The City of Waltham

Invites
Interested Parties
To propose the best offer and or bid
For the service or product herewith described:

CEDAR STREET & OAK STREET STORM DRAIN AND SURFACE IMPROVEMENTS

The bid opening will be held: 10:00 AM on Wednesday August 5, 2015

A pre-bid meeting will be held: 1:00 PM on Wednesday July 29 2013
(Meet at the corner of Cedar Street and Oak Street, Waltham, MA 02452)

Last day for written questions: 12 Noon Thursday July 30, 2015.
to jpedulla@city.waltham.ma.us

CITY OF WALTHAM, MASSACHUSETTS
CEDAR STREET & OAK STREET STORM DRAIN AND SURFACE IMPROVEMENTS

INVITATION TO BID

SECTION 00020

Sealed Bids for the **CEDAR STREET & OAK STREET STORM DRAIN AND SURFACE IMPROVEMENTS** will be received by Joseph Pedulla Purchasing Agent, City Hall, 610 Main Street, Waltham, Massachusetts 02452 until **10:00 AM Wednesday August 5, 2015** and at that time and place bids will be publicly opened and read aloud.

The work of this contract this Contract shall consist of drainage replacement of existing trunk lines, pipes, catch basin lateral pipes, manholes and catch basins with new RCP, precast manholes and catch basins; replacement of sewer laterals from the sewer trunk line to the apparent Right Of Way with new PVC pipe; full depth roadway reconstruction; new cement concrete sidewalks meeting ADA compliance, pavement markings and new street signs in Oak Street and Cedar Street in the City of Waltham, Massachusetts. The project requires all work necessary or incidental to this purpose including providing all necessary supervisors, personnel, equipment and materials.; and all miscellaneous work and cleanup as specified.

The Contract Time shall be **220 Calendar Days** commencing following the receipt of the Notice to Proceed.

Contract Documents may be examined and/or obtained by visiting the City of Waltham's web site at www.city.waltham.ma.us/open-bids.

Contract Documents are available for examination at www.city.waltham.ma.us/open-bids

Bids shall be received only on the separate Bid Forms provided, properly filled out and placed in a sealed envelop addressed to the Purchasing Agent, Waltham, Massachusetts and endorsed "Bid for Cedar Street & Oak Street Storm Drain And Surface Improvements," along with the Bidder's name. Each Bid shall be submitted in accordance with the Instructions to Bidders and shall be accompanied by a Bid Security in the amount of 5 percent of the Bid.

Bidders may not withdraw their Bids for a period of thirty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the Bids.

The Successful Bidder must furnish a 100 percent Performance Bond and a 100 percent Payment Bond with a surety company acceptable to the Owner.

Complete instructions for filing Bids are included in the Instructions to Bidders.

Wage rates for this Project are subject to the Prevailing Wage rates as per M.G.L., Chapter 149, Section 26 to 27H inclusive and can be found at www.city.waltham.ma.us/open-bids

The bidding and award of this Contract will be under the provisions of M.G.L. Chapter 30, Section 39M.

The Owner reserves the right to waive any informality in or to reject any or all Bids if deemed to be in its best interest.

The successful Bidder shall observe faithfully all statutory requirements and local ordinances.

JOSEPH P. PEDULLA, MCPPO
Chief Procurement Officer
CITY OF WALTHAM, MASSACHUSETTS

CITY OF WALTHAM, MASSACHUSETTS
CEDAR STREET & OAK STREET STORM DRAIN AND SURFACE IMPROVEMENTS

INSTRUCTIONS TO BIDDERS
SECTION 00100

ARTICLE 1. QUALIFICATIONS OF BIDDERS

1.1 Bidders may be investigated by The City Of Waltham to determine if they are qualified to perform the Work. All Bidders shall be prepared to submit within five days of The City Of Waltham 's request, written evidence of such information and data necessary to make this determination.

1.2 The investigation of a Bidder will seek to determine whether the organization is adequate in size, is authorized to do business in the jurisdiction where the project is located, has had previous experience and whether available equipment and financial resources are adequate to assure The City Of Waltham that the Work will be completed in accordance with the terms of the Agreement. The amount of other work to which the Bidder is committed may also be considered.

1.3 In evaluating Bids, The City Of Waltham will consider the qualifications of only those Bidders whose Bids are in compliance with the prescribed requirements.

