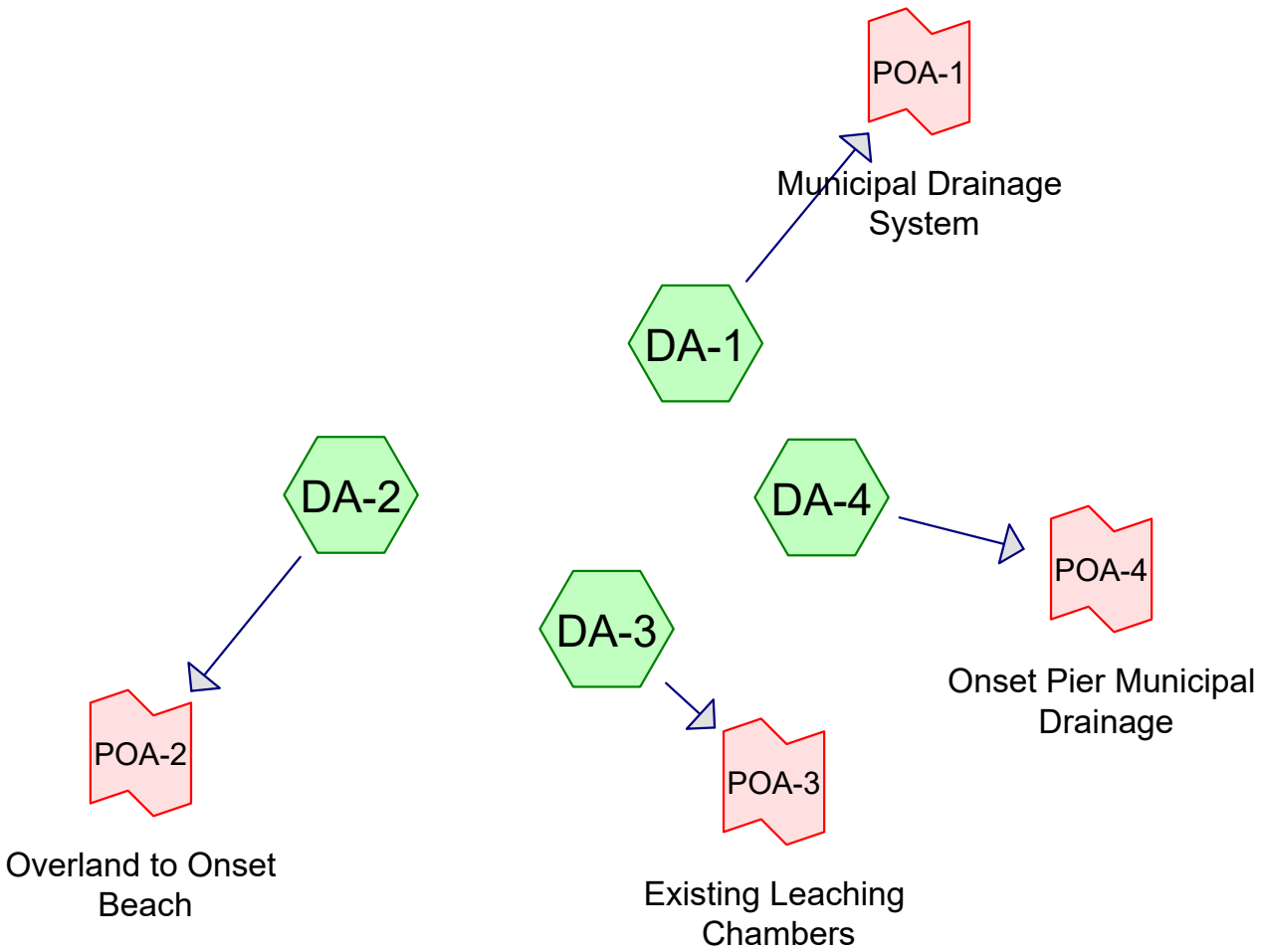
Rev: 1.7 Date: 08/12/2019



Subcat Reach Pond Link

Routing Diagram for Existing
Prepared by Weston and Sampson, Printed 1/16/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.44	2
2	10-Year	Type III 24-hr		Default	24.00	1	5.04	2
3	100-Year	Type III 24-hr		Default	24.00	1	7.57	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
49,416	39	>75% Grass cover, Good, HSG A (DA-1, DA-2, DA-3, DA-4)
8,721	98	Paved parking, HSG A (DA-1, DA-2, DA-3, DA-4)
58,137	**48**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
58,137	HSG A	DA-1, DA-2, DA-3, DA-4
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
58,137		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
49,416	0	0	0	0	49,416	>75% Grass cover, Good	
8,721	0	0	0	0	8,721	Paved parking	
58,137	**0**	**0**	**0**	**0**	**58,137**	**TOTAL AREA**	

Time span=1.00-20.00 hrs, dt=0.02 hrs, 951 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDA-1: Runoff Area=14,126 sf 19.74% Impervious Runoff Depth>0.17"
Flow Length=149' Tc=7.8 min CN=51 Runoff=0.02 cfs 200 cf

SubcatchmentDA-2: Runoff Area=22,347 sf 9.82% Impervious Runoff Depth>0.05"
Flow Length=199' Tc=8.3 min CN=45 Runoff=0.01 cfs 101 cf

SubcatchmentDA-3: Runoff Area=1,399 sf 22.73% Impervious Runoff Depth>0.19"
Tc=6.0 min CN=52 Runoff=0.00 cfs 23 cf

SubcatchmentDA-4: Runoff Area=20,265 sf 16.88% Impervious Runoff Depth>0.13"
Flow Length=199' Tc=5.5 min CN=49 Runoff=0.02 cfs 212 cf

Link POA-1: Municipal Drainage System Inflow=0.02 cfs 200 cf
Primary=0.02 cfs 200 cf

Link POA-2: Overland to Onset Beach Inflow=0.01 cfs 101 cf
Primary=0.01 cfs 101 cf

Link POA-3: Existing Leaching Chambers Inflow=0.00 cfs 23 cf
Primary=0.00 cfs 23 cf

Link POA-4: Onset Pier Municipal Drainage Inflow=0.02 cfs 212 cf
Primary=0.02 cfs 212 cf

Total Runoff Area = 58,137 sf Runoff Volume = 536 cf Average Runoff Depth = 0.11"
85.00% Pervious = 49,416 sf 15.00% Impervious = 8,721 sf

Summary for Subcatchment DA-1:

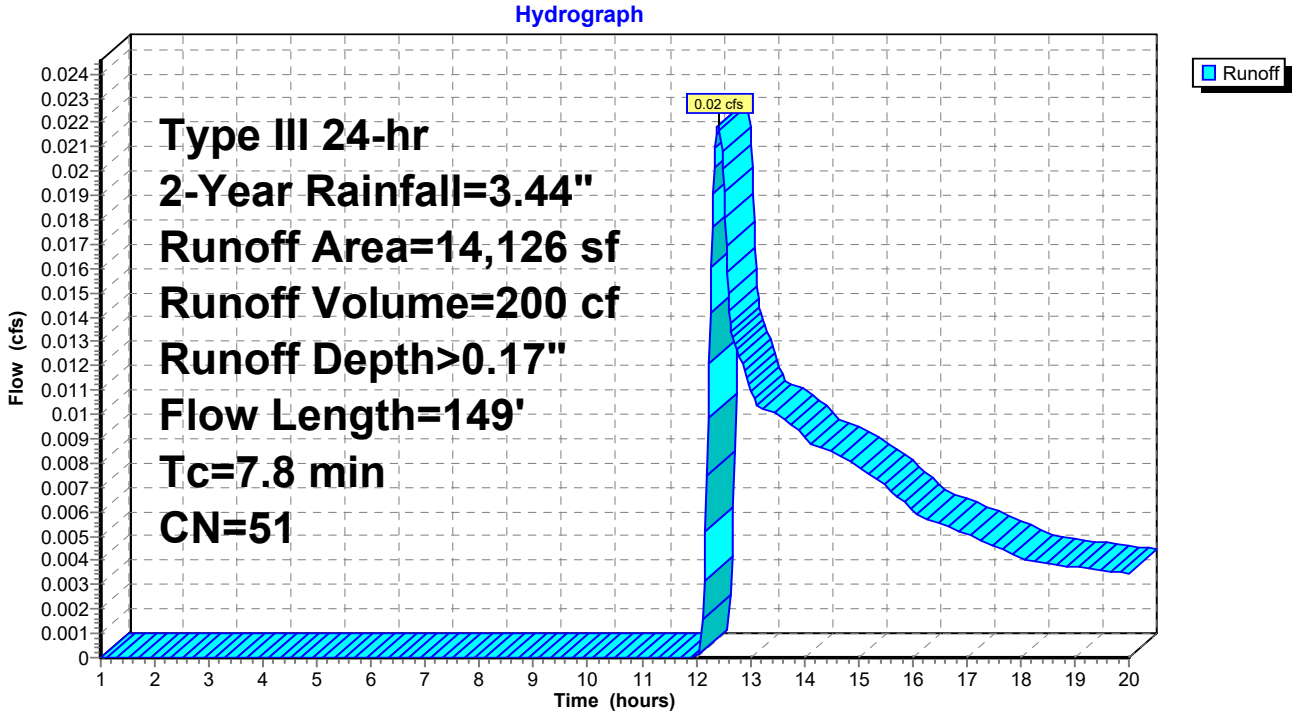
Runoff = 0.02 cfs @ 12.42 hrs, Volume= 200 cf, Depth> 0.17"
Routed to Link POA-1 : Municipal Drainage System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
11,337	39	>75% Grass cover, Good, HSG A
2,789	98	Paved parking, HSG A
14,126	51	Weighted Average
11,337		80.26% Pervious Area
2,789		19.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0350	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	49	0.0670	4.17		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	149	Total			

Subcatchment DA-1:



Summary for Subcatchment DA-2:

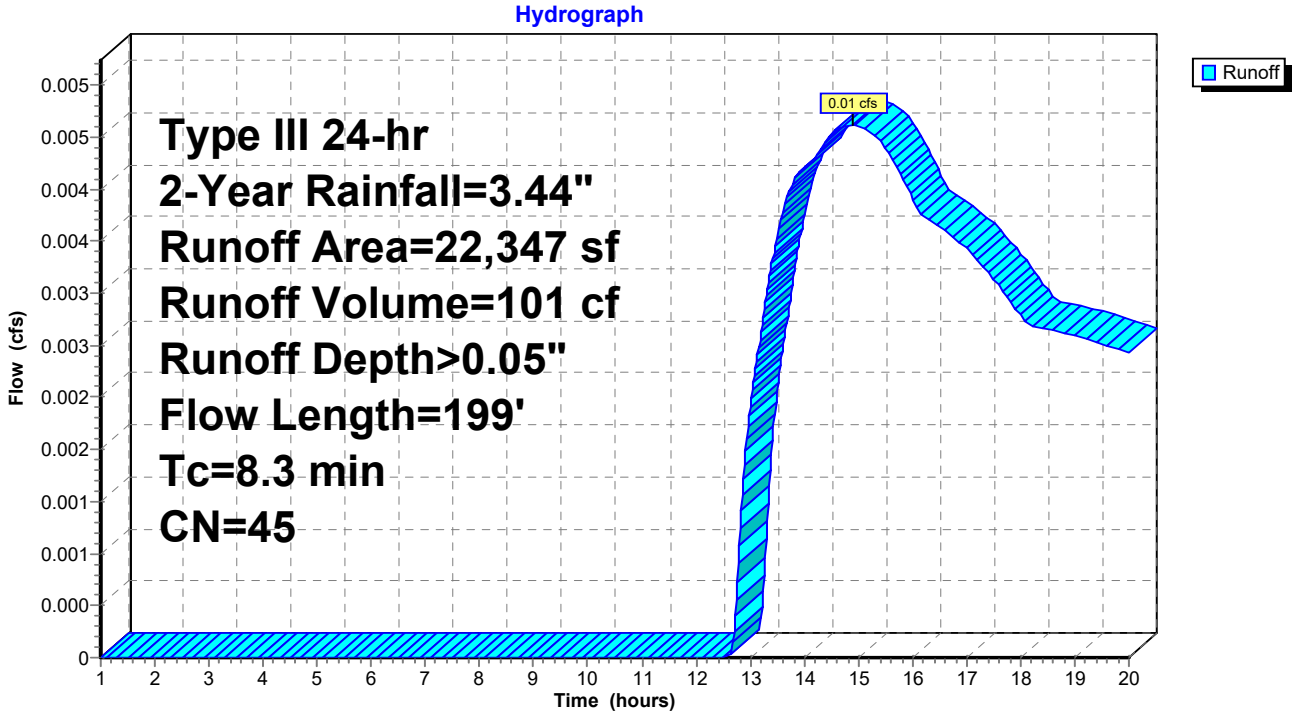
Runoff = 0.01 cfs @ 14.88 hrs, Volume= 101 cf, Depth> 0.05"
Routed to Link POA-2 : Overland to Onset Beach

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
20,153	39	>75% Grass cover, Good, HSG A
2,194	98	Paved parking, HSG A
22,347	45	Weighted Average
20,153		90.18% Pervious Area
2,194		9.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	61	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	38	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	199	Total			

Subcatchment DA-2:



Summary for Subcatchment DA-3:

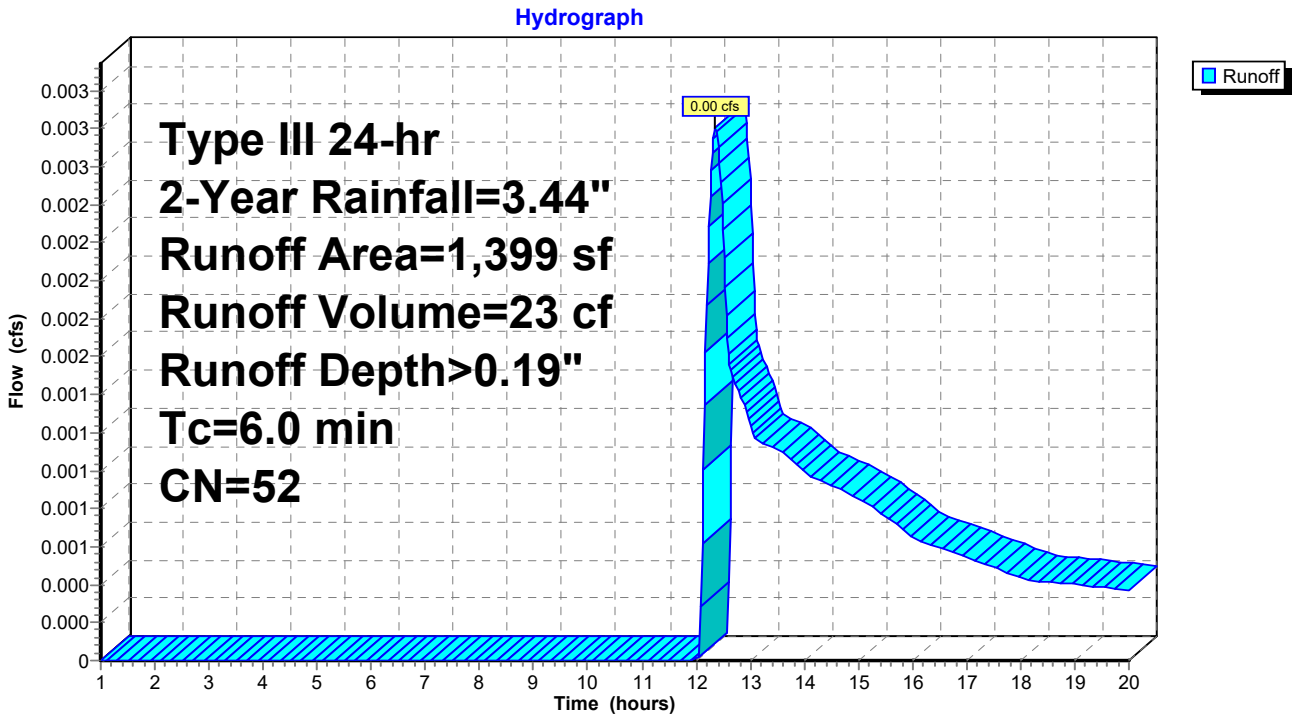
Runoff = 0.00 cfs @ 12.36 hrs, Volume= 23 cf, Depth> 0.19"
Routed to Link POA-3 : Existing Leaching Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
1,081	39	>75% Grass cover, Good, HSG A
318	98	Paved parking, HSG A
1,399	52	Weighted Average
1,081		77.27% Pervious Area
318		22.73% Impervious Area

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

Subcatchment DA-3:



Summary for Subcatchment DA-4:

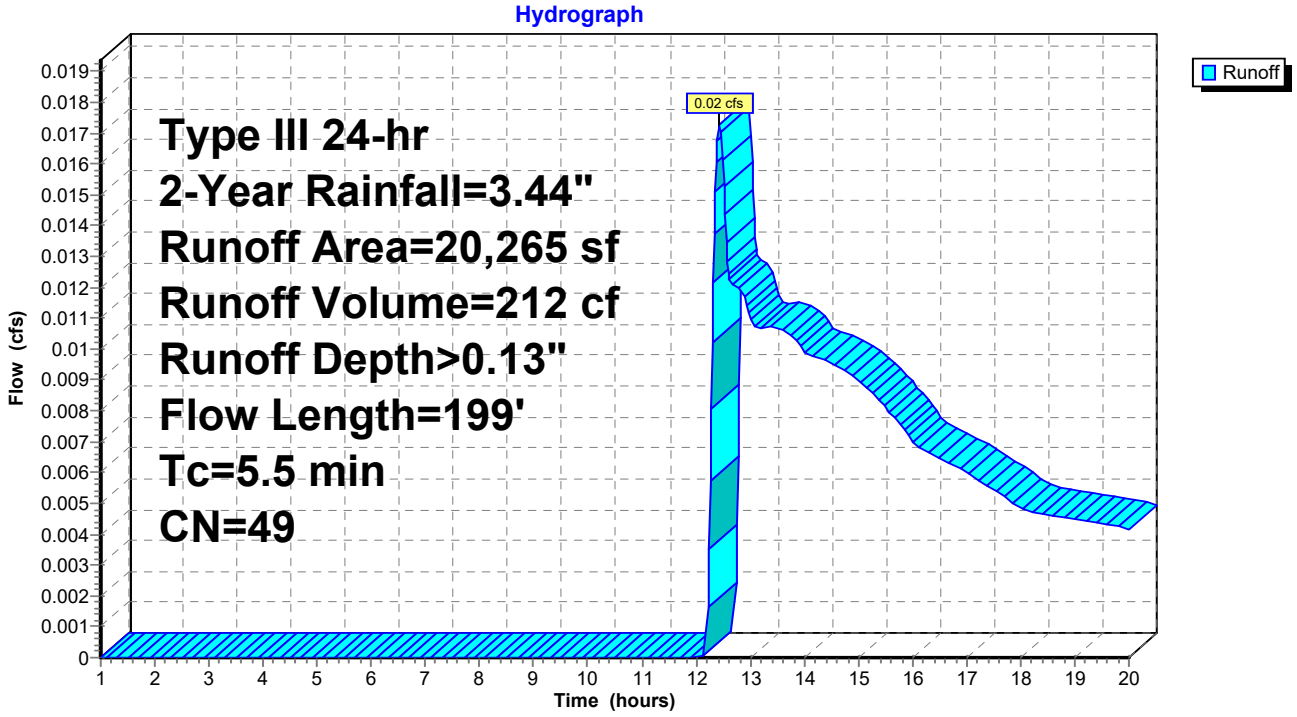
Runoff = 0.02 cfs @ 12.44 hrs, Volume= 212 cf, Depth> 0.13"
Routed to Link POA-4 : Onset Pier Municipal Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
16,845	39	>75% Grass cover, Good, HSG A
3,420	98	Paved parking, HSG A
20,265	49	Weighted Average
16,845		83.12% Pervious Area
3,420		16.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.0900	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	61	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	38	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.5	199	Total			

Subcatchment DA-4:

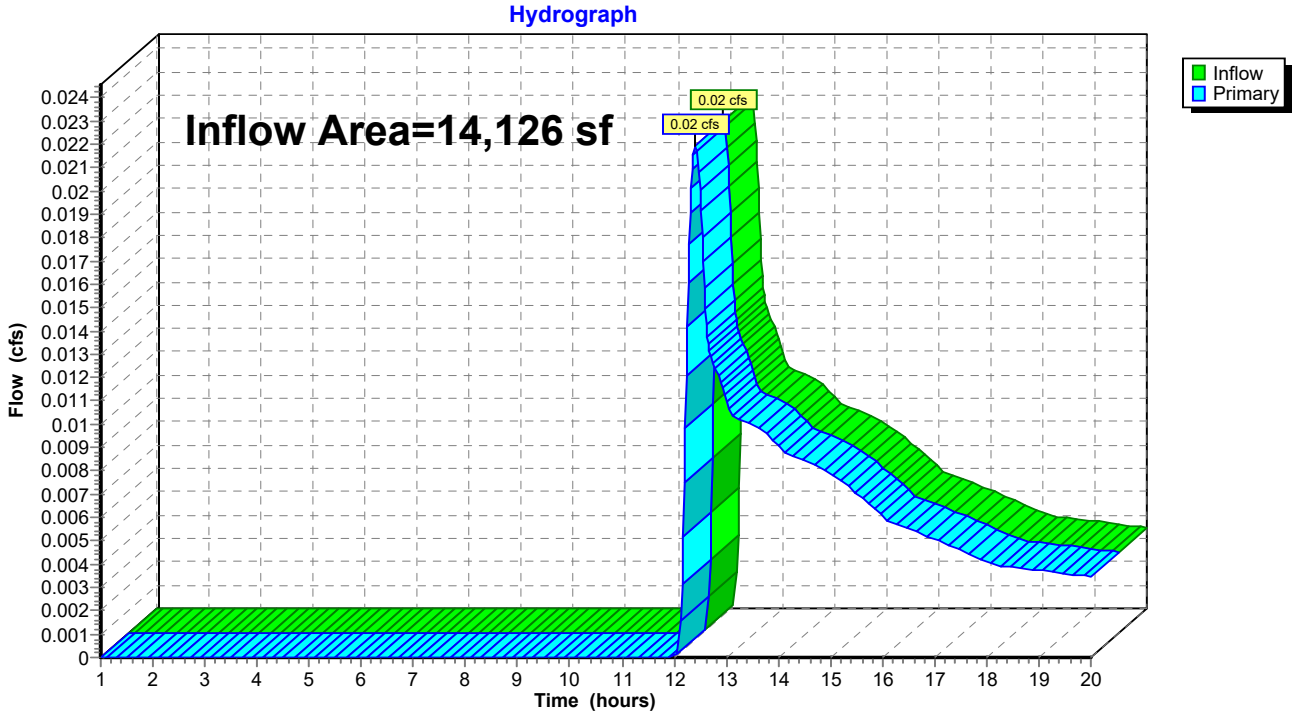


Summary for Link POA-1: Municipal Drainage System

Inflow Area = 14,126 sf, 19.74% Impervious, Inflow Depth > 0.17" for 2-Year event
Inflow = 0.02 cfs @ 12.42 hrs, Volume= 200 cf
Primary = 0.02 cfs @ 12.42 hrs, Volume= 200 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-1: Municipal Drainage System

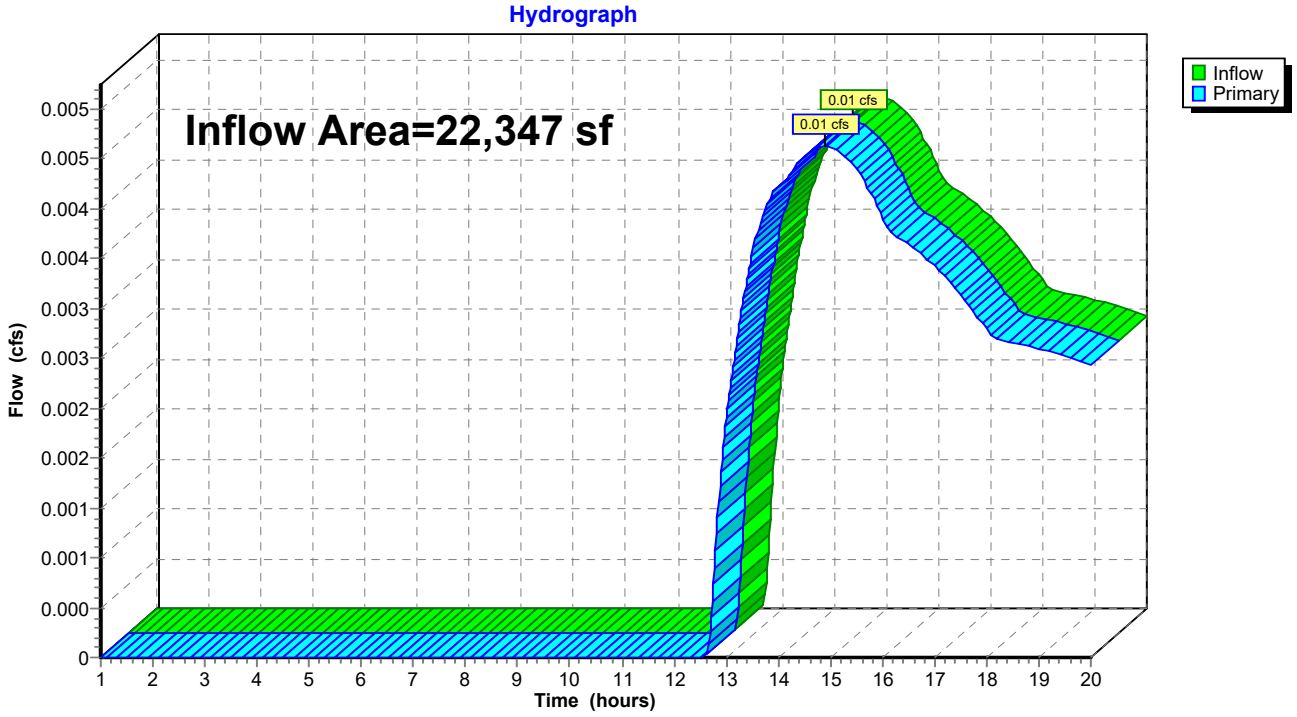


Summary for Link POA-2: Overland to Onset Beach

Inflow Area = 22,347 sf, 9.82% Impervious, Inflow Depth > 0.05" for 2-Year event
Inflow = 0.01 cfs @ 14.88 hrs, Volume= 101 cf
Primary = 0.01 cfs @ 14.88 hrs, Volume= 101 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-2: Overland to Onset Beach

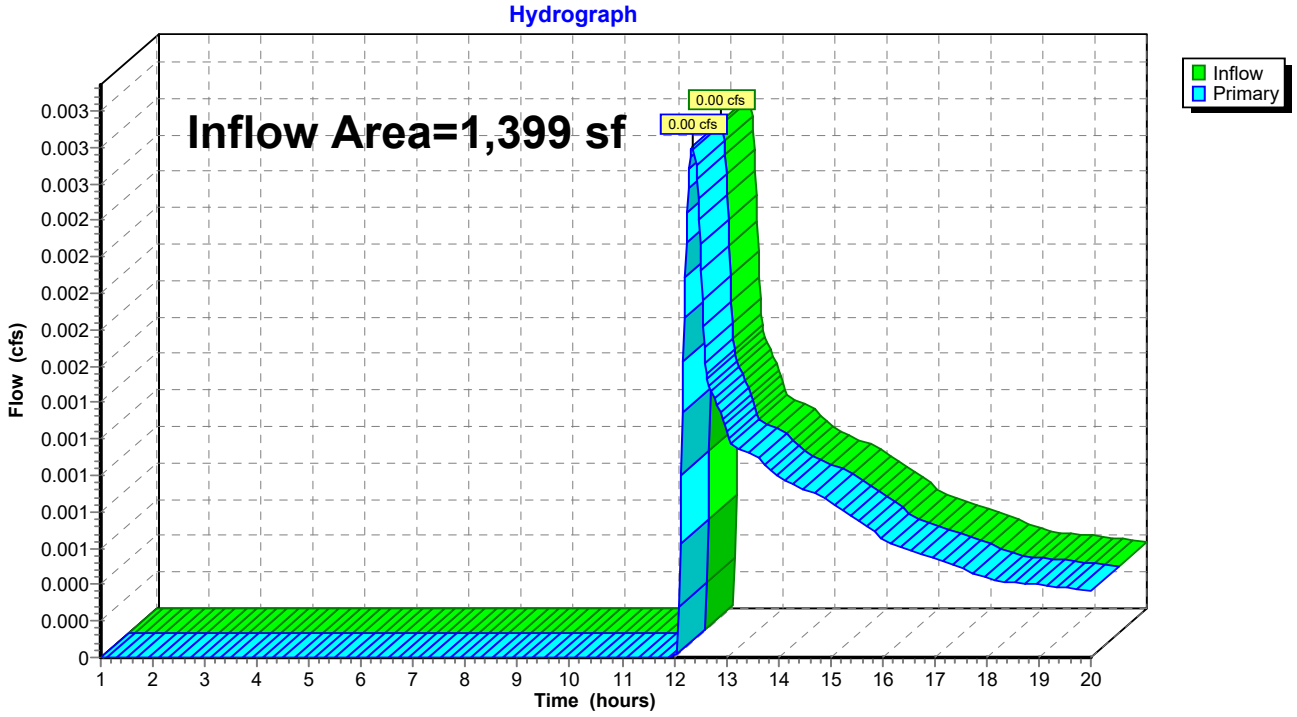


Summary for Link POA-3: Existing Leaching Chambers

Inflow Area = 1,399 sf, 22.73% Impervious, Inflow Depth > 0.19" for 2-Year event
Inflow = 0.00 cfs @ 12.36 hrs, Volume= 23 cf
Primary = 0.00 cfs @ 12.36 hrs, Volume= 23 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-3: Existing Leaching Chambers

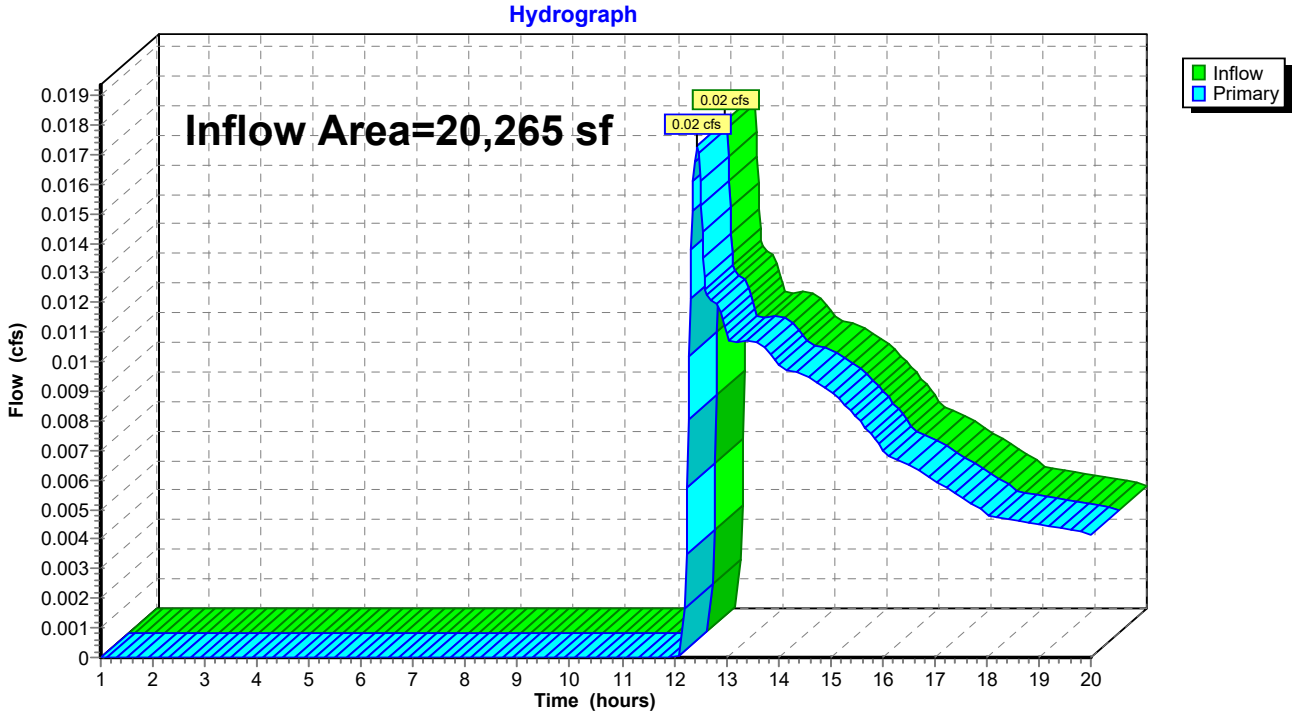


Summary for Link POA-4: Onset Pier Municipal Drainage

Inflow Area = 20,265 sf, 16.88% Impervious, Inflow Depth > 0.13" for 2-Year event
Inflow = 0.02 cfs @ 12.44 hrs, Volume= 212 cf
Primary = 0.02 cfs @ 12.44 hrs, Volume= 212 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-4: Onset Pier Municipal Drainage



Time span=1.00-20.00 hrs, dt=0.02 hrs, 951 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDA-1: Runoff Area=14,126 sf 19.74% Impervious Runoff Depth>0.67"
Flow Length=149' Tc=7.8 min CN=51 Runoff=0.18 cfs 789 cf

SubcatchmentDA-2: Runoff Area=22,347 sf 9.82% Impervious Runoff Depth>0.39"
Flow Length=199' Tc=8.3 min CN=45 Runoff=0.10 cfs 717 cf

SubcatchmentDA-3: Runoff Area=1,399 sf 22.73% Impervious Runoff Depth>0.72"
Tc=6.0 min CN=52 Runoff=0.02 cfs 84 cf

SubcatchmentDA-4: Runoff Area=20,265 sf 16.88% Impervious Runoff Depth>0.57"
Flow Length=199' Tc=5.5 min CN=49 Runoff=0.21 cfs 962 cf

Link POA-1: Municipal Drainage System Inflow=0.18 cfs 789 cf
Primary=0.18 cfs 789 cf

Link POA-2: Overland to Onset Beach Inflow=0.10 cfs 717 cf
Primary=0.10 cfs 717 cf

Link POA-3: Existing Leaching Chambers Inflow=0.02 cfs 84 cf
Primary=0.02 cfs 84 cf

Link POA-4: Onset Pier Municipal Drainage Inflow=0.21 cfs 962 cf
Primary=0.21 cfs 962 cf

Total Runoff Area = 58,137 sf Runoff Volume = 2,553 cf Average Runoff Depth = 0.53"
85.00% Pervious = 49,416 sf 15.00% Impervious = 8,721 sf

Summary for Subcatchment DA-1:

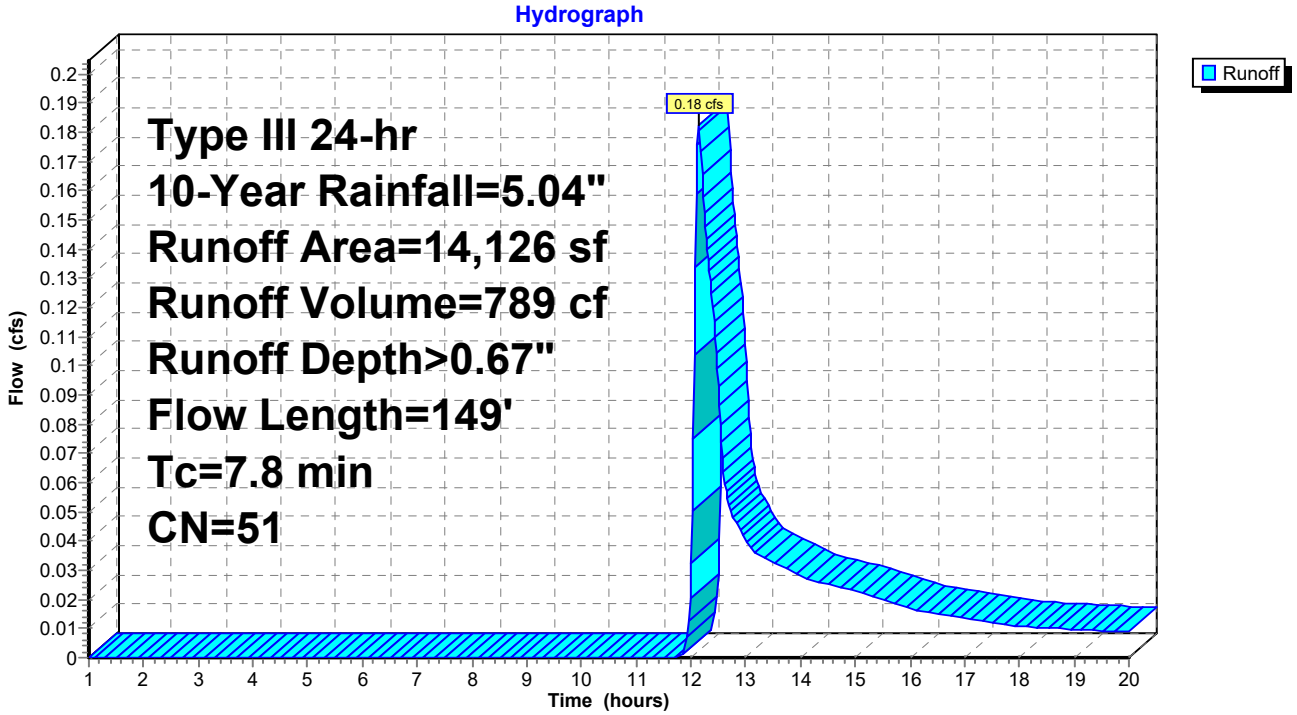
Runoff = 0.18 cfs @ 12.15 hrs, Volume= 789 cf, Depth> 0.67"
Routed to Link POA-1 : Municipal Drainage System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
11,337	39	>75% Grass cover, Good, HSG A
2,789	98	Paved parking, HSG A
14,126	51	Weighted Average
11,337		80.26% Pervious Area
2,789		19.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0350	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	49	0.0670	4.17		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	149	Total			

Subcatchment DA-1:



Summary for Subcatchment DA-2:

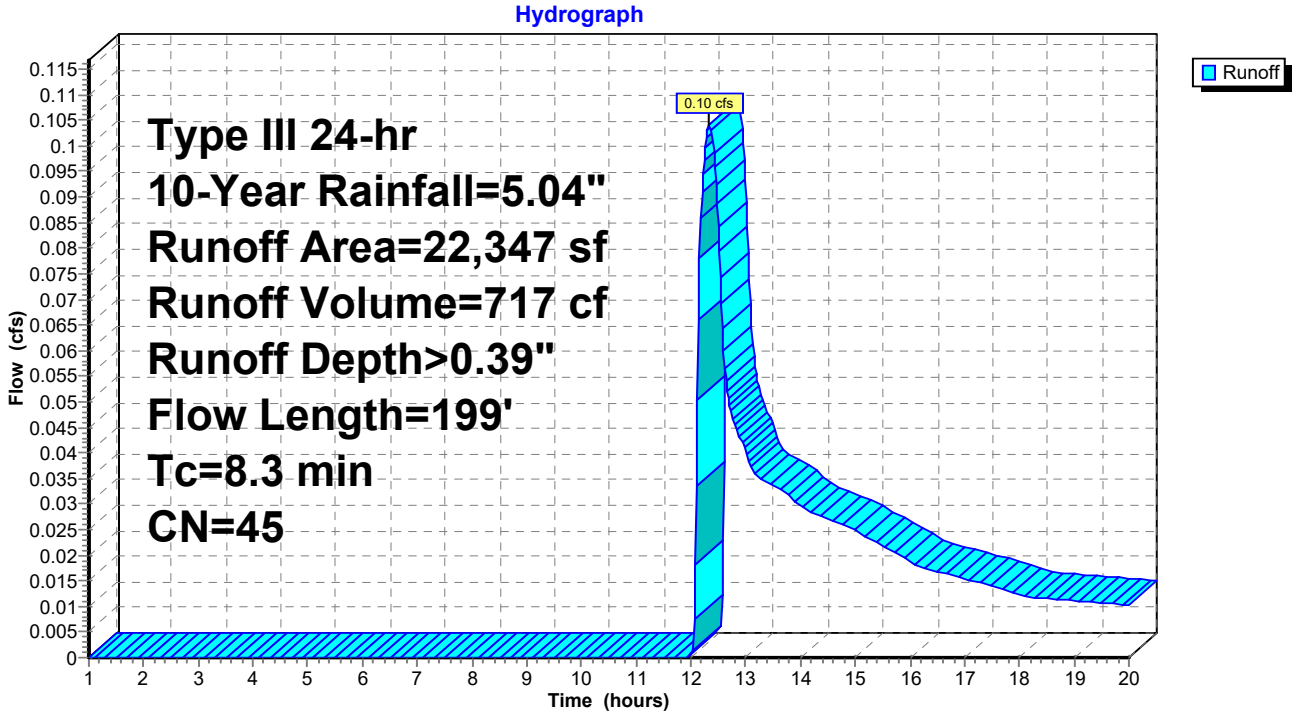
Runoff = 0.10 cfs @ 12.34 hrs, Volume= 717 cf, Depth> 0.39"
Routed to Link POA-2 : Overland to Onset Beach

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
20,153	39	>75% Grass cover, Good, HSG A
2,194	98	Paved parking, HSG A
22,347	45	Weighted Average
20,153		90.18% Pervious Area
2,194		9.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	61	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	38	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	199	Total			

Subcatchment DA-2:



Summary for Subcatchment DA-3:

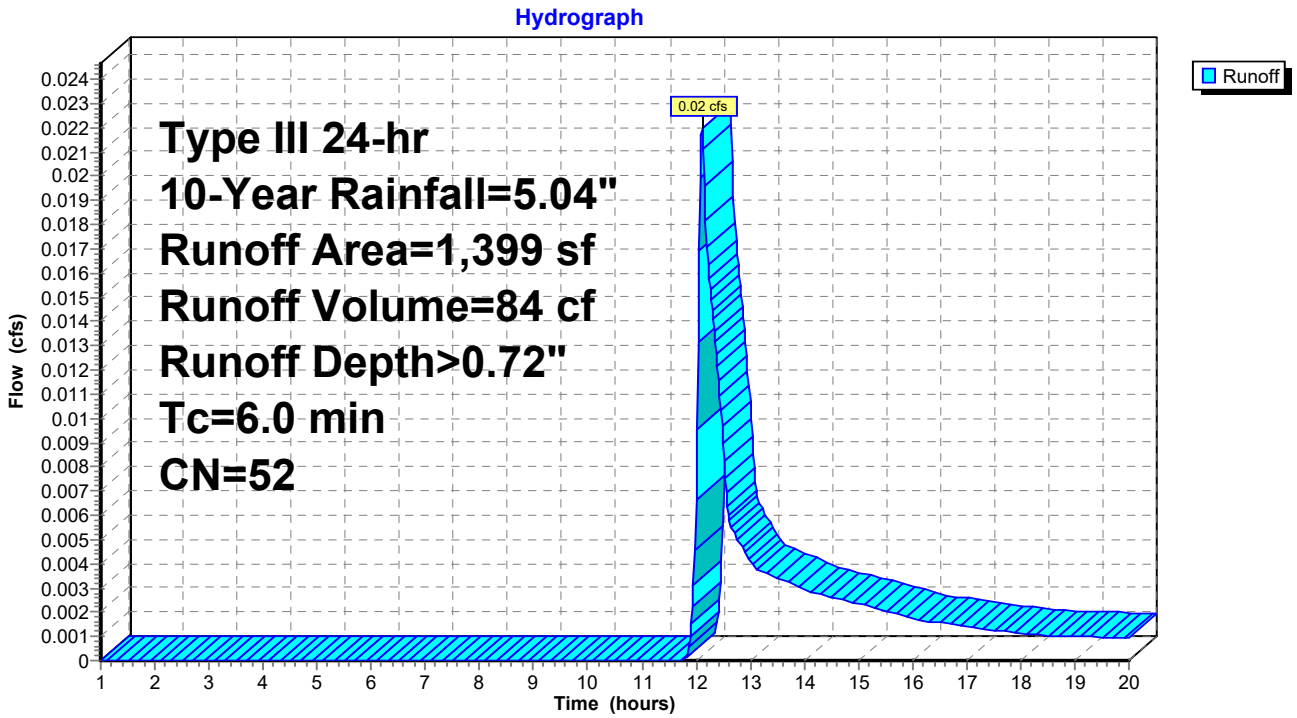
Runoff = 0.02 cfs @ 12.11 hrs, Volume= 84 cf, Depth> 0.72"
Routed to Link POA-3 : Existing Leaching Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
1,081	39	>75% Grass cover, Good, HSG A
318	98	Paved parking, HSG A
1,399	52	Weighted Average
1,081		77.27% Pervious Area
318		22.73% Impervious Area

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

Subcatchment DA-3:



Summary for Subcatchment DA-4:

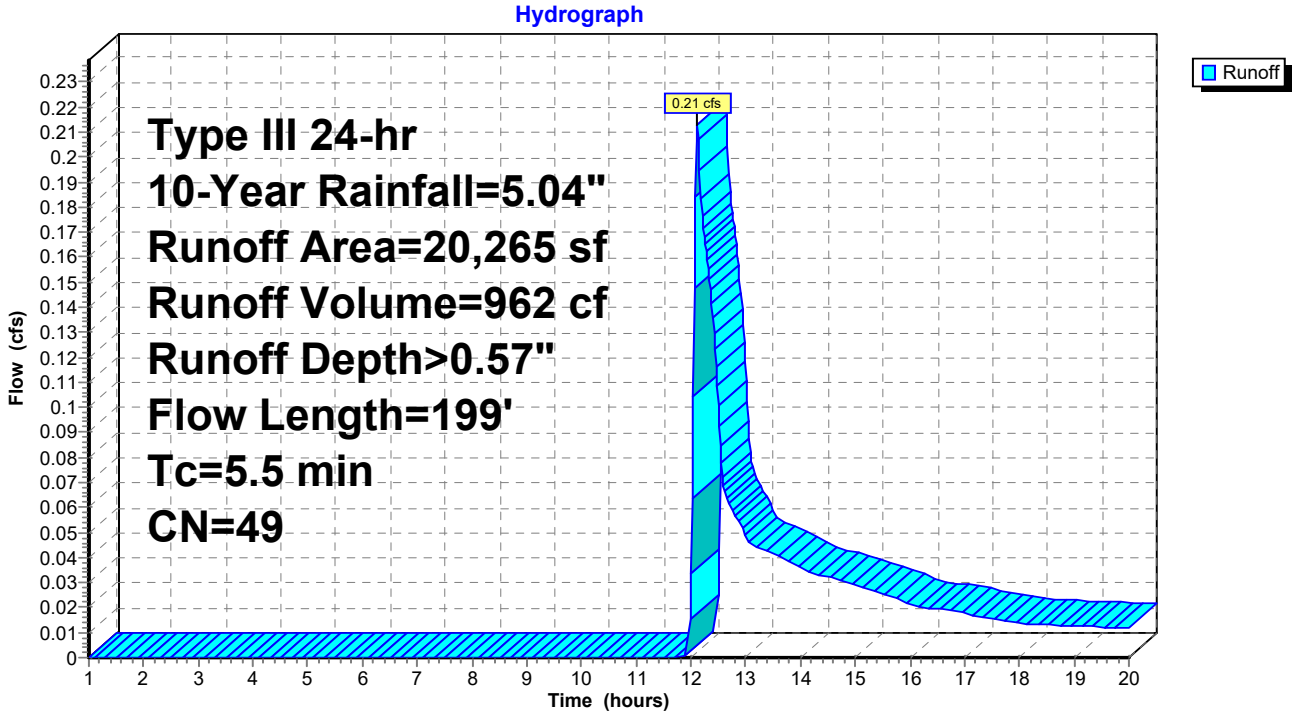
Runoff = 0.21 cfs @ 12.12 hrs, Volume= 962 cf, Depth> 0.57"
Routed to Link POA-4 : Onset Pier Municipal Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
16,845	39	>75% Grass cover, Good, HSG A
3,420	98	Paved parking, HSG A
20,265	49	Weighted Average
16,845		83.12% Pervious Area
3,420		16.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.0900	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	61	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	38	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.5	199	Total			

Subcatchment DA-4:

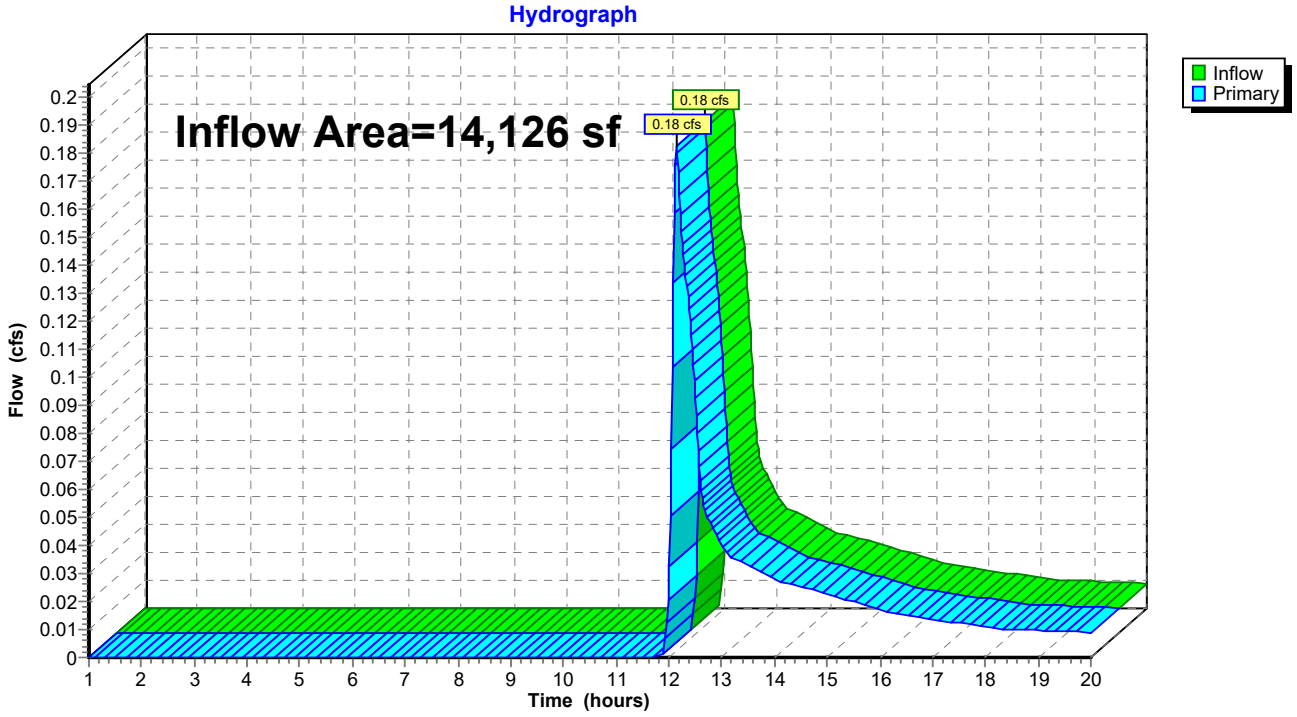


Summary for Link POA-1: Municipal Drainage System

Inflow Area = 14,126 sf, 19.74% Impervious, Inflow Depth > 0.67" for 10-Year event
Inflow = 0.18 cfs @ 12.15 hrs, Volume= 789 cf
Primary = 0.18 cfs @ 12.15 hrs, Volume= 789 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-1: Municipal Drainage System

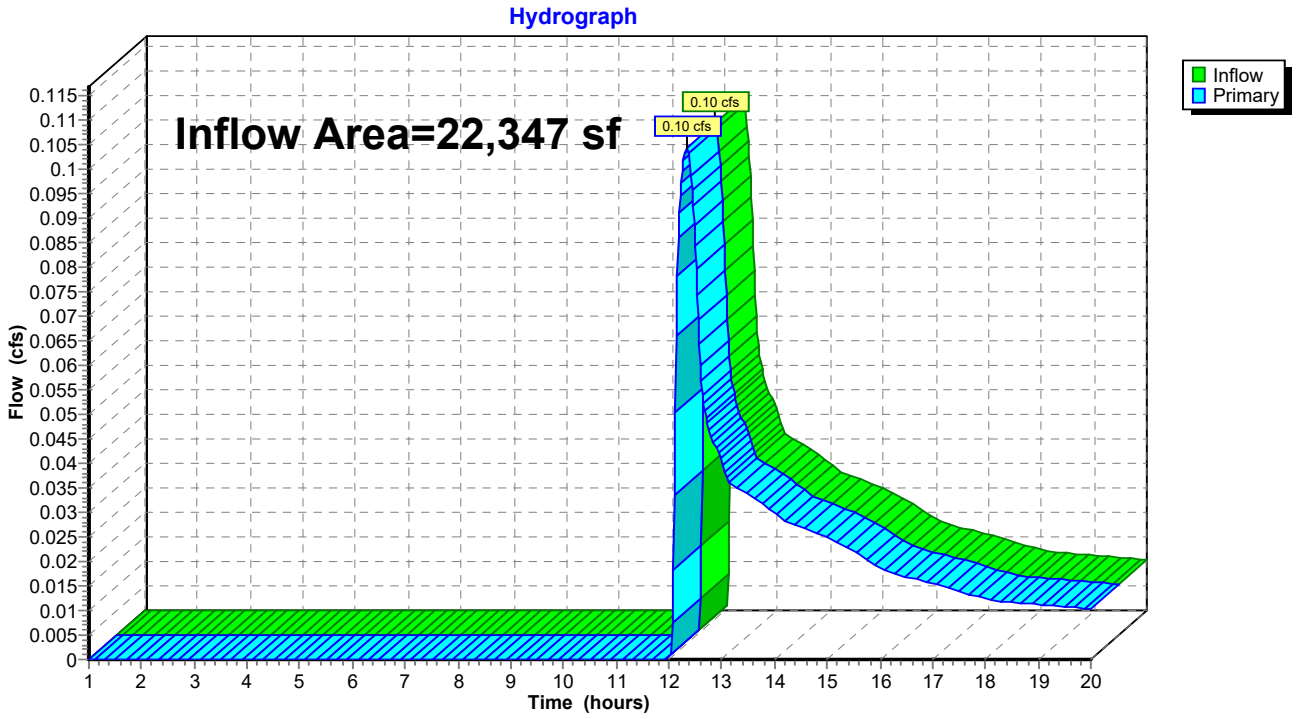


Summary for Link POA-2: Overland to Onset Beach

Inflow Area = 22,347 sf, 9.82% Impervious, Inflow Depth > 0.39" for 10-Year event
Inflow = 0.10 cfs @ 12.34 hrs, Volume= 717 cf
Primary = 0.10 cfs @ 12.34 hrs, Volume= 717 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-2: Overland to Onset Beach

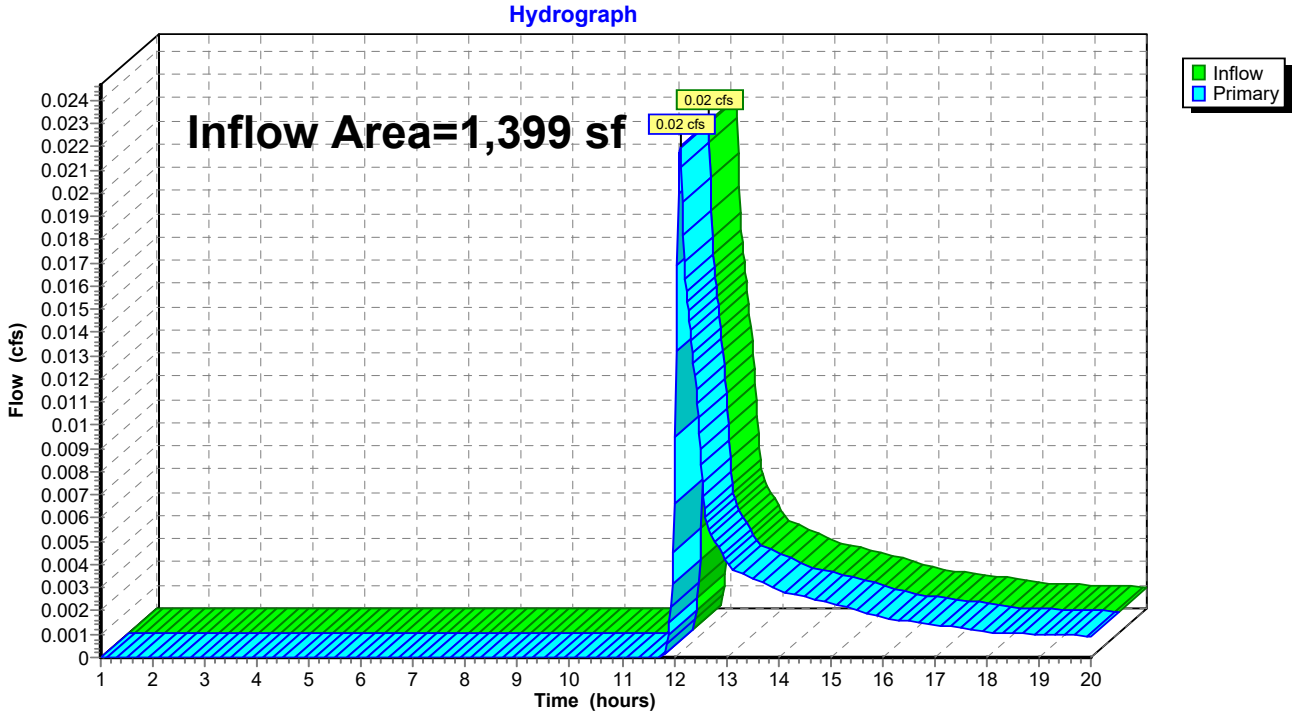


Summary for Link POA-3: Existing Leaching Chambers

Inflow Area = 1,399 sf, 22.73% Impervious, Inflow Depth > 0.72" for 10-Year event
Inflow = 0.02 cfs @ 12.11 hrs, Volume= 84 cf
Primary = 0.02 cfs @ 12.11 hrs, Volume= 84 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-3: Existing Leaching Chambers

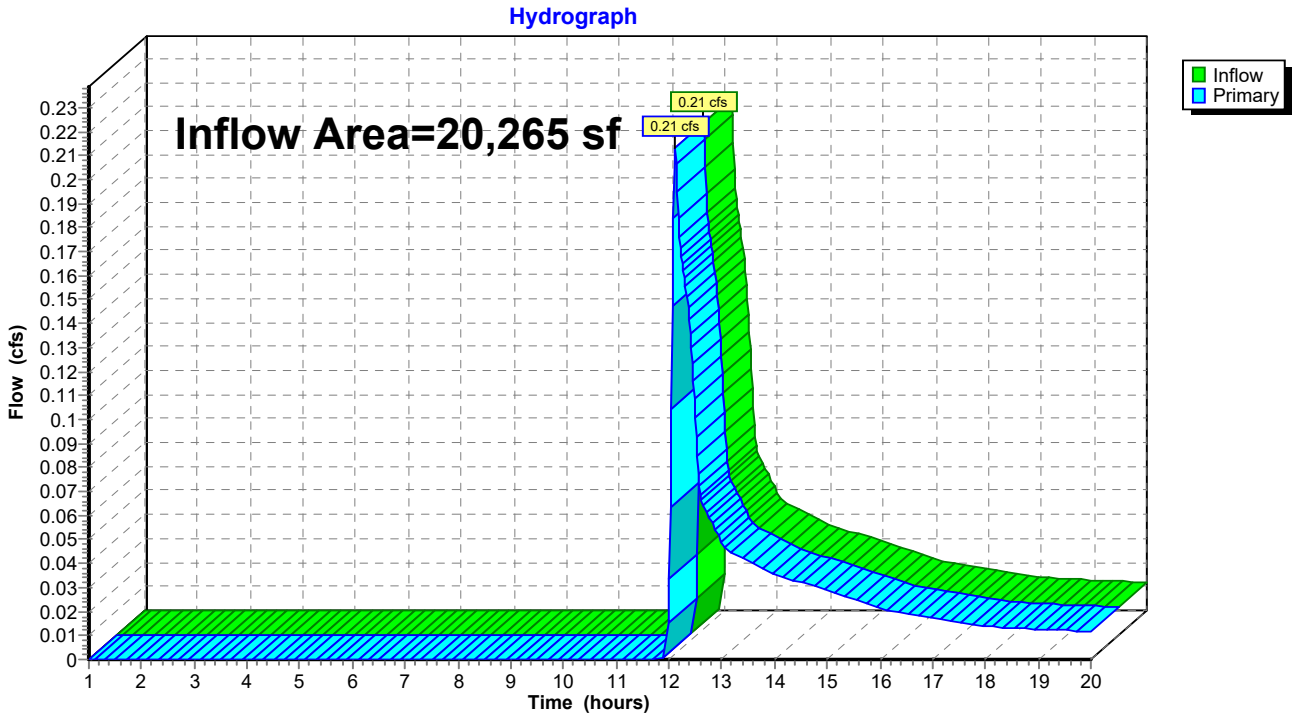


Summary for Link POA-4: Onset Pier Municipal Drainage

Inflow Area = 20,265 sf, 16.88% Impervious, Inflow Depth > 0.57" for 10-Year event
Inflow = 0.21 cfs @ 12.12 hrs, Volume= 962 cf
Primary = 0.21 cfs @ 12.12 hrs, Volume= 962 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-4: Onset Pier Municipal Drainage



Time span=1.00-20.00 hrs, dt=0.02 hrs, 951 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDA-1: Runoff Area=14,126 sf 19.74% Impervious Runoff Depth>1.89"
Flow Length=149' Tc=7.8 min CN=51 Runoff=0.68 cfs 2,226 cf

SubcatchmentDA-2: Runoff Area=22,347 sf 9.82% Impervious Runoff Depth>1.35"
Flow Length=199' Tc=8.3 min CN=45 Runoff=0.67 cfs 2,510 cf

SubcatchmentDA-3: Runoff Area=1,399 sf 22.73% Impervious Runoff Depth>1.99"
Tc=6.0 min CN=52 Runoff=0.08 cfs 232 cf

SubcatchmentDA-4: Runoff Area=20,265 sf 16.88% Impervious Runoff Depth>1.71"
Flow Length=199' Tc=5.5 min CN=49 Runoff=0.93 cfs 2,884 cf

Link POA-1: Municipal Drainage System Inflow=0.68 cfs 2,226 cf
Primary=0.68 cfs 2,226 cf

Link POA-2: Overland to Onset Beach Inflow=0.67 cfs 2,510 cf
Primary=0.67 cfs 2,510 cf

Link POA-3: Existing Leaching Chambers Inflow=0.08 cfs 232 cf
Primary=0.08 cfs 232 cf

Link POA-4: Onset Pier Municipal Drainage Inflow=0.93 cfs 2,884 cf
Primary=0.93 cfs 2,884 cf

Total Runoff Area = 58,137 sf Runoff Volume = 7,852 cf Average Runoff Depth = 1.62"
85.00% Pervious = 49,416 sf 15.00% Impervious = 8,721 sf

Summary for Subcatchment DA-1:

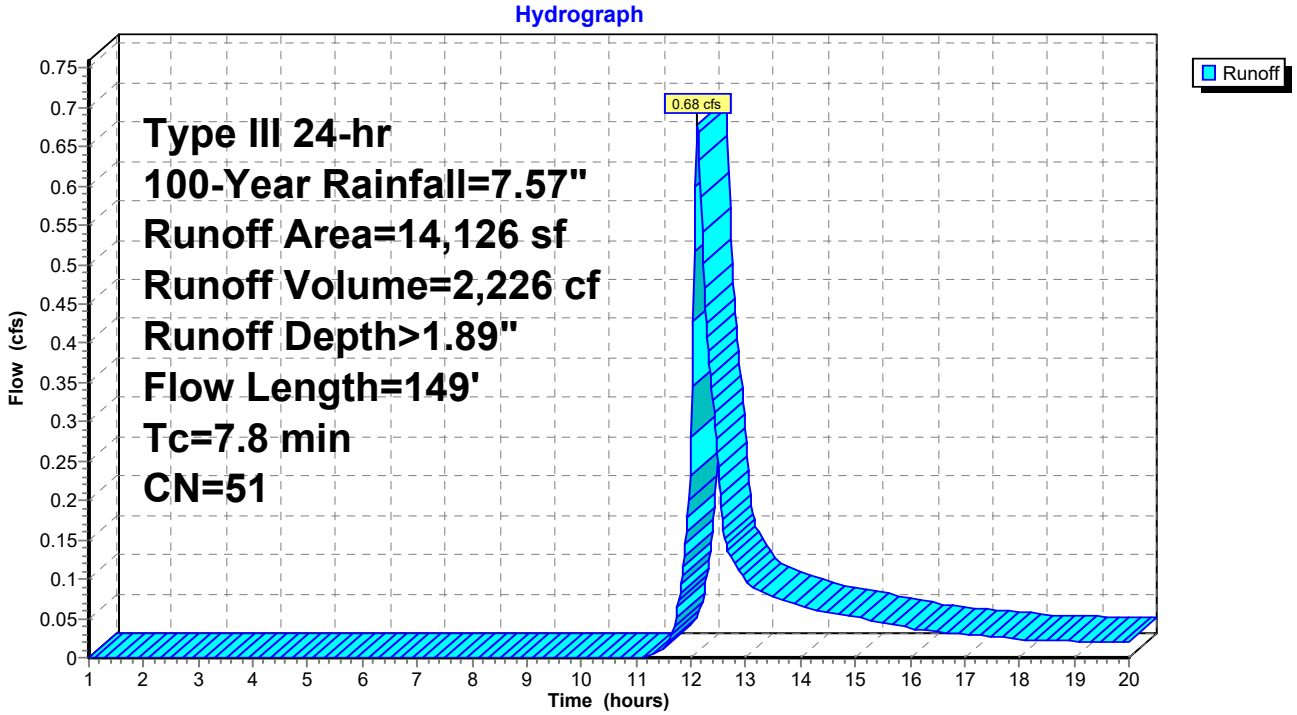
Runoff = 0.68 cfs @ 12.12 hrs, Volume= 2,226 cf, Depth> 1.89"
Routed to Link POA-1 : Municipal Drainage System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
11,337	39	>75% Grass cover, Good, HSG A
2,789	98	Paved parking, HSG A
14,126	51	Weighted Average
11,337		80.26% Pervious Area
2,789		19.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0350	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	49	0.0670	4.17		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	149	Total			

Subcatchment DA-1:



Summary for Subcatchment DA-2:

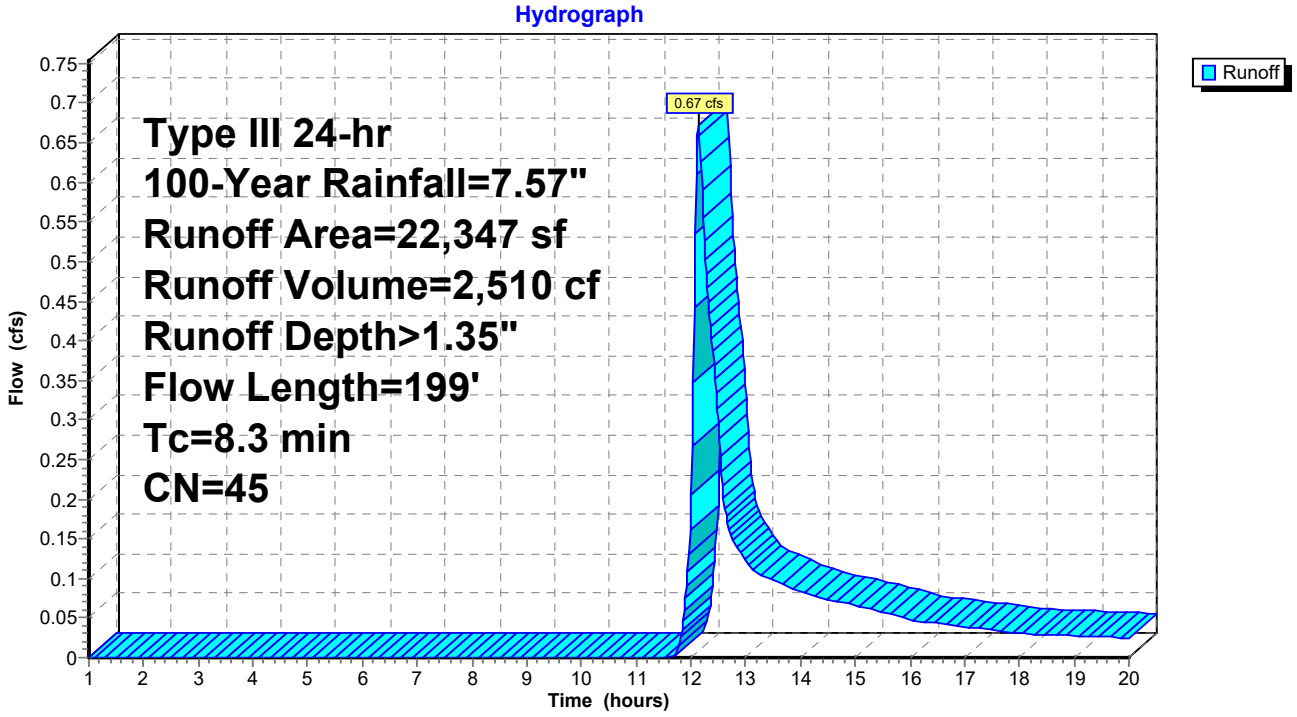
Runoff = 0.67 cfs @ 12.14 hrs, Volume= 2,510 cf, Depth> 1.35"
Routed to Link POA-2 : Overland to Onset Beach

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
20,153	39	>75% Grass cover, Good, HSG A
2,194	98	Paved parking, HSG A
22,347	45	Weighted Average
20,153		90.18% Pervious Area
2,194		9.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	61	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	38	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.3	199	Total			

Subcatchment DA-2:



Summary for Subcatchment DA-3:

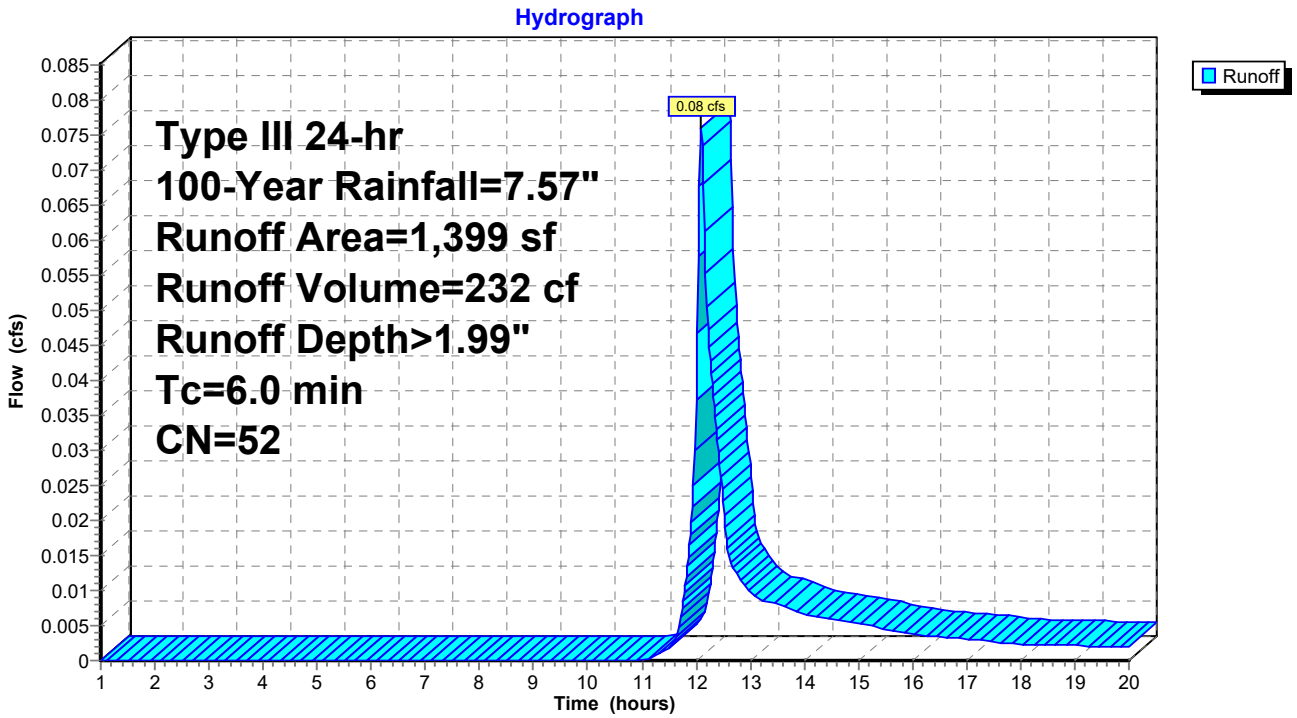
Runoff = 0.08 cfs @ 12.10 hrs, Volume= 232 cf, Depth> 1.99"
Routed to Link POA-3 : Existing Leaching Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
1,081	39	>75% Grass cover, Good, HSG A
318	98	Paved parking, HSG A
1,399	52	Weighted Average
1,081		77.27% Pervious Area
318		22.73% Impervious Area

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

Subcatchment DA-3:



Summary for Subcatchment DA-4:

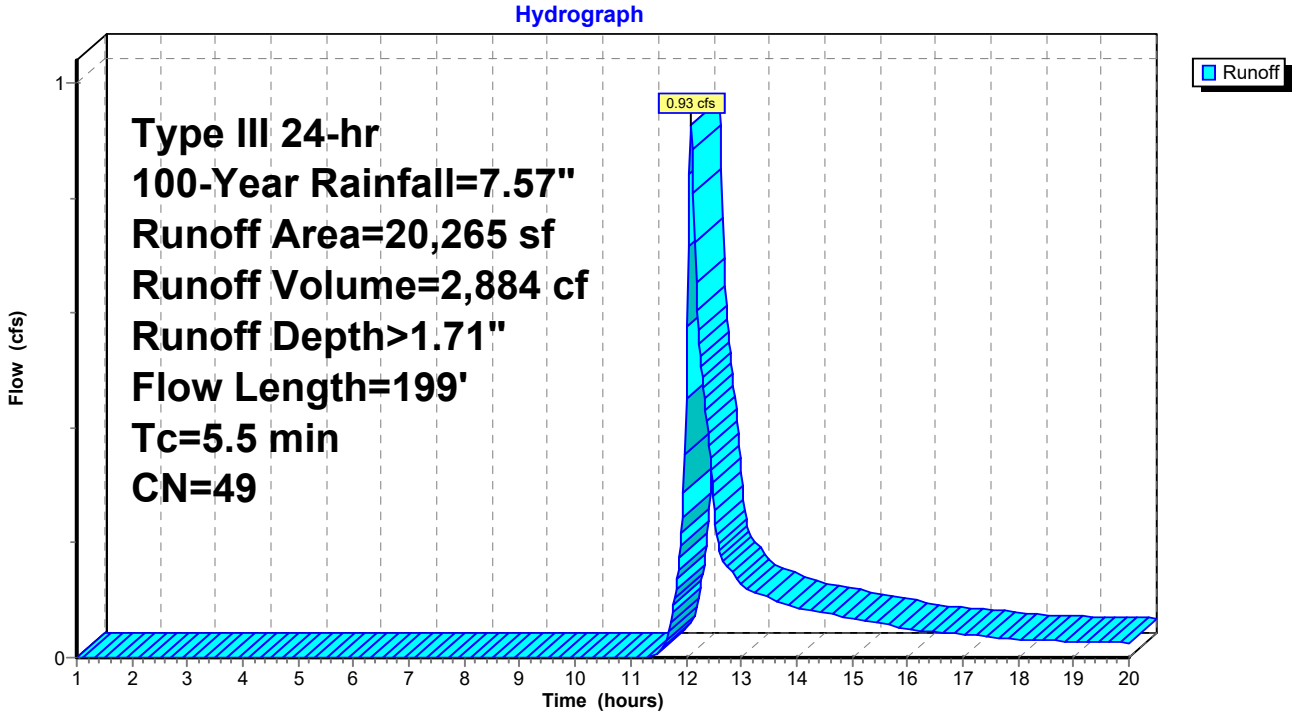
Runoff = 0.93 cfs @ 12.09 hrs, Volume= 2,884 cf, Depth> 1.71"
Routed to Link POA-4 : Onset Pier Municipal Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
16,845	39	>75% Grass cover, Good, HSG A
3,420	98	Paved parking, HSG A
20,265	49	Weighted Average
16,845		83.12% Pervious Area
3,420		16.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	100	0.0900	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	61	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	38	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.5	199	Total			

Subcatchment DA-4:

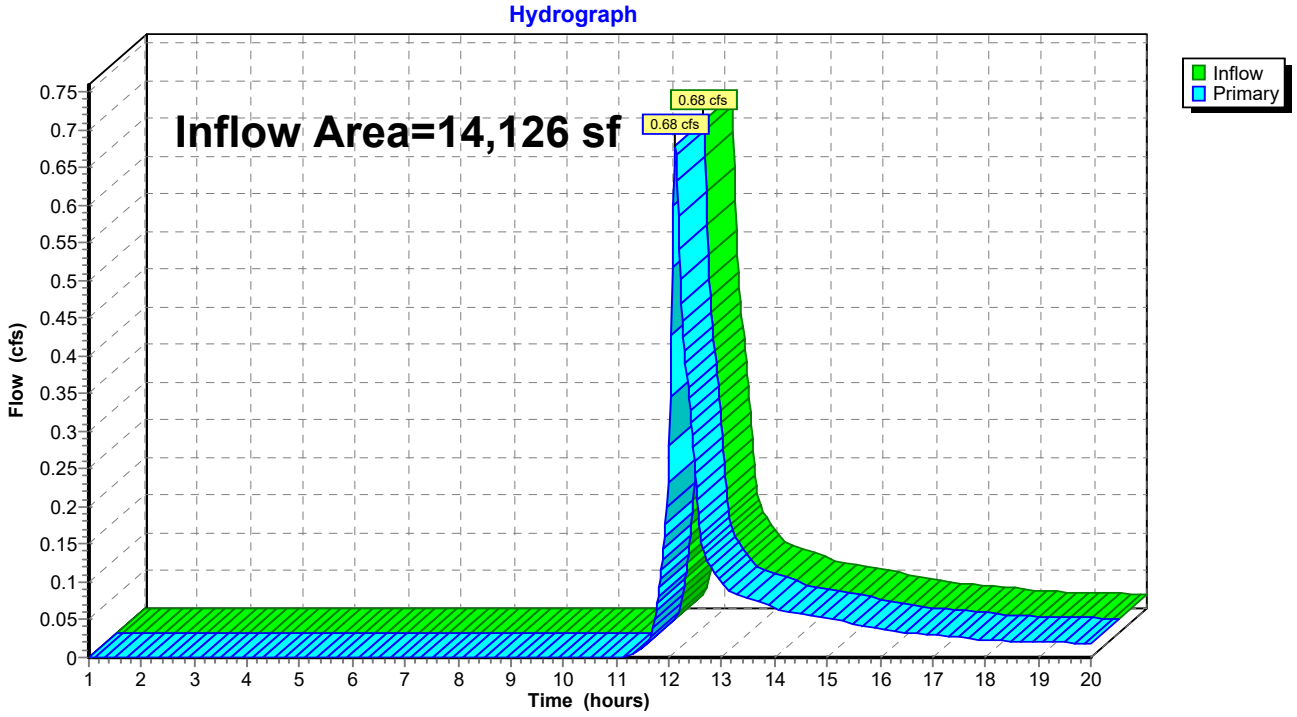


Summary for Link POA-1: Municipal Drainage System

Inflow Area = 14,126 sf, 19.74% Impervious, Inflow Depth > 1.89" for 100-Year event
Inflow = 0.68 cfs @ 12.12 hrs, Volume= 2,226 cf
Primary = 0.68 cfs @ 12.12 hrs, Volume= 2,226 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-1: Municipal Drainage System

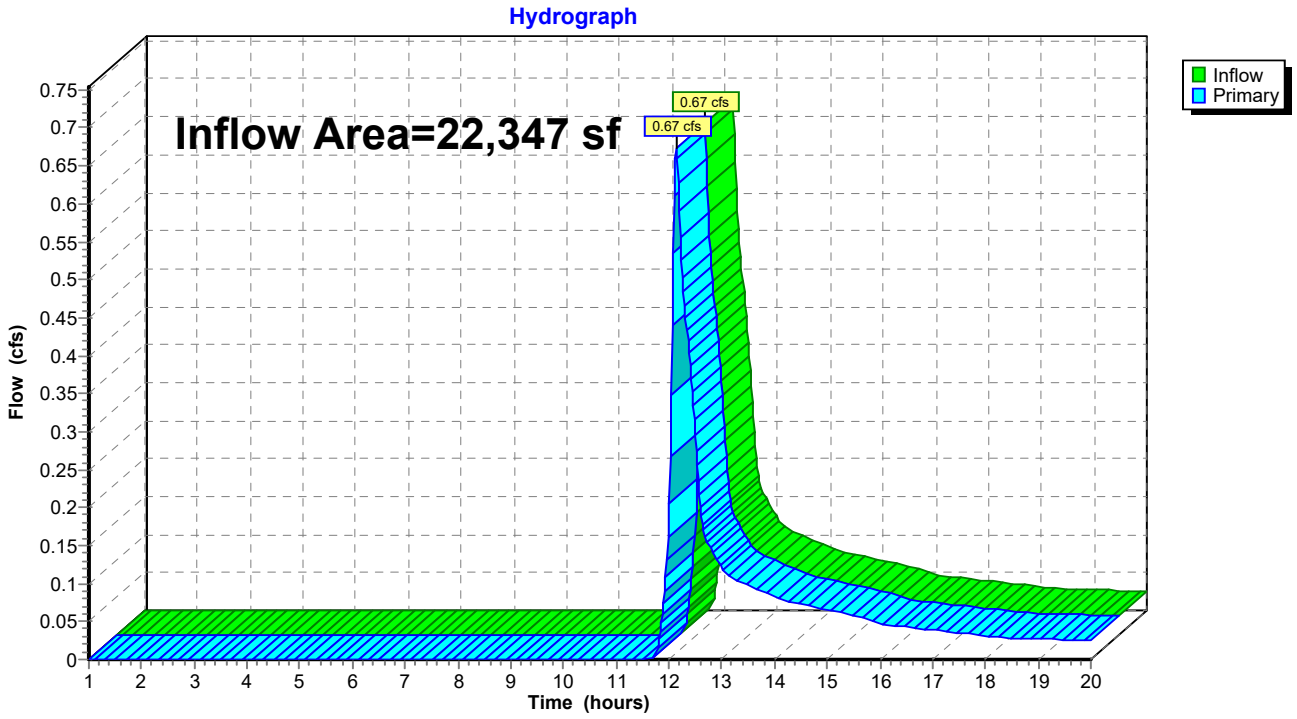


Summary for Link POA-2: Overland to Onset Beach

Inflow Area = 22,347 sf, 9.82% Impervious, Inflow Depth > 1.35" for 100-Year event
Inflow = 0.67 cfs @ 12.14 hrs, Volume= 2,510 cf
Primary = 0.67 cfs @ 12.14 hrs, Volume= 2,510 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-2: Overland to Onset Beach

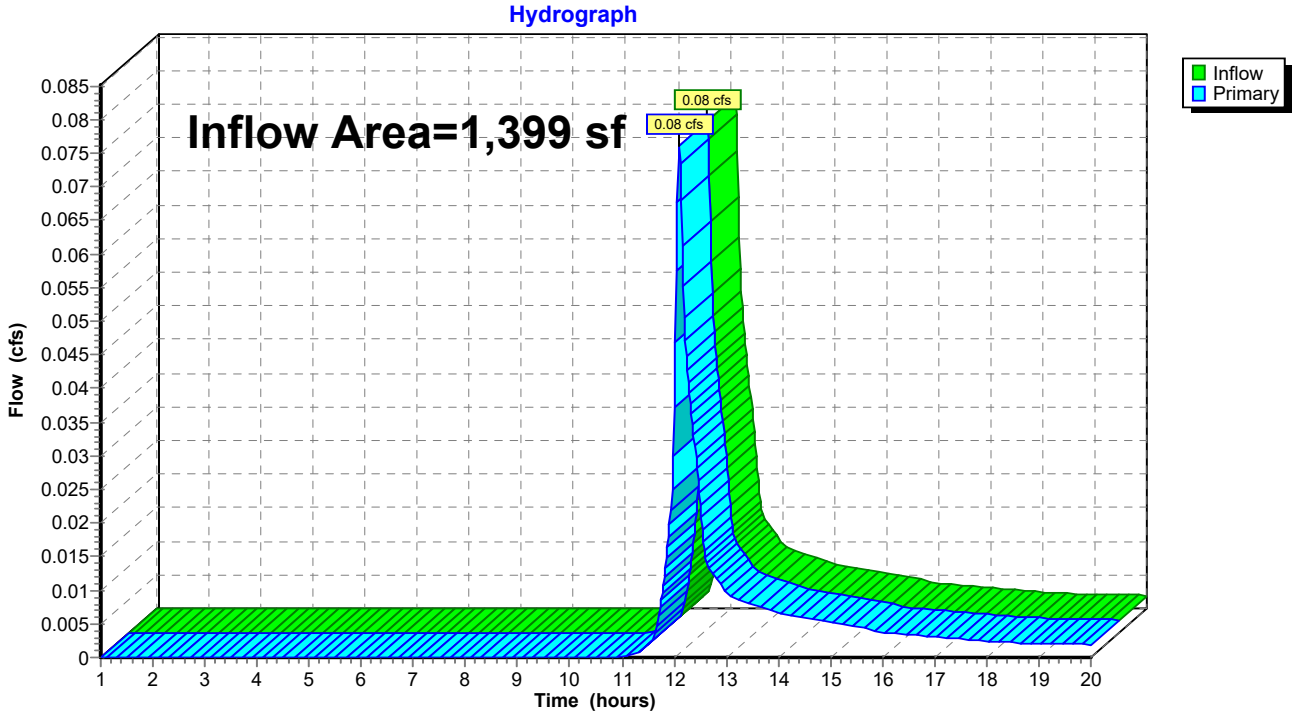


Summary for Link POA-3: Existing Leaching Chambers

Inflow Area = 1,399 sf, 22.73% Impervious, Inflow Depth > 1.99" for 100-Year event
Inflow = 0.08 cfs @ 12.10 hrs, Volume= 232 cf
Primary = 0.08 cfs @ 12.10 hrs, Volume= 232 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-3: Existing Leaching Chambers

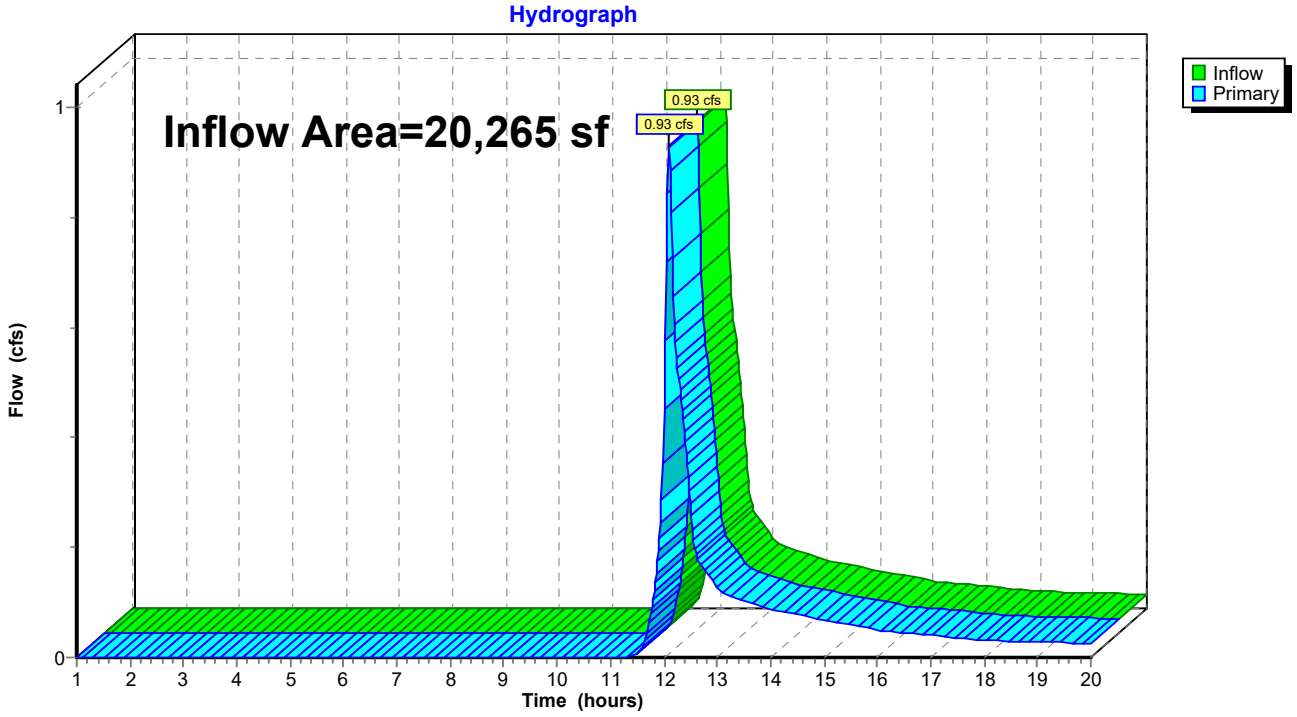


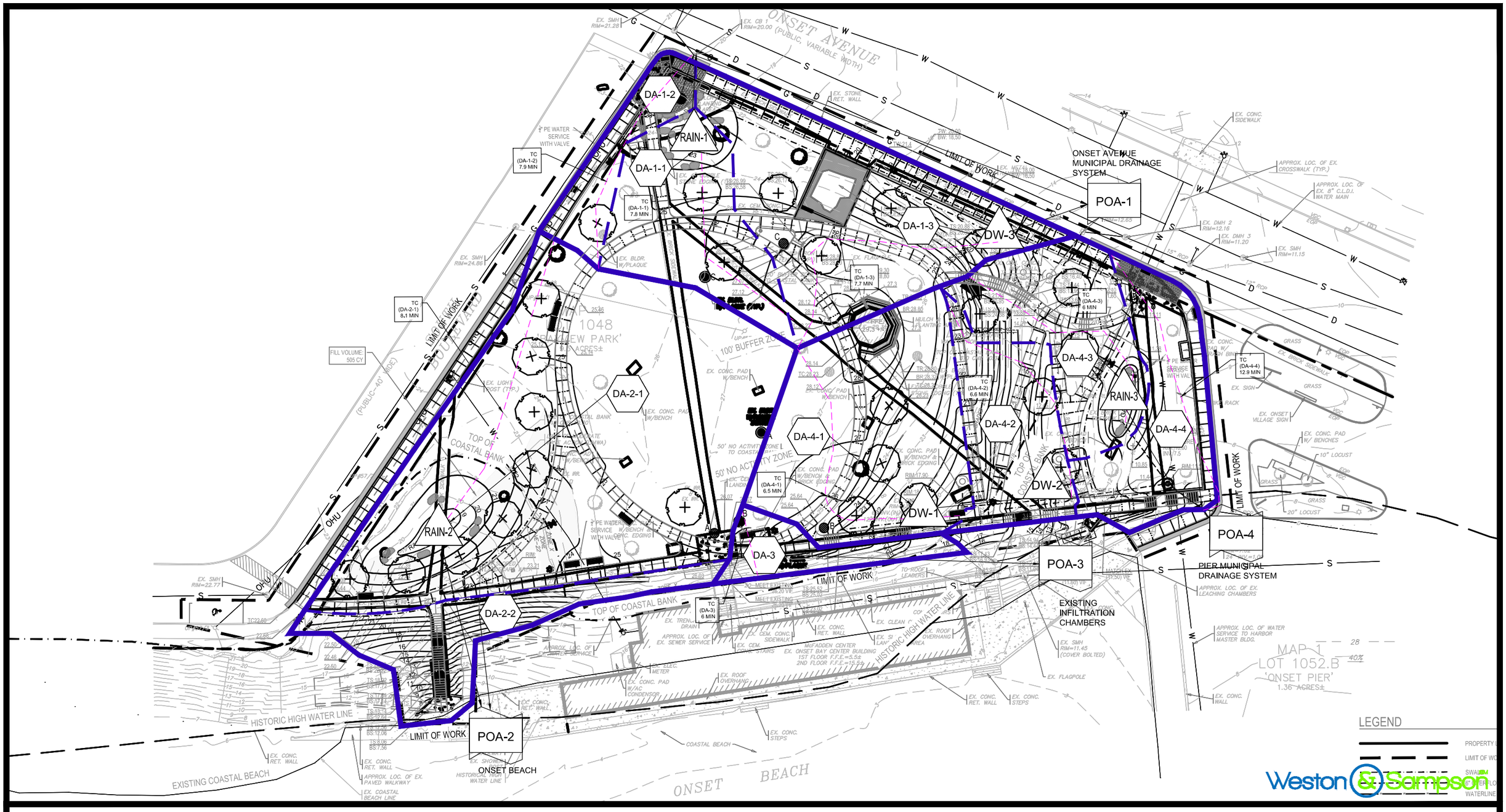
Summary for Link POA-4: Onset Pier Municipal Drainage

Inflow Area = 20,265 sf, 16.88% Impervious, Inflow Depth > 1.71" for 100-Year event
Inflow = 0.93 cfs @ 12.09 hrs, Volume= 2,884 cf
Primary = 0.93 cfs @ 12.09 hrs, Volume= 2,884 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-4: Onset Pier Municipal Drainage





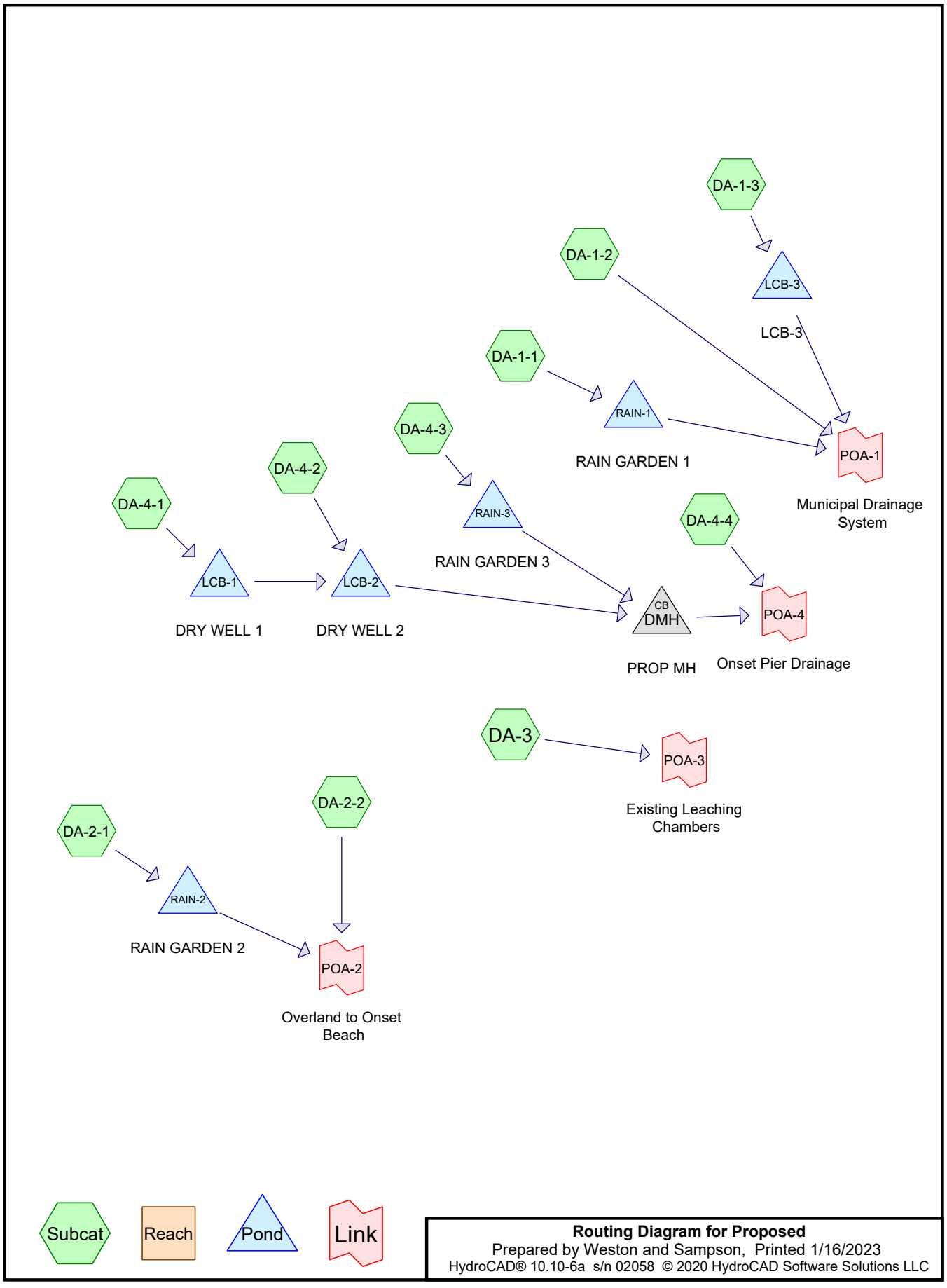
WAREHAM, MA
BAYVIEW PARK IMPROVEMENTS

PROPOSED DRAINAGE MAP

SCALE: 1"=40'

0 40 80

Rev: 1.7 Date: 08/12/2019



Routing Diagram for Proposed
Prepared by Weston and Sampson, Printed 1/16/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.44	2
2	10-Year	Type III 24-hr		Default	24.00	1	5.04	2
3	100-Year	Type III 24-hr		Default	24.00	1	7.57	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
45,783	39	>75% Grass cover, Good, HSG A (DA-1-1, DA-1-2, DA-1-3, DA-2-1, DA-2-2, DA-3, DA-4-1, DA-4-2, DA-4-3, DA-4-4)
12,354	98	Paved parking, HSG A (DA-1-1, DA-1-2, DA-1-3, DA-2-1, DA-2-2, DA-3, DA-4-1, DA-4-2, DA-4-3, DA-4-4)
58,137	**52**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
58,137	HSG A	DA-1-1, DA-1-2, DA-1-3, DA-2-1, DA-2-2, DA-3, DA-4-1, DA-4-2, DA-4-3, DA-4-4
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
58,137		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
45,783	0	0	0	0	45,783	>75% Grass cover, Good	
12,354	0	0	0	0	12,354	Paved parking	
58,137	**0**	**0**	**0**	**0**	**58,137**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	DMH	6.00	4.70	20.0	0.0650	0.012	0.0	6.0	0.0
2	LCB-1	16.00	9.50	48.0	0.1354	0.012	0.0	6.0	0.0
3	LCB-2	9.50	8.50	45.0	0.0222	0.012	0.0	6.0	0.0
4	LCB-3	11.50	10.00	20.0	0.0750	0.012	0.0	6.0	0.0
5	RAIN-3	8.00	7.50	36.0	0.0139	0.013	0.0	6.0	0.0

Time span=1.00-20.00 hrs, dt=0.02 hrs, 951 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDA-1-1: Runoff Area=4,336 sf 14.83% Impervious Runoff Depth>0.11"
Flow Length=149' Tc=7.8 min CN=48 Runoff=0.00 cfs 38 cf

SubcatchmentDA-1-2: Runoff Area=1,816 sf 43.01% Impervious Runoff Depth>0.60"
Flow Length=80' Slope=0.0200 '/' Tc=7.9 min CN=64 Runoff=0.02 cfs 91 cf

SubcatchmentDA-1-3: Runoff Area=8,246 sf 33.35% Impervious Runoff Depth>0.41"
Flow Length=125' Tc=7.7 min CN=59 Runoff=0.06 cfs 280 cf

SubcatchmentDA-2-1: Runoff Area=19,177 sf 13.51% Impervious Runoff Depth>0.09"
Flow Length=132' Tc=8.1 min CN=47 Runoff=0.01 cfs 138 cf

SubcatchmentDA-2-2: Runoff Area=3,554 sf 9.96% Impervious Runoff Depth>0.05"
Tc=6.0 min CN=45 Runoff=0.00 cfs 16 cf

SubcatchmentDA-3: Runoff Area=1,506 sf 18.59% Impervious Runoff Depth>0.15"
Tc=6.0 min CN=50 Runoff=0.00 cfs 18 cf

SubcatchmentDA-4-1: Runoff Area=7,605 sf 16.31% Impervious Runoff Depth>0.13"
Flow Length=161' Tc=6.5 min CN=49 Runoff=0.01 cfs 79 cf

SubcatchmentDA-4-2: Runoff Area=3,475 sf 33.04% Impervious Runoff Depth>0.37"
Flow Length=169' Tc=6.6 min CN=58 Runoff=0.02 cfs 108 cf

SubcatchmentDA-4-3: Runoff Area=4,445 sf 29.99% Impervious Runoff Depth>0.34"
Tc=6.0 min CN=57 Runoff=0.02 cfs 126 cf

SubcatchmentDA-4-4: Runoff Area=3,977 sf 31.03% Impervious Runoff Depth>0.34"
Flow Length=160' Tc=12.9 min CN=57 Runoff=0.02 cfs 112 cf

Pond DMH: PROP MH Peak Elev=6.00' Inflow=0.00 cfs 0 cf
6.0" Round Culvert n=0.012 L=20.0' S=0.0650 '/' Outflow=0.00 cfs 0 cf

Pond LCB-1: DRY WELL 1 Peak Elev=10.13' Storage=1 cf Inflow=0.01 cfs 79 cf
Discarded=0.01 cfs 79 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 79 cf

Pond LCB-2: DRY WELL 2 Peak Elev=4.97' Storage=21 cf Inflow=0.02 cfs 108 cf
Discarded=0.01 cfs 108 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 108 cf

Pond LCB-3: LCB-3 Peak Elev=7.14' Storage=50 cf Inflow=0.06 cfs 280 cf
Discarded=0.02 cfs 279 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 279 cf

Pond RAIN-1: RAIN GARDEN 1 Peak Elev=22.00' Storage=0 cf Inflow=0.00 cfs 38 cf
Discarded=0.00 cfs 38 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 38 cf

Pond RAIN-2: RAIN GARDEN 2 Peak Elev=19.01' Storage=1 cf Inflow=0.01 cfs 138 cf
Discarded=0.01 cfs 138 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 138 cf

Pond RAIN-3: RAIN GARDEN 3 Peak Elev=10.01' Storage=2 cf Inflow=0.02 cfs 126 cf
Discarded=0.02 cfs 126 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 126 cf

Link POA-1: Municipal Drainage System Inflow=0.02 cfs 91 cf
Primary=0.02 cfs 91 cf

Link POA-2: Overland to Onset Beach Inflow=0.00 cfs 16 cf
Primary=0.00 cfs 16 cf

Link POA-3: Existing Leaching Chambers Inflow=0.00 cfs 18 cf
Primary=0.00 cfs 18 cf

Link POA-4: Onset Pier Drainage Inflow=0.02 cfs 112 cf
Primary=0.02 cfs 112 cf

Total Runoff Area = 58,137 sf Runoff Volume = 1,006 cf Average Runoff Depth = 0.21"
78.75% Pervious = 45,783 sf 21.25% Impervious = 12,354 sf

Summary for Subcatchment DA-1-1:

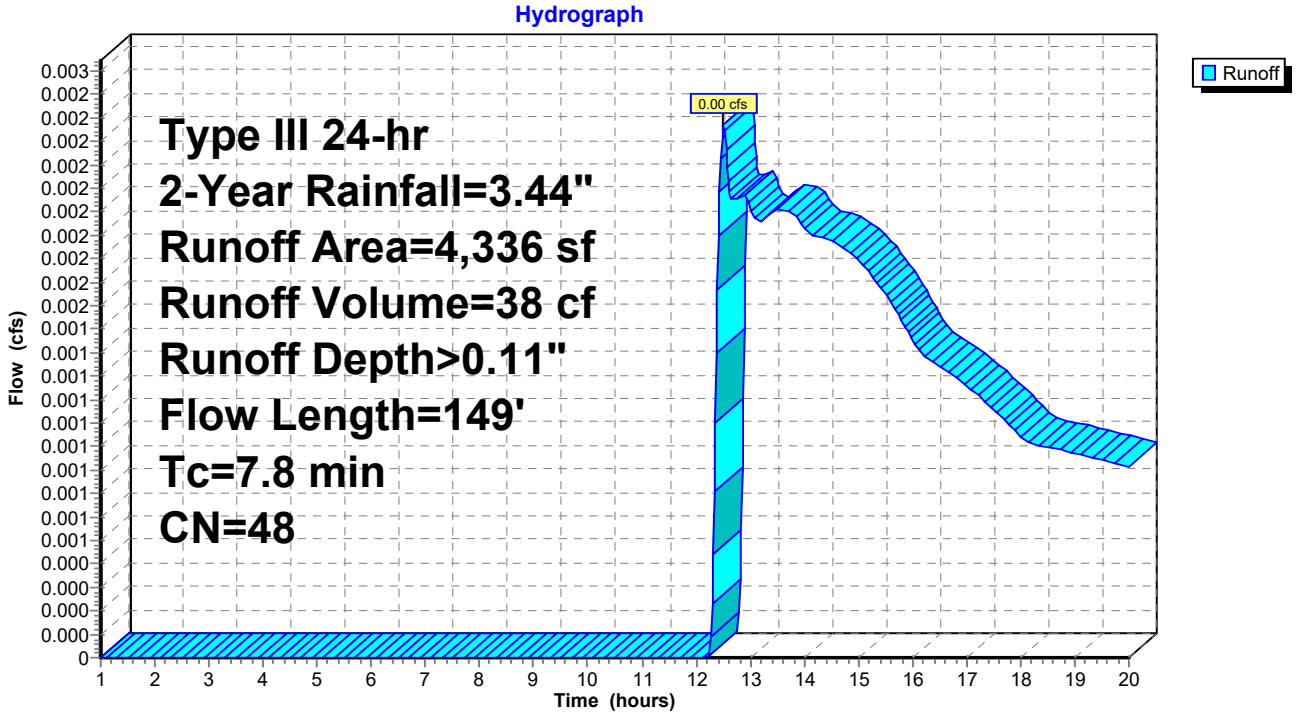
Runoff = 0.00 cfs @ 12.51 hrs, Volume= 38 cf, Depth> 0.11"
Routed to Pond RAIN-1 : RAIN GARDEN 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
3,693	39	>75% Grass cover, Good, HSG A
643	98	Paved parking, HSG A
4,336	48	Weighted Average
3,693		85.17% Pervious Area
643		14.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0350	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	49	0.0670	4.17		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	149	Total			

Subcatchment DA-1-1:



Summary for Subcatchment DA-1-2:

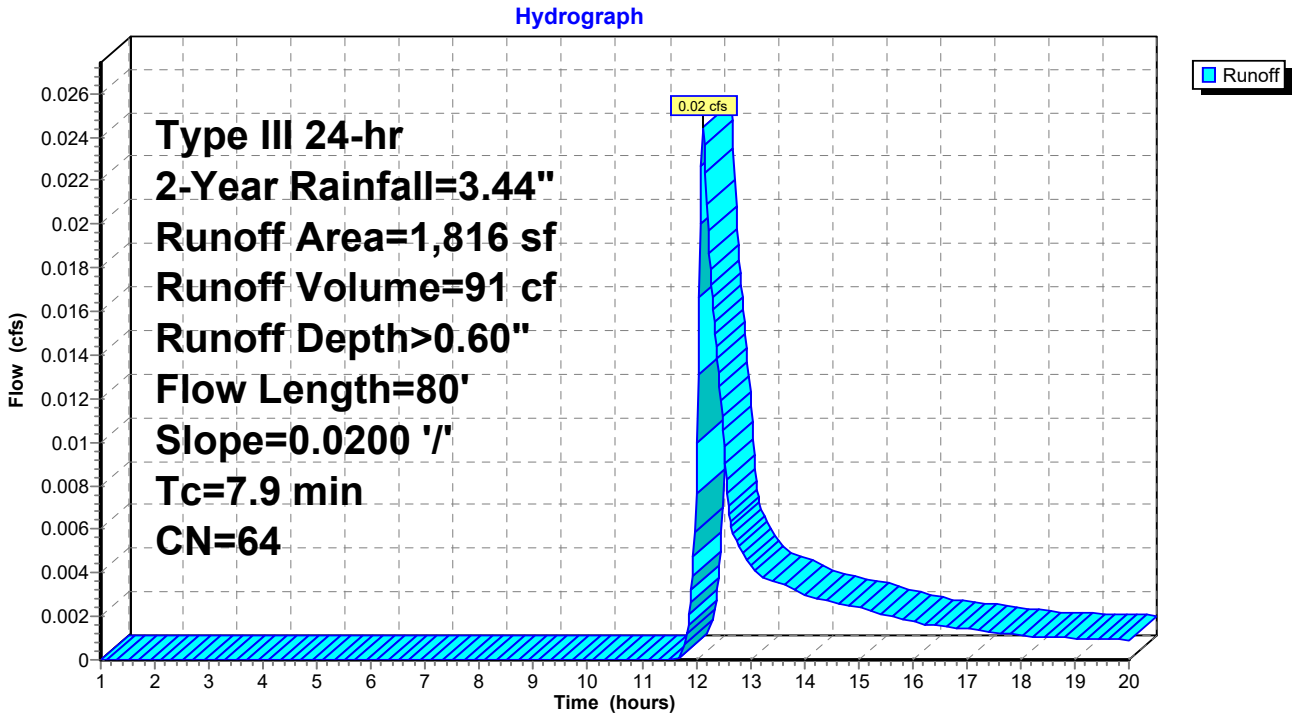
Runoff = 0.02 cfs @ 12.13 hrs, Volume= 91 cf, Depth> 0.60"
Routed to Link POA-1 : Municipal Drainage System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
1,035	39	>75% Grass cover, Good, HSG A
781	98	Paved parking, HSG A
1,816	64	Weighted Average
1,035		56.99% Pervious Area
781		43.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	80	0.0200	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"

Subcatchment DA-1-2:



Summary for Subcatchment DA-1-3:

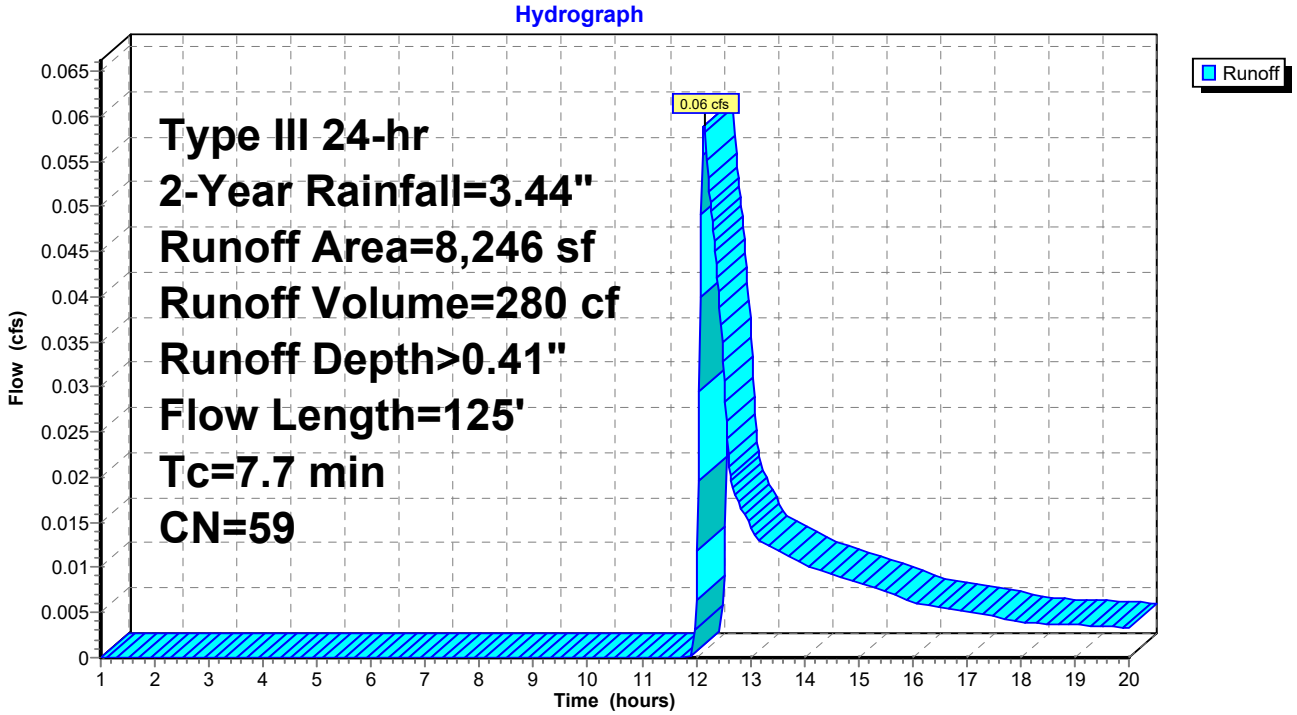
Runoff = 0.06 cfs @ 12.15 hrs, Volume= 280 cf, Depth> 0.41"
Routed to Pond LCB-3 : LCB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
5,496	39	>75% Grass cover, Good, HSG A
2,750	98	Paved parking, HSG A
8,246	59	Weighted Average
5,496		66.65% Pervious Area
2,750		33.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0350	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.1	25	0.0670	4.17		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.7	125	Total			

Subcatchment DA-1-3:



Summary for Subcatchment DA-2-1:

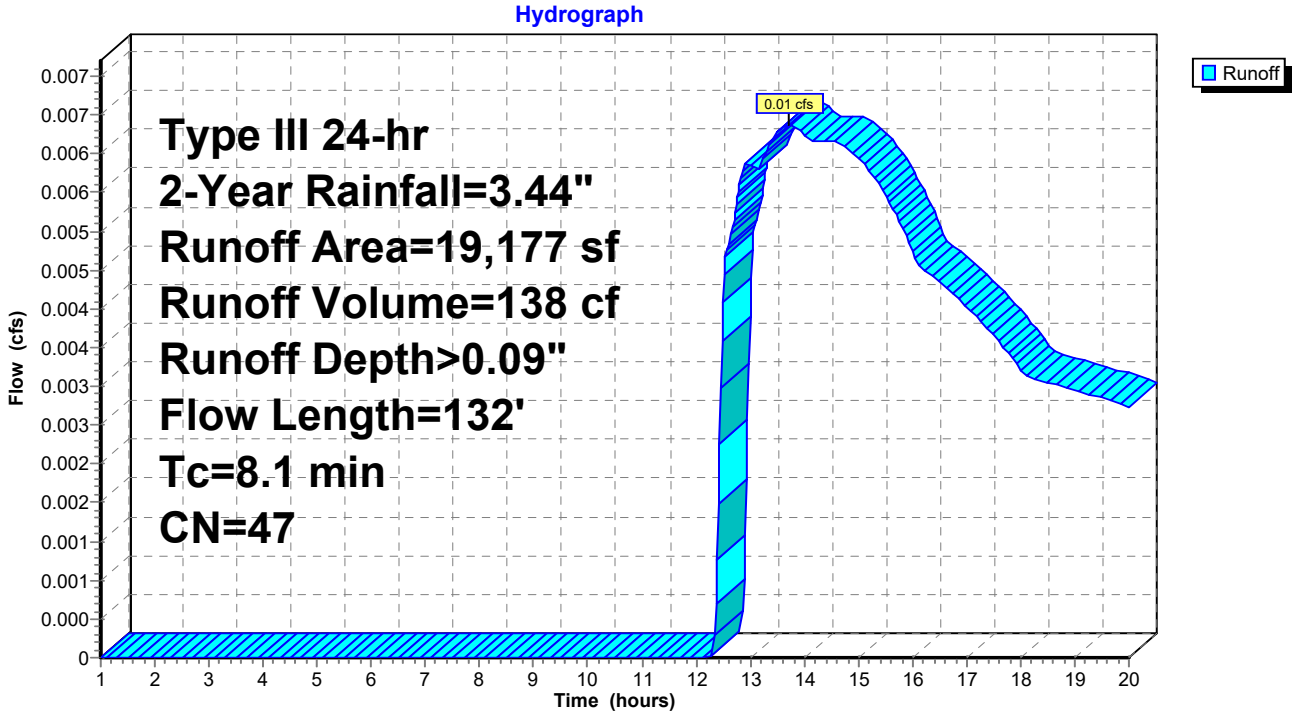
Runoff = 0.01 cfs @ 13.73 hrs, Volume= 138 cf, Depth> 0.09"
Routed to Pond RAIN-2 : RAIN GARDEN 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
16,586	39	>75% Grass cover, Good, HSG A
2,591	98	Paved parking, HSG A
19,177	47	Weighted Average
16,586		86.49% Pervious Area
2,591		13.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.1	32	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	132	Total			

Subcatchment DA-2-1:



Summary for Subcatchment DA-2-2:

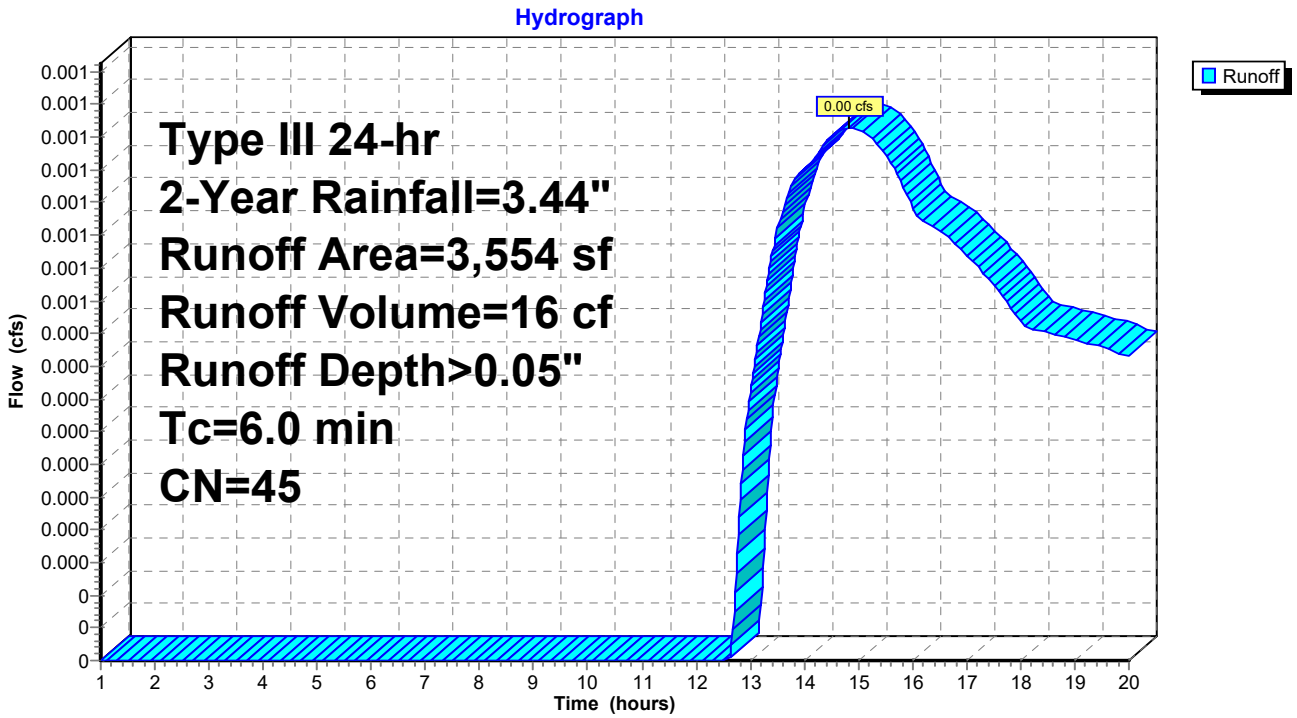
Runoff = 0.00 cfs @ 14.84 hrs, Volume= 16 cf, Depth> 0.05"
Routed to Link POA-2 : Overland to Onset Beach

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
3,200	39	>75% Grass cover, Good, HSG A
354	98	Paved parking, HSG A
3,554	45	Weighted Average
3,200		90.04% Pervious Area
354		9.96% Impervious Area

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

Subcatchment DA-2-2:



Summary for Subcatchment DA-3:

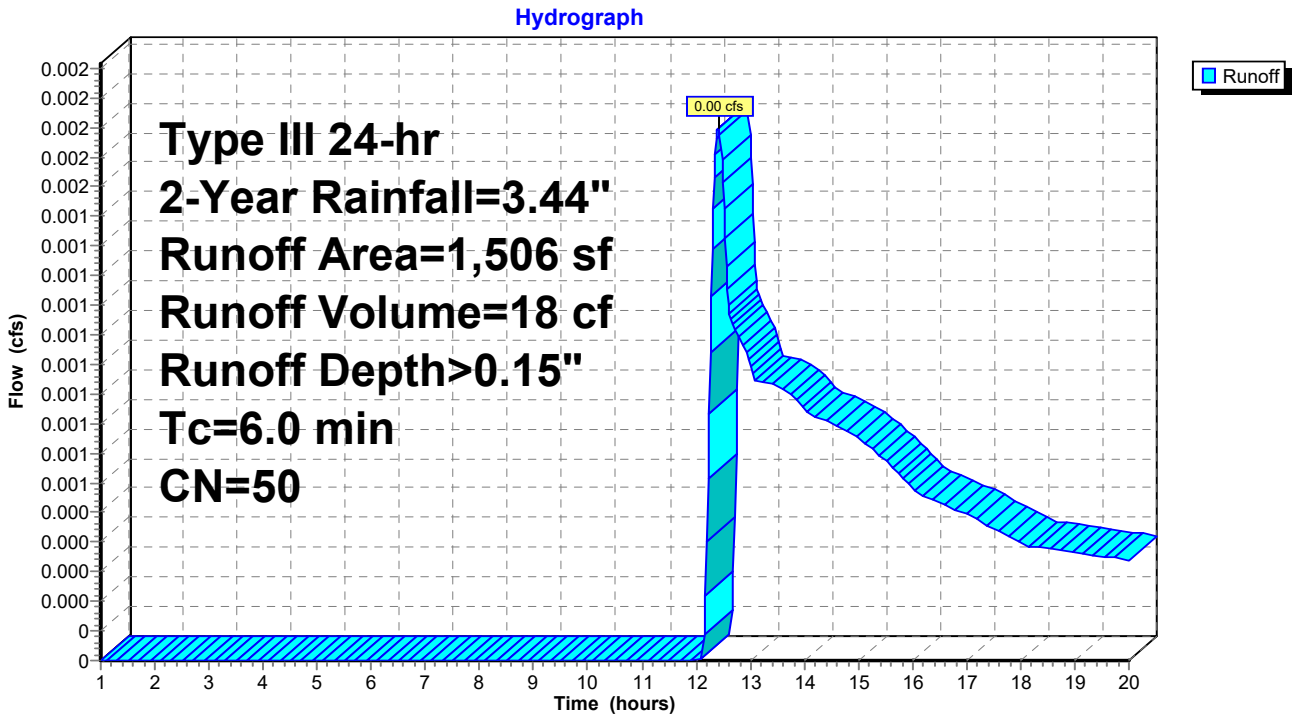
Runoff = 0.00 cfs @ 12.41 hrs, Volume= 18 cf, Depth> 0.15"
Routed to Link POA-3 : Existing Leaching Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
1,226	39	>75% Grass cover, Good, HSG A
280	98	Paved parking, HSG A
1,506	50	Weighted Average
1,226		81.41% Pervious Area
280		18.59% Impervious Area

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

Subcatchment DA-3:



Summary for Subcatchment DA-4-1:

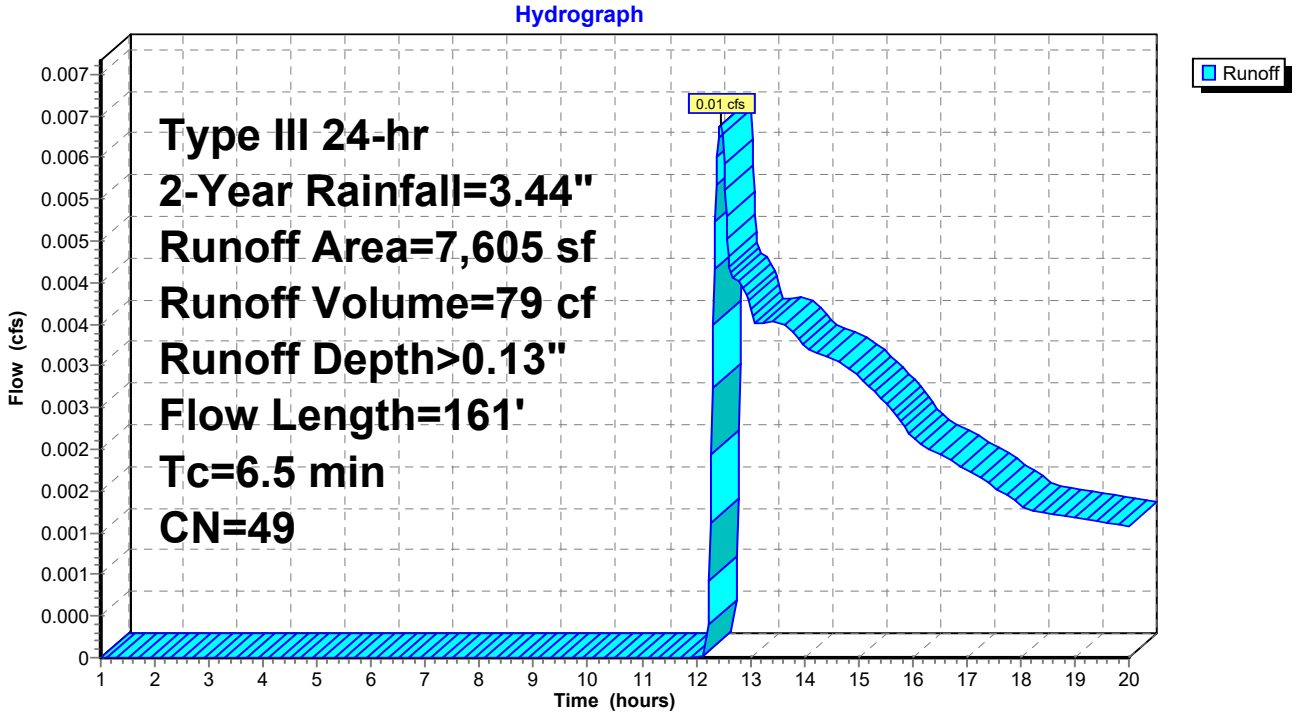
Runoff = 0.01 cfs @ 12.45 hrs, Volume= 79 cf, Depth> 0.13"
Routed to Pond LCB-1 : DRY WELL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
6,365	39	>75% Grass cover, Good, HSG A
1,240	98	Paved parking, HSG A
7,605	49	Weighted Average
6,365		83.69% Pervious Area
1,240		16.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.0650	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.6	61	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	161	Total			

Subcatchment DA-4-1:



Summary for Subcatchment DA-4-2:

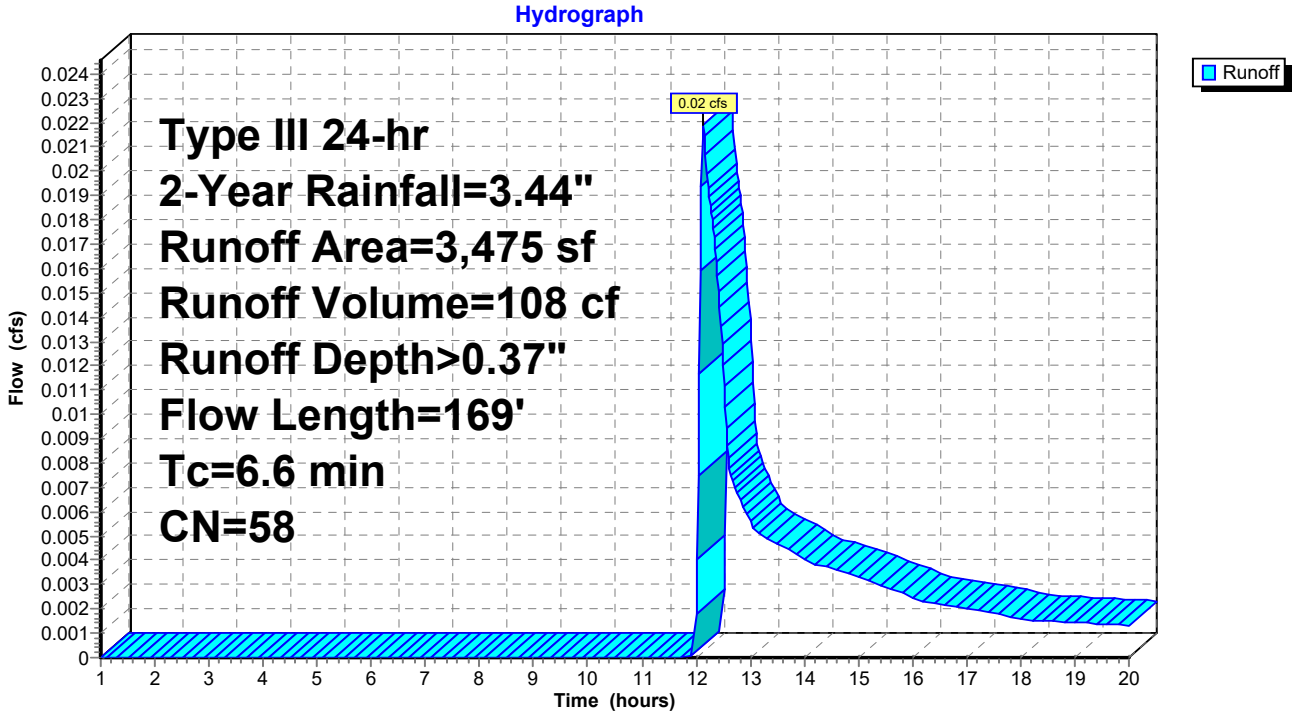
Runoff = 0.02 cfs @ 12.14 hrs, Volume= 108 cf, Depth> 0.37"
Routed to Pond LCB-2 : DRY WELL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
2,327	39	>75% Grass cover, Good, HSG A
1,148	98	Paved parking, HSG A
3,475	58	Weighted Average
2,327		66.96% Pervious Area
1,148		33.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	56	0.0450	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
1.8	46	0.2600	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.5	67	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	169	Total			

Subcatchment DA-4-2:



Summary for Subcatchment DA-4-3:

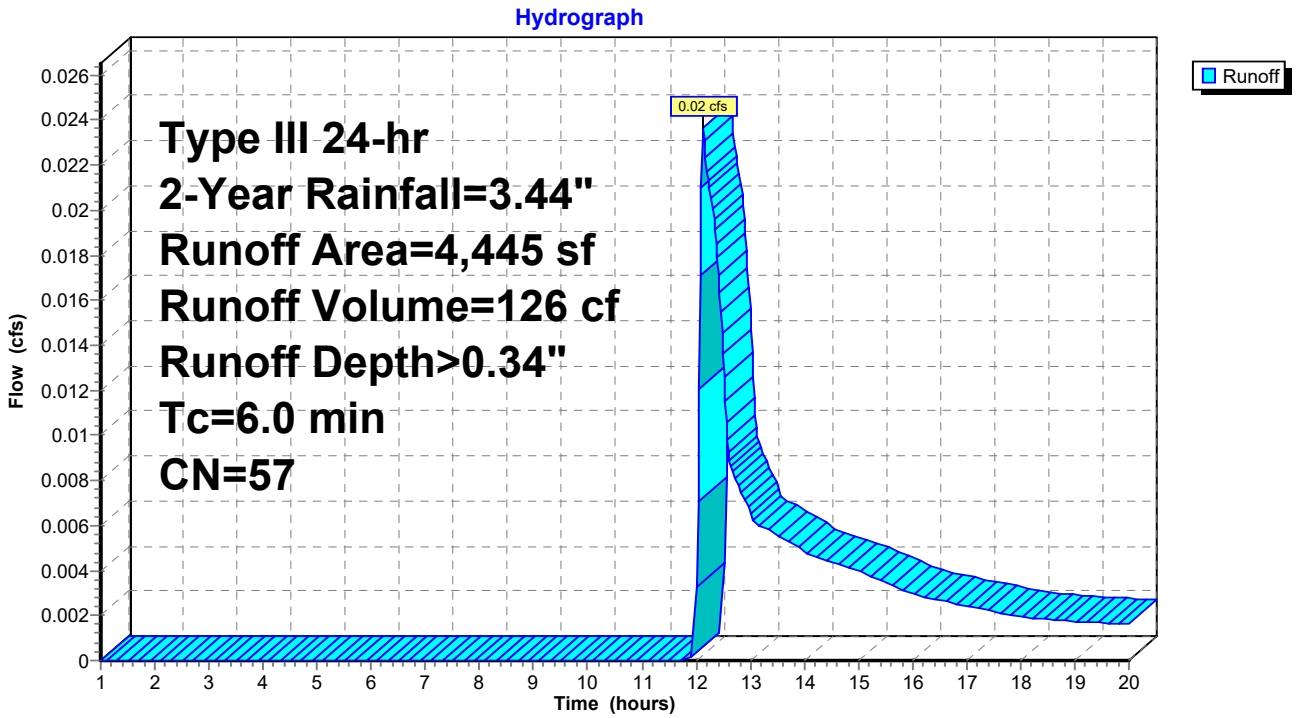
Runoff = 0.02 cfs @ 12.14 hrs, Volume= 126 cf, Depth> 0.34"
Routed to Pond RAIN-3 : RAIN GARDEN 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
3,112	39	>75% Grass cover, Good, HSG A
1,333	98	Paved parking, HSG A
4,445	57	Weighted Average
3,112		70.01% Pervious Area
1,333		29.99% Impervious Area

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

Subcatchment DA-4-3:



Summary for Subcatchment DA-4-4:

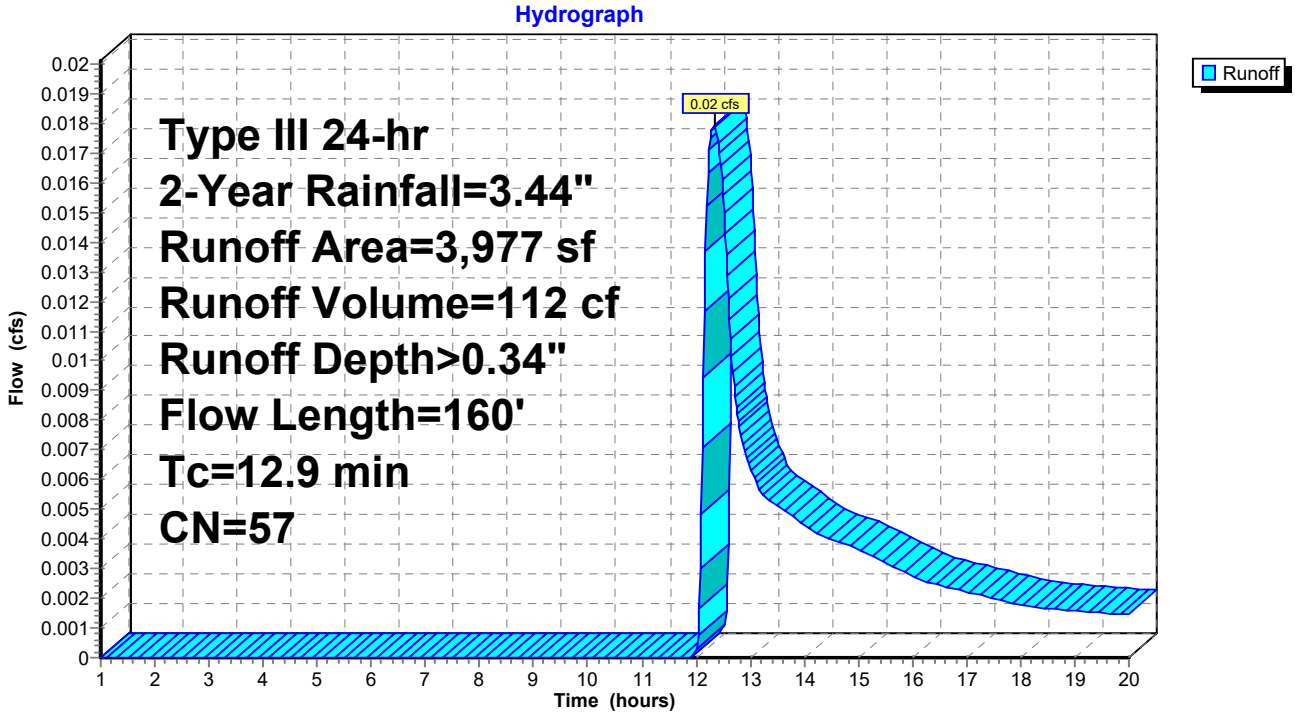
Runoff = 0.02 cfs @ 12.33 hrs, Volume= 112 cf, Depth> 0.34"
Routed to Link POA-4 : Onset Pier Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
2,743	39	>75% Grass cover, Good, HSG A
1,234	98	Paved parking, HSG A
3,977	57	Weighted Average
2,743		68.97% Pervious Area
1,234		31.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.4	60	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.9	160	Total			

Subcatchment DA-4-4:



Summary for Pond DMH: PROP MH

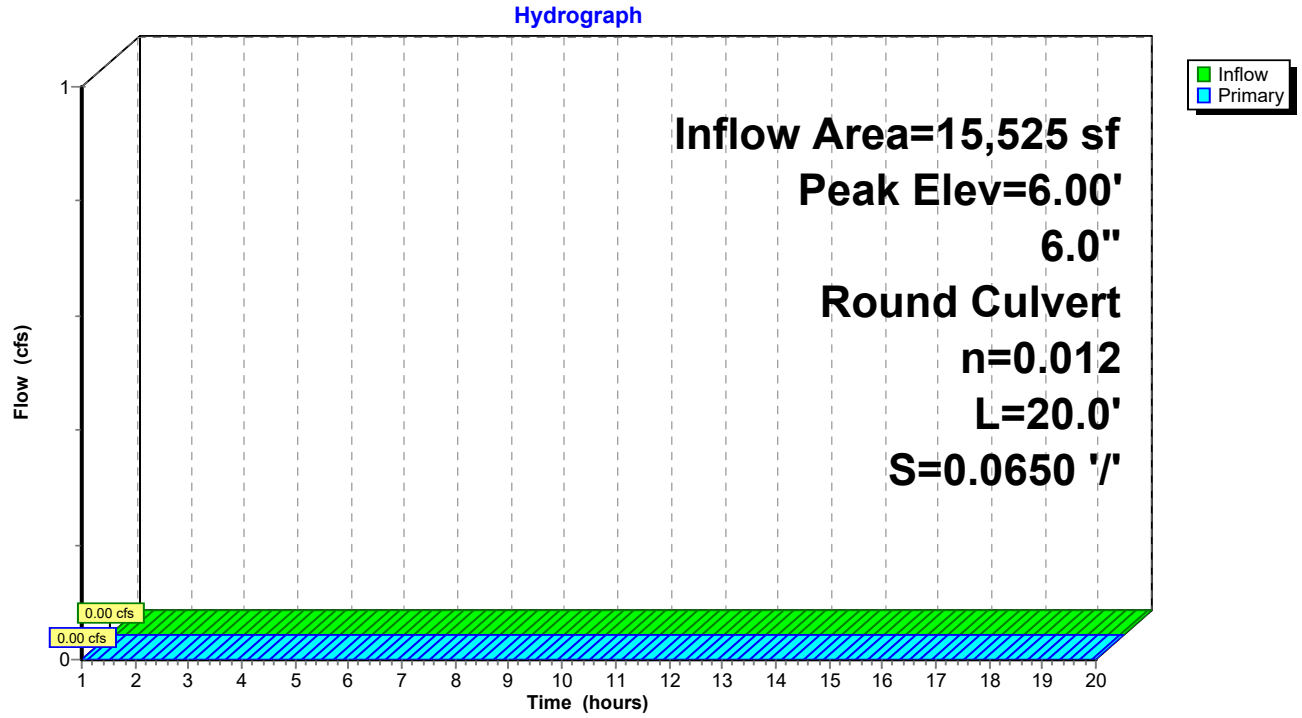
Inflow Area = 15,525 sf, 23.97% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Link POA-4 : Onset Pier Drainage

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 6.00' @ 1.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.00'	**6.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.00' / 4.70' S= 0.0650 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=6.00' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Pond DMH: PROP MH



Summary for Pond LCB-1: DRY WELL 1

Inflow Area = 7,605 sf, 16.31% Impervious, Inflow Depth > 0.13" for 2-Year event
Inflow = 0.01 cfs @ 12.45 hrs, Volume= 79 cf
Outflow = 0.01 cfs @ 12.48 hrs, Volume= 79 cf, Atten= 4%, Lag= 1.5 min
Discarded = 0.01 cfs @ 12.48 hrs, Volume= 79 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond LCB-2 : DRY WELL 2

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 10.13' @ 12.50 hrs Surf.Area= 32 sf Storage= 1 cf

Plug-Flow detention time= 2.4 min calculated for 79 cf (100% of inflow)
Center-of-Mass det. time= 1.6 min (921.5 - 919.9)

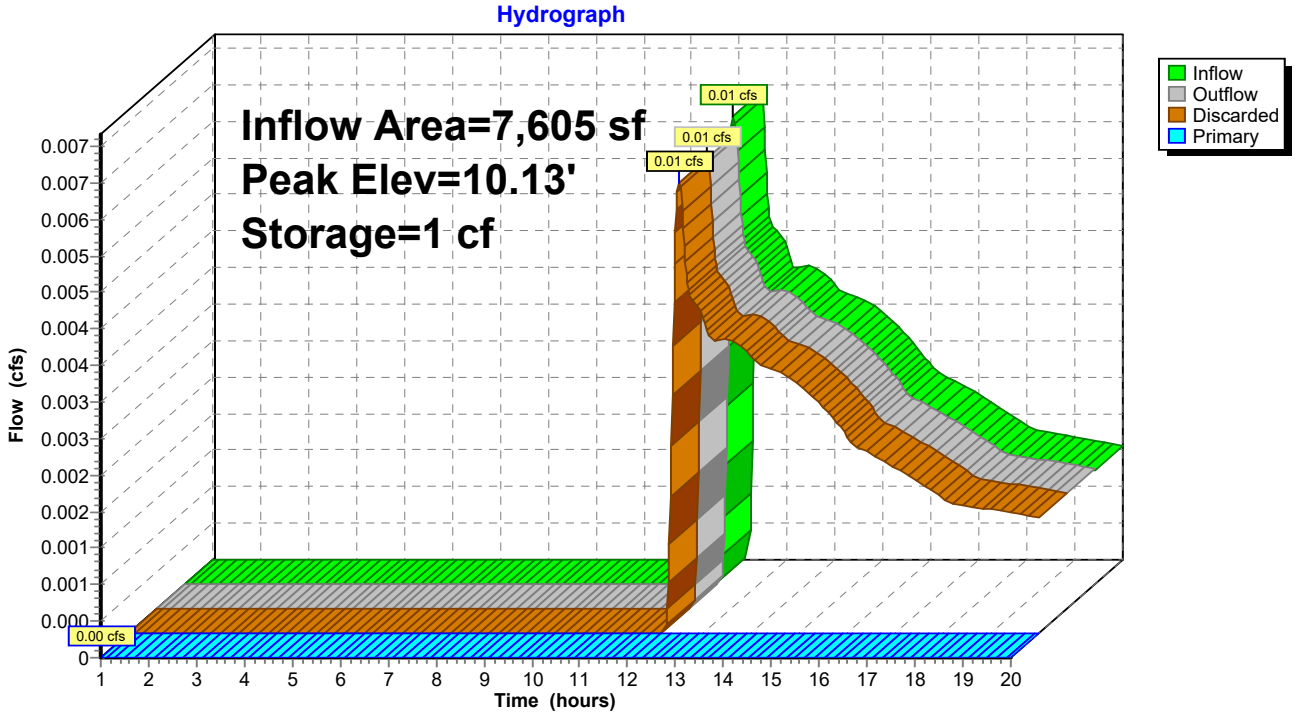
Volume	Invert	Avail.Storage	Storage Description
#1	10.56'	118 cf	**5.00'D x 6.00'H Vertical Cone/Cylinder**Inside #2 160 cf Overall - 5.0" Wall Thickness = 118 cf
#2	10.06'	26 cf	**6.40'D x 7.00'H Vertical Cone/Cylinder** 225 cf Overall - 160 cf Embedded = 65 cf x 40.0% Voids
		144 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.06'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	16.00'	**6.0" Round Culvert** L= 48.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.00' / 9.50' S= 0.1354 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 12.48 hrs HW=10.13' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=10.06' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Pond LCB-1: DRY WELL 1



Summary for Pond LCB-2: DRY WELL 2

Inflow Area = 11,080 sf, 21.55% Impervious, Inflow Depth > 0.12" for 2-Year event
Inflow = 0.02 cfs @ 12.14 hrs, Volume= 108 cf
Outflow = 0.01 cfs @ 12.08 hrs, Volume= 108 cf, Atten= 72%, Lag= 0.0 min
Discarded = 0.01 cfs @ 12.08 hrs, Volume= 108 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond DMH : PROP MH

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 4.97' @ 12.89 hrs Surf.Area= 32 sf Storage= 21 cf

Plug-Flow detention time= 26.9 min calculated for 108 cf (100% of inflow)
Center-of-Mass det. time= 26.3 min (888.5 - 862.3)

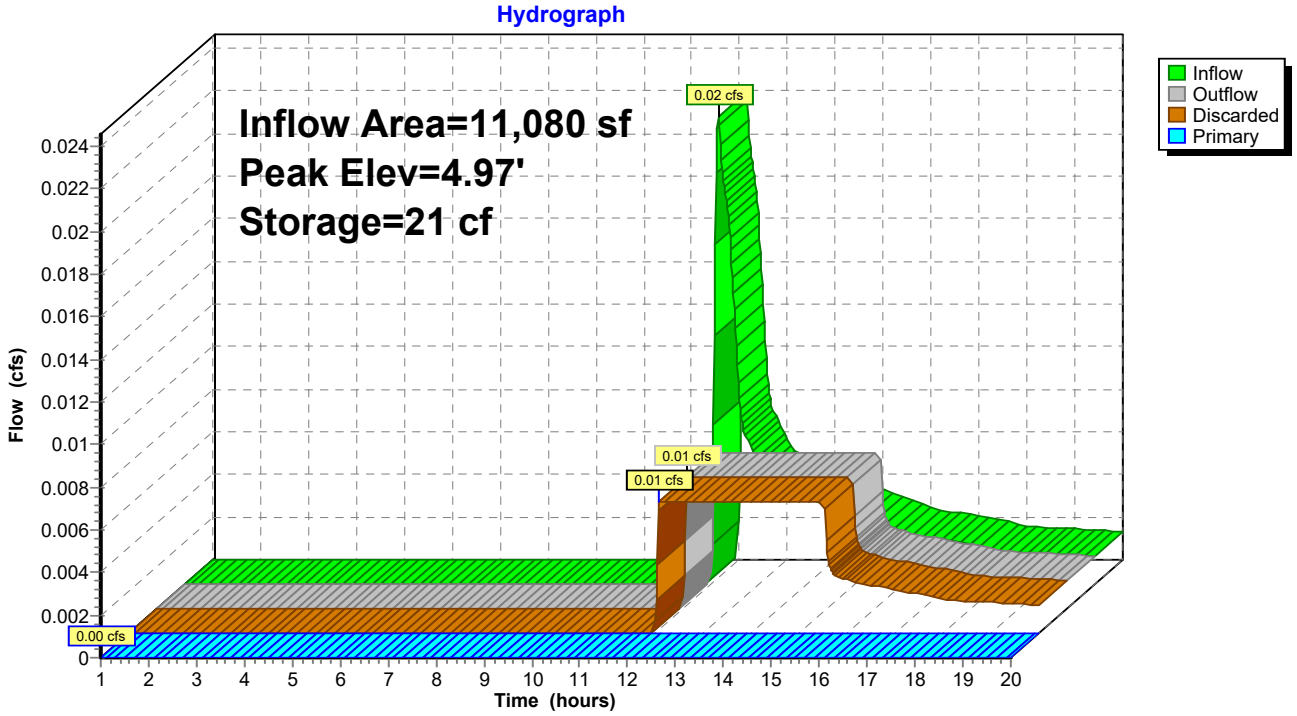
Volume	Invert	Avail.Storage	Storage Description
#1	4.30'	118 cf	**5.00'D x 6.00'H Vertical Cone/Cylinder**Inside #2 160 cf Overall - 5.0" Wall Thickness = 118 cf
#2	3.80'	26 cf	**6.40'D x 7.00'H Vertical Cone/Cylinder** 225 cf Overall - 160 cf Embedded = 65 cf x 40.0% Voids
		144 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	3.80'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**6.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.50' / 8.50' S= 0.0222 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 12.08 hrs HW=3.91' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=3.80' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Pond LCB-2: DRY WELL 2



Summary for Pond LCB-3: LCB-3

Inflow Area = 8,246 sf, 33.35% Impervious, Inflow Depth > 0.41" for 2-Year event
Inflow = 0.06 cfs @ 12.15 hrs, Volume= 280 cf
Outflow = 0.02 cfs @ 12.08 hrs, Volume= 279 cf, Atten= 67%, Lag= 0.0 min
Discarded = 0.02 cfs @ 12.08 hrs, Volume= 279 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Link POA-1 : Municipal Drainage System

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 7.14' @ 12.67 hrs Surf.Area= 101 sf Storage= 50 cf

Plug-Flow detention time= 17.5 min calculated for 279 cf (100% of inflow)
Center-of-Mass det. time= 16.9 min (875.8 - 858.9)

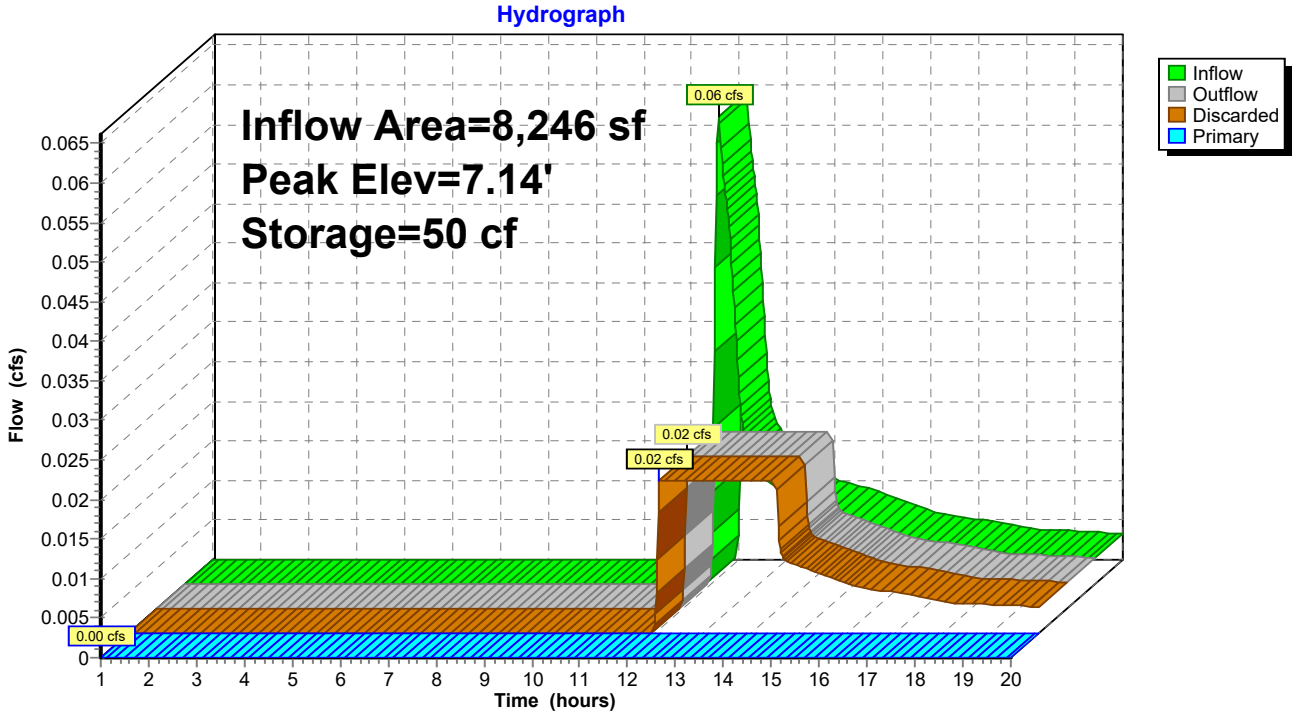
Volume	Invert	Avail.Storage	Storage Description
#1	7.00'	339 cf	**6.00'D x 6.00'H Vertical Cone/Cylinder**x 2 Inside #2 440 cf Overall - 5.0" Wall Thickness = 339 cf
#2	6.00'	105 cf	**8.00'D x 7.00'H Vertical Cone/Cylinder**x 2 704 cf Overall - 440 cf Embedded = 264 cf x 40.0% Voids
		445 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	11.50'	**6.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 11.50' / 10.00' S= 0.0750 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.02 cfs @ 12.08 hrs HW=6.09' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=6.00' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Pond LCB-3: LCB-3



Summary for Pond RAIN-1: RAIN GARDEN 1

Inflow Area = 4,336 sf, 14.83% Impervious, Inflow Depth > 0.11" for 2-Year event
Inflow = 0.00 cfs @ 12.51 hrs, Volume= 38 cf
Outflow = 0.00 cfs @ 12.53 hrs, Volume= 38 cf, Atten= 1%, Lag= 1.4 min
Discarded = 0.00 cfs @ 12.53 hrs, Volume= 38 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Link POA-1 : Municipal Drainage System

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 22.00' @ 12.53 hrs Surf.Area= 103 sf Storage= 0 cf

Plug-Flow detention time= 1.3 min calculated for 38 cf (100% of inflow)
Center-of-Mass det. time= 0.8 min (931.8 - 931.0)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	354 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

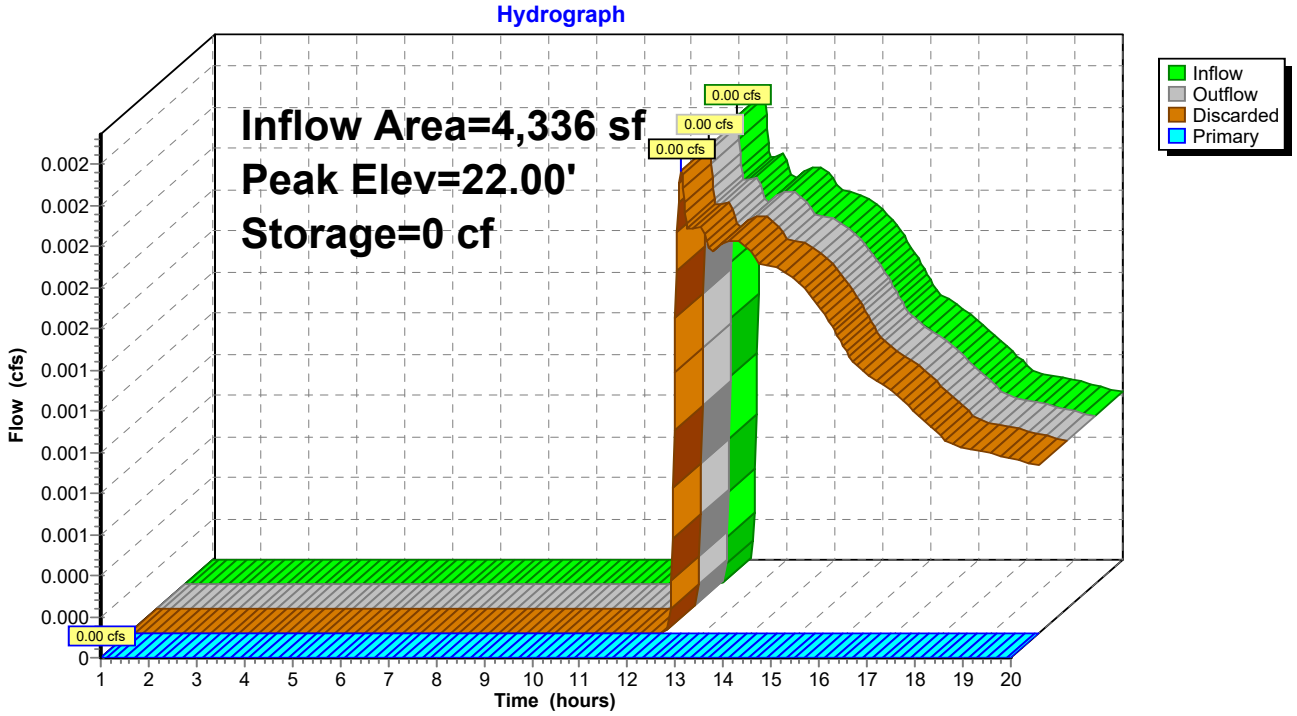
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	103	0	0
23.00	267	185	185
23.50	407	169	354

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**5.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.02 cfs @ 12.53 hrs HW=22.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=22.00' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond RAIN-1: RAIN GARDEN 1



Summary for Pond RAIN-2: RAIN GARDEN 2

Inflow Area = 19,177 sf, 13.51% Impervious, Inflow Depth > 0.09" for 2-Year event
Inflow = 0.01 cfs @ 13.73 hrs, Volume= 138 cf
Outflow = 0.01 cfs @ 13.78 hrs, Volume= 138 cf, Atten= 0%, Lag= 3.1 min
Discarded = 0.01 cfs @ 13.78 hrs, Volume= 138 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Link POA-2 : Overland to Onset Beach

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 19.01' @ 13.78 hrs Surf.Area= 223 sf Storage= 1 cf

Plug-Flow detention time= 3.0 min calculated for 137 cf (99% of inflow)
Center-of-Mass det. time= 1.9 min (944.7 - 942.8)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	4,606 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

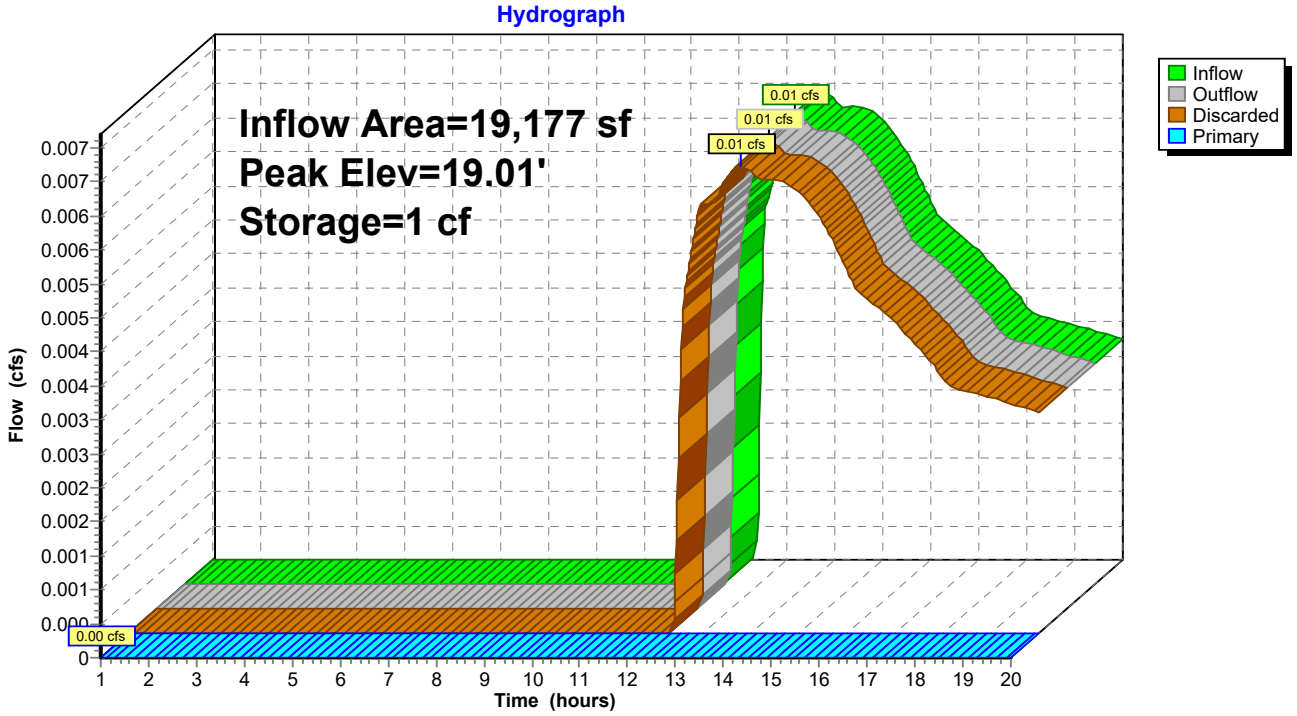
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	221	0	0
20.00	588	405	405
21.00	1,338	963	1,368
22.00	2,411	1,875	3,242
22.50	3,045	1,364	4,606

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	22.39'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.04 cfs @ 13.78 hrs HW=19.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=19.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond RAIN-2: RAIN GARDEN 2



Summary for Pond RAIN-3: RAIN GARDEN 3

Inflow Area = 4,445 sf, 29.99% Impervious, Inflow Depth > 0.34" for 2-Year event
Inflow = 0.02 cfs @ 12.14 hrs, Volume= 126 cf
Outflow = 0.02 cfs @ 12.17 hrs, Volume= 126 cf, Atten= 3%, Lag= 1.6 min
Discarded = 0.02 cfs @ 12.17 hrs, Volume= 126 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond DMH : PROP MH

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 10.01' @ 12.17 hrs Surf.Area= 198 sf Storage= 2 cf

Plug-Flow detention time= 1.3 min calculated for 126 cf (100% of inflow)
Center-of-Mass det. time= 1.0 min (867.2 - 866.3)

Volume	Invert	Avail.Storage	Storage Description
#1	10.00'	605 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

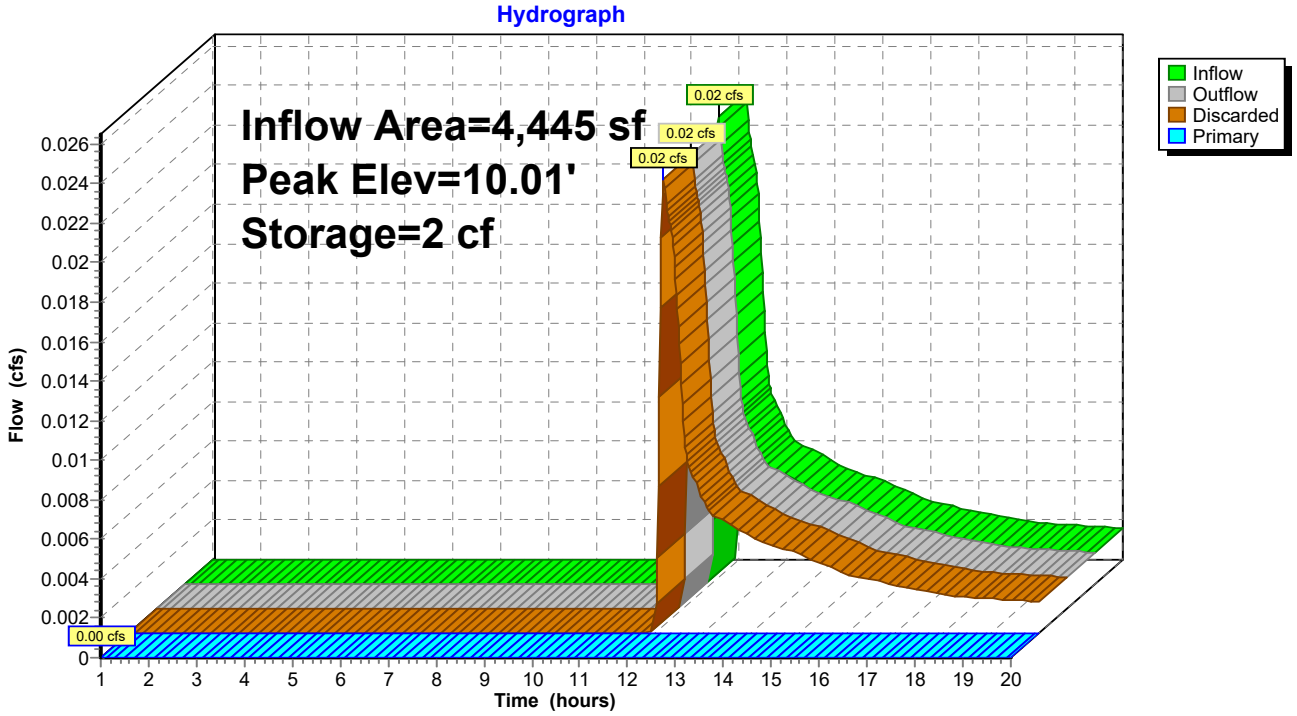
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	196	0	0
11.00	472	334	334
11.50	612	271	605

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	10.60'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	8.00'	**6.0" Round Culvert** L= 36.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 8.00' / 7.50' S= 0.0139 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#4	Primary	10.85'	**5.5' long + 3.0 '/' SideZ x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.04 cfs @ 12.17 hrs HW=10.01' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=10.00' (Free Discharge)
├**3=Culvert** (Passes 0.00 cfs of 0.99 cfs potential flow)
│└**2=Orifice/Grate** (Controls 0.00 cfs)
└**4=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond RAIN-3: RAIN GARDEN 3

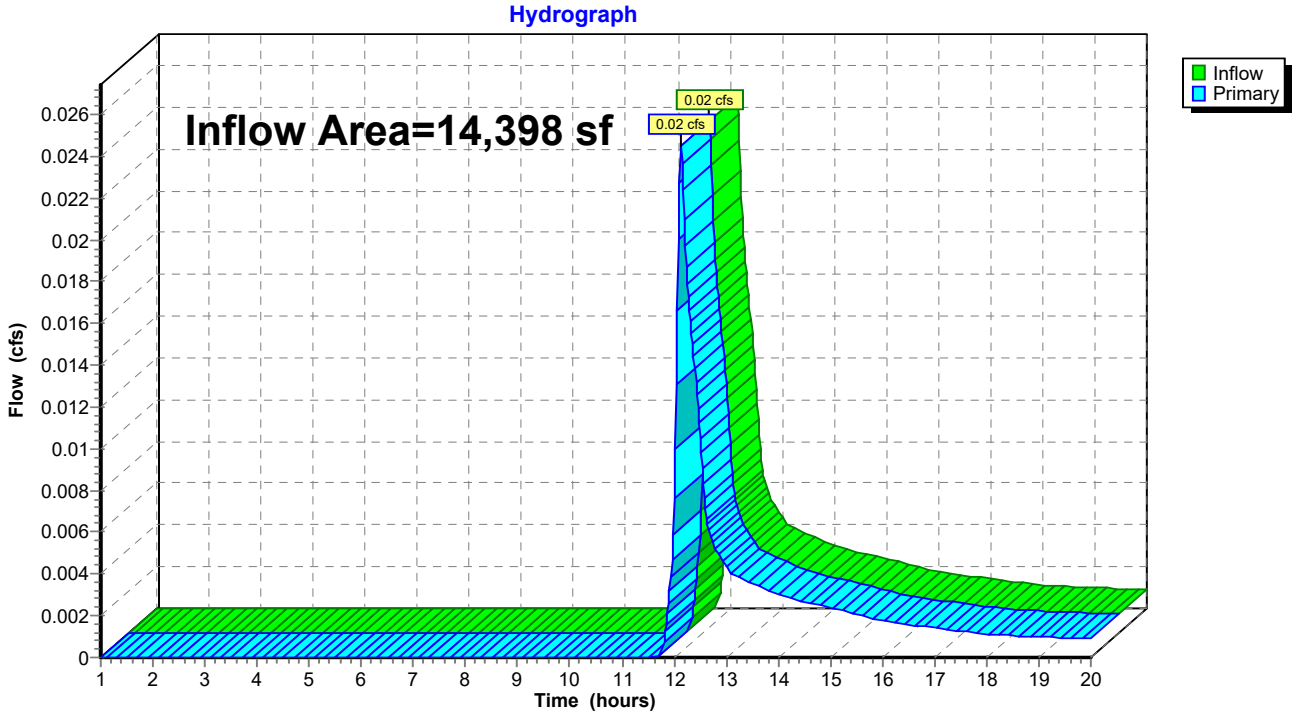


Summary for Link POA-1: Municipal Drainage System

Inflow Area = 14,398 sf, 28.99% Impervious, Inflow Depth > 0.08" for 2-Year event
Inflow = 0.02 cfs @ 12.13 hrs, Volume= 91 cf
Primary = 0.02 cfs @ 12.13 hrs, Volume= 91 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-1: Municipal Drainage System

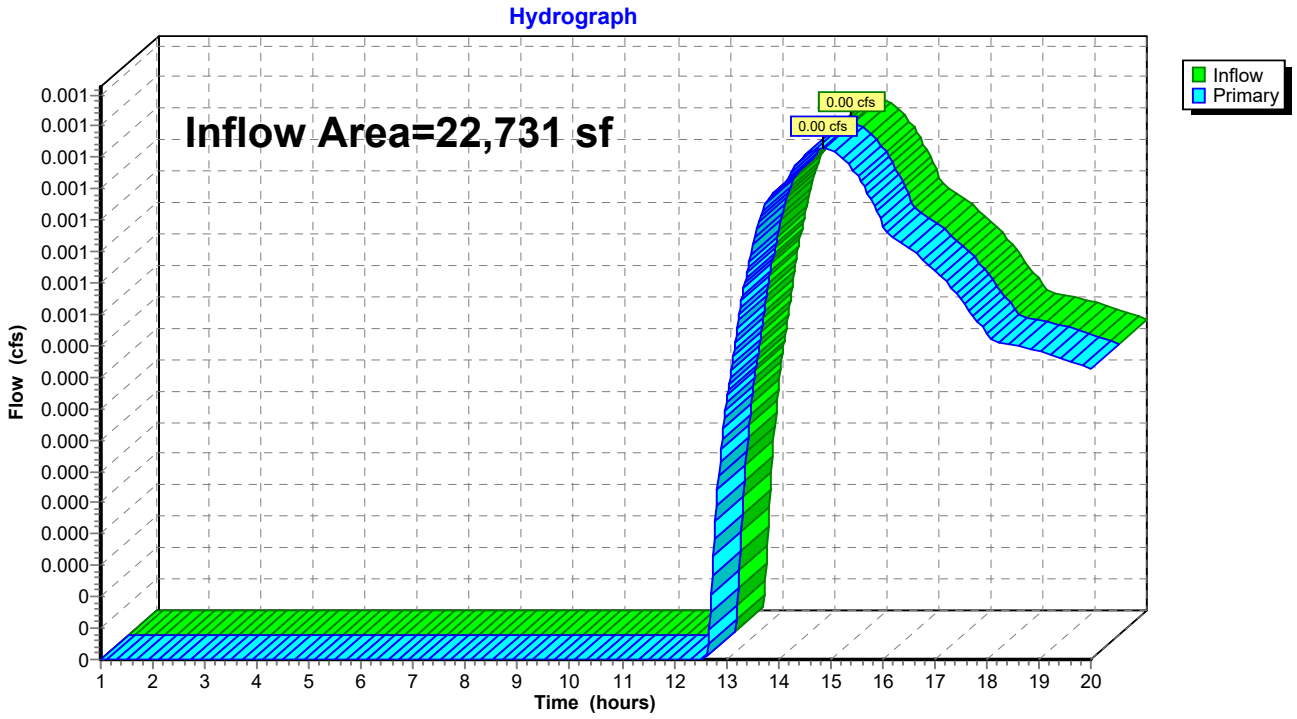


Summary for Link POA-2: Overland to Onset Beach

Inflow Area = 22,731 sf, 12.96% Impervious, Inflow Depth > 0.01" for 2-Year event
Inflow = 0.00 cfs @ 14.84 hrs, Volume= 16 cf
Primary = 0.00 cfs @ 14.84 hrs, Volume= 16 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-2: Overland to Onset Beach

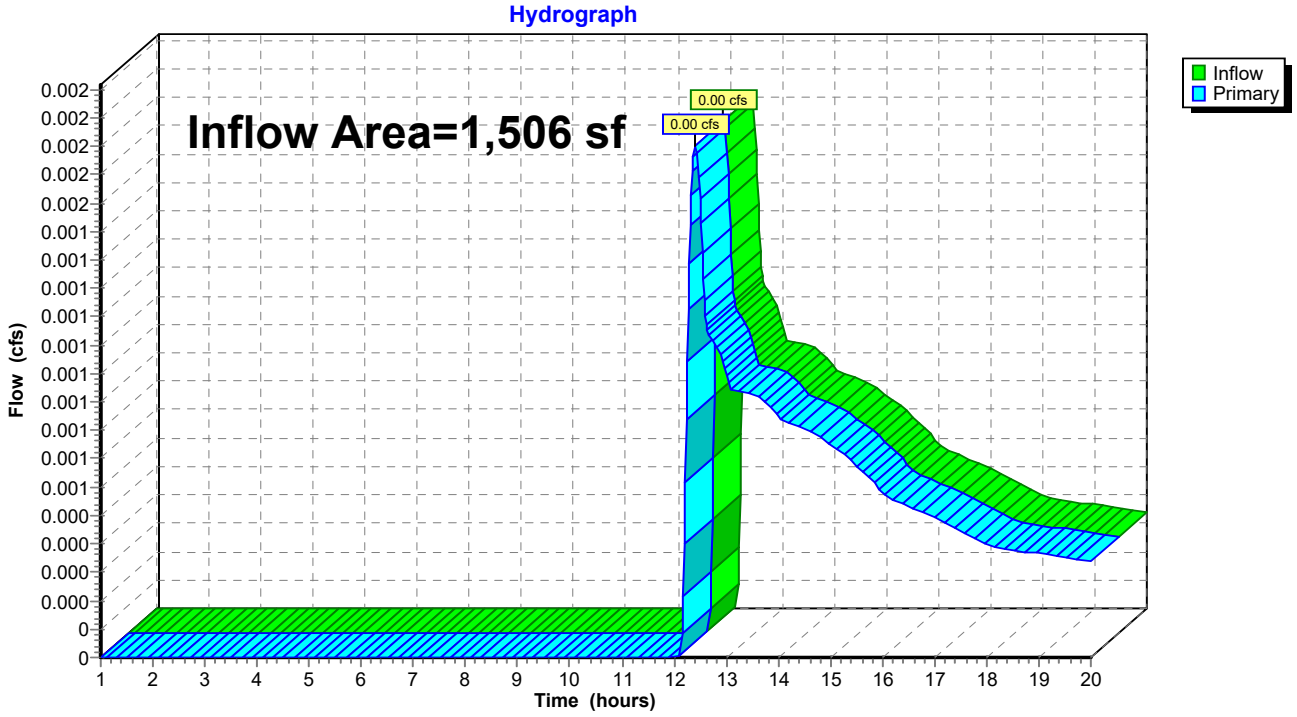


Summary for Link POA-3: Existing Leaching Chambers

Inflow Area = 1,506 sf, 18.59% Impervious, Inflow Depth > 0.15" for 2-Year event
Inflow = 0.00 cfs @ 12.41 hrs, Volume= 18 cf
Primary = 0.00 cfs @ 12.41 hrs, Volume= 18 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-3: Existing Leaching Chambers

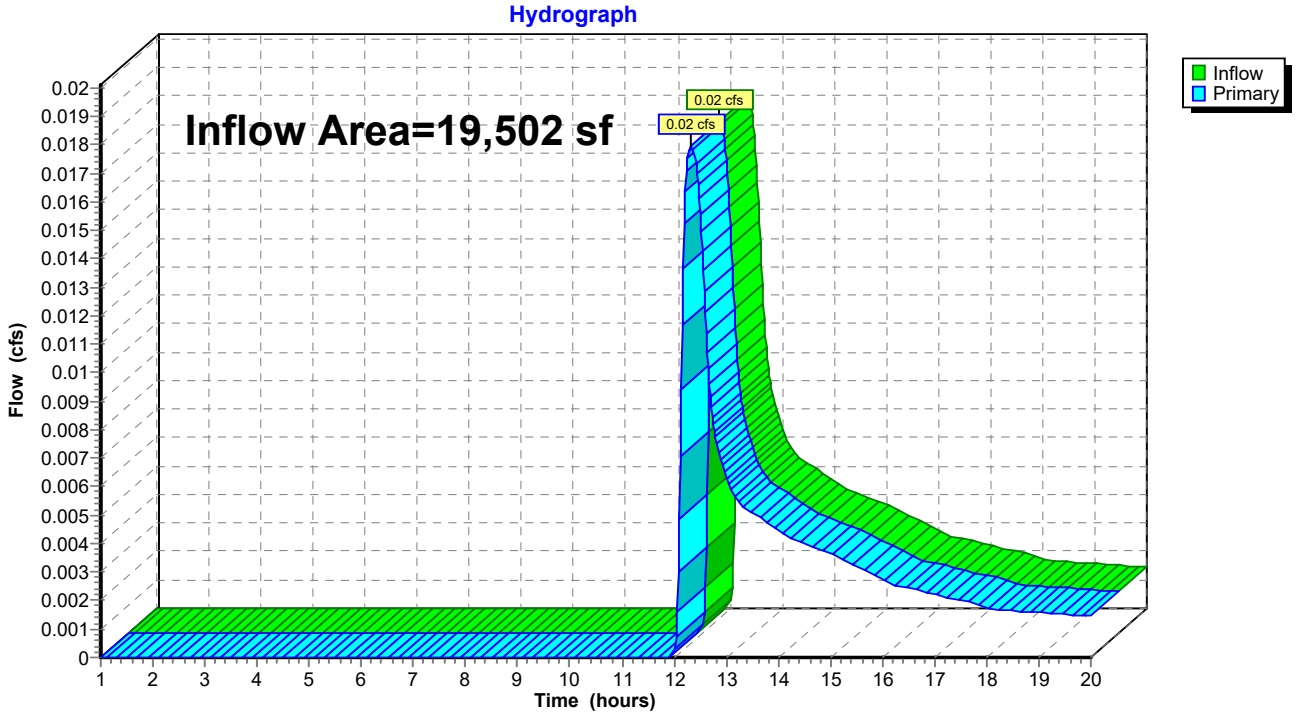


Summary for Link POA-4: Onset Pier Drainage

Inflow Area = 19,502 sf, 25.41% Impervious, Inflow Depth > 0.07" for 2-Year event
Inflow = 0.02 cfs @ 12.33 hrs, Volume= 112 cf
Primary = 0.02 cfs @ 12.33 hrs, Volume= 112 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-4: Onset Pier Drainage



Time span=1.00-20.00 hrs, dt=0.02 hrs, 951 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDA-1-1: Runoff Area=4,336 sf 14.83% Impervious Runoff Depth>0.52"
Flow Length=149' Tc=7.8 min CN=48 Runoff=0.03 cfs 188 cf

SubcatchmentDA-1-2: Runoff Area=1,816 sf 43.01% Impervious Runoff Depth>1.46"
Flow Length=80' Slope=0.0200 '/' Tc=7.9 min CN=64 Runoff=0.07 cfs 221 cf

SubcatchmentDA-1-3: Runoff Area=8,246 sf 33.35% Impervious Runoff Depth>1.13"
Flow Length=125' Tc=7.7 min CN=59 Runoff=0.23 cfs 777 cf

SubcatchmentDA-2-1: Runoff Area=19,177 sf 13.51% Impervious Runoff Depth>0.47"
Flow Length=132' Tc=8.1 min CN=47 Runoff=0.13 cfs 757 cf

SubcatchmentDA-2-2: Runoff Area=3,554 sf 9.96% Impervious Runoff Depth>0.39"
Tc=6.0 min CN=45 Runoff=0.02 cfs 114 cf

SubcatchmentDA-3: Runoff Area=1,506 sf 18.59% Impervious Runoff Depth>0.62"
Tc=6.0 min CN=50 Runoff=0.02 cfs 78 cf

SubcatchmentDA-4-1: Runoff Area=7,605 sf 16.31% Impervious Runoff Depth>0.57"
Flow Length=161' Tc=6.5 min CN=49 Runoff=0.08 cfs 361 cf

SubcatchmentDA-4-2: Runoff Area=3,475 sf 33.04% Impervious Runoff Depth>1.07"
Flow Length=169' Tc=6.6 min CN=58 Runoff=0.09 cfs 310 cf

SubcatchmentDA-4-3: Runoff Area=4,445 sf 29.99% Impervious Runoff Depth>1.01"
Tc=6.0 min CN=57 Runoff=0.11 cfs 374 cf

SubcatchmentDA-4-4: Runoff Area=3,977 sf 31.03% Impervious Runoff Depth>1.01"
Flow Length=160' Tc=12.9 min CN=57 Runoff=0.08 cfs 333 cf

Pond DMH: PROP MH Peak Elev=6.07' Inflow=0.02 cfs 105 cf
6.0" Round Culvert n=0.012 L=20.0' S=0.0650 '/' Outflow=0.02 cfs 105 cf

Pond LCB-1: DRY WELL 1 Peak Elev=16.06' Storage=126 cf Inflow=0.08 cfs 361 cf
Discarded=0.01 cfs 178 cf Primary=0.01 cfs 69 cf Outflow=0.02 cfs 247 cf

Pond LCB-2: DRY WELL 2 Peak Elev=9.58' Storage=122 cf Inflow=0.09 cfs 379 cf
Discarded=0.01 cfs 184 cf Primary=0.02 cfs 105 cf Outflow=0.02 cfs 289 cf

Pond LCB-3: LCB-3 Peak Elev=11.54' Storage=346 cf Inflow=0.23 cfs 777 cf
Discarded=0.02 cfs 575 cf Primary=0.01 cfs 12 cf Outflow=0.02 cfs 587 cf

Pond RAIN-1: RAIN GARDEN 1 Peak Elev=22.12' Storage=13 cf Inflow=0.03 cfs 188 cf
Discarded=0.02 cfs 188 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 188 cf

Pond RAIN-2: RAIN GARDEN 2 Peak Elev=19.33' Storage=94 cf Inflow=0.13 cfs 757 cf
Discarded=0.07 cfs 755 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 755 cf

Pond RAIN-3: RAIN GARDEN 3 Peak Elev=10.23' Storage=51 cf Inflow=0.11 cfs 374 cf
Discarded=0.05 cfs 373 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 373 cf

Link POA-1: Municipal Drainage System Inflow=0.07 cfs 233 cf
Primary=0.07 cfs 233 cf

Link POA-2: Overland to Onset Beach Inflow=0.02 cfs 114 cf
Primary=0.02 cfs 114 cf

Link POA-3: Existing Leaching Chambers Inflow=0.02 cfs 78 cf
Primary=0.02 cfs 78 cf

Link POA-4: Onset Pier Drainage Inflow=0.08 cfs 438 cf
Primary=0.08 cfs 438 cf

Total Runoff Area = 58,137 sf Runoff Volume = 3,514 cf Average Runoff Depth = 0.73"
78.75% Pervious = 45,783 sf 21.25% Impervious = 12,354 sf

Summary for Subcatchment DA-1-1:

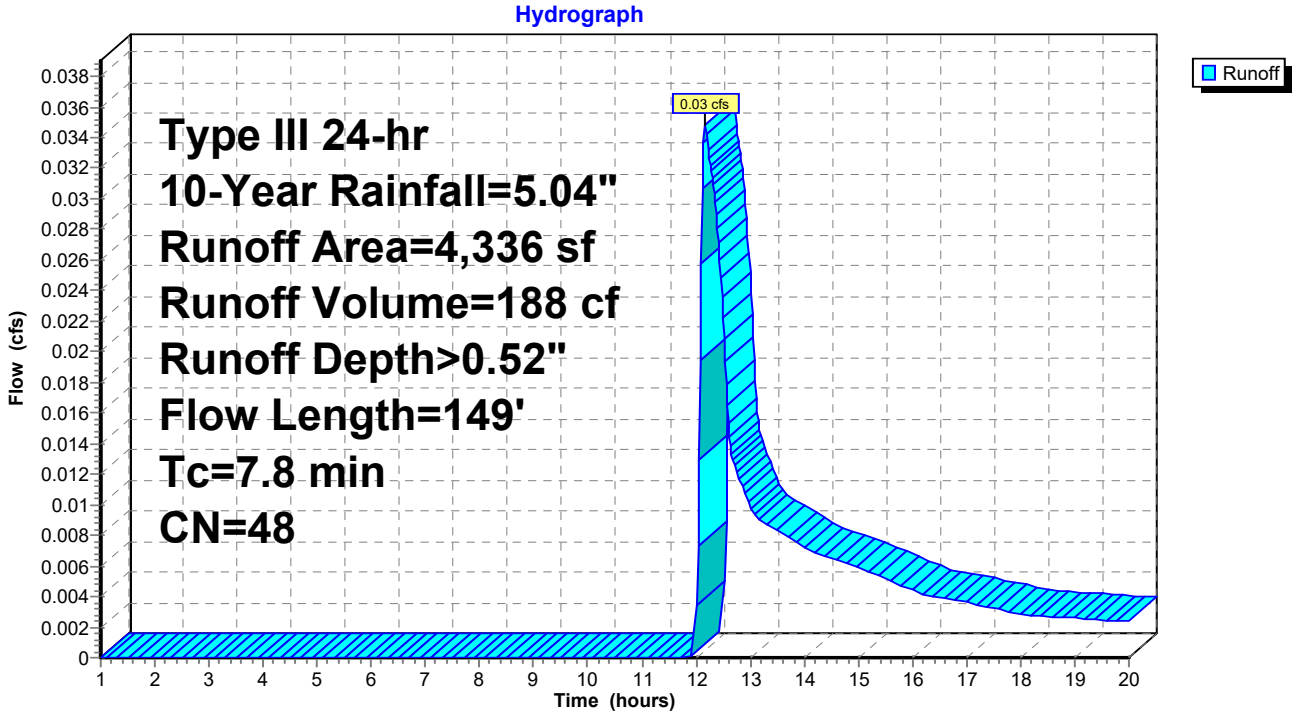
Runoff = 0.03 cfs @ 12.17 hrs, Volume= 188 cf, Depth> 0.52"
Routed to Pond RAIN-1 : RAIN GARDEN 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
3,693	39	>75% Grass cover, Good, HSG A
643	98	Paved parking, HSG A
4,336	48	Weighted Average
3,693		85.17% Pervious Area
643		14.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0350	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	49	0.0670	4.17		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	149	Total			

Subcatchment DA-1-1:



Summary for Subcatchment DA-1-2:

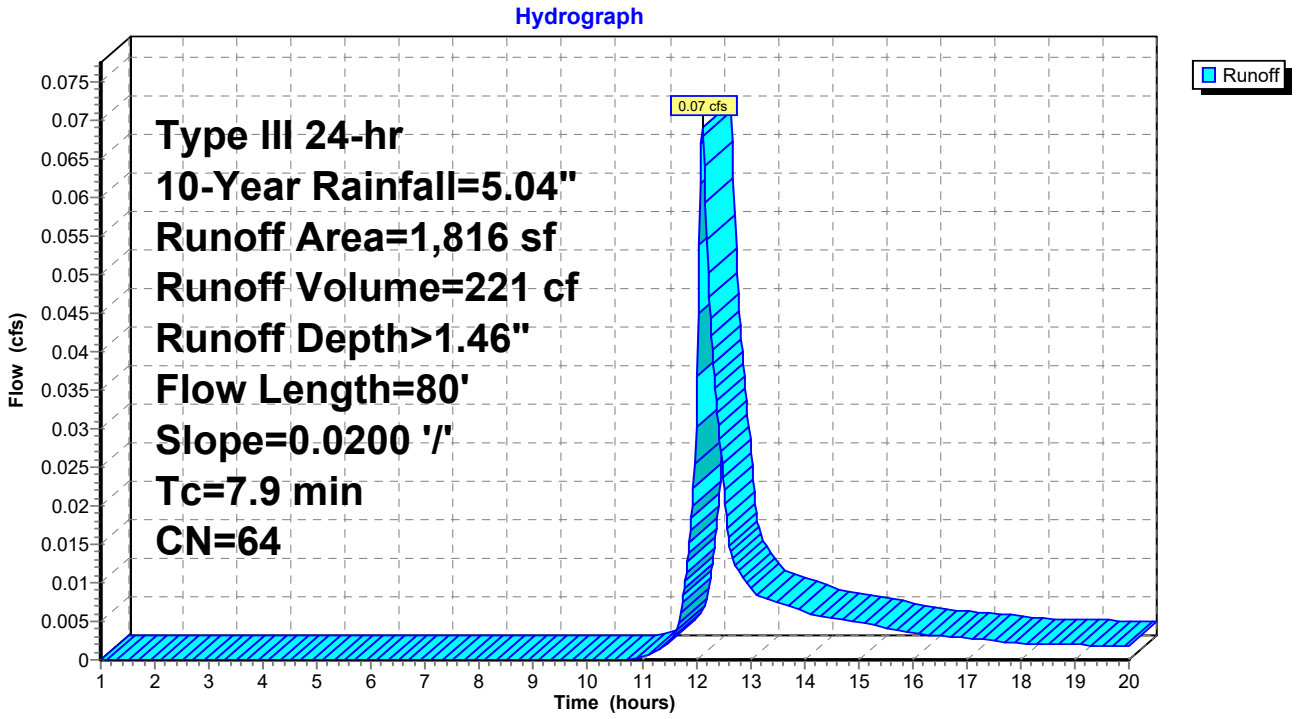
Runoff = 0.07 cfs @ 12.12 hrs, Volume= 221 cf, Depth> 1.46"
Routed to Link POA-1 : Municipal Drainage System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
1,035	39	>75% Grass cover, Good, HSG A
781	98	Paved parking, HSG A
1,816	64	Weighted Average
1,035		56.99% Pervious Area
781		43.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	80	0.0200	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"

Subcatchment DA-1-2:



Summary for Subcatchment DA-1-3:

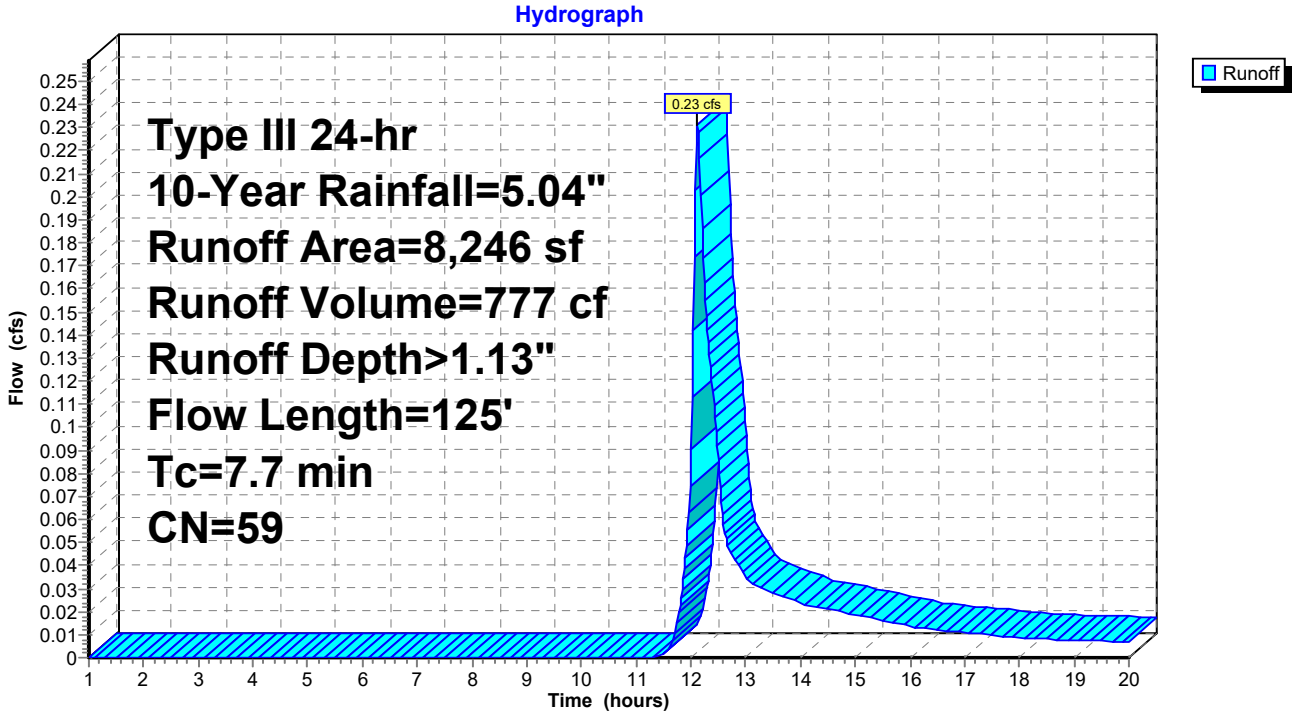
Runoff = 0.23 cfs @ 12.12 hrs, Volume= 777 cf, Depth> 1.13"
Routed to Pond LCB-3 : LCB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
5,496	39	>75% Grass cover, Good, HSG A
2,750	98	Paved parking, HSG A
8,246	59	Weighted Average
5,496		66.65% Pervious Area
2,750		33.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0350	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.1	25	0.0670	4.17		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.7	125	Total			

Subcatchment DA-1-3:



Summary for Subcatchment DA-2-1:

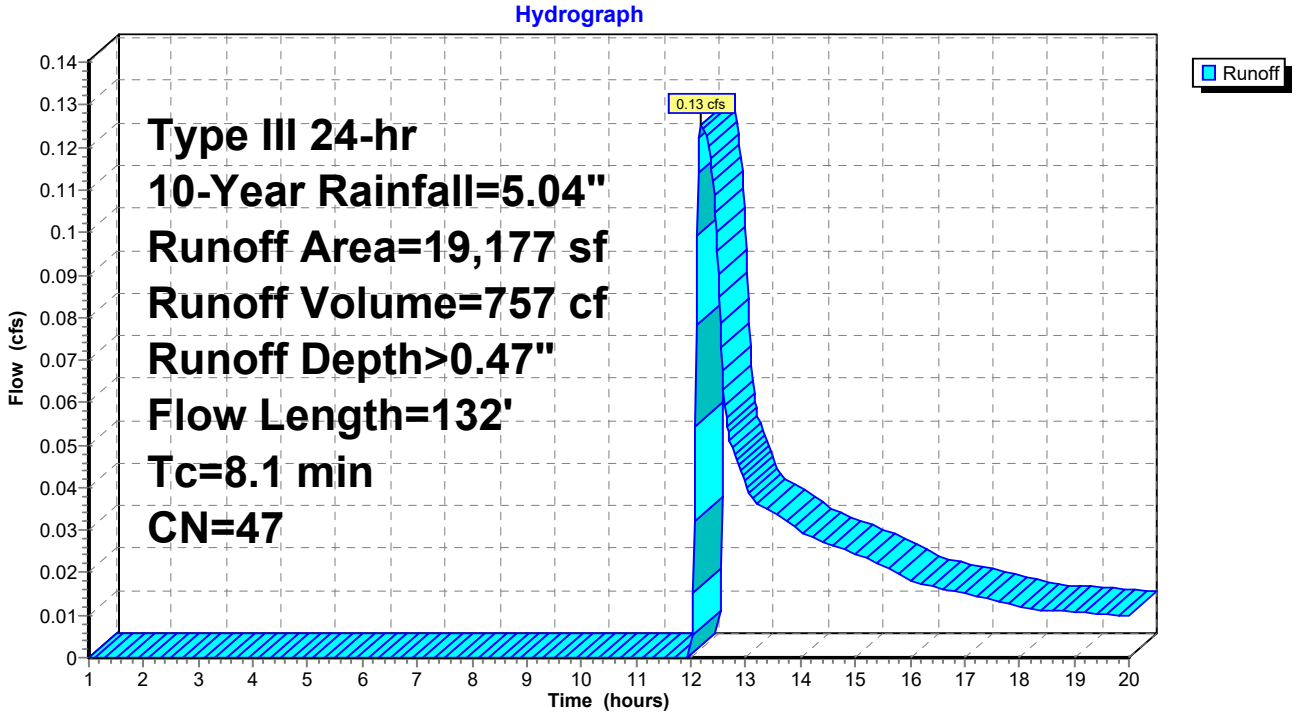
Runoff = 0.13 cfs @ 12.19 hrs, Volume= 757 cf, Depth> 0.47"
Routed to Pond RAIN-2 : RAIN GARDEN 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
16,586	39	>75% Grass cover, Good, HSG A
2,591	98	Paved parking, HSG A
19,177	47	Weighted Average
16,586		86.49% Pervious Area
2,591		13.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.1	32	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	132	Total			

Subcatchment DA-2-1:



Summary for Subcatchment DA-2-2:

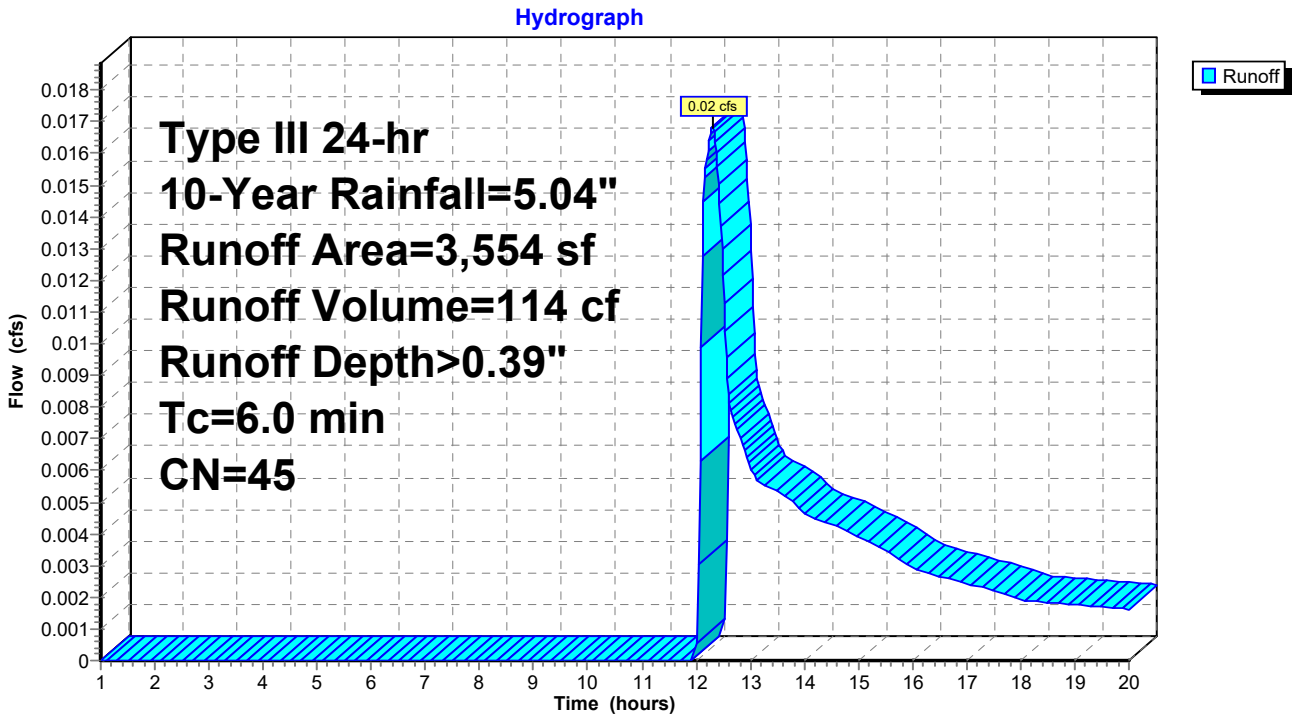
Runoff = 0.02 cfs @ 12.30 hrs, Volume= 114 cf, Depth> 0.39"
Routed to Link POA-2 : Overland to Onset Beach

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
3,200	39	>75% Grass cover, Good, HSG A
354	98	Paved parking, HSG A
3,554	45	Weighted Average
3,200		90.04% Pervious Area
354		9.96% Impervious Area

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

Subcatchment DA-2-2:



Summary for Subcatchment DA-3:

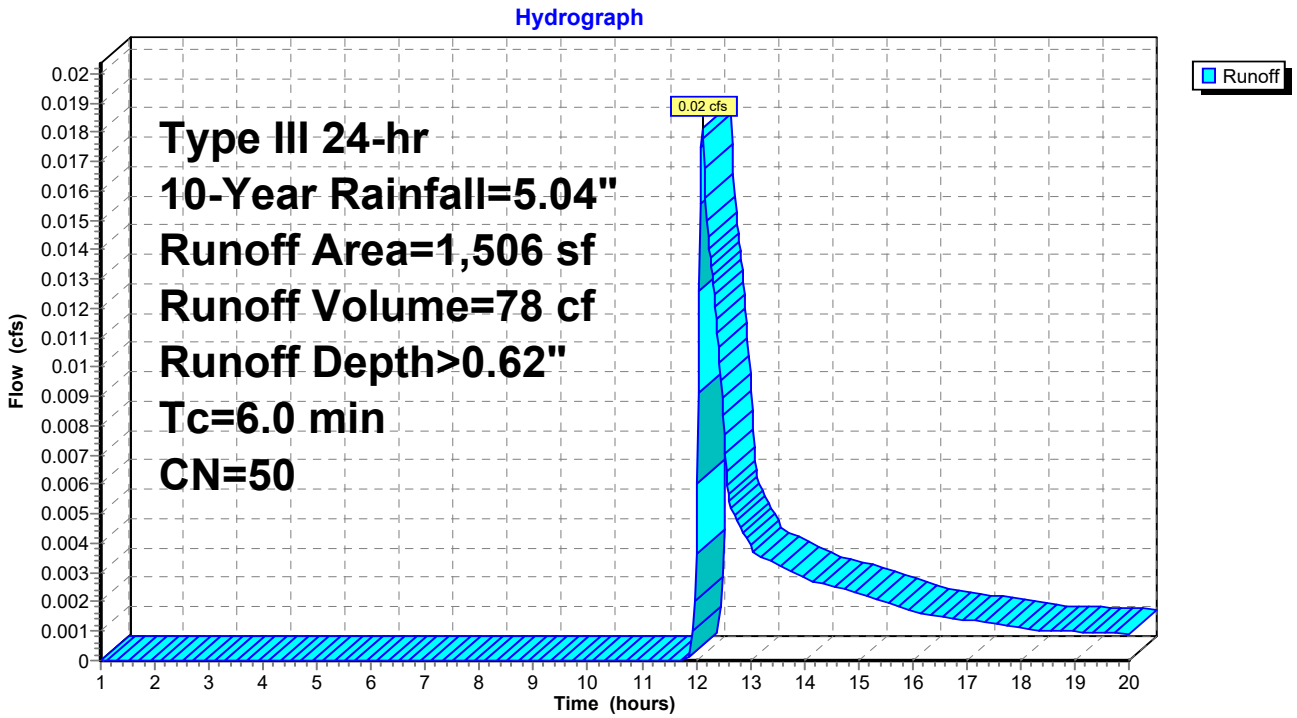
Runoff = 0.02 cfs @ 12.12 hrs, Volume= 78 cf, Depth> 0.62"
Routed to Link POA-3 : Existing Leaching Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
1,226	39	>75% Grass cover, Good, HSG A
280	98	Paved parking, HSG A
1,506	50	Weighted Average
1,226		81.41% Pervious Area
280		18.59% Impervious Area

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

Subcatchment DA-3:



Summary for Subcatchment DA-4-1:

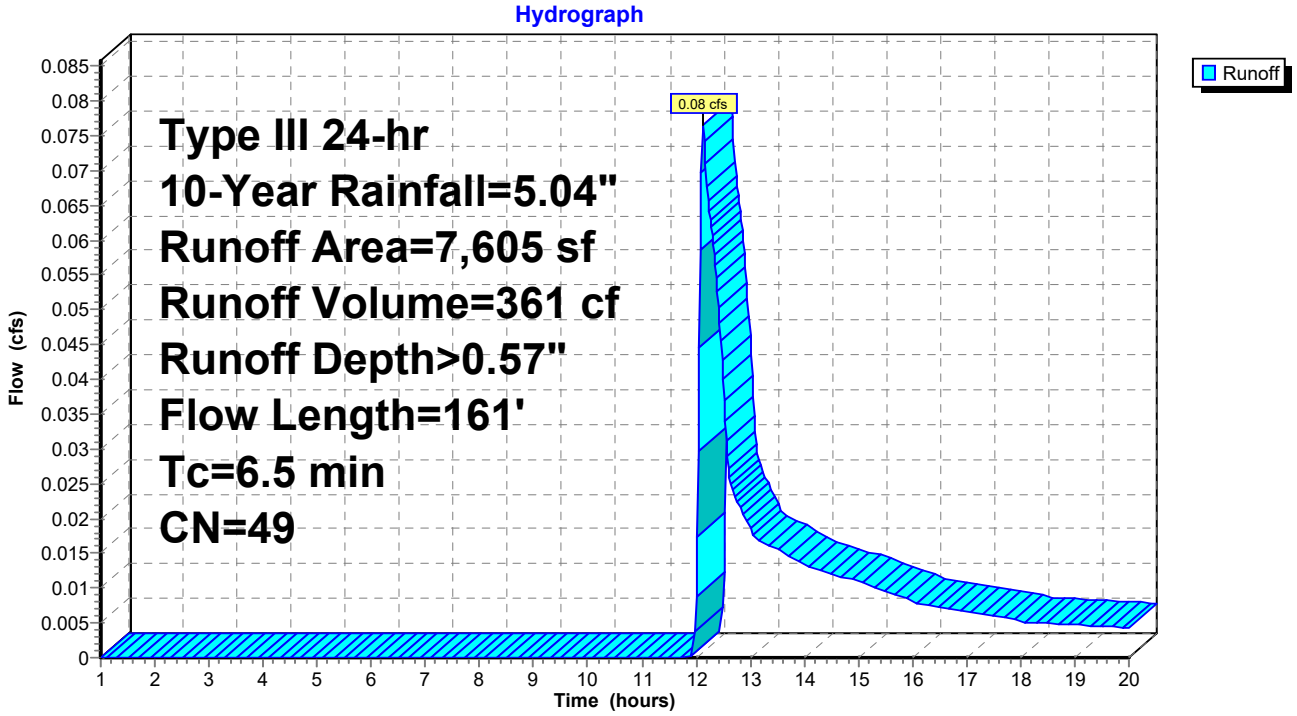
Runoff = 0.08 cfs @ 12.14 hrs, Volume= 361 cf, Depth> 0.57"
Routed to Pond LCB-1 : DRY WELL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
6,365	39	>75% Grass cover, Good, HSG A
1,240	98	Paved parking, HSG A
7,605	49	Weighted Average
6,365		83.69% Pervious Area
1,240		16.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.0650	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.6	61	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	161	Total			

Subcatchment DA-4-1:



Summary for Subcatchment DA-4-2:

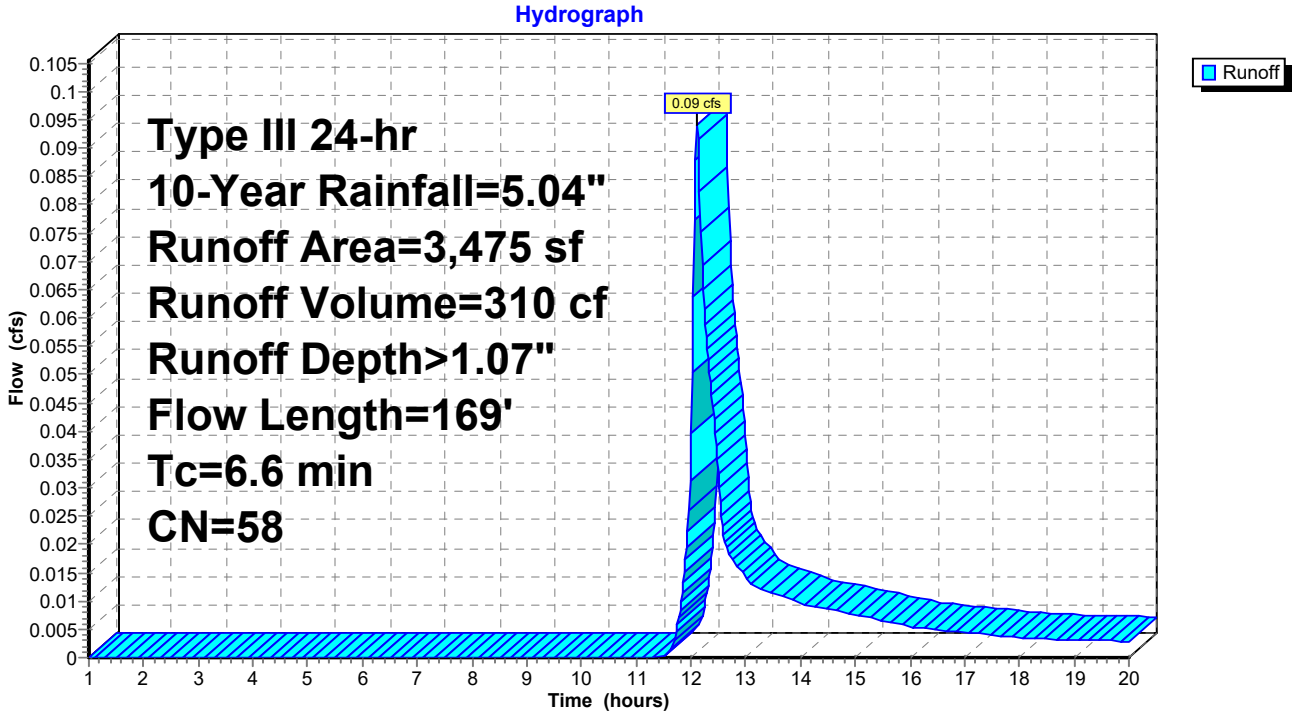
Runoff = 0.09 cfs @ 12.11 hrs, Volume= 310 cf, Depth> 1.07"
Routed to Pond LCB-2 : DRY WELL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
2,327	39	>75% Grass cover, Good, HSG A
1,148	98	Paved parking, HSG A
3,475	58	Weighted Average
2,327		66.96% Pervious Area
1,148		33.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	56	0.0450	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
1.8	46	0.2600	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.5	67	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	169	Total			

Subcatchment DA-4-2:



Summary for Subcatchment DA-4-3:

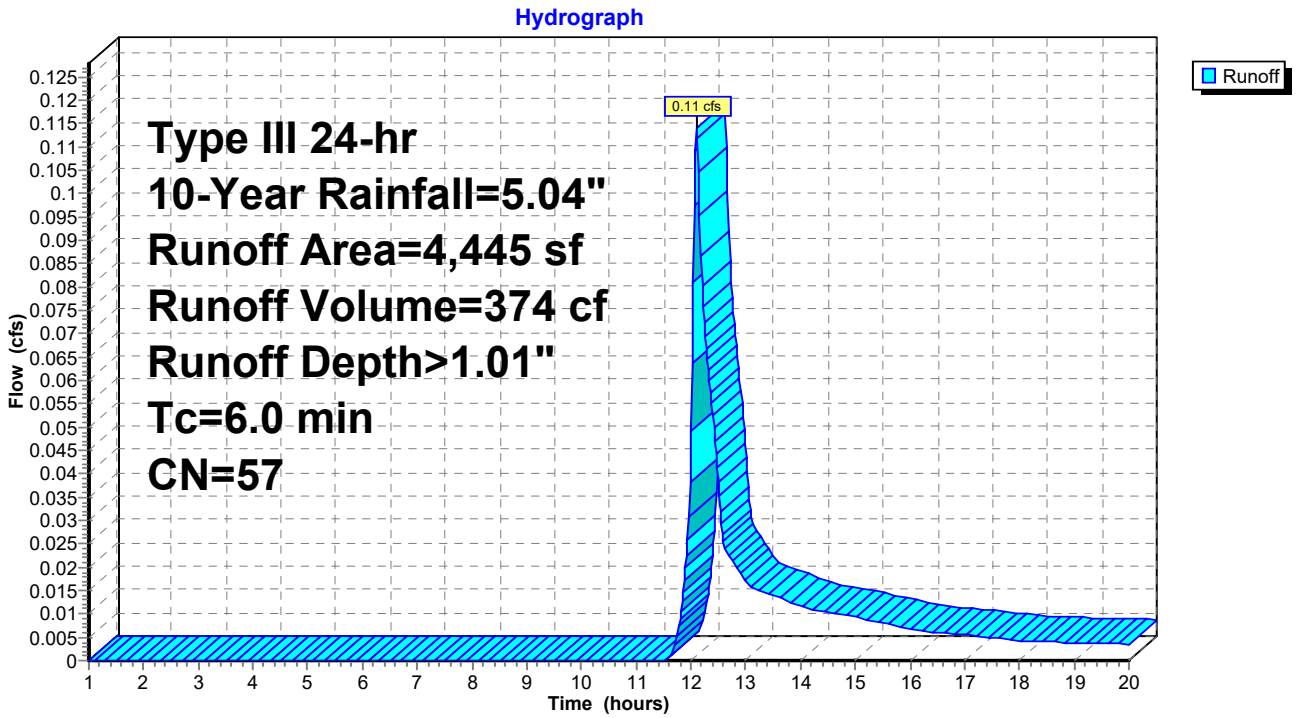
Runoff = 0.11 cfs @ 12.10 hrs, Volume= 374 cf, Depth> 1.01"
Routed to Pond RAIN-3 : RAIN GARDEN 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
3,112	39	>75% Grass cover, Good, HSG A
1,333	98	Paved parking, HSG A
4,445	57	Weighted Average
3,112		70.01% Pervious Area
1,333		29.99% Impervious Area

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

Subcatchment DA-4-3:



Summary for Subcatchment DA-4-4:

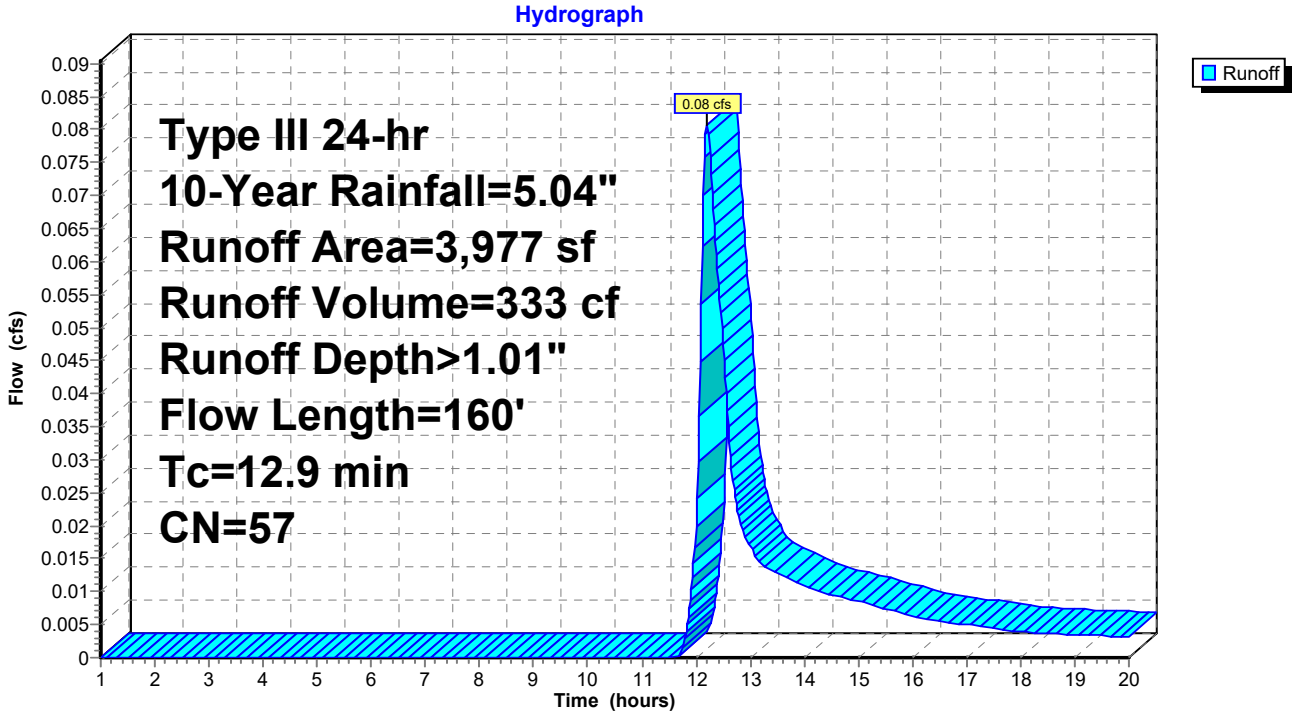
Runoff = 0.08 cfs @ 12.21 hrs, Volume= 333 cf, Depth> 1.01"
Routed to Link POA-4 : Onset Pier Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=5.04"

Area (sf)	CN	Description
2,743	39	>75% Grass cover, Good, HSG A
1,234	98	Paved parking, HSG A
3,977	57	Weighted Average
2,743		68.97% Pervious Area
1,234		31.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.4	60	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.9	160	Total			

Subcatchment DA-4-4:



Summary for Pond DMH: PROP MH

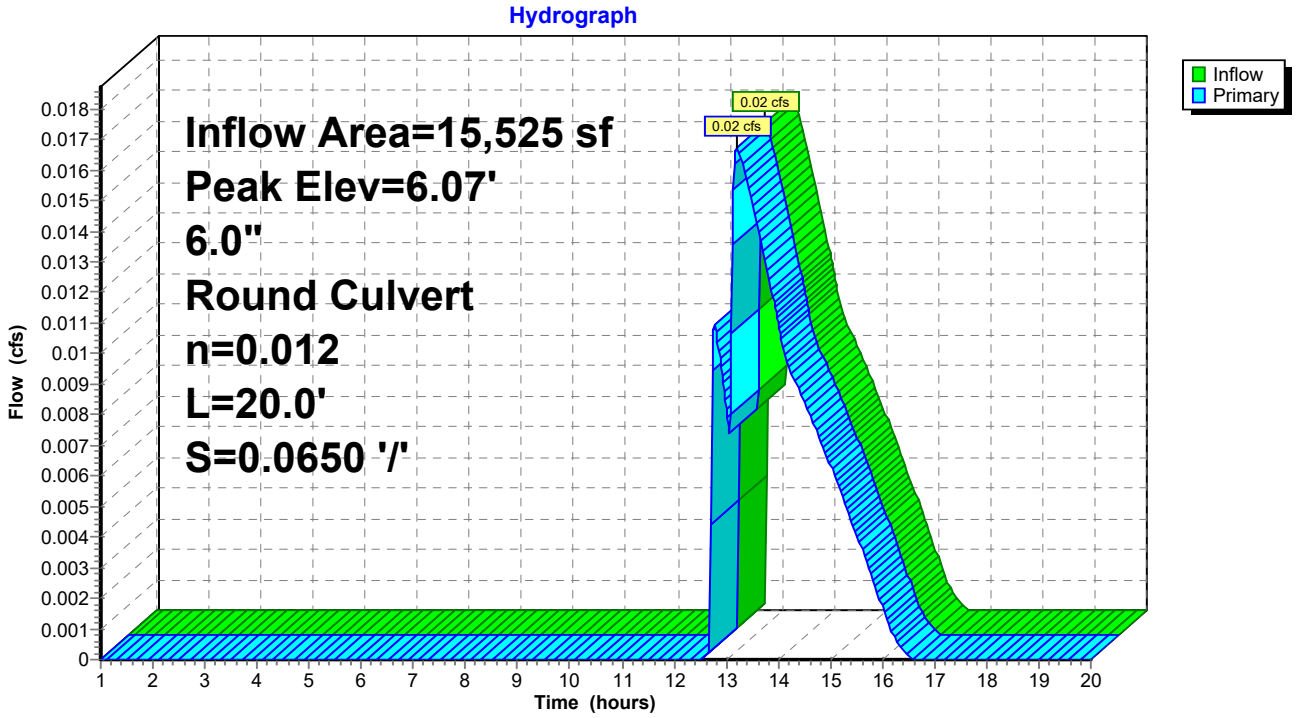
Inflow Area = 15,525 sf, 23.97% Impervious, Inflow Depth = 0.08" for 10-Year event
Inflow = 0.02 cfs @ 13.21 hrs, Volume= 105 cf
Outflow = 0.02 cfs @ 13.21 hrs, Volume= 105 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.02 cfs @ 13.21 hrs, Volume= 105 cf
Routed to Link POA-4 : Onset Pier Drainage

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 6.07' @ 13.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.00'	**6.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.00' / 4.70' S= 0.0650 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.02 cfs @ 13.21 hrs HW=6.07' (Free Discharge)
1=Culvert (Inlet Controls 0.02 cfs @ 0.93 fps)

Pond DMH: PROP MH



Summary for Pond LCB-1: DRY WELL 1

Inflow Area = 7,605 sf, 16.31% Impervious, Inflow Depth > 0.57" for 10-Year event
Inflow = 0.08 cfs @ 12.14 hrs, Volume= 361 cf
Outflow = 0.02 cfs @ 13.20 hrs, Volume= 247 cf, Atten= 78%, Lag= 63.7 min
Discarded = 0.01 cfs @ 12.02 hrs, Volume= 178 cf
Primary = 0.01 cfs @ 13.20 hrs, Volume= 69 cf
Routed to Pond LCB-2 : DRY WELL 2

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 16.06' @ 13.20 hrs Surf.Area= 32 sf Storage= 126 cf

Plug-Flow detention time= 150.5 min calculated for 247 cf (68% of inflow)
Center-of-Mass det. time= 72.5 min (932.7 - 860.2)

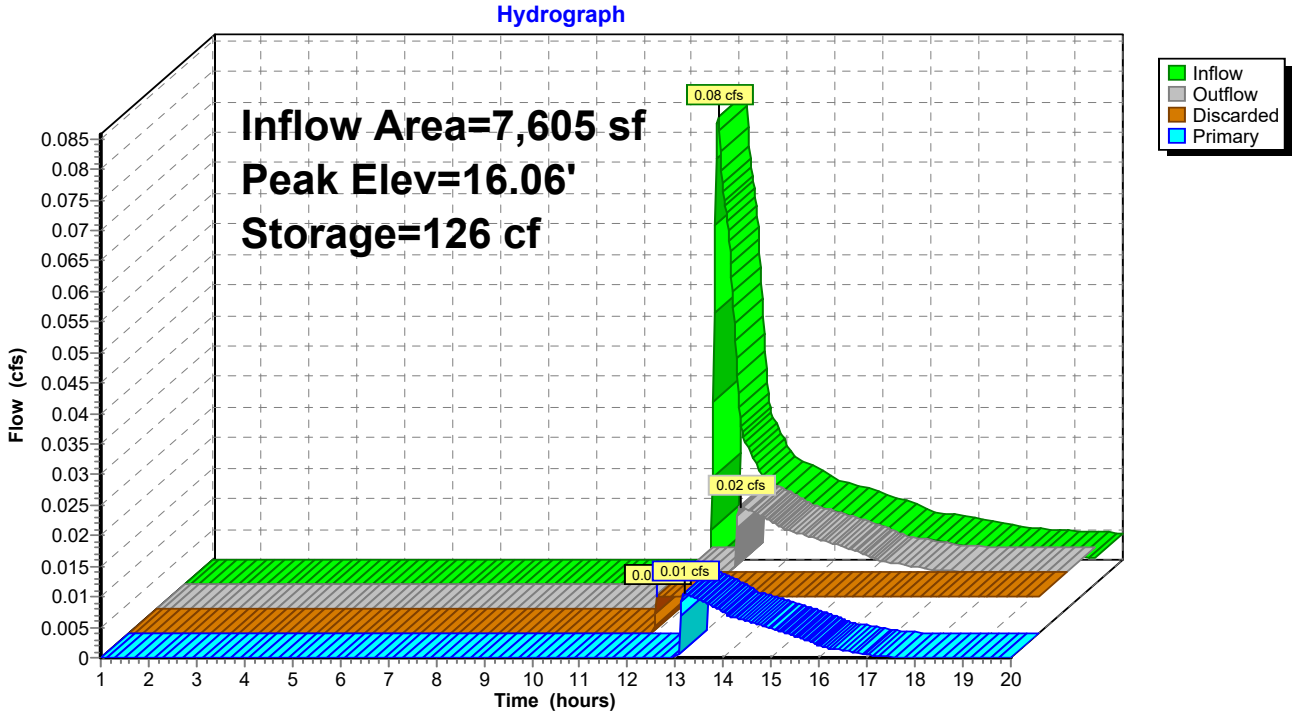
Volume	Invert	Avail.Storage	Storage Description
#1	10.56'	118 cf	**5.00'D x 6.00'H Vertical Cone/Cylinder**Inside #2 160 cf Overall - 5.0" Wall Thickness = 118 cf
#2	10.06'	26 cf	**6.40'D x 7.00'H Vertical Cone/Cylinder** 225 cf Overall - 160 cf Embedded = 65 cf x 40.0% Voids
		144 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.06'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	16.00'	**6.0" Round Culvert** L= 48.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.00' / 9.50' S= 0.1354 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 12.02 hrs HW=10.14' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.01 cfs @ 13.20 hrs HW=16.06' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 0.01 cfs @ 0.64 fps)

Pond LCB-1: DRY WELL 1



Summary for Pond LCB-2: DRY WELL 2

Inflow Area = 11,080 sf, 21.55% Impervious, Inflow Depth > 0.41" for 10-Year event
Inflow = 0.09 cfs @ 12.11 hrs, Volume= 379 cf
Outflow = 0.02 cfs @ 13.21 hrs, Volume= 289 cf, Atten= 76%, Lag= 65.8 min
Discarded = 0.01 cfs @ 11.80 hrs, Volume= 184 cf
Primary = 0.02 cfs @ 13.21 hrs, Volume= 105 cf
Routed to Pond DMH : PROP MH

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 9.58' @ 13.21 hrs Surf.Area= 32 sf Storage= 122 cf

Plug-Flow detention time= 128.8 min calculated for 289 cf (76% of inflow)
Center-of-Mass det. time= 73.2 min (911.3 - 838.1)

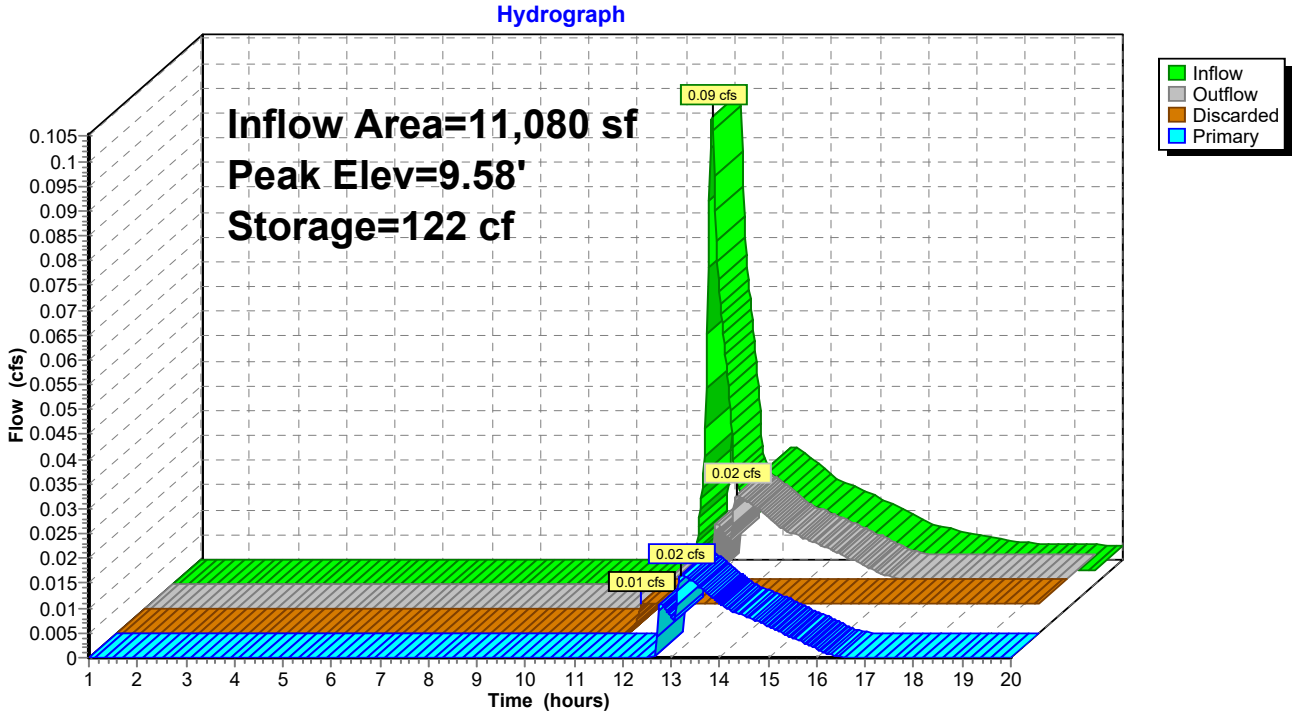
Volume	Invert	Avail.Storage	Storage Description
#1	4.30'	118 cf	**5.00'D x 6.00'H Vertical Cone/Cylinder**Inside #2 160 cf Overall - 5.0" Wall Thickness = 118 cf
#2	3.80'	26 cf	**6.40'D x 7.00'H Vertical Cone/Cylinder** 225 cf Overall - 160 cf Embedded = 65 cf x 40.0% Voids
		144 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	3.80'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**6.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.50' / 8.50' S= 0.0222 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 11.80 hrs HW=3.87' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.01 cfs @ 13.21 hrs HW=9.58' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 0.01 cfs @ 0.74 fps)

Pond LCB-2: DRY WELL 2



Summary for Pond LCB-3: LCB-3

Inflow Area = 8,246 sf, 33.35% Impervious, Inflow Depth > 1.13" for 10-Year event
Inflow = 0.23 cfs @ 12.12 hrs, Volume= 777 cf
Outflow = 0.02 cfs @ 13.95 hrs, Volume= 587 cf, Atten= 90%, Lag= 109.8 min
Discarded = 0.02 cfs @ 11.82 hrs, Volume= 575 cf
Primary = 0.01 cfs @ 13.95 hrs, Volume= 12 cf
Routed to Link POA-1 : Municipal Drainage System

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 11.54' @ 13.95 hrs Surf.Area= 101 sf Storage= 346 cf

Plug-Flow detention time= 181.7 min calculated for 587 cf (76% of inflow)
Center-of-Mass det. time= 118.4 min (949.5 - 831.1)