1.4 The City Of Waltham reserves the right to reject any Bid if the evidence submitted by, or the investigation of, such Bidder fails to satisfy The City Of Waltham that such Bidder is properly qualified to carry out the obligations of the Contract Documents and to complete the Work contemplated therein.

ARTICLE 2. COPIES OF CONTRACT DOCUMENTS

2.1 Complete sets of Contract Documents shall be used in preparing Bids; The City Of Waltham assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

2.2 The City Of Waltham in making copies of Contract Documents available do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

ARTICLE 3. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

3.1 Before submitting a Bid, each Bidder must (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may in any manner affect cost, progress or performance of the Work, (c) become familiar with Federal, State and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work; and (d) study and carefully correlate Bidder's observations with the requirements of the Contract Documents.

3.2 Before submitting a Bid, Bidders may, at their own expense, make such investigations and tests as they may deem necessary to determine their Bid for performance of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

3.3 left blank intentionally

3.4 The lands upon which the Work is to be performed, rights-of-way for access thereto and other lands designated for use by CONTRACTOR in performing the Work are identified in the Drawings.

3.5 The submission of a Bid will constitute an incontrovertible representation that the Bidder has complied with every requirement of this Article 3 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the Work.

ARTICLE 4. INTERPRETATIONS

4.1 All questions about the meaning or intent of the Contract Documents shall be received in via e-mail only by jpedulla@city.waltham.ma.us at least five days before the date set herein for the opening of bids.

4.2 Written clarifications or interpretations will be issued by Addenda not later than three days before the bid opening date. Only questions answered by formal written Addenda will be binding. Oral and other clarifications or interpretations will be without legal effect. Addenda will be faxed to all parties recorded as having received the Contract Documents.

4.3 Bidders are responsible for determining that they have received all Addenda issued.

ARTICLE 5.
Will be held at **1.00 PM Wednesday July 29, 2015.** Meet at the corner of Cedar St. and Oak Street.

ARTICLE 6. BID SECURITY

6.1 Each Bid must be accompanied by a5% bid bond, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to City of Waltham.. The Bid Security shall be in the amount stated in the Invitation to Bid. All Bid Securities except those of the three lowest responsible and eligible Bidders will be returned within five days, Saturdays, Sundays, and legal holidays excluded, after opening of the Bids. All Bid Securities will be returned on the execution of the Agreement or if no award is made, within thirty days, excluding Saturdays, Sundays and legal holidays after the actual date of opening of the Bids, unless forfeited under the conditions herein stipulated.

6.2 In case a party to whom a Contract is awarded shall fail or neglect to execute the Agreement and furnish the satisfactory bonds within the time specified, the CITY OF WALTHAM may determine that the Bidder has abandoned the Contract, and thereupon the Bid Forms and acceptance shall be null and void and the Bid Security accompanying the Bid Form shall be forfeited to The City Of Waltham as liquidated damages for such failure or neglect and to indemnify said The City Of Waltham for any loss which may be sustained by failure of the Bidder to execute the Agreement and furnish the bonds as aforesaid, provided that the amount forfeited to THE CITY OF WALTHAM shall not exceed the difference between the Bid Price of said Bidder and that of the next lowest responsible and eligible bidder and provided further that, in case of death, disability, or other unforeseen circumstances affecting the Bidder, such Bid Security may be returned to the Bidder. After execution of the Agreement and acceptance of the bonds by The City Of Waltham, the Bid Security accompanying the Bid Form of the Successful Bidder will be returned.

ARTICLE 7. PERFORMANCE, PAYMENT AND OTHER BONDS

7.1 Performance, Payment and other Bonds shall be provided in accordance with Article 5 of the Conditions of the Contract.

7.2 All Bonds required as Contract Security shall be furnished with the executed Agreement.

ARTICLE 8. BID FORM

8.1 Each Bid shall be submitted on the Bid Form on the perforated pages appended to the Project Manual. The Bid Form shall be removed and submitted separately. All blank spaces for Bid prices must be filled in with the unit price for the item or the lump sum for which the Bid is made.

8.2 Bid Forms shall be completed in ink or by typewriter. The Bid price of each item on the form shall be stated in words, and figures. If unit prices are required on the Bid Form, discrepancies between unit prices and their respective total amounts will be resolved in favor of the unit prices. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

8.3 Bids by corporations shall be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

8.4 Bids by partnerships shall be executed in the partnership name and signed by a partner, whose title shall appear under the signature. The official address of the partnership shall be shown below the signature.