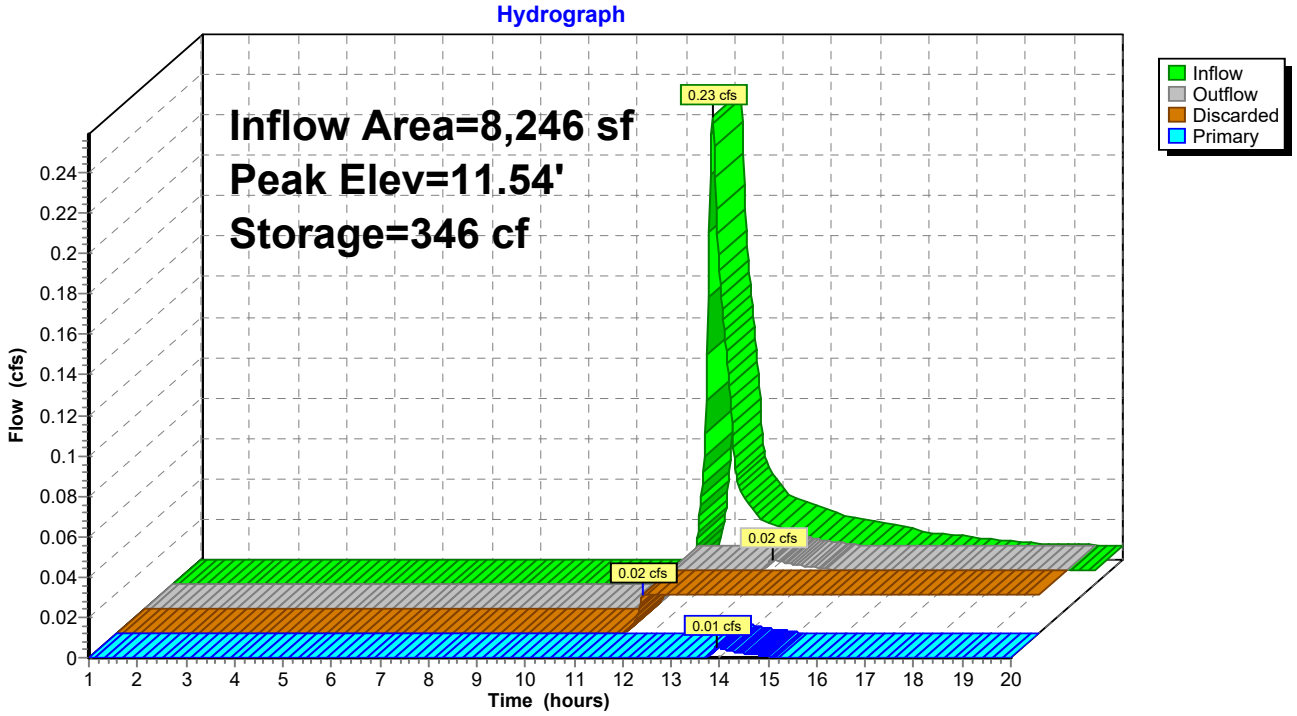
Volume	Invert	Avail.Storage	Storage Description
#1	7.00'	339 cf	**6.00'D x 6.00'H Vertical Cone/Cylinder**x 2 Inside #2 440 cf Overall - 5.0" Wall Thickness = 339 cf
#2	6.00'	105 cf	**8.00'D x 7.00'H Vertical Cone/Cylinder**x 2 704 cf Overall - 440 cf Embedded = 264 cf x 40.0% Voids
		445 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	11.50'	**6.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 11.50' / 10.00' S= 0.0750 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.02 cfs @ 11.82 hrs HW=6.07' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 13.95 hrs HW=11.54' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 0.00 cfs @ 0.53 fps)

Pond LCB-3: LCB-3



Summary for Pond RAIN-1: RAIN GARDEN 1

Inflow Area = 4,336 sf, 14.83% Impervious, Inflow Depth > 0.52" for 10-Year event
Inflow = 0.03 cfs @ 12.17 hrs, Volume= 188 cf
Outflow = 0.02 cfs @ 12.48 hrs, Volume= 188 cf, Atten= 33%, Lag= 19.0 min
Discarded = 0.02 cfs @ 12.48 hrs, Volume= 188 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Link POA-1 : Municipal Drainage System

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 22.12' @ 12.48 hrs Surf.Area= 122 sf Storage= 13 cf

Plug-Flow detention time= 3.0 min calculated for 188 cf (100% of inflow)
Center-of-Mass det. time= 2.7 min (868.0 - 865.3)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	354 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

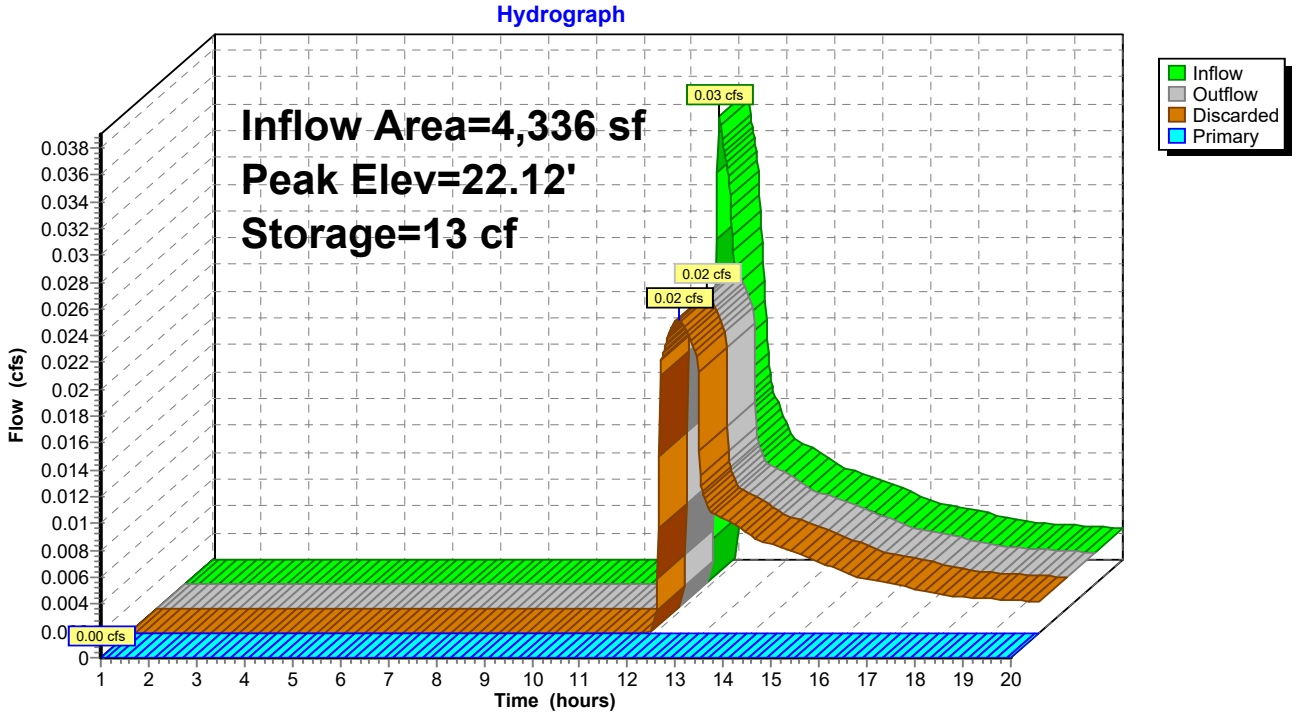
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	103	0	0
23.00	267	185	185
23.50	407	169	354

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**5.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.02 cfs @ 12.48 hrs HW=22.12' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=22.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond RAIN-1: RAIN GARDEN 1



Summary for Pond RAIN-2: RAIN GARDEN 2

Inflow Area = 19,177 sf, 13.51% Impervious, Inflow Depth > 0.47" for 10-Year event
Inflow = 0.13 cfs @ 12.19 hrs, Volume= 757 cf
Outflow = 0.07 cfs @ 12.59 hrs, Volume= 755 cf, Atten= 48%, Lag= 23.8 min
Discarded = 0.07 cfs @ 12.59 hrs, Volume= 755 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Link POA-2 : Overland to Onset Beach

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 19.33' @ 12.59 hrs Surf.Area= 343 sf Storage= 94 cf

Plug-Flow detention time= 9.5 min calculated for 755 cf (100% of inflow)
Center-of-Mass det. time= 8.7 min (878.7 - 870.0)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	4,606 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

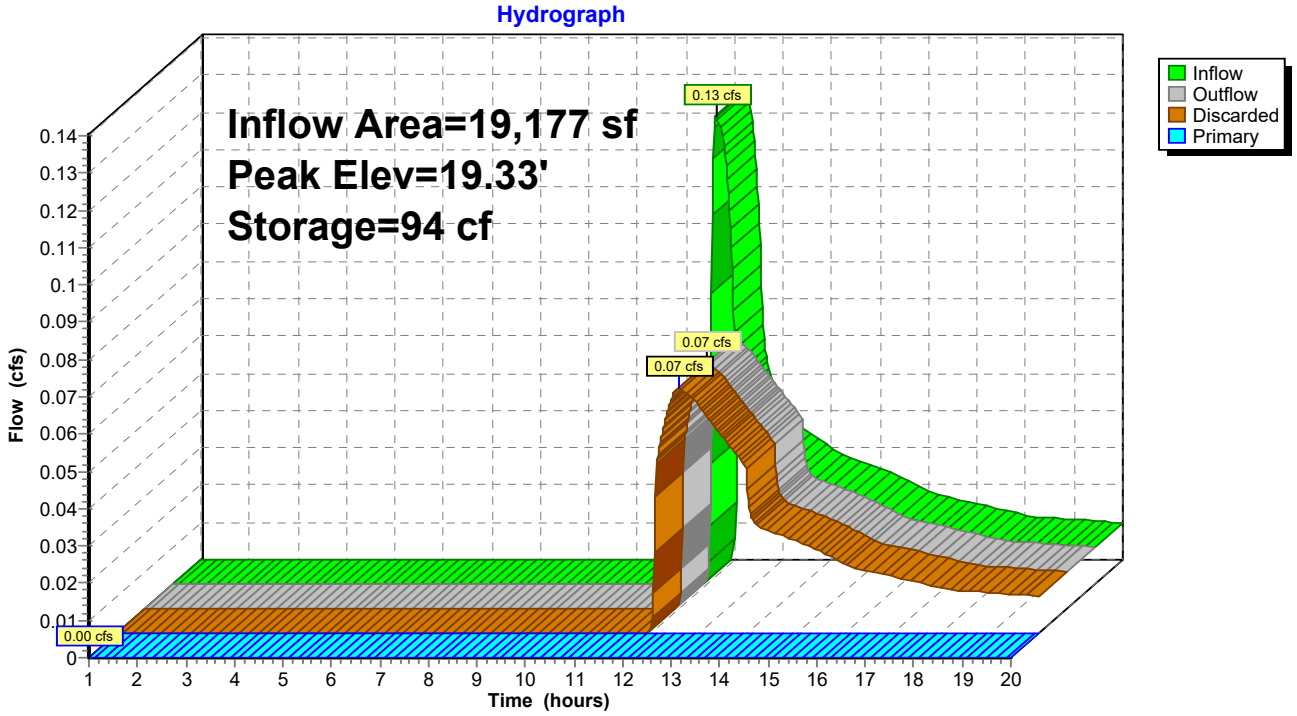
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	221	0	0
20.00	588	405	405
21.00	1,338	963	1,368
22.00	2,411	1,875	3,242
22.50	3,045	1,364	4,606

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	22.39'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.07 cfs @ 12.59 hrs HW=19.33' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=19.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond RAIN-2: RAIN GARDEN 2



Summary for Pond RAIN-3: RAIN GARDEN 3

Inflow Area = 4,445 sf, 29.99% Impervious, Inflow Depth > 1.01" for 10-Year event
Inflow = 0.11 cfs @ 12.10 hrs, Volume= 374 cf
Outflow = 0.05 cfs @ 12.42 hrs, Volume= 373 cf, Atten= 57%, Lag= 19.1 min
Discarded = 0.05 cfs @ 12.42 hrs, Volume= 373 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond DMH : PROP MH

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 10.23' @ 12.42 hrs Surf.Area= 258 sf Storage= 51 cf

Plug-Flow detention time= 6.2 min calculated for 373 cf (100% of inflow)
Center-of-Mass det. time= 5.9 min (840.6 - 834.7)

Volume	Invert	Avail.Storage	Storage Description
#1	10.00'	605 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

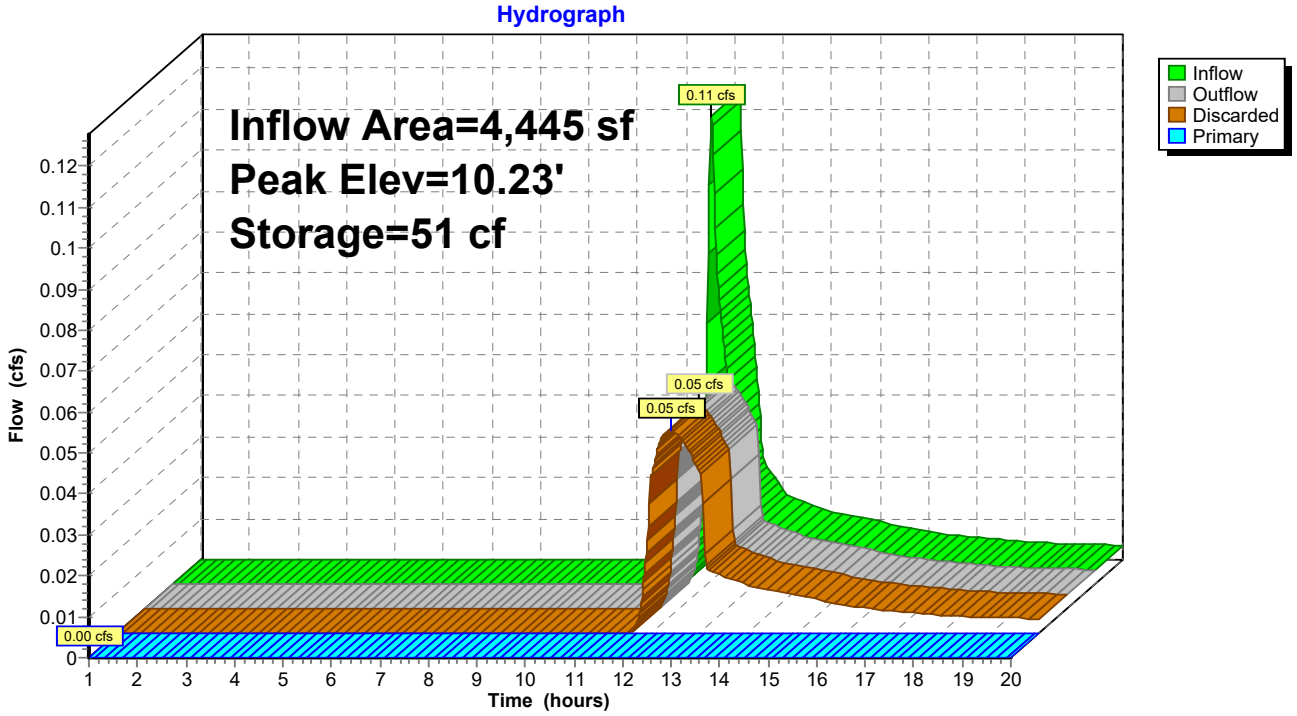
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	196	0	0
11.00	472	334	334
11.50	612	271	605

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	10.60'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	8.00'	**6.0" Round Culvert** L= 36.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 8.00' / 7.50' S= 0.0139 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#4	Primary	10.85'	**5.5' long + 3.0 '/' SideZ x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.05 cfs @ 12.42 hrs HW=10.23' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=10.00' (Free Discharge)
├**3=Culvert** (Passes 0.00 cfs of 0.99 cfs potential flow)
│└**2=Orifice/Grate** (Controls 0.00 cfs)
└**4=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond RAIN-3: RAIN GARDEN 3

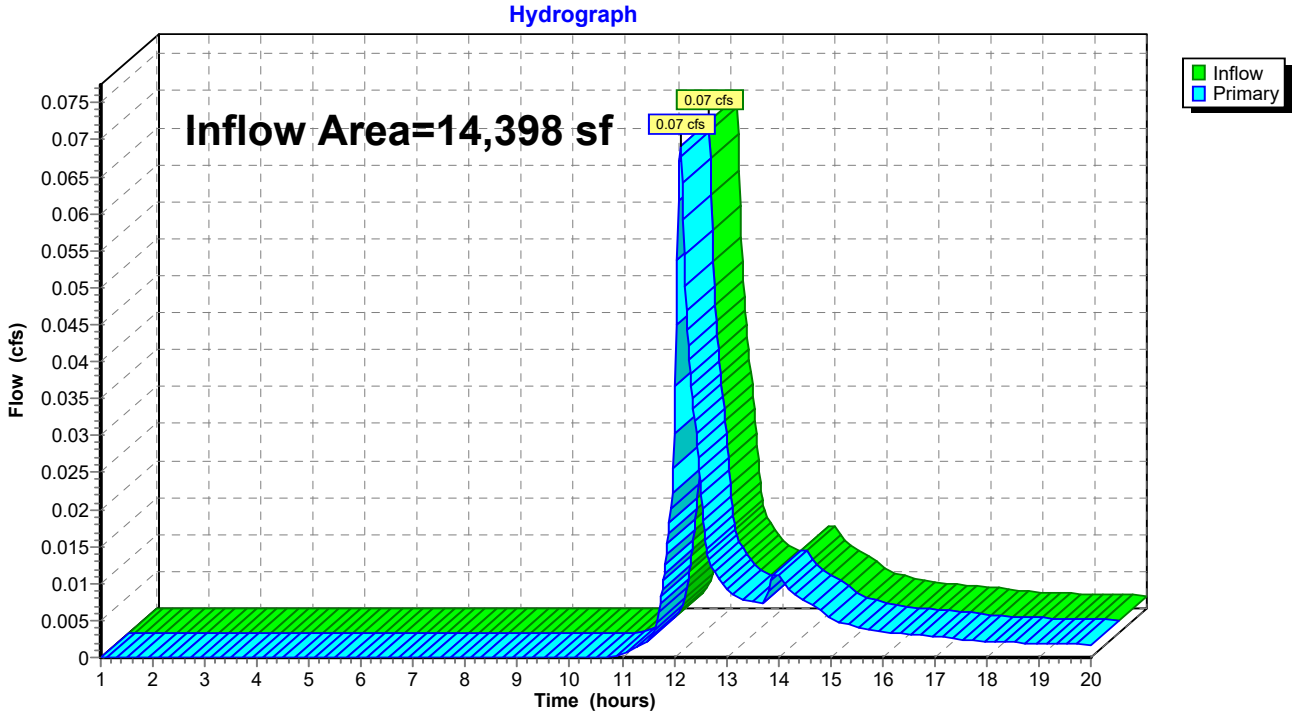


Summary for Link POA-1: Municipal Drainage System

Inflow Area = 14,398 sf, 28.99% Impervious, Inflow Depth > 0.19" for 10-Year event
Inflow = 0.07 cfs @ 12.12 hrs, Volume= 233 cf
Primary = 0.07 cfs @ 12.12 hrs, Volume= 233 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-1: Municipal Drainage System

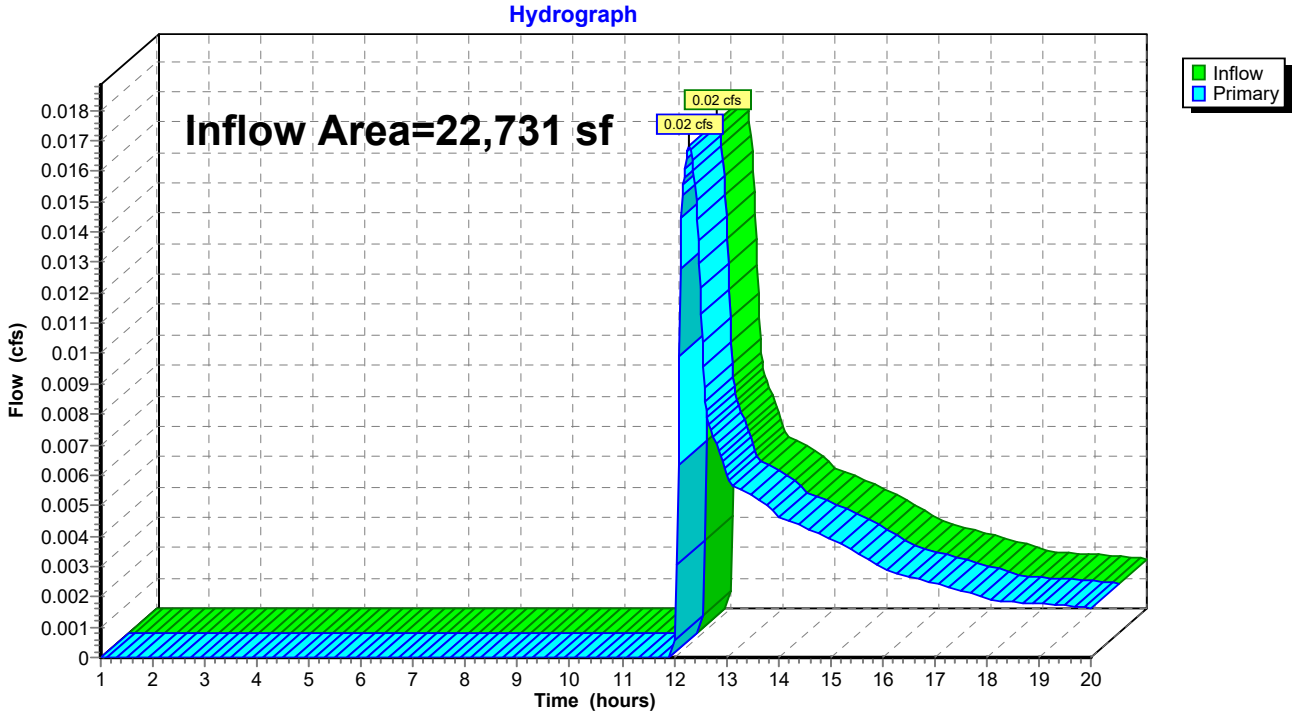


Summary for Link POA-2: Overland to Onset Beach

Inflow Area = 22,731 sf, 12.96% Impervious, Inflow Depth > 0.06" for 10-Year event
Inflow = 0.02 cfs @ 12.30 hrs, Volume= 114 cf
Primary = 0.02 cfs @ 12.30 hrs, Volume= 114 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-2: Overland to Onset Beach

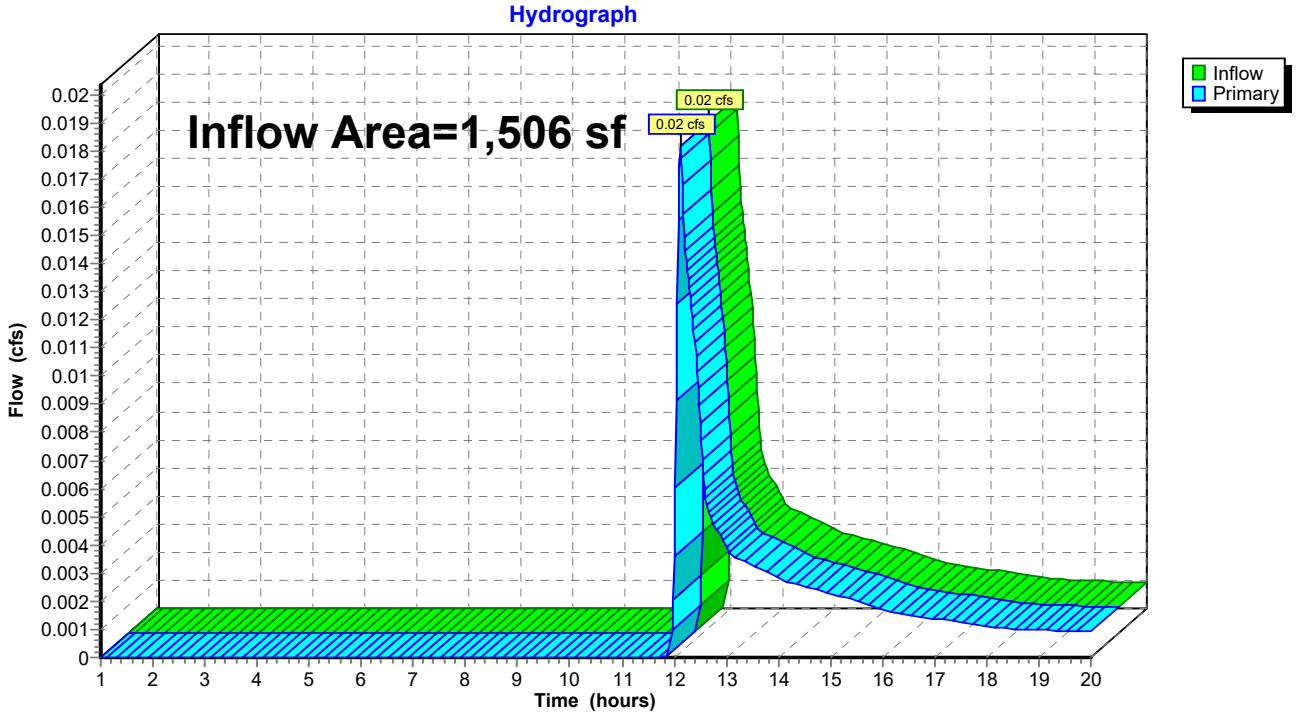


Summary for Link POA-3: Existing Leaching Chambers

Inflow Area = 1,506 sf, 18.59% Impervious, Inflow Depth > 0.62" for 10-Year event
Inflow = 0.02 cfs @ 12.12 hrs, Volume= 78 cf
Primary = 0.02 cfs @ 12.12 hrs, Volume= 78 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-3: Existing Leaching Chambers

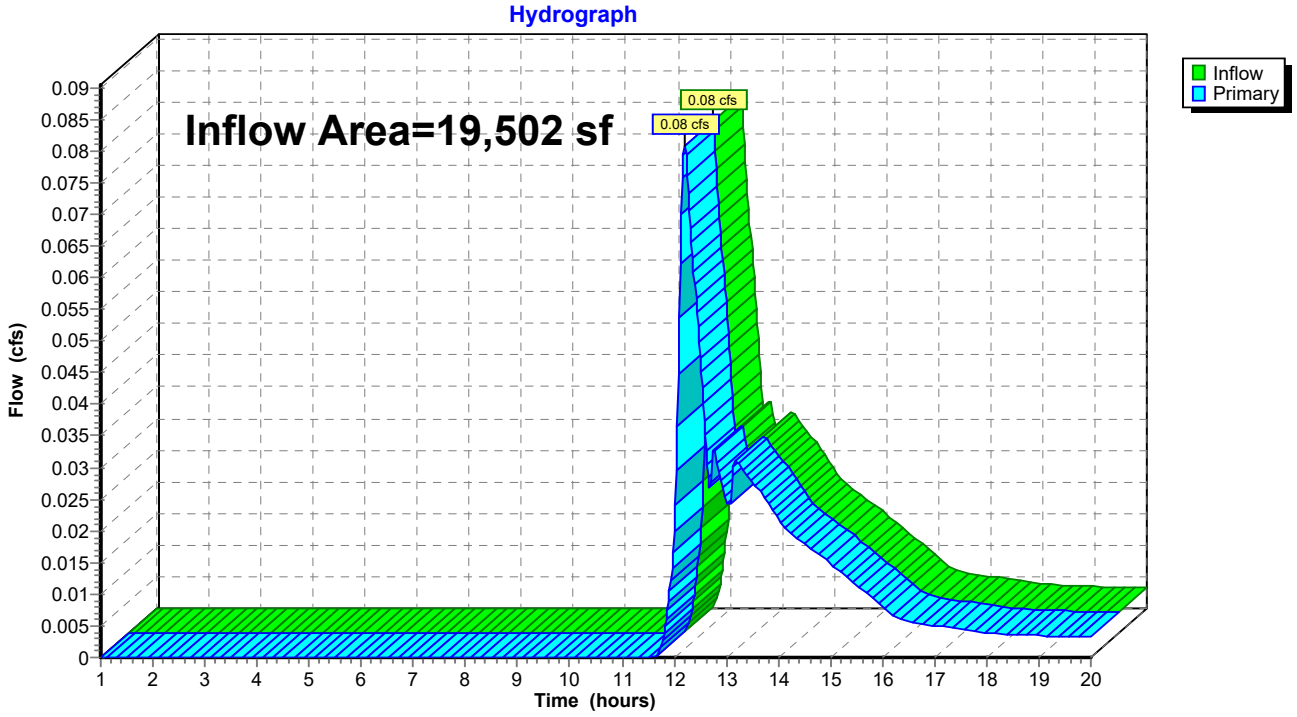


Summary for Link POA-4: Onset Pier Drainage

Inflow Area = 19,502 sf, 25.41% Impervious, Inflow Depth > 0.27" for 10-Year event
Inflow = 0.08 cfs @ 12.21 hrs, Volume= 438 cf
Primary = 0.08 cfs @ 12.21 hrs, Volume= 438 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-4: Onset Pier Drainage



Time span=1.00-20.00 hrs, dt=0.02 hrs, 951 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDA-1-1: Runoff Area=4,336 sf 14.83% Impervious Runoff Depth>1.61"
Flow Length=149' Tc=7.8 min CN=48 Runoff=0.17 cfs 583 cf

SubcatchmentDA-1-2: Runoff Area=1,816 sf 43.01% Impervious Runoff Depth>3.18"
Flow Length=80' Slope=0.0200 '/' Tc=7.9 min CN=64 Runoff=0.16 cfs 481 cf

SubcatchmentDA-1-3: Runoff Area=8,246 sf 33.35% Impervious Runoff Depth>2.67"
Flow Length=125' Tc=7.7 min CN=59 Runoff=0.59 cfs 1,834 cf

SubcatchmentDA-2-1: Runoff Area=19,177 sf 13.51% Impervious Runoff Depth>1.52"
Flow Length=132' Tc=8.1 min CN=47 Runoff=0.69 cfs 2,436 cf

SubcatchmentDA-2-2: Runoff Area=3,554 sf 9.96% Impervious Runoff Depth>1.35"
Tc=6.0 min CN=45 Runoff=0.12 cfs 400 cf

SubcatchmentDA-3: Runoff Area=1,506 sf 18.59% Impervious Runoff Depth>1.80"
Tc=6.0 min CN=50 Runoff=0.07 cfs 226 cf

SubcatchmentDA-4-1: Runoff Area=7,605 sf 16.31% Impervious Runoff Depth>1.71"
Flow Length=161' Tc=6.5 min CN=49 Runoff=0.34 cfs 1,082 cf

SubcatchmentDA-4-2: Runoff Area=3,475 sf 33.04% Impervious Runoff Depth>2.57"
Flow Length=169' Tc=6.6 min CN=58 Runoff=0.25 cfs 744 cf

SubcatchmentDA-4-3: Runoff Area=4,445 sf 29.99% Impervious Runoff Depth>2.47"
Tc=6.0 min CN=57 Runoff=0.31 cfs 916 cf

SubcatchmentDA-4-4: Runoff Area=3,977 sf 31.03% Impervious Runoff Depth>2.46"
Flow Length=160' Tc=12.9 min CN=57 Runoff=0.22 cfs 817 cf

Pond DMH: PROP MH Peak Elev=6.59' Inflow=0.55 cfs 1,268 cf
6.0" Round Culvert n=0.012 L=20.0' S=0.0650 '/' Outflow=0.55 cfs 1,268 cf

Pond LCB-1: DRY WELL 1 Peak Elev=16.45' Storage=135 cf Inflow=0.34 cfs 1,082 cf
Discarded=0.01 cfs 188 cf Primary=0.33 cfs 768 cf Outflow=0.34 cfs 956 cf

Pond LCB-2: DRY WELL 2 Peak Elev=10.30' Storage=137 cf Inflow=0.57 cfs 1,513 cf
Discarded=0.01 cfs 204 cf Primary=0.55 cfs 1,186 cf Outflow=0.56 cfs 1,390 cf

Pond LCB-3: LCB-3 Peak Elev=12.15' Storage=387 cf Inflow=0.59 cfs 1,834 cf
Discarded=0.02 cfs 635 cf Primary=0.47 cfs 889 cf Outflow=0.49 cfs 1,525 cf

Pond RAIN-1: RAIN GARDEN 1 Peak Elev=22.77' Storage=129 cf Inflow=0.17 cfs 583 cf
Discarded=0.04 cfs 556 cf Primary=0.04 cfs 27 cf Outflow=0.09 cfs 583 cf

Pond RAIN-2: RAIN GARDEN 2 Peak Elev=20.40' Storage=704 cf Inflow=0.69 cfs 2,436 cf
Discarded=0.17 cfs 2,432 cf Primary=0.00 cfs 0 cf Outflow=0.17 cfs 2,432 cf

Pond RAIN-3: RAIN GARDEN 3 Peak Elev=10.65' Storage=188 cf Inflow=0.31 cfs 916 cf
Discarded=0.07 cfs 833 cf Primary=0.09 cfs 82 cf Outflow=0.16 cfs 915 cf

Link POA-1: Municipal Drainage System Inflow=0.60 cfs 1,398 cf
Primary=0.60 cfs 1,398 cf

Link POA-2: Overland to Onset Beach Inflow=0.12 cfs 400 cf
Primary=0.12 cfs 400 cf

Link POA-3: Existing Leaching Chambers Inflow=0.07 cfs 226 cf
Primary=0.07 cfs 226 cf

Link POA-4: Onset Pier Drainage Inflow=0.75 cfs 2,085 cf
Primary=0.75 cfs 2,085 cf

Total Runoff Area = 58,137 sf Runoff Volume = 9,519 cf Average Runoff Depth = 1.96"
78.75% Pervious = 45,783 sf 21.25% Impervious = 12,354 sf

Summary for Subcatchment DA-1-1:

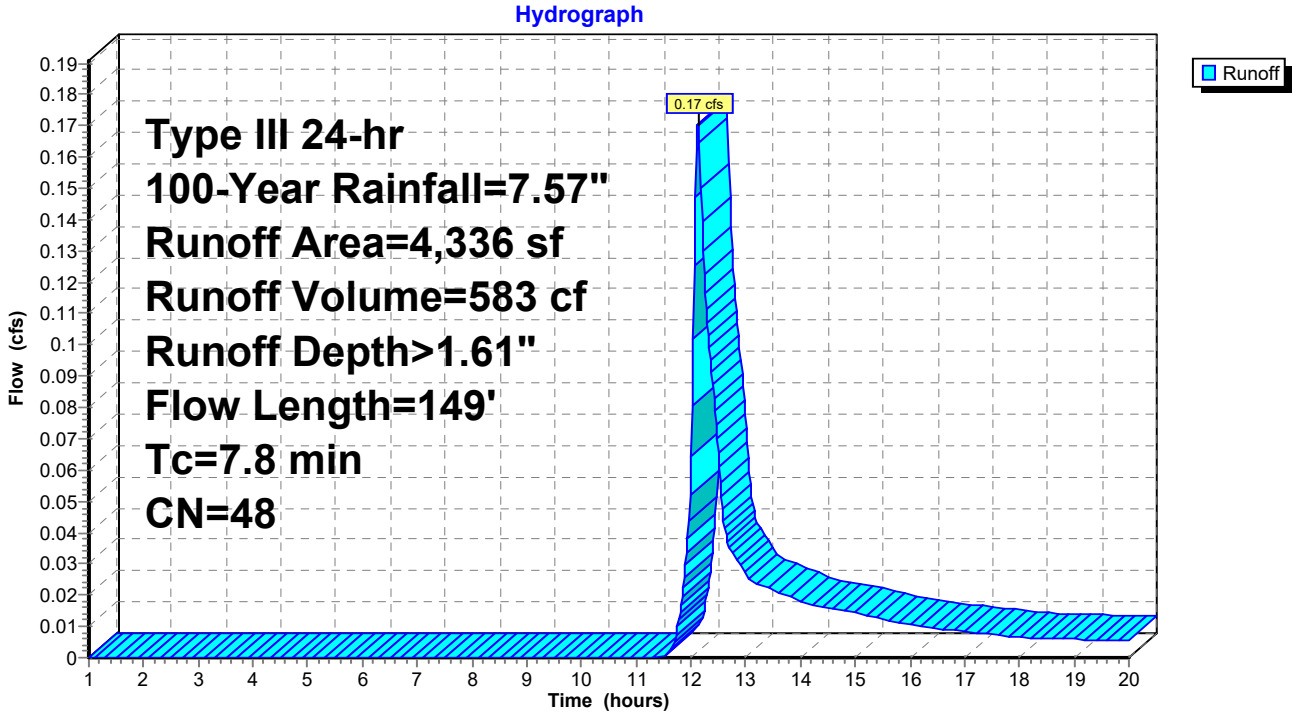
Runoff = 0.17 cfs @ 12.13 hrs, Volume= 583 cf, Depth> 1.61"
Routed to Pond RAIN-1 : RAIN GARDEN 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
3,693	39	>75% Grass cover, Good, HSG A
643	98	Paved parking, HSG A
4,336	48	Weighted Average
3,693		85.17% Pervious Area
643		14.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0350	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.2	49	0.0670	4.17		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	149	Total			

Subcatchment DA-1-1:



Summary for Subcatchment DA-1-2:

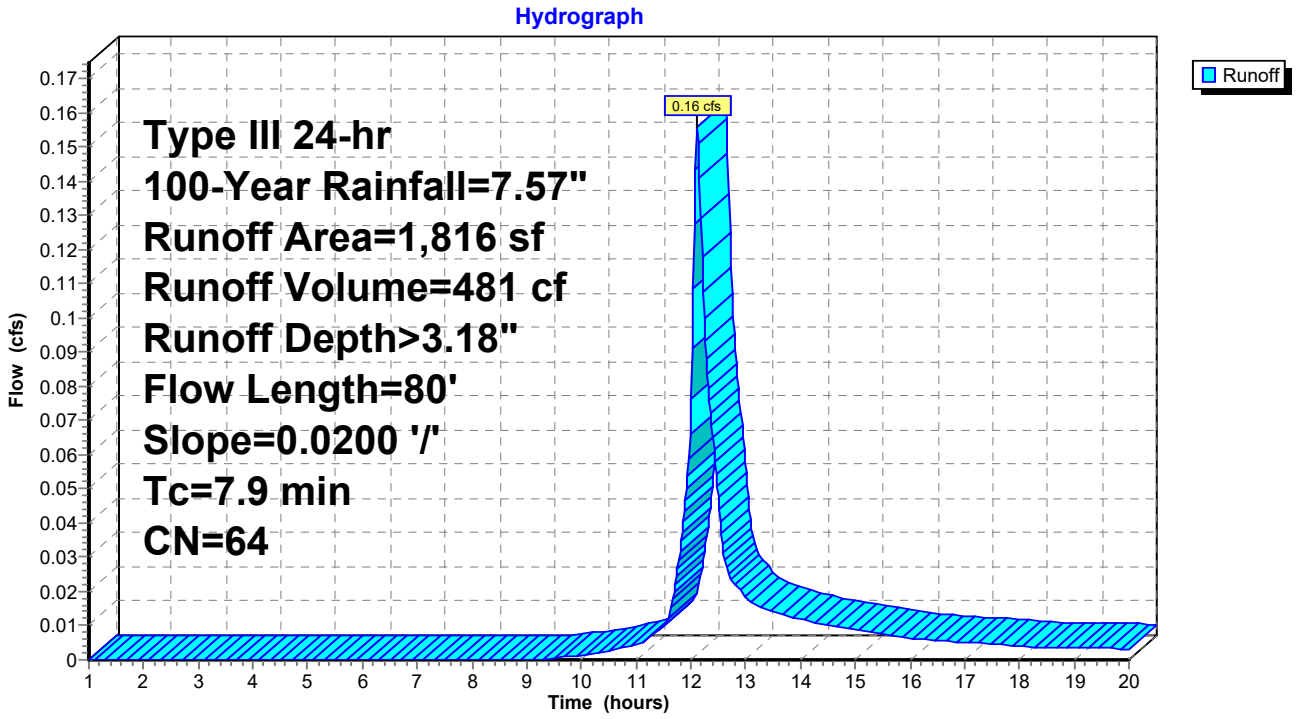
Runoff = 0.16 cfs @ 12.12 hrs, Volume= 481 cf, Depth> 3.18"
Routed to Link POA-1 : Municipal Drainage System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
1,035	39	>75% Grass cover, Good, HSG A
781	98	Paved parking, HSG A
1,816	64	Weighted Average
1,035		56.99% Pervious Area
781		43.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	80	0.0200	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"

Subcatchment DA-1-2:



Summary for Subcatchment DA-1-3:

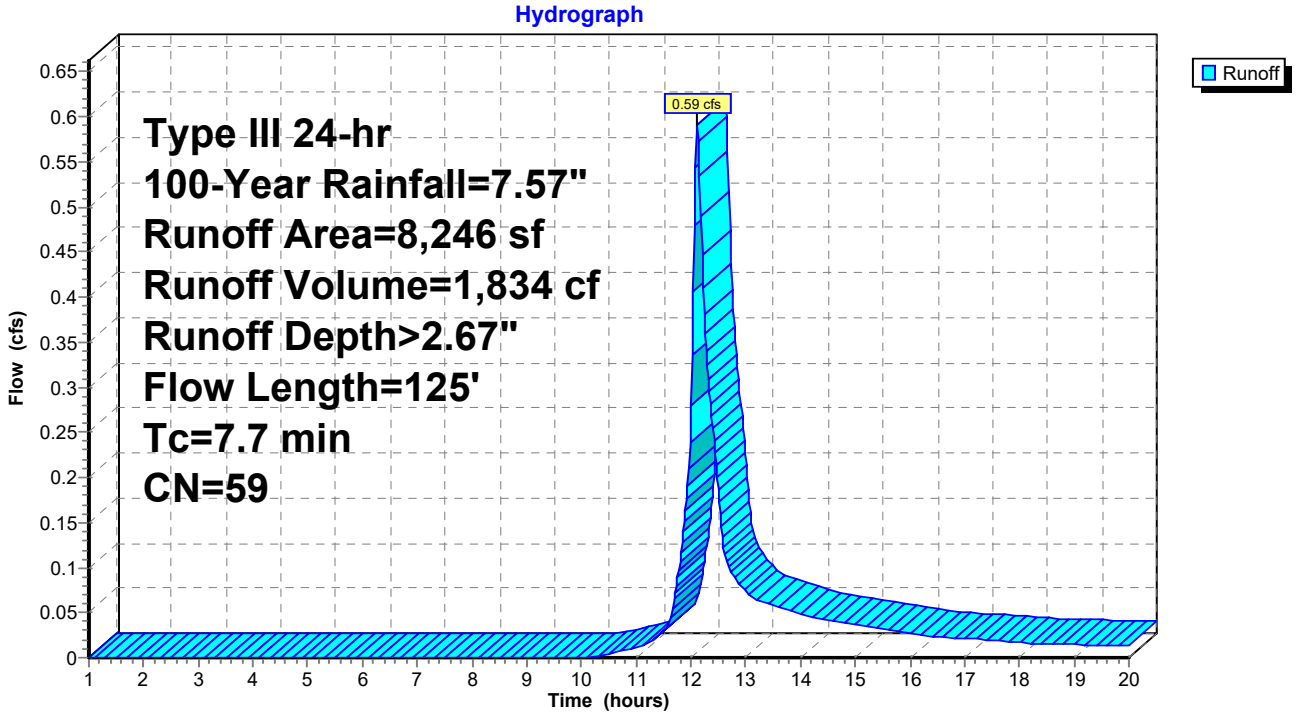
Runoff = 0.59 cfs @ 12.12 hrs, Volume= 1,834 cf, Depth> 2.67"
Routed to Pond LCB-3 : LCB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
5,496	39	>75% Grass cover, Good, HSG A
2,750	98	Paved parking, HSG A
8,246	59	Weighted Average
5,496		66.65% Pervious Area
2,750		33.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0350	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.1	25	0.0670	4.17		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.7	125	Total			

Subcatchment DA-1-3:



Summary for Subcatchment DA-2-1:

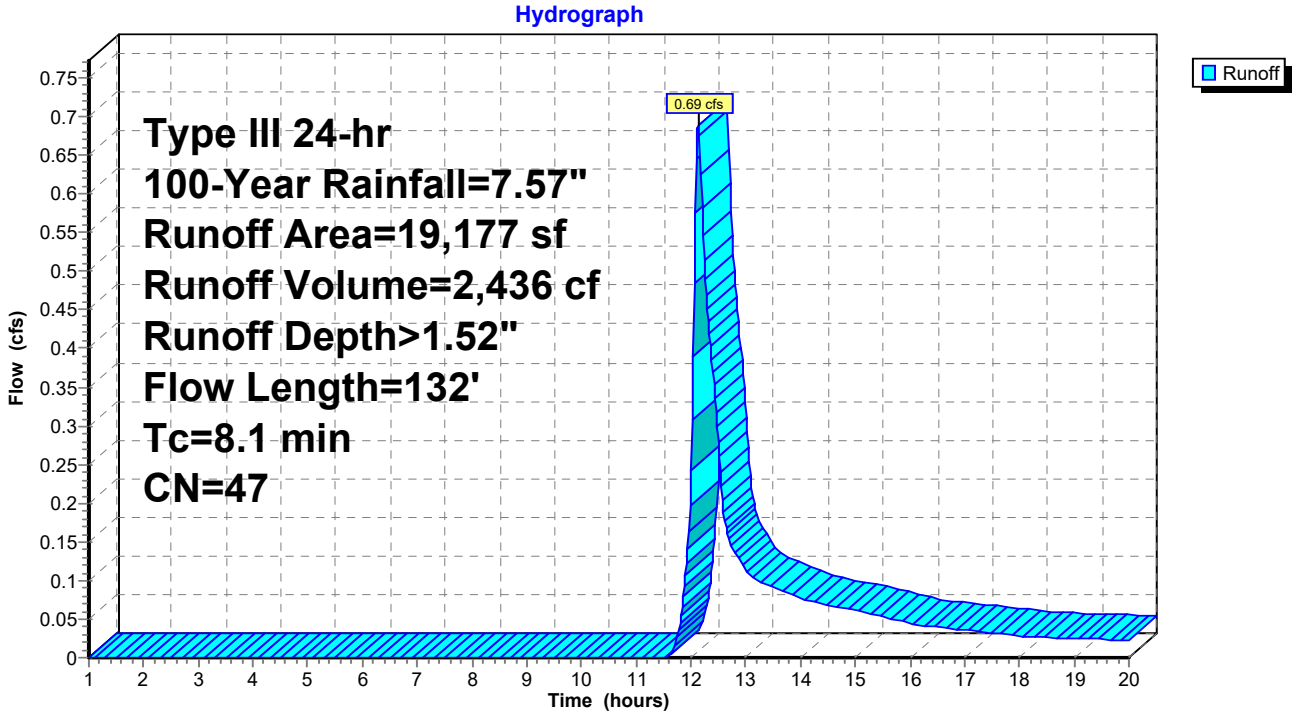
Runoff = 0.69 cfs @ 12.13 hrs, Volume= 2,436 cf, Depth> 1.52"
Routed to Pond RAIN-2 : RAIN GARDEN 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
16,586	39	>75% Grass cover, Good, HSG A
2,591	98	Paved parking, HSG A
19,177	47	Weighted Average
16,586		86.49% Pervious Area
2,591		13.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.1	32	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	132	Total			

Subcatchment DA-2-1:



Summary for Subcatchment DA-2-2:

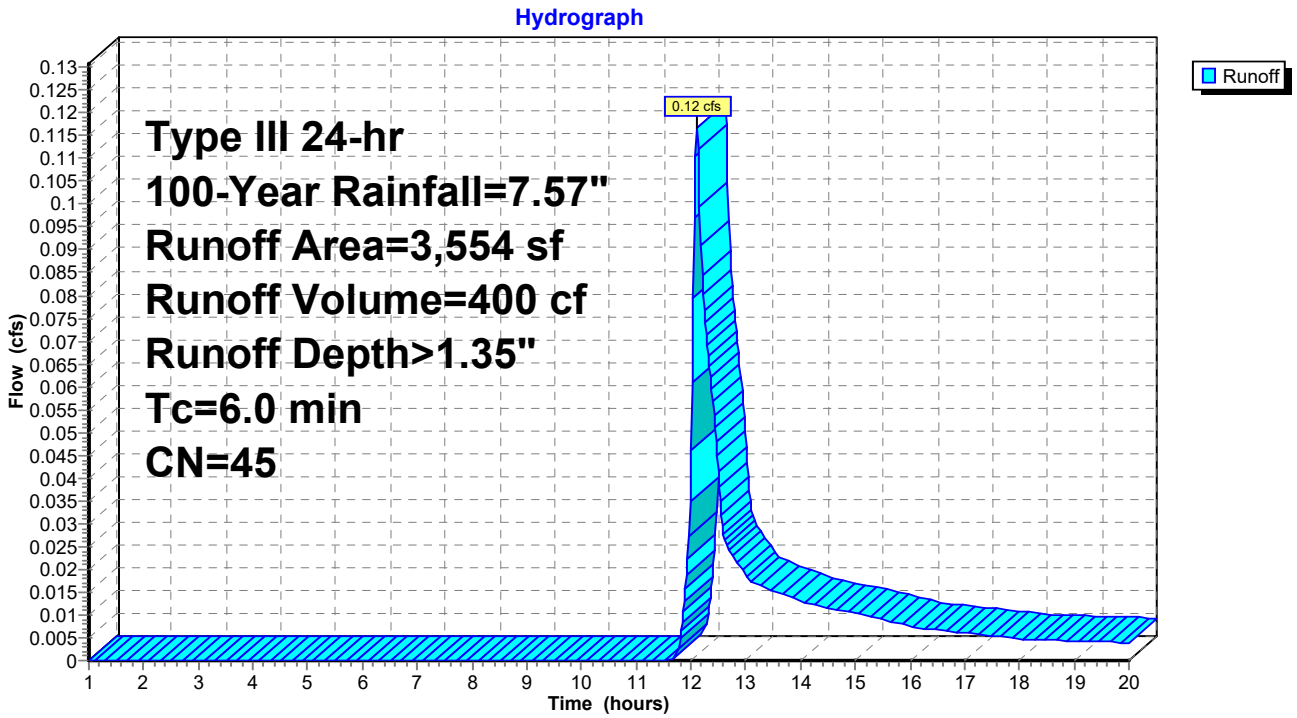
Runoff = 0.12 cfs @ 12.11 hrs, Volume= 400 cf, Depth> 1.35"
Routed to Link POA-2 : Overland to Onset Beach

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
3,200	39	>75% Grass cover, Good, HSG A
354	98	Paved parking, HSG A
3,554	45	Weighted Average
3,200		90.04% Pervious Area
354		9.96% Impervious Area

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

Subcatchment DA-2-2:



Summary for Subcatchment DA-3:

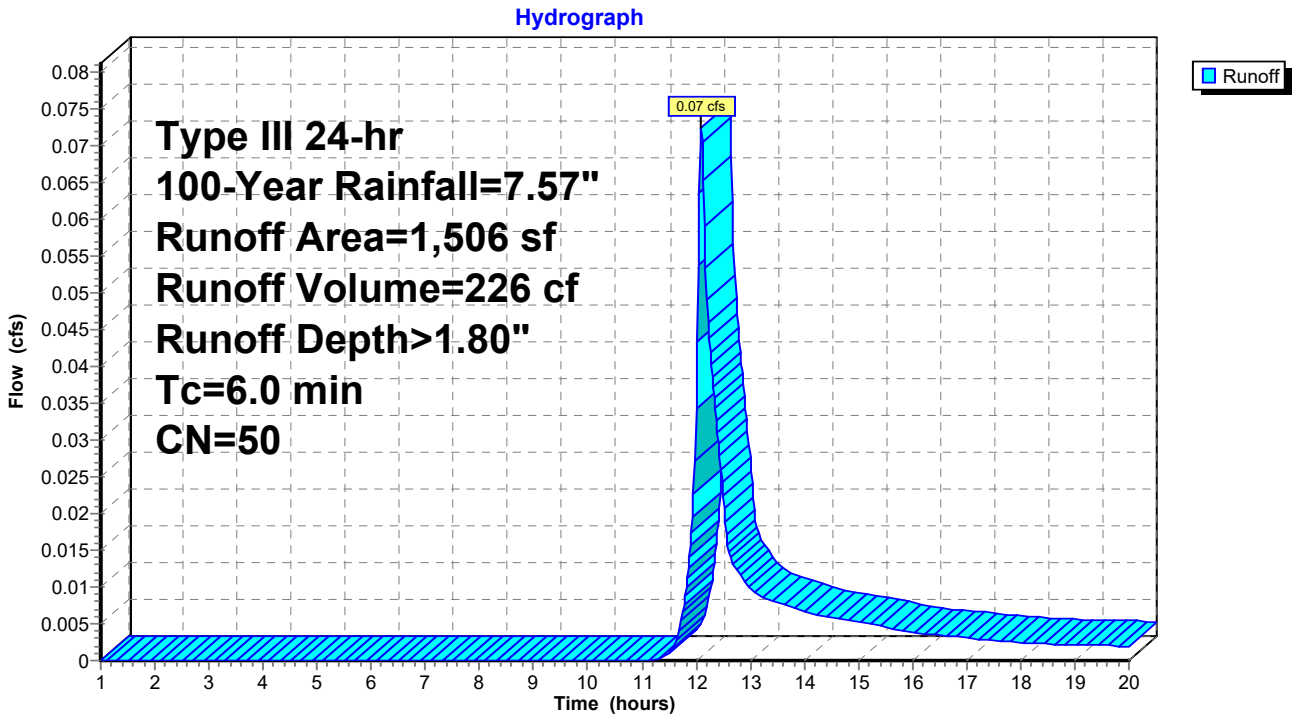
Runoff = 0.07 cfs @ 12.10 hrs, Volume= 226 cf, Depth> 1.80"
Routed to Link POA-3 : Existing Leaching Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
1,226	39	>75% Grass cover, Good, HSG A
280	98	Paved parking, HSG A
1,506	50	Weighted Average
1,226		81.41% Pervious Area
280		18.59% Impervious Area

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

Subcatchment DA-3:



Summary for Subcatchment DA-4-1:

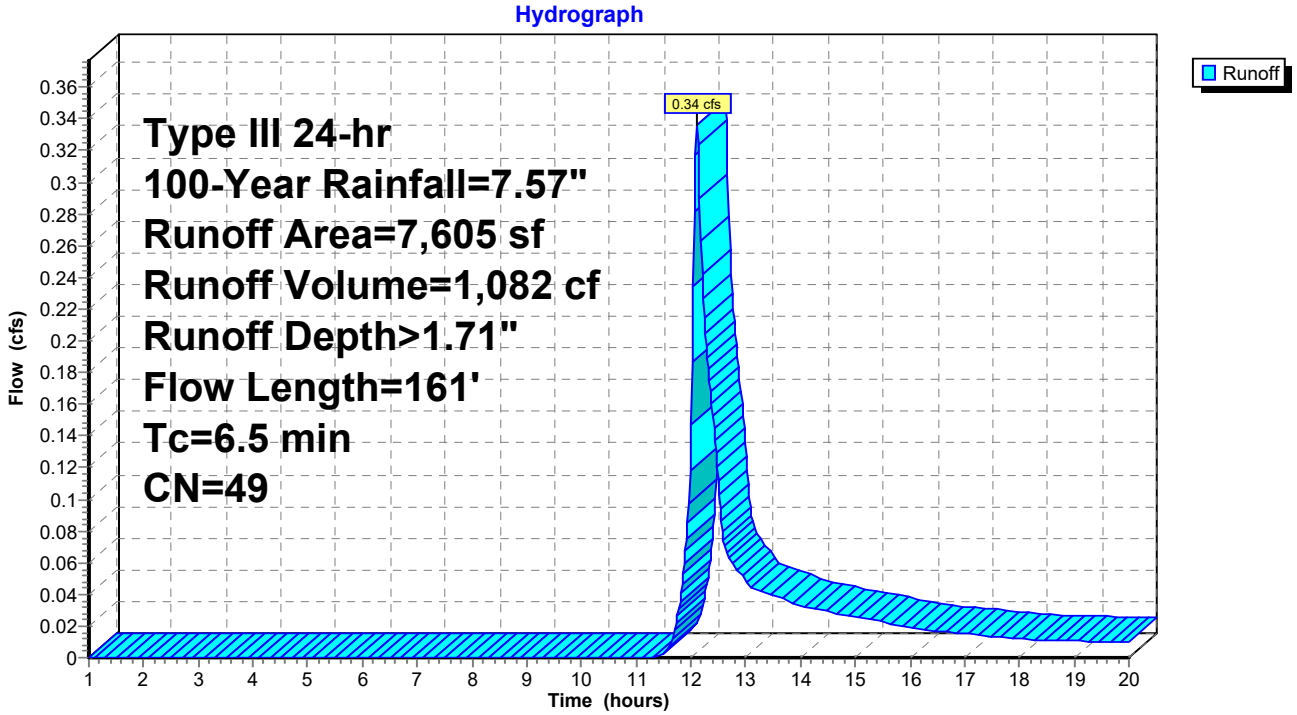
Runoff = 0.34 cfs @ 12.11 hrs, Volume= 1,082 cf, Depth> 1.71"
Routed to Pond LCB-1 : DRY WELL 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
6,365	39	>75% Grass cover, Good, HSG A
1,240	98	Paved parking, HSG A
7,605	49	Weighted Average
6,365		83.69% Pervious Area
1,240		16.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.0650	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.6	61	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.5	161	Total			

Subcatchment DA-4-1:



Summary for Subcatchment DA-4-2:

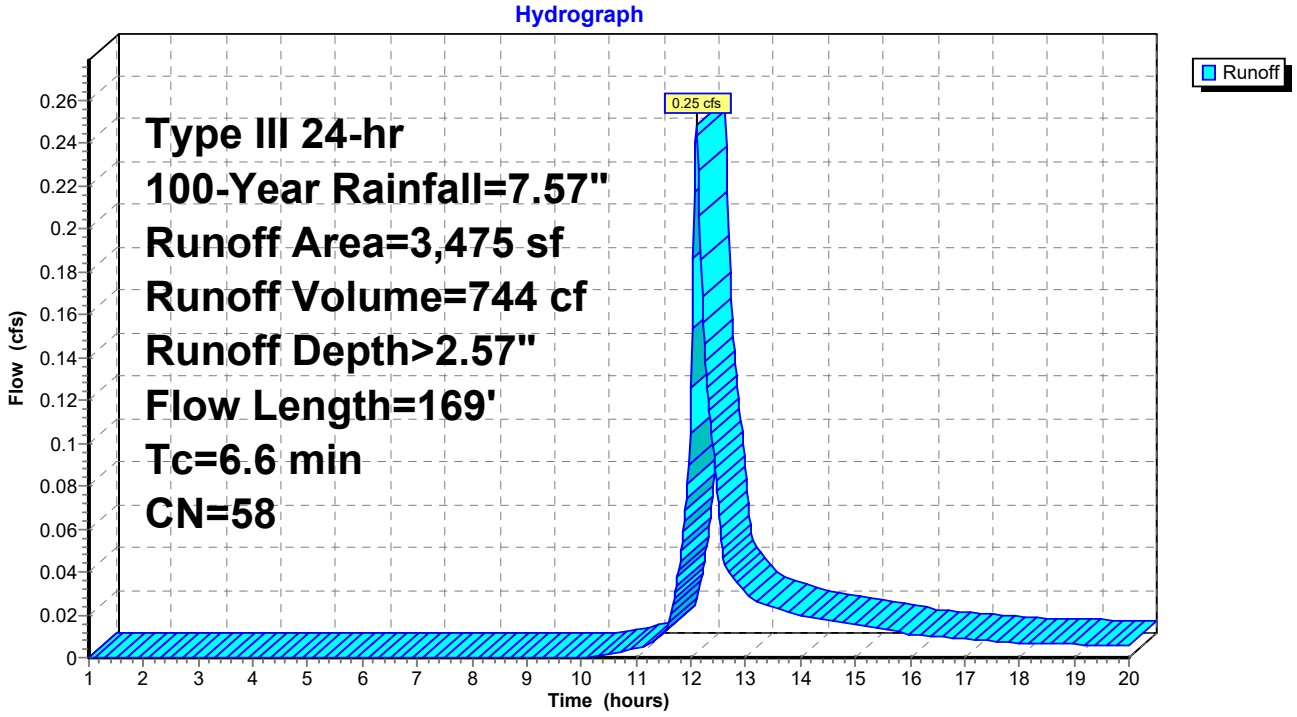
Runoff = 0.25 cfs @ 12.10 hrs, Volume= 744 cf, Depth> 2.57"
Routed to Pond LCB-2 : DRY WELL 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
2,327	39	>75% Grass cover, Good, HSG A
1,148	98	Paved parking, HSG A
3,475	58	Weighted Average
2,327		66.96% Pervious Area
1,148		33.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	56	0.0450	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
1.8	46	0.2600	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.5	67	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	169	Total			

Subcatchment DA-4-2:



Summary for Subcatchment DA-4-3:

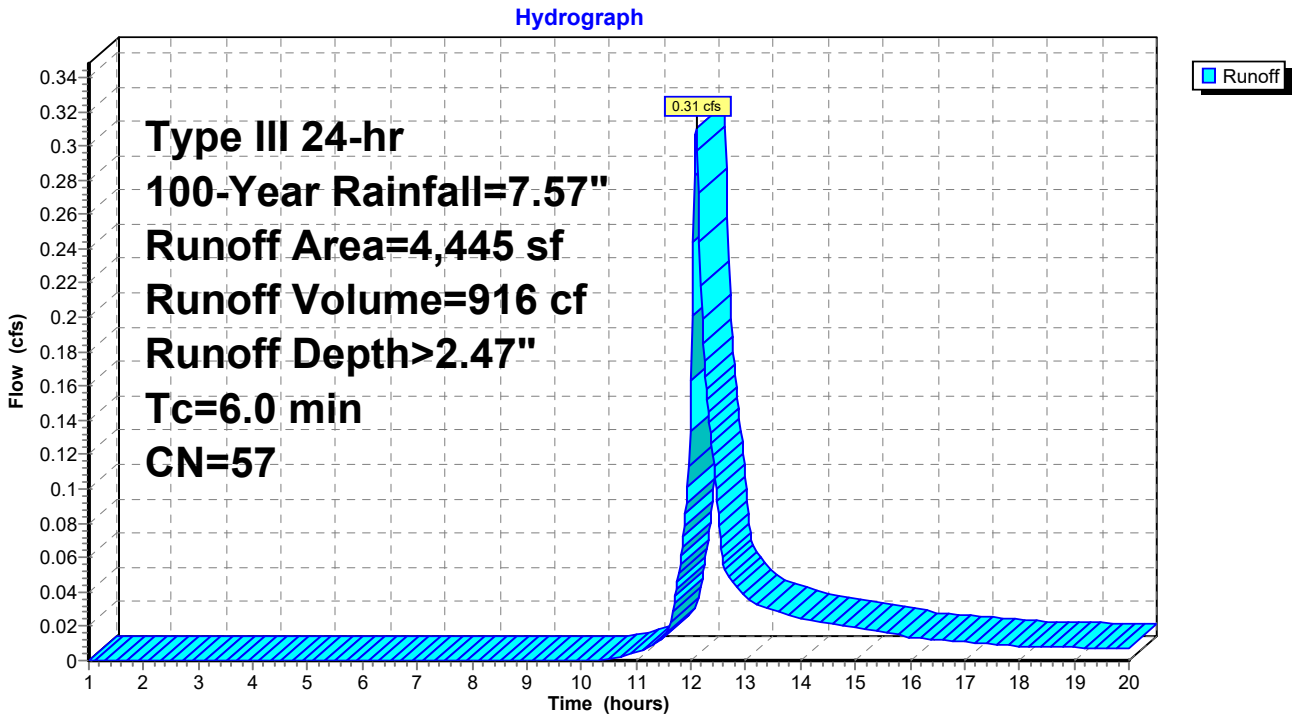
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 916 cf, Depth> 2.47"
Routed to Pond RAIN-3 : RAIN GARDEN 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
3,112	39	>75% Grass cover, Good, HSG A
1,333	98	Paved parking, HSG A
4,445	57	Weighted Average
3,112		70.01% Pervious Area
1,333		29.99% Impervious Area

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

Subcatchment DA-4-3:



Summary for Subcatchment DA-4-4:

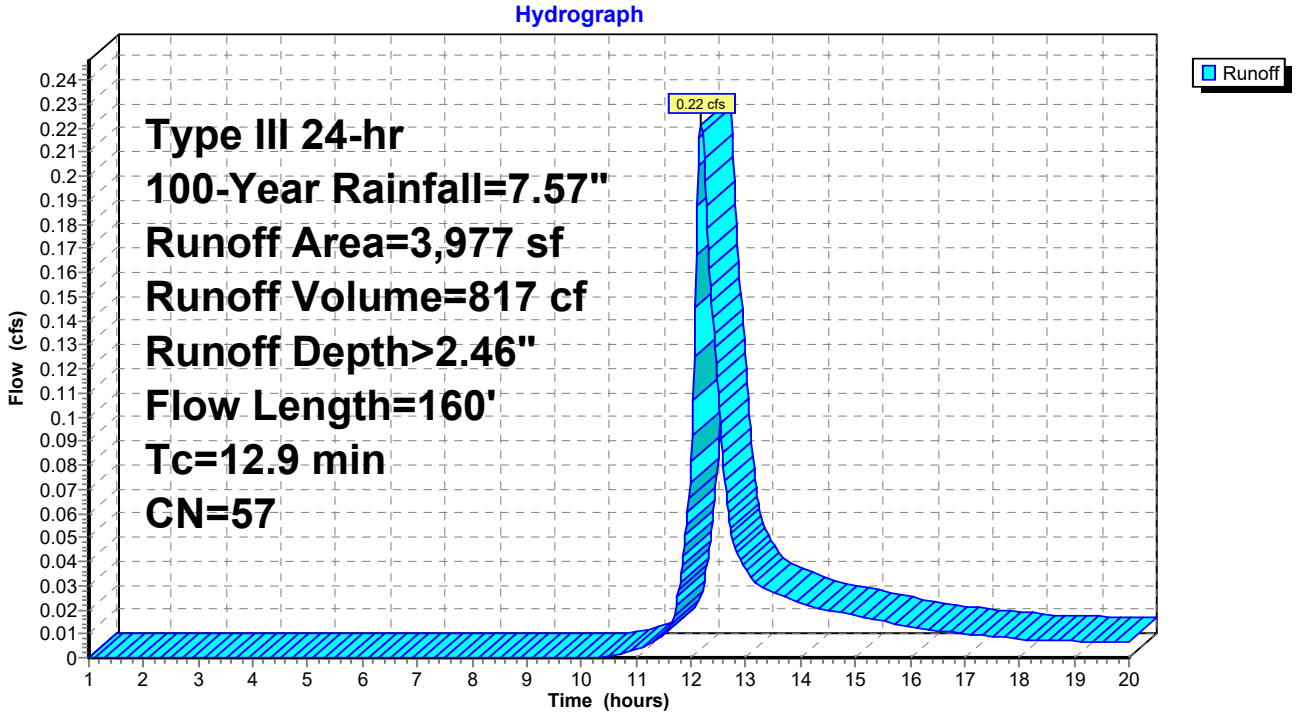
Runoff = 0.22 cfs @ 12.19 hrs, Volume= 817 cf, Depth> 2.46"
Routed to Link POA-4 : Onset Pier Drainage

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.57"

Area (sf)	CN	Description
2,743	39	>75% Grass cover, Good, HSG A
1,234	98	Paved parking, HSG A
3,977	57	Weighted Average
2,743		68.97% Pervious Area
1,234		31.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.4	60	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.9	160	Total			

Subcatchment DA-4-4:



Summary for Pond DMH: PROP MH

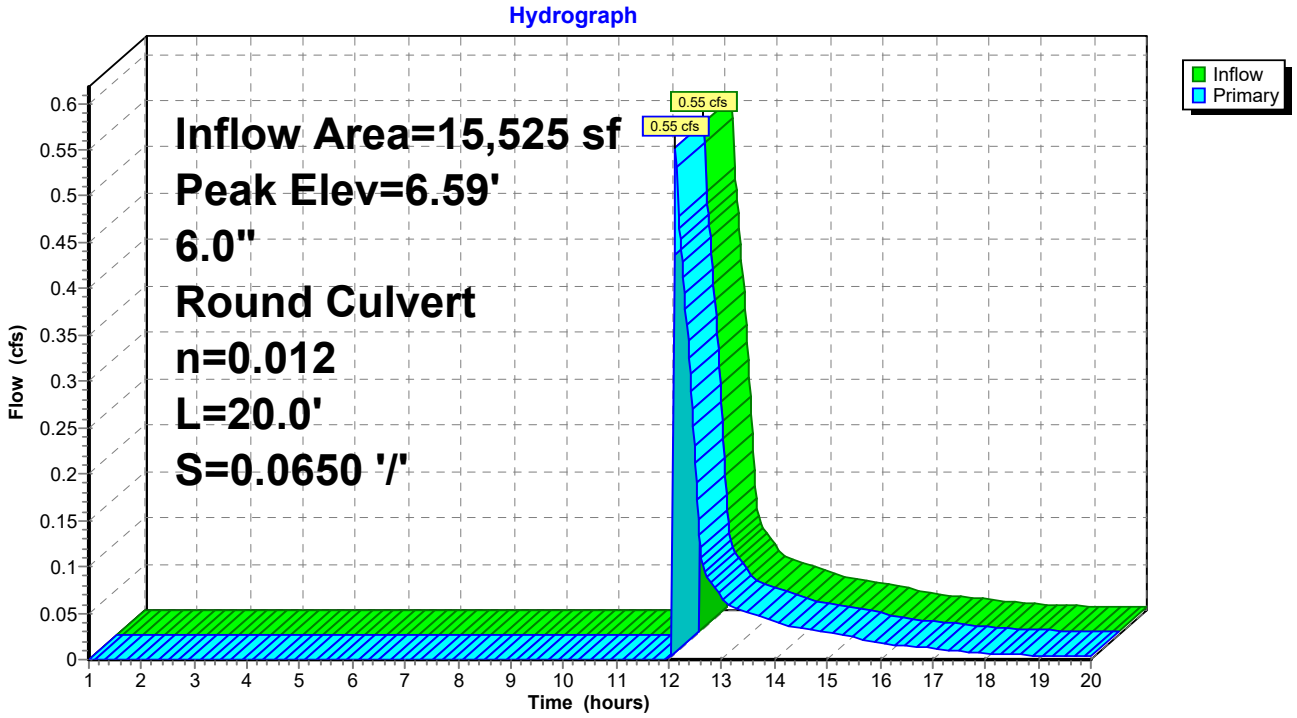
Inflow Area = 15,525 sf, 23.97% Impervious, Inflow Depth > 0.98" for 100-Year event
Inflow = 0.55 cfs @ 12.13 hrs, Volume= 1,268 cf
Outflow = 0.55 cfs @ 12.13 hrs, Volume= 1,268 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.13 hrs, Volume= 1,268 cf
Routed to Link POA-4 : Onset Pier Drainage

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 6.59' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.00'	**6.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.00' / 4.70' S= 0.0650 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.55 cfs @ 12.13 hrs HW=6.59' (Free Discharge)
1=Culvert (Inlet Controls 0.55 cfs @ 2.79 fps)

Pond DMH: PROP MH



Summary for Pond LCB-1: DRY WELL 1

Inflow Area = 7,605 sf, 16.31% Impervious, Inflow Depth > 1.71" for 100-Year event
Inflow = 0.34 cfs @ 12.11 hrs, Volume= 1,082 cf
Outflow = 0.34 cfs @ 12.12 hrs, Volume= 956 cf, Atten= 0%, Lag= 0.6 min
Discarded = 0.01 cfs @ 11.64 hrs, Volume= 188 cf
Primary = 0.33 cfs @ 12.12 hrs, Volume= 768 cf
Routed to Pond LCB-2 : DRY WELL 2

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 16.45' @ 12.12 hrs Surf.Area= 32 sf Storage= 135 cf

Plug-Flow detention time= 51.1 min calculated for 955 cf (88% of inflow)
Center-of-Mass det. time= 15.3 min (845.3 - 830.1)

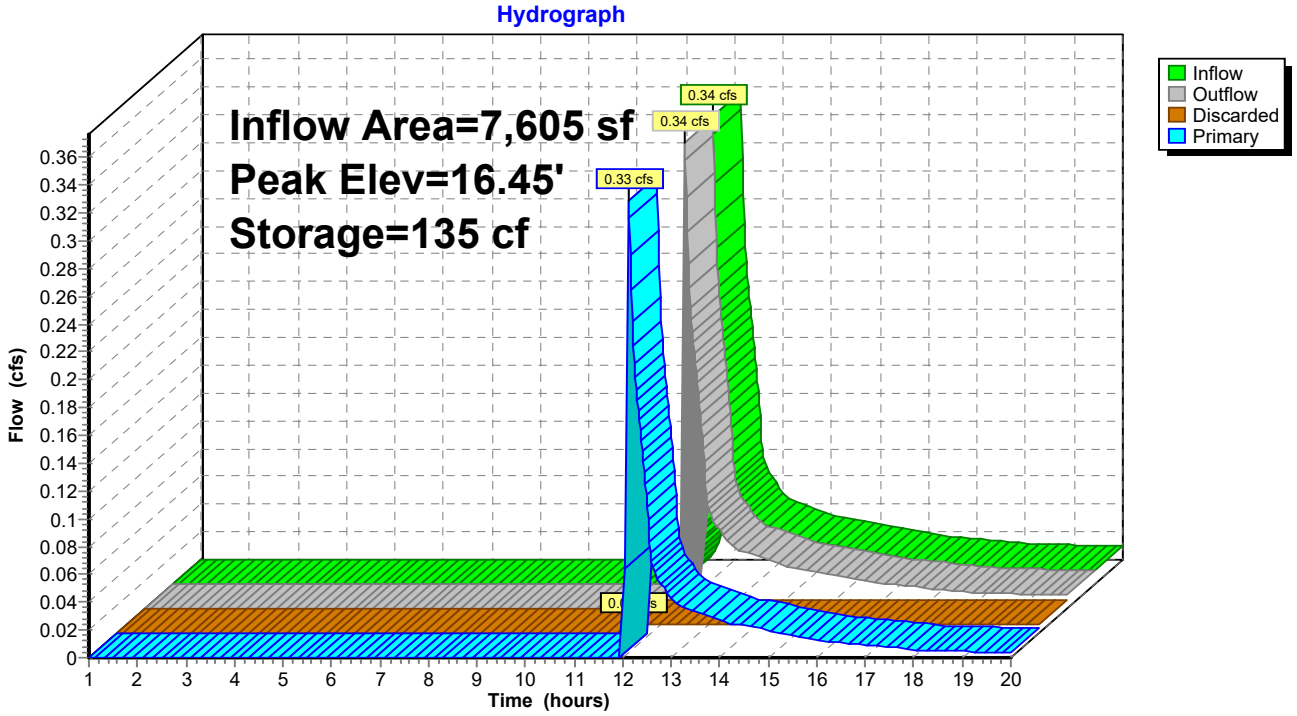
Volume	Invert	Avail.Storage	Storage Description
#1	10.56'	118 cf	**5.00'D x 6.00'H Vertical Cone/Cylinder**Inside #2 160 cf Overall - 5.0" Wall Thickness = 118 cf
#2	10.06'	26 cf	**6.40'D x 7.00'H Vertical Cone/Cylinder** 225 cf Overall - 160 cf Embedded = 65 cf x 40.0% Voids
		144 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.06'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	16.00'	**6.0" Round Culvert** L= 48.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 16.00' / 9.50' S= 0.1354 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 11.64 hrs HW=10.13' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.33 cfs @ 12.12 hrs HW=16.44' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 0.33 cfs @ 1.79 fps)

Pond LCB-1: DRY WELL 1



Summary for Pond LCB-2: DRY WELL 2

Inflow Area = 11,080 sf, 21.55% Impervious, Inflow Depth > 1.64" for 100-Year event
Inflow = 0.57 cfs @ 12.11 hrs, Volume= 1,513 cf
Outflow = 0.56 cfs @ 12.13 hrs, Volume= 1,390 cf, Atten= 3%, Lag= 1.1 min
Discarded = 0.01 cfs @ 11.24 hrs, Volume= 204 cf
Primary = 0.55 cfs @ 12.13 hrs, Volume= 1,186 cf
Routed to Pond DMH : PROP MH

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 10.30' @ 12.13 hrs Surf.Area= 32 sf Storage= 137 cf

Plug-Flow detention time= 34.9 min calculated for 1,389 cf (92% of inflow)
Center-of-Mass det. time= 9.5 min (826.1 - 816.6)

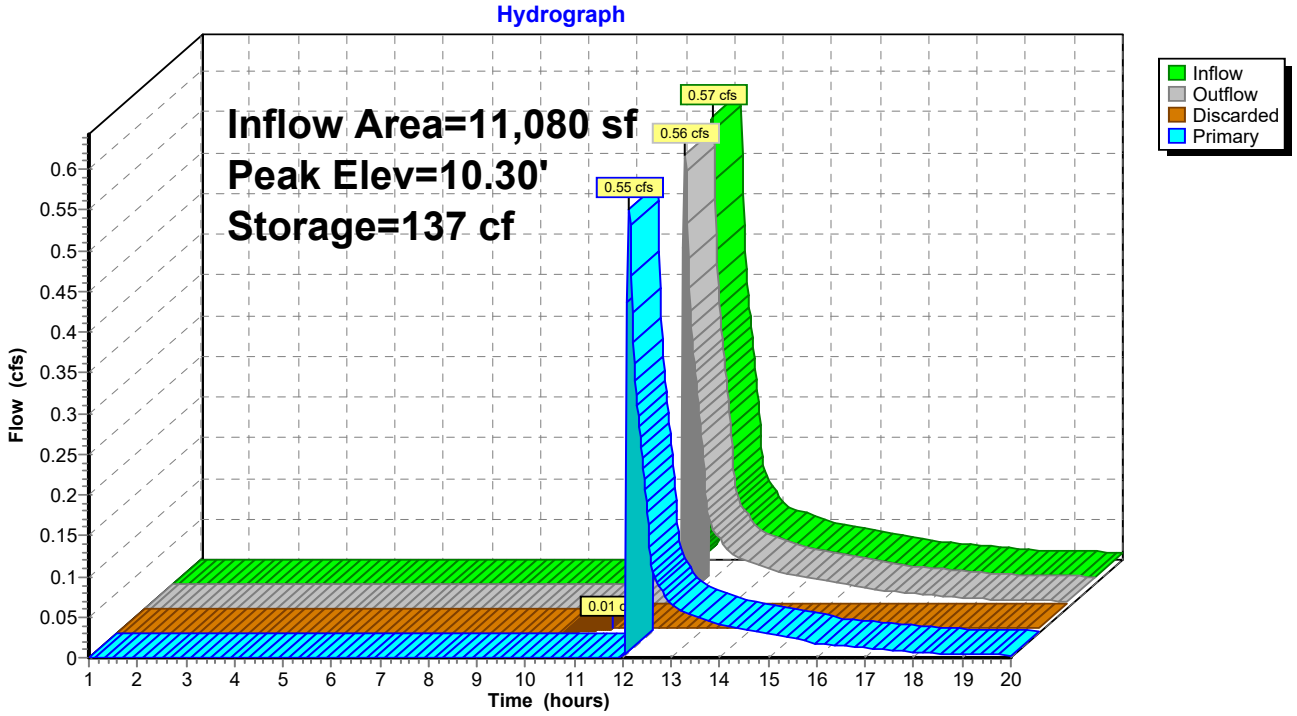
Volume	Invert	Avail.Storage	Storage Description
#1	4.30'	118 cf	**5.00'D x 6.00'H Vertical Cone/Cylinder**Inside #2 160 cf Overall - 5.0" Wall Thickness = 118 cf
#2	3.80'	26 cf	**6.40'D x 7.00'H Vertical Cone/Cylinder** 225 cf Overall - 160 cf Embedded = 65 cf x 40.0% Voids
		144 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	3.80'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**6.0" Round Culvert** L= 45.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.50' / 8.50' S= 0.0222 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.01 cfs @ 11.24 hrs HW=3.87' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.55 cfs @ 12.13 hrs HW=10.29' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 0.55 cfs @ 2.79 fps)

Pond LCB-2: DRY WELL 2



Summary for Pond LCB-3: LCB-3

Inflow Area = 8,246 sf, 33.35% Impervious, Inflow Depth > 2.67" for 100-Year event
Inflow = 0.59 cfs @ 12.12 hrs, Volume= 1,834 cf
Outflow = 0.49 cfs @ 12.18 hrs, Volume= 1,525 cf, Atten= 17%, Lag= 4.0 min
Discarded = 0.02 cfs @ 11.32 hrs, Volume= 635 cf
Primary = 0.47 cfs @ 12.18 hrs, Volume= 889 cf
Routed to Link POA-1 : Municipal Drainage System

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 12.15' @ 12.18 hrs Surf.Area= 101 sf Storage= 387 cf

Plug-Flow detention time= 78.1 min calculated for 1,525 cf (83% of inflow)
Center-of-Mass det. time= 30.1 min (841.6 - 811.5)

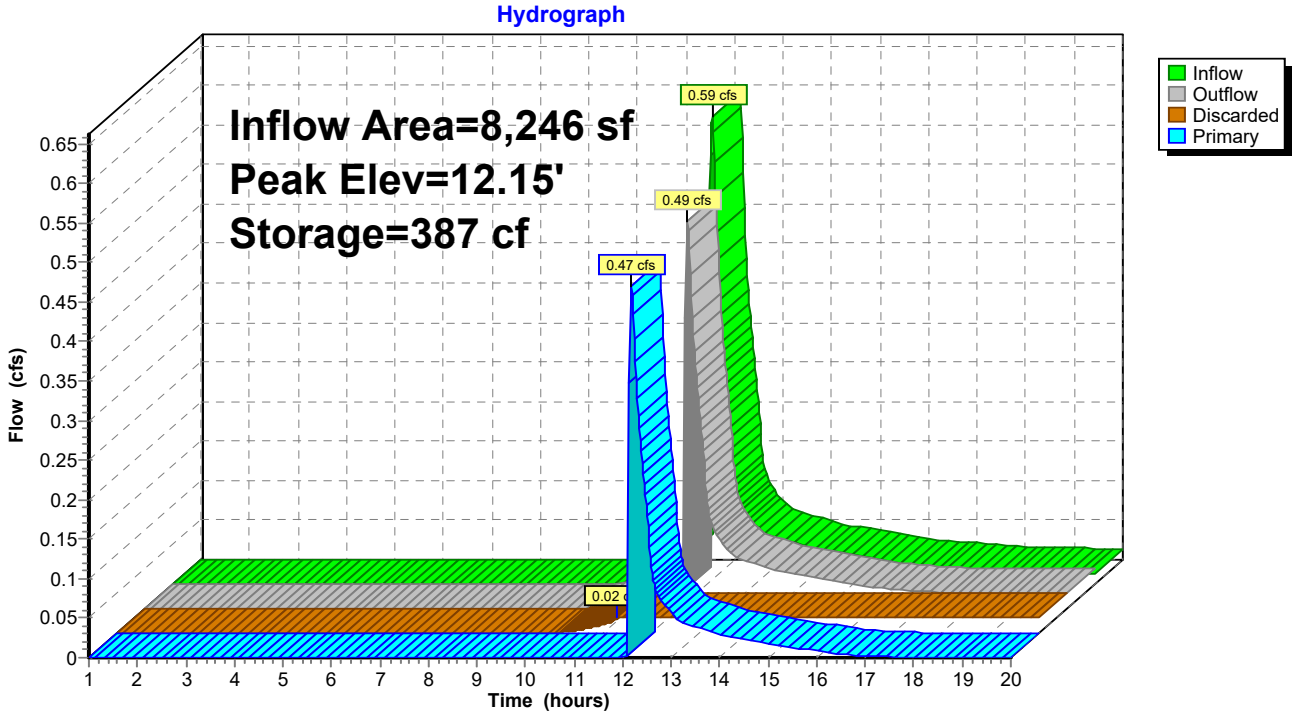
Volume	Invert	Avail.Storage	Storage Description
#1	7.00'	339 cf	**6.00'D x 6.00'H Vertical Cone/Cylinder**x 2 Inside #2 440 cf Overall - 5.0" Wall Thickness = 339 cf
#2	6.00'	105 cf	**8.00'D x 7.00'H Vertical Cone/Cylinder**x 2 704 cf Overall - 440 cf Embedded = 264 cf x 40.0% Voids
		445 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	11.50'	**6.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 11.50' / 10.00' S= 0.0750 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.02 cfs @ 11.32 hrs HW=6.07' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.47 cfs @ 12.18 hrs HW=12.14' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 0.47 cfs @ 2.39 fps)

Pond LCB-3: LCB-3



Summary for Pond RAIN-1: RAIN GARDEN 1

Inflow Area = 4,336 sf, 14.83% Impervious, Inflow Depth > 1.61" for 100-Year event
Inflow = 0.17 cfs @ 12.13 hrs, Volume= 583 cf
Outflow = 0.09 cfs @ 12.41 hrs, Volume= 583 cf, Atten= 49%, Lag= 16.7 min
Discarded = 0.04 cfs @ 12.41 hrs, Volume= 556 cf
Primary = 0.04 cfs @ 12.41 hrs, Volume= 27 cf
Routed to Link POA-1 : Municipal Drainage System

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 22.77' @ 12.41 hrs Surf.Area= 230 sf Storage= 129 cf

Plug-Flow detention time= 23.2 min calculated for 582 cf (100% of inflow)
Center-of-Mass det. time= 22.9 min (856.2 - 833.3)

Volume	Invert	Avail.Storage	Storage Description
#1	22.00'	354 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

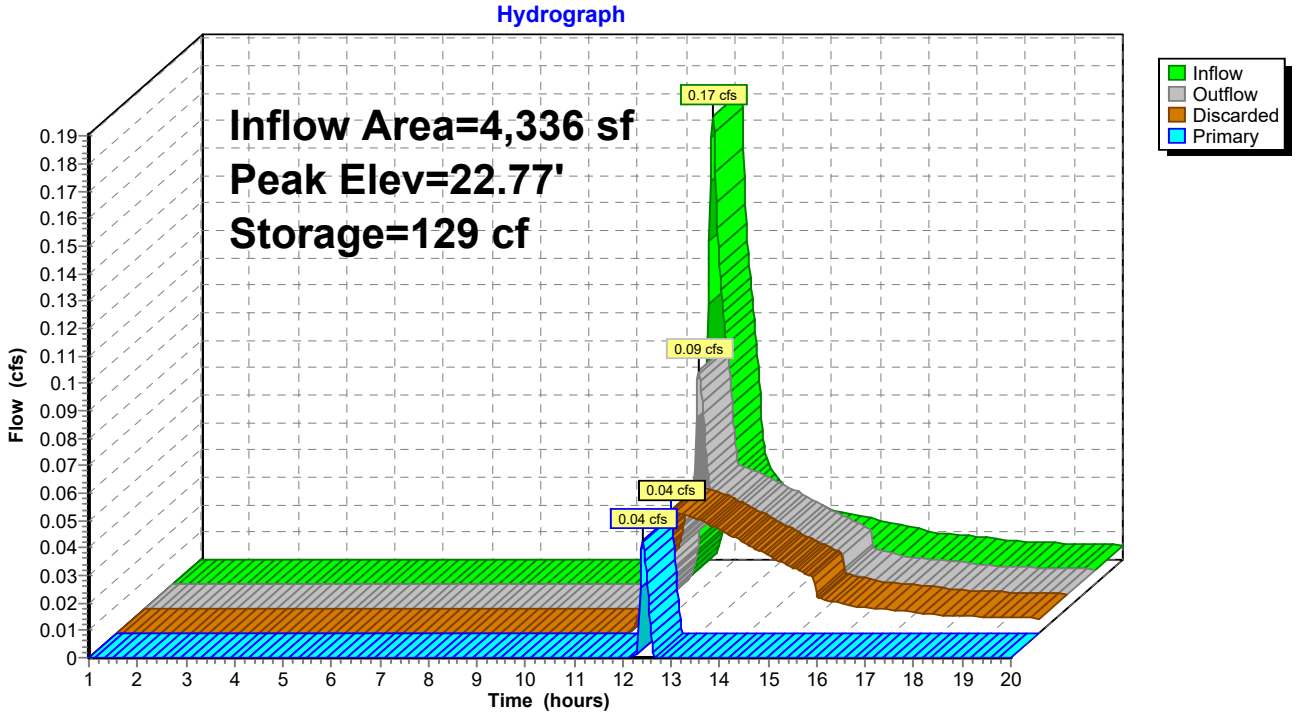
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
22.00	103	0	0
23.00	267	185	185
23.50	407	169	354

Device	Routing	Invert	Outlet Devices
#1	Discarded	22.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	22.75'	**5.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.04 cfs @ 12.41 hrs HW=22.77' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.04 cfs @ 12.41 hrs HW=22.77' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.04 cfs @ 0.35 fps)

Pond RAIN-1: RAIN GARDEN 1



Summary for Pond RAIN-2: RAIN GARDEN 2

Inflow Area = 19,177 sf, 13.51% Impervious, Inflow Depth > 1.52" for 100-Year event
Inflow = 0.69 cfs @ 12.13 hrs, Volume= 2,436 cf
Outflow = 0.17 cfs @ 12.63 hrs, Volume= 2,432 cf, Atten= 75%, Lag= 30.1 min
Discarded = 0.17 cfs @ 12.63 hrs, Volume= 2,432 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Link POA-2 : Overland to Onset Beach

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 20.40' @ 12.63 hrs Surf.Area= 892 sf Storage= 704 cf

Plug-Flow detention time= 47.2 min calculated for 2,429 cf (100% of inflow)
Center-of-Mass det. time= 46.6 min (882.5 - 836.0)

Volume	Invert	Avail.Storage	Storage Description
#1	19.00'	4,606 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

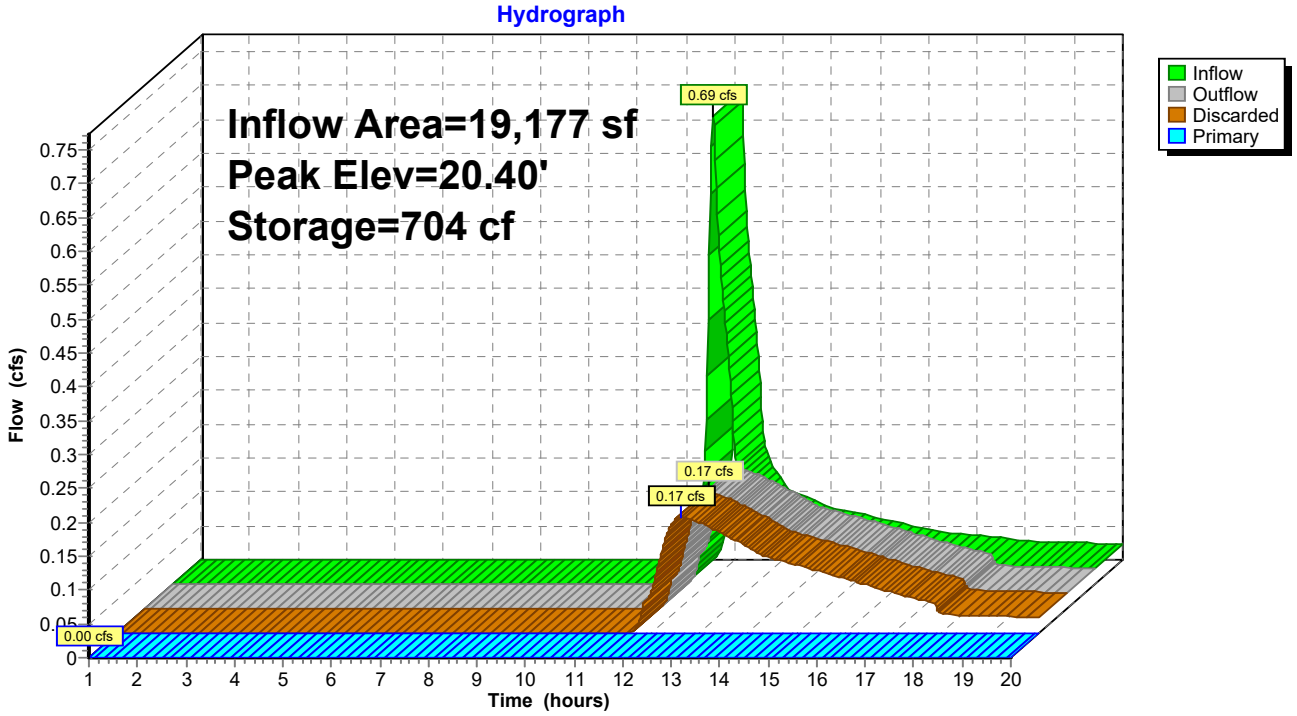
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.00	221	0	0
20.00	588	405	405
21.00	1,338	963	1,368
22.00	2,411	1,875	3,242
22.50	3,045	1,364	4,606

Device	Routing	Invert	Outlet Devices
#1	Discarded	19.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	22.39'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.17 cfs @ 12.63 hrs HW=20.40' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=19.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond RAIN-2: RAIN GARDEN 2



Summary for Pond RAIN-3: RAIN GARDEN 3

Inflow Area = 4,445 sf, 29.99% Impervious, Inflow Depth > 2.47" for 100-Year event
Inflow = 0.31 cfs @ 12.09 hrs, Volume= 916 cf
Outflow = 0.16 cfs @ 12.28 hrs, Volume= 915 cf, Atten= 48%, Lag= 10.9 min
Discarded = 0.07 cfs @ 12.28 hrs, Volume= 833 cf
Primary = 0.09 cfs @ 12.28 hrs, Volume= 82 cf
Routed to Pond DMH : PROP MH

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs
Peak Elev= 10.65' @ 12.28 hrs Surf.Area= 377 sf Storage= 188 cf

Plug-Flow detention time= 17.4 min calculated for 914 cf (100% of inflow)
Center-of-Mass det. time= 17.2 min (830.9 - 813.7)

Volume	Invert	Avail.Storage	Storage Description
#1	10.00'	605 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

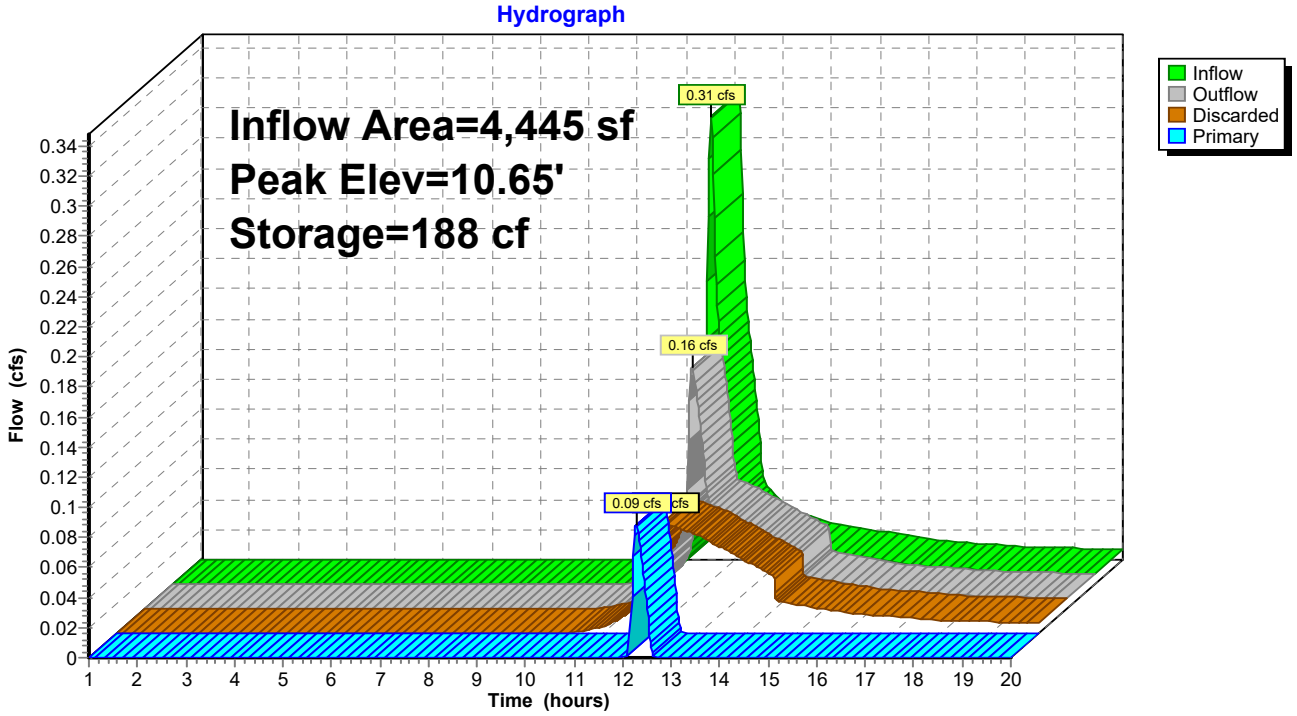
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	196	0	0
11.00	472	334	334
11.50	612	271	605

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Device 3	10.60'	**8.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	8.00'	**6.0" Round Culvert** L= 36.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 8.00' / 7.50' S= 0.0139 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#4	Primary	10.85'	**5.5' long + 3.0 '/' SideZ x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.07 cfs @ 12.28 hrs HW=10.65' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.09 cfs @ 12.28 hrs HW=10.65' (Free Discharge)
├**3=Culvert** (Passes 0.09 cfs of 1.16 cfs potential flow)
│ └**2=Orifice/Grate** (Weir Controls 0.09 cfs @ 0.77 fps)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond RAIN-3: RAIN GARDEN 3

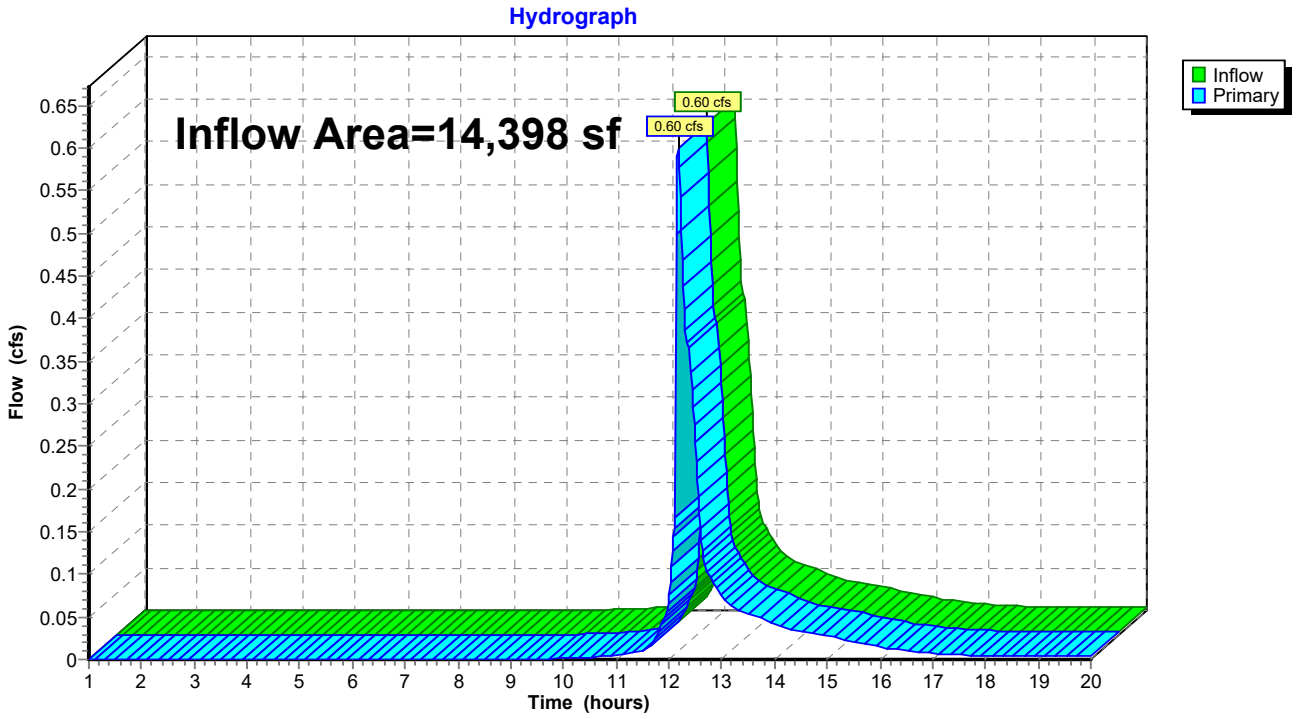


Summary for Link POA-1: Municipal Drainage System

Inflow Area = 14,398 sf, 28.99% Impervious, Inflow Depth > 1.16" for 100-Year event
Inflow = 0.60 cfs @ 12.18 hrs, Volume= 1,398 cf
Primary = 0.60 cfs @ 12.18 hrs, Volume= 1,398 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-1: Municipal Drainage System

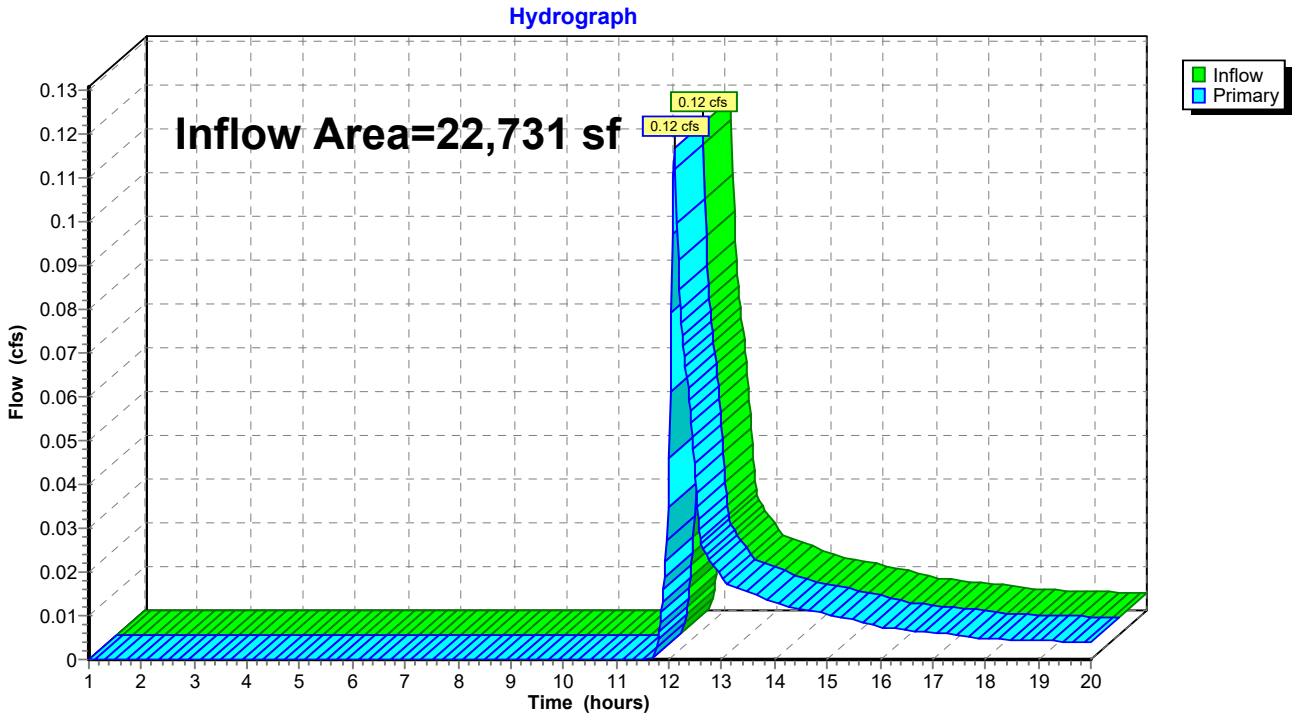


Summary for Link POA-2: Overland to Onset Beach

Inflow Area = 22,731 sf, 12.96% Impervious, Inflow Depth > 0.21" for 100-Year event
Inflow = 0.12 cfs @ 12.11 hrs, Volume= 400 cf
Primary = 0.12 cfs @ 12.11 hrs, Volume= 400 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-2: Overland to Onset Beach

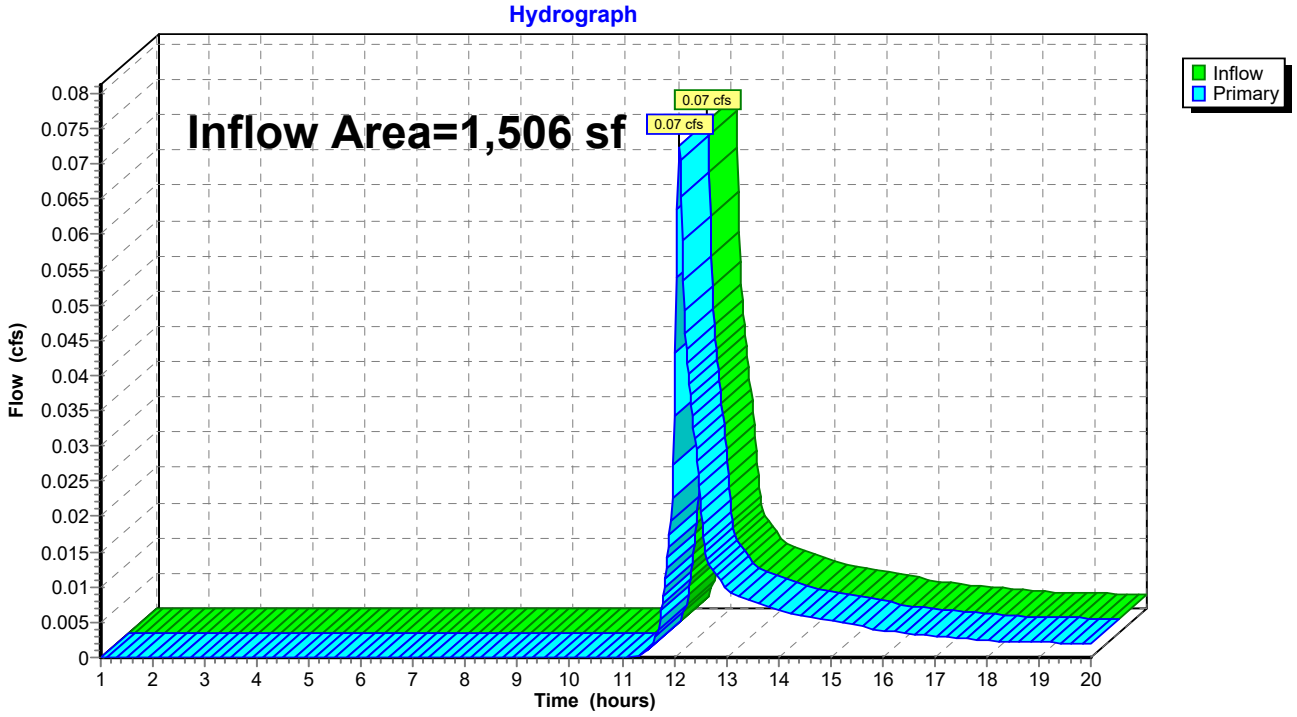


Summary for Link POA-3: Existing Leaching Chambers

Inflow Area = 1,506 sf, 18.59% Impervious, Inflow Depth > 1.80" for 100-Year event
Inflow = 0.07 cfs @ 12.10 hrs, Volume= 226 cf
Primary = 0.07 cfs @ 12.10 hrs, Volume= 226 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-3: Existing Leaching Chambers

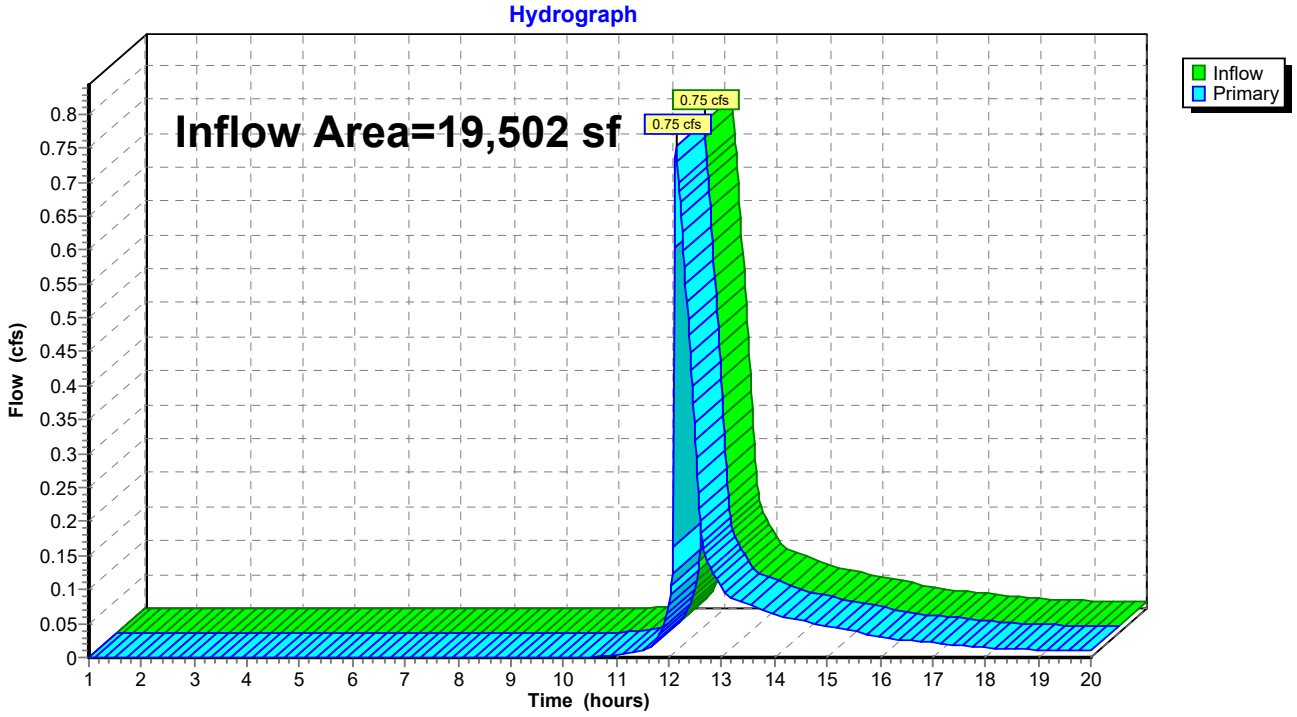


Summary for Link POA-4: Onset Pier Drainage

Inflow Area = 19,502 sf, 25.41% Impervious, Inflow Depth > 1.28" for 100-Year event
Inflow = 0.75 cfs @ 12.14 hrs, Volume= 2,085 cf
Primary = 0.75 cfs @ 12.14 hrs, Volume= 2,085 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 1.00-20.00 hrs, dt= 0.02 hrs

Link POA-4: Onset Pier Drainage



APPENDIX C

Bayveiw Park Improvements
Recharge Calculation

Required Recharge

Area Summary	
	Area (SF)*
Existing Impervious	8,711
Proposed Impervious	12,354
Required Recharge Area *(Proposed - Existing)*	3,643

* See Note

Note (1) Site consists of HSG A soils; therefore 0.6 Target Depth Factor will be used for calculation.

Hydrologic Soil Group Summary		
Group	Target Depth Factor (in)	Area (SF)
A	0.6	3,643
B	0.35	0
C	0.25	0
D	0.1	0

Required Recharge (*Rv*) Calculation:

Rv = Target Depth Factor x Δ Impervious Area
Rv = 0.6 x (1/12) x 3,643
Rv = 182 CF

Proposed Recharge Summary
RECHARGE VOLUME OBTAINED FROM HYDROCAD MODEL

Location	Volume (CF)
LCB-1	126
LCB-2	120
LCB-3	343
RAIN-1	123
RAIN-2	700
RAIN-3	186
Total	1,598

Rv = 182 CF
Provided recharge = 1,598 CF

Recharge Requirement is met.

Bayveiw Park Improvements
Drawdown Calculation

-- Maximum drawdown time is 72 hours **--**

Time to drawdown calculation

$$\text{Time} = \frac{Rv}{k * \text{bottom area}}$$

where,

Rv = storage volume

k = saturated hydraulic conductivity rate

bottom area = average surface storage area of recharge structure

Proposed Storage Drawdown Calcuations

	LCB-1	LCB-2	LCB-3	RAIN-1	RAIN-2	RAIN-3
Net storage volume (CF)	126	120	343	123	700	186
Bottom area (SF)	39	39	77	103	221	196
k - Rawl's Rate (in/hr)	8.27	8.27	8.27	8.27	8.27	8.27
Time (hours)	4.75	4.46	6.46	1.73	4.60	1.38

Bayveiw Park Improvements
Water Quality Volume

Standard 4 Water Quality

As stated in the Stormwater Handbook, the required water quality volume equals 1 inches of runoff times the total impervious area of the post-development site for sites with a rapid infiltration rate.

Proposed Impervious Area	12,354	SF

Req'd Water Quality Volume

12,354	sf	x	1"	x	1'/12"=	1,030	CF

Provided Recharge Volume =	1,598	CF

WQV Requirement is met.

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

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.

Location: Flow directed to Leaching Catch Basins

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)
Street Sweeping - 5%	0.05	1.00	0.05	0.95
Leaching Catch Basin	0.80	0.95	0.76	0.19
	0.00	0.19	0.00	0.19
	0.00	0.19	0.00	0.19
	0.00	0.19	0.00	0.19

Total TSS Removal = 81%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Bayview Park Improvements

Prepared By: Elena Compter

Date: 8/16/2021

*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

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: Flow directed to Rain Garden

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)
Street Sweeping - 5%	0.05	1.00	0.05	0.95
Rain Garden	0.90	0.95	0.86	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10

Total TSS Removal = 91%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Bayview Park Improvements
Prepared By: Elena Compter
Date: 8/16/2021

*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

APPENDIX D

Long Term Pollution Prevention Plan
Bayview Park Improvements, Wareham, MA

To meet the requirements of Standard 4 of the Massachusetts Stormwater Handbook, this Long Term Pollution Prevention Plan is provided to identify potential sources of pollution that may affect the quality of stormwater discharge, and to describe the proper procedures to reduce the pollutants in stormwater discharges.

Storage and Handling of Oil and other Hazardous Materials

No oil or other hazardous materials will be stored in the project area.

De-icing & Snow Disposal

Wareham DPW will utilize salt and sand to treat the paved surfaces. No salt will be stored in the project area. Snow storage will consist of pushing the snow towards grassed areas off the paved pathways. No snow will be stored within rain gardens.

Vehicle Storage and Washing

No vehicles will be stored or washed in the project area.

Landscaping

The landscaped areas will be maintained by the Wareham Municipal Maintenance Department. Only slow-release organic fertilizer should be used in the planting and mulch areas and should be minimized to the first year of the installation of plant materials. Fertilizer and pest management applications (when necessary) shall be performed only by licensed applicators in accordance with the manufacturer's label instructions. No fertilizer will be stored on site.

Pet Waste Management

The town of Wareham has regulations regarding the care of pets within pubic areas. The Town has a leash law and a pet waste law that requires pet owners to remove pet waste from public areas. The Town DPW maintenance crew shall remove any obvious pet waste that has been left behind by pet owners within the project area. The pet waste shall be disposed of in accordance with local and state regulations.

Septic System

No wastewater is expected to be generated in the project area; therefore, no provision for wastewater is provided.

Operation and Maintenance of Stormwater Control Structures

Included within this Appendix is the Operation and Maintenance plan for the project area. Wareham Municipal Maintenance Department will be responsible for the implementation of the plans. Additional details will be provided in a final combined plan that will incorporate the requirements of the following:

- Stormwater Operation and Maintenance Plan
- Long Term Pollution Prevention Plan

In addition to the basic components described above, additional Best Management Practices (BMPs) and Good Housekeeping measures will be provided.

Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

SECTION 1: Introduction

The project consists of improvements to the Bayview Park in Wareham, MA aimed to improve ADA accessibility of the park. As part of the improvements, the pathways throughout park will be re-configured to provide accessible entry and circulation across the park. Additional improvements will include lighting, drainage, and landscaping upgrades.

As part of this project, this "Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan" has been created to ensure that no disturbance to the resource area occurs during the construction of these repairs.

SECTION 2: Construction Period Pollution Prevention Measures

Best Management Practices (BMPs) will be utilized as Construction Period Pollution Prevention Measures to reduce potential pollutants and prevent any off-site discharge. The objectives of the BMPs for construction activity are to minimize the disturbed areas, stabilize any disturbed areas, control the site perimeter and retain sediment. Both erosion and sedimentation controls and non-stormwater best management measures will be used to minimize site disturbance and ensure compliance with the performance standards of the Wetlands Protection Act (WPA) and MassDEP Stormwater Standards. Measures will be taken to minimize the area disturbed by construction activities to reduce the potential for soil erosion and stormwater pollution problems. In addition, good housekeeping measures will be followed for the day-to-day operation of the construction site under the control of the contractor to minimize the impact of construction. This section describes the control practices that will be in place during construction activities. All recommended control practices will comply with the standards set in the MassDEP Stormwater Handbook.

2.1 Minimize Disturbed Area and Protect Natural Features and Soil

To minimize disturbed areas, all work will be completed within well-defined work limits. These work limits are shown on the site plans included with this submission. The Contractor shall not disturb native vegetation in the undisturbed area without prior approval from the Engineer. The Contractor will be responsible to make sure that all workers know the proper work limits and do not extend their work into the undisturbed areas. The protective measures are described in more detail in the following sections.

2.2 Control Stormwater Flowing onto and through the project

The Contractor will be required to install compost filter tubes between the work area and the resource area.

2.3 Stabilize Soils

The Contractor shall limit the area of land which is exposed and free from vegetation during the project. In areas where the peri of exposure will be greater than one month, mulching, the use of erosion control mats, or other protective measures shall be provided as specified.

The contractor shall take account of the conditions of the soil where erosion control seeding will take place to ensure what materials used for re-vegetation are adaptive to the sediment control.

Following the completion of construction, all disturbed areas will be finished with topsoil and seed. Slopes in excess of 3H:1V will be stabilized with erosion matting to prevent erosion during the interim period in which vegetation is being established. The overland areas of the proposed construction staging areas will also be re-seeded

2.4 Proper storage and cover of any stockpiles

The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site and shall require written approval of the Engineer.

Adequate measures for erosion and sediment control, such as the placement of compost filter tubes around the downstream perimeter of stockpiles, shall be employed to protect any downstream areas from siltation.

The Engineer may designate an area or areas where the Contractor may store materials used in his operations.

2.5 Perimeter Controls and Sediment Barriers

Erosion control measures as described in Section 5 will be utilized to ensure that no sedimentation occurs outside the perimeter of the work area.

2.6 Storm Drain Inlet Protection

Catch basin protection will be implemented for all catch basins affected by the work area. Filter fabric will be placed over the catch basin to minimize sediment loading into the catch basin.

2.7 Retain Sediment On-Site

The Contractor will be responsible to monitor all erosion control measures. Whenever necessary, the Contractor will clear all sediment from compost filter tubes. Daily monitoring should be conducted using the attached Inspection Form.

2.8 Material Handling and Waste Management

All materials stored on-site will be stored in a neat, orderly manner in appropriate containers. All materials 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.

All waste materials will be collected and stored in a securely lidded metal container from a licensed management company. The waste and any construction debris from the site will be hauled off-site daily and disposed of properly. The Contractor will be responsible for all waste removal. Manufacturer's recommendations for proper use and disposal will be followed for all materials.

2.9 Designated Washout Areas

The Contractor shall use washout facilities at their own plants, unless otherwise directed by the Engineer.

2.10 Proper Equipment/Vehicle Fueling and Maintenance Practices

On-site vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the risk of leakage. To ensure that leaks on stored equipment do not contaminate the site, oil-absorbing mats will be placed under all equipment during storage. Regular fueling and service of the equipment may be performed using approved methods and with care taken to minimize chance of spills. Repair of equipment or machinery within the 100' of water resources area shall not be allowed without the prior approval of the Engineer. Any petroleum products will be stored in tightly sealed containers that are clearly labeled.

2.11 Equipment/Vehicle Washing

The Contractor will be responsible to ensure that no equipment is washed on site except to remove sediments prior to transport from the site.

SECTION 3: Spill Prevention and Control Plan

The Contractor will be responsible for preventing spills in accordance with the project specifications and applicable federal, state and local regulations. The Contractor will identify a properly trained site employee, involved with the day-to-day site operations to be the spill prevention and cleanup coordinator. The name(s) of the responsible spill personnel will be posted on-site. Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator.

3.1 Spill Control Equipment

Spill control/containment equipment will be kept in the Work Area. Materials and equipment necessary for spill cleanup will be kept either in the Work Area or in an otherwise accessible on-site location. Equipment and materials will include, but not be limited to, absorbent booms/mats, brooms, dust pans, mops, rags, gloves, goggles, sand, plastic and metal containers specifically for this purpose. It is the responsibility of the Contractor to ensure the inventory will be readily accessible and maintained.

3.2 Notification

All workers will be directed to inform the on-site supervisor of a spill event. The supervisor will

assess the incident and initiate proper containment and response procedures immediately upon notification. Workers should avoid direct contact with spilled materials during the containment procedures. Primary notification of a spill should be made to the local Fire Department and Police Departments. Secondary Notification will be to the certified cleanup contractor if deemed necessary by Fire and/or Police personnel. The third level of notification is to the DEP. The specific cleanup contractor to be used will be identified by the Contractor prior to commencement of construction activities.

3.3 Spill Containment and Clean-Up Measures

Spills will be contained with granular sorbent material, sand, sorbent pads, booms or all the above to prevent spreading. Certified cleanup contractors should complete spill cleanup. The material manufacturer's recommended methods for spill cleanup will be clearly posted and on-site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

3.4 Hazardous Materials Spill Report

The Contractor will report and record any spill. The spill report will present a description of the release, including the quantity and type of material, date of the spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

This document does not relieve the Contractor of the Federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302 and the State requirements specified under the Massachusetts Contingency Plan (M.C.P) relating to spills or other releases of oils or hazardous substances. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a twenty-four (24) hour period, the Contractor is required to comply with the response requirements of the above-mentioned regulations. Spills of oil or hazardous material in excess of the reportable quantity will be reported to the National Response Center (NRC).

SECTION 4: Contact Information/Responsible Parties

Owner/Operator:
Town of Wareham
95 Charge Pond Road
Wareham, MA
(508) 295-5300

Engineer:
Alyssa Peck, PE
Weston & Sampson, Inc.
100 Foxborough Blvd, Suite 250
Foxborough, MA 02035
(508) 698-3034

Site Inspector:
TBD

Contractor:
TBD

SECTION 5: Erosion and Sedimentation Control

Erosion and Sedimentation Control details and layout can be found in the attached plan set. A Stormwater Pollution Prevention Plan (SWPPP) will be required for this project in accordance

with EPA regulations. The contractor shall refer to the SWPPP for additional requirements.

SECTION 6: Site Development Plan

The Site Development Plan is included in the plan set submitted with this submittal.

SECTION 7: Operation and Maintenance of Erosion Control

The erosion control measures will be installed as detailed in the Site Development Plans and specifications. If there is a failure to the controls, the Contractor will be required to stop work until the failure is repaired.

Periodically throughout the work, whenever the Engineer deems it necessary, the sediment that has been deposited against the controls will be removed to ensure that the controls are working properly.

SECTION 8: Inspection Schedule

During construction, the erosion and sedimentation controls will be inspected daily. Once the contractor is selected, an on-site inspector will be selected to work closely with the Engineer to ensure that all erosion and sedimentation controls are in place and working properly. An Inspection Form is included.

Inspection Form

Inspected By: _____ Date: _____Time:_____

YES	NO	DOES NOT APPLY	ITEM
			Do any erosion/siltation control measures require repair or clean out to maintain adequate function?
			Is there any evidence that sediment is leaving the site and entering the wetlands?
			Are any temporary soil stockpiles or construction materials located in non-approved areas?
			Are on-site construction traffic routes, parking, and storage of equipment and supplies located in areas not specifically designed for them?

Specific location, current weather conditions, and action to be taken:

_____

_____

_____

_____

_____

Other Comments:

_____

_____

Pending the actions noted above I certify that the site is in compliance with the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan.

Signature: _____ Date: _____

Illicit Discharge Compliance Statement

Section I – Purpose/Intent

The purpose of this document is to provide for the health, safety, and general welfare of the citizens of Wareham, Massachusetts through the regulation of non-stormwater discharges into existing outstanding resource areas near the proposed project site to the maximum extent practicable, as required by federal and state law. This document establishes methods for controlling the introduction of pollutants into existing outstanding resource areas to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process.

Section II - Definitions

For the purposes of this statement, the following shall mean:

Best Management Practices (BMPs): Schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

Clean Water Act: The federal Water Pollution Control Act (33 U.S.C § 1251 et seq.), and any subsequent amendments thereto.

Construction Activity: Activities subject to the Massachusetts Erosion and Sedimentation Control Act or NPDES Construction Permits. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

Hazardous Materials: Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Connection: An illegal connection is defined as either of the following:

a. Any pipe, open channel, drain or conveyance, whether on the surface or subsurface, which allows an illicit discharge to enter the outstanding resource area including but not limited to any conveyances which allow any non-stormwater discharge including sewage, process wastewater, and wash water, regardless of whether said drain or connection has been previously allowed, permitted, or approved by an authorized enforcement agency; or
b. Any pipe, open channel, drain or conveyance connected to municipal storm water treatment system which has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Illicit Discharge: Any direct or indirect non-stormwater discharge to Wareham stormwater treatment system, except as exempted in Section II of this ordinance.

Industrial Activity: Activities subject to NPDES Industrial Permits as defined in 40CFR, Section 122.26 (b) (14).

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit: A permit issued by MassDEP under authority delegated pursuant to 33 USC § 1342 (b) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Wareham Stormwater Treatment System: Any facility, owned or maintained by the Town of Wareham, designed or used for collecting and/or conveying stormwater, including but not limited to roads with drainage systems, Wareham streets, curbs, gutters, inlets, catch basins, piped storm drains, pumping facilities, infiltration, retention and detention basins, natural and man-made or altered drainage channels, reservoirs, and other drainage structures.

Non-Stormwater Discharge: Any discharge to the storm drain system that is not composed entirely of stormwater.

Person: Any individual, association, organization, partnership, firm, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, city, county or other political subdivision of the State, interstate body, or any other legal entity.

Pollutant: Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; petroleum hydrocarbons; automotive fluids; cooking grease; detergents (biodegradable or otherwise); degreasers; cleaning chemicals; non-hazardous liquid and solid wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; liquid and solid wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; concrete and cement; and noxious or offensive matter of any kind.

Pollution: Contamination or other alteration of any water's physical, chemical, or biological properties by addition of any constituent including but not limited to a change in temperature, taste, color, turbidity, or odor of such waters, or the discharge of any liquid, gaseous, solid, radioactive, or other substance into any such waters as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to the public health, safety, welfare, or environment, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

Premises: Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Stormwater: Any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation, and resulting from such precipitation.

Wastewater: Any water or other liquid discharged from a facility, that has been used, as for washing, flushing, or in a manufacturing process, and so contains waste products.

Section III - Prohibitions

Prohibition of Illicit Discharges:

No person shall throw, drain, or otherwise discharge, cause or allow others under its control to throw, drain, or otherwise discharge into Wareham stormwater treatment system or watercourses any materials, including but not limited to, any pollutants or waters containing any pollutants, other than stormwater. The commencement, conduct or continuance of any illicit discharge to the storm drain system is prohibited except as described as follows:

1. Water line flushing performed by a government agency, other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, natural riparian habitat or wetland flows, and any other water source not containing pollutants;

2. Discharges or flows from fire fighting, and other discharges specified in writing by Town of Wareham as being necessary to protect public health and safety;

3. Dye testing is an allowable discharge, but requires a verbal notification to Town of Wareham prior to the time of the test;

4. Any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for a discharge to Wareham stormwater treatment system.

Section IV - Industrial or Construction Activity Discharges

Any person subject to an industrial or construction activity NPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the Wareham Municipal Maintenance Department prior to allowing discharges to the Wareham stormwater treatment system.

Section V - Notification of Spills and Accidental Discharges

Notwithstanding other requirements of law, as soon as any person responsible for a facility, activity or operation, or responsible for emergency response for a facility, activity or operation has information of any known or suspected release of pollutants or non-stormwater discharges from that facility, activity, or operation which are resulting or may result in illicit discharges or pollutants discharging into stormwater, Wareham stormwater treatment system, State Waters, or Waters of the U.S., said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release so as to minimize the effects of the discharge. In the event of such a release of hazardous materials, said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify Wareham Municipal Maintenance Department in person or by phone no later than the next business day, including the nature, quantity and time of occurrence of the discharge. Notifications in person or by phone shall be confirmed by written notice, via certified mail return receipt requested addressed to Wareham Municipal Maintenance Department within three (3) business days of the initial notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

IN WITNESS WHEREOF the parties hereto have executed copies of this Agreement on the _____ day of _____, _____.

_____

Operations and Maintenance Plan

Bayview Park Improvements

Wareham, Massachusetts

August 2022

Weston & Sampson
100 Foxborough Boulevard
Suite 250
Foxboro, MA 02035

www.westonandsapmson.com
Tel: 508-698-3034

Table of Contents

1.0 Introduction

The following document has been written to comply with the stormwater guidelines set forth by the Massachusetts Department of Environmental Protection (MassDEP). The intent of these guidelines is to encourage Low Impact Development techniques to improve the quality of the stormwater runoff. These techniques, also known as Best Management Practices (BMPs) collect, store, and treat the runoff before discharging to adjacent environmental resources.

2.0 Responsible parties

Town of Wareham
ATTN: Dave Menard
95 Charge Pond Road
Wareham, MA 02571
(508)295-5300

3.0 Purpose

This Operation and Maintenance Plan (O&M Plan) is intended to provide a mechanism for the consistent inspection and maintenance of each BMP installed on the project site. Included in this O&M Plan is a description of each BMP type and an inspection form for each BMP. The Town of Wareham is the owner and operator of the system and is responsible for its upkeep and maintenance. This work will be funded on an annual basis through Town of Wareham operating budget. The estimated budget to maintain these BMPs utilizing is approximately $5,000 per year.

In the event the Owner sells the property, it is the Owner's responsibility to transfer this plan, as well as the past three years of operation and maintenance records, to the new property owner.

4.0 BMP Description and Locations

Proposed BMPs are described below and identified on the BMP Location Map included in Appendix A of O&M Plan.

4.1 Deep Sump Catch Basins/Area Drains

There are several deep sump catch basins/area drains that collect stormwater runoff in the project area. Deep sump catch basins /area drains are part of a stormwater collection systems that are designed to remove trash, debris, and coarse sediment from the stormwater runoff. These structures will be equipped with a hood, which is designed to trap oil and debris within a catch basin preventing pollutants from traveling downstream.

4.2 Rain Gardens/ Bioretention Areas

There are thee proposed rain gardens/bioretention areas within project area that will receive stormwater. Bioretention areas are shallow depressions filled with bioretention soil that use soil, plants, and microbes to treat stormwater before it is infiltrated or discharged.

4.3 Leaching Basins

There are four leaching basins on site. These structures will be installed in off-line configuration, in combination with a deep sump catch basin for to provide pre-treatment. Leaching basins will be set in an excavation lined with a geotextile and backfilled with free draining crushed stone. The base and barrel of the basin are perforated, so that water entering the basin can enter the surrounding stone and infiltrate into the ground.

5.0 Inspection, Maintenance Checklist and Schedule

5.1 Deep Sump Catch Basins/Area Dains

Inspect and/or clean catch basins at least four times per year and at the end of foliage and snow removal seasons. Sediments must be removed whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. Each catch basin should be cleaned a minimum of four times per year regardless of the amount of sediment in the basin. They shall be cleaned using clamshell buckets or vacuum trucks.

In the event of contamination by a spill or other means, all cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000 and handled as hazardous waste.

In the absence of evidence of contamination, catch basin cleanings may be taken to a landfill or other facility permitted by MassDEP to accept Solid Waste without any prior approval by MassDEP. Please note that current MassDEP regulations prevent landfills from accepting materials that contain free-draining liquids.

5.2 Rain Garden/Bioretention Area

Rain Gardens/Bioretention Areas should be inspected after every major storm for the first few months after installation to ensue it is stabilized and is functioning properly.

Upon establishing that the system is functioning properly, the basin shall be inspected at least twice per year.

The following actions should be performed during inspection:

- Inspect pretreatment devices and bioretention areas for sediment build-up, structural damage and standing water
- Inspect for erosion and re-mulch void areas
- Remove and replace dead vegetation in spring and fall
- Remove weeds and/or invasive species to prevent from spreading within bioretention area
- Periodically observe function under wet condition.
- Upon failure, excavate bioretention area, scarify bottom and sides, replace filter fabric and soil, replant and re-mulch.

5.3 Leaching Basin

Leaching basin shall be inspected every six months for the first year. Following the first year, the structures can be inspected a minimum of once per year or as first year data indicates. The structures shall be cleaned a minimum of once per year or when the sediment depth is 15% of its capacity. Polluted water, sediments, and debris should be disposed of in accordance with local, state, and federal regulations.

6.0 Documentation and Record Keeping

- An inspection form should be filled out every time maintenance work is performed.

- A binder should be kept at the Town of Wareham Municipal Maintenance Department that contains all the completed inspection forms and any other related materials. All operation and maintenance log forms for the last three years, at a minimum, shall be kept at Town of Wareham Municipal Maintenance Department.

- A review of all Operation & Maintenance actions should take place annually to ensure that these Stormwater BMPs are being taken care of in the manner illustrated in this Operation & Maintenance Plan.

- The inspection and maintenance schedule may be refined in the future based on the findings and results of this operation and maintenance program or policy.

- The owner of the property shall maintain a log of disposal activities which shall include the types of material disposed and disposal locations.

Bayview Park Improvements
Wareham, MA
Permanent BMP Inspection Checklist

Street Sweeping

Frequency: Street sweeping shall be done quarterly.

Inspected By: _____ Date: _____
Observations: _____
_____
_____

Actions Taken: _____
_____
_____

Instructions: Sweep all paved areas of sediment and debris. Dispose of sediment and debris in accordance with local, state, and federal laws.

Deep Sump Catch Basins

Frequency:	Inspect and clean deep sump catch basins and leaching galleys in March, June, September and December.
Structure Number:	_____
Inspected By:	_____ Date: _____
Observations:	_____ _____ _____
Actions Taken:	_____ _____ _____
Instructions:	Clean unit four times per year or whenever the depth of the deposits is greater than or equal to one half the depth from the bottom of the invert to lowest pipe in the basin/galley.

Leaching Catch Basin

Frequency: Inspect every six months for the first year and minimum once per year following the first year.

Structure Number: _____

Inspected By: _____ Date: _____

Observations: _____
_____
_____

Actions Taken: _____
_____
_____

Instructions: Remove sediment when the basin is 50% filled.
Dispose of sediment and debris in accordance with local, state, and federal laws.
Rehabilitate the basin if it fails due to clogging.

Rain Garden/Bioretention Area

Frequency:	Inspect and Remove trash from the Rain Garden/Bioretention Areas monthly. Annually, in the spring, remove and replace dead vegetation, prune existing vegetation, and add/replace mulch.
Inspected By:	_____ Date: _____
Observations:	_____ _____ _____
Actions Taken:	_____ _____ _____
Instructions:	1. Inspect pretreatment filter strip and bioretention areas monthly for sediment build-up, structural damage and standing water. 2. Inspect for erosion and re-mulch void areas or as necessary. 3. Remove and replace dead vegetation in spring and fall. 4. Remove weeds to prevent from spreading within bioretention area 5. Do not store snow in bioretention areas 6. Periodically observe function under wet weather conditions

SECTION 01570

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 DESCRIPTION:

A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during, and as a result of, construction operations under this contract.

B. The requirements set forth in this section of the specifications apply to construction in and adjacent to wetlands, unless otherwise specifically stated.

C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions, as well as any conditional requirements applied, all of which are attached to Section 00890, PERMITS.

D. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

1.02 RELATED WORK:

A. Section 01562, DUST CONTROL

1.03 SUBMITTALS:

A. The Contractor shall submit for approval six sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands or in areas designated as wetlands.

PART 2 - PRODUCTS

2.01 COMPOST FILTER TUBES:

A. Compost filter tubes shall be jute mesh or approved biodegradable material. Compost filter tubes shall be a minimum of 12 inches in diameter with an effective height of 9.5 inches.

B. 2-inch x 2-inch x 3-feet untreated hardwood stakes shall be used to secure compost filter tubes in place. A 2-inch x 12-inch wide layer of loose compost material shall be placed on the uphill/flow side of the compost filter tubes to fill the space between the soil surface and the compost filter tubes.

PART 3- EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

A. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of the Order of Conditions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Engineer until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3.02 AREA OF CONSTRUCTION ACTIVITY:

A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.03 PROTECTION OF WATER RESOURCES:

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters.

3.04 CONSTRUCTION IN AREAS DESIGNATED AS WETLANDS ON THE DRAWINGS:

A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as wetlands.

B. The Contractor shall perform his work in such a way that these areas are left in the condition existing prior to construction.

C. The elevations of areas designated as wetlands shall not be unduly disturbed by the Contractor's operations. If such disturbance does occur, the Contractor shall take all

measures necessary to return these areas to the elevations which existed prior to construction.

D. Excavated materials shall not be permanently placed or temporarily stored in areas designated as wetlands. Temporary storage areas for excavated material shall be as required by the Engineer.

3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

3.06 LOCATION OF STORAGE AREAS:

A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of compost filter tubes around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as wetlands.

D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

3.07 PROTECTION OF LANDSCAPE:

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

3.08 CLEARING AND GRUBBING:

A. The Contractor shall clear and grub only on the Owner's land or the Owner's easements, and only the area required for construction operations, as approved by the Engineer.

3.09 DISCHARGE OF DEWATERING OPERATIONS:

A. Any water that is pumped and discharged from the trench and/or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.

C. The pumped water shall be filtered through filter fabric and baled straw, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

3.10 DUST CONTROL:

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall be as specified under Section 01562, DUST CONTROL.

B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

3.11 CATCH BASIN PROTECTION:

A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems and entering wetlands. Siltation fabric shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation fabric from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The contractor shall properly dispose of all debris at no additional cost to the Owner.

3.12 COMPOST FILTER TUBES:

A. The compost filter tubes will be placed on the ground and staked in the ground using wooden stakes. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

END OF SECTION

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