8.5 All names shall be typed or printed below the signature.

8.6 The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which shall be filled in on the Bid Form).

8.7 The address to which communications regarding the Bid are to be directed shall be shown.

8.8 One copy of each Bid shall be submitted in a sealed opaque envelope bearing on the outside the Bidder's name, address, and the Project Title for which the Bid is submitted. (If forwarded by mail, Bid and sealed envelope marked as described above shall be enclosed in another envelope with the notation "BID ENCLOSED" on the face and addressed as indicated in the Invitation to Bid.) The Bid Security shall be submitted in a separate envelope from the Bid and attached to the envelope containing the Bid.

ARTICLE 9. RECEIPT OF BIDS

9.1 Sealed Bids for the work of this Contract will be received at the time and place indicated in the Invitation to Bid.

9.2 The City Of Waltham may consider informal any Bid not prepared and submitted in accordance with the provisions hereof.

9.3 Bidders are cautioned that it is the responsibility of each individual bidder to assure that their bid is in the possession of the responsible official or the designated alternate prior to the stated time and at the place of the Bid Opening. The City Of Waltham is not responsible for bids delayed by mail and/or delivery services, of any nature.

ARTICLE 10. MODIFICATION AND WITHDRAWAL OF BIDS

10.1 Bids may be modified only by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

10.2 Bids may be withdrawn prior to the scheduled time (or authorized postponement thereof) for the opening of Bids.

10.3 Any Bid received after the time and date specified shall not be considered. No Bid may be withdrawn for a period of thirty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the Bids.

ARTICLE 11. AWARD OF CONTRACT

11.1 The Contract will be awarded to the lowest responsible and eligible Bidder (Successful Bidder). Such a Bidder shall possess the skill, ability, and integrity necessary for the faithful performance of the work. The term "lowest responsible and eligible Bidder" as used herein

shall mean the Bidder whose Bid is the lowest of those Bidders possessing the skill, ability and integrity necessary to the faithful performance of the Work.

11.2 The City Of Waltham reserves the right to reject any and all Bids, to waive any and all informalities if it is in The City Of Waltham 's best interest to do so, and the right to disregard all nonconforming, non-responsive or conditional Bids.

11.3 LEFT BLANK.

11.4 The City Of Waltham also reserves the right to reject the Bid of any Bidder that The City Of Waltham considers to be unqualified relative to Article 1 above.

11.5 If the Contract is to be awarded, The City Of Waltham will give the Successful Bidder a Notice of Award within thirty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the Bids. All bids shall remain open for thirty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the Bids but The City Of Waltham may, at The City Of Waltham 's sole discretion, release any Bid and return the Bid Security prior to that date.

ARTICLE 12. EXECUTION OF AGREEMENT

12.1 When The City Of Waltham gives a Notice of Award to the Successful Bidder. Within five days, excluding Saturdays, Sundays and legal holidays, after the date of receipt of such notification CONTRACTOR shall execute and return all copies of the Agreement and all other applicable Contract Documents to The City Of Waltham. Within ten days thereafter The City Of Waltham will deliver one fully signed copy to CONTRACTOR.

ARTICLE 13. SAFETY AND HEALTH REGULATIONS

13.1 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.

13.2 The Successful Bidder shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 (PL-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL-91-54).

13.3 The Successful Bidder shall have a competent person or persons, as required under the Occupational Safety and Health Act on the Site to inspect the Work and to supervise the conformance of the Work with the regulations of the Act.

ARTICLE 14. MANUFACTURER'S EXPERIENCE

14.1 Whenever it is written that an equipment manufacturer must have a specified period of experience with his 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 a Bond or cash deposit for the duration of the specified time period which will guarantee replacement of that equipment in the event of failure.

ARTICLE 15. ACCESS TO WORK

15.1 Representatives of the City Of Waltham and any local agencies having a direct interest in the Work shall have access to the Work under this contract wherever it is in preparation or progress and the Contractor shall provide proper facilities for such access and inspection.

ARTICLE 16. CHANGE ORDERS

16.1 Change orders are not effective until, if, as and when signed by the Mayor and no work is to commence until the change orders are fully executed.

ARTICLE 17. MASSACHUSETTS GENERAL LAWS AND REGULATIONS

17.1 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 conflict between Code of Federal Regulations and State Laws and Regulations exist, the more stringent requirement shall apply.

ARTICLE 18. SALES TAX

18.1 The City is exempt from state sales taxes.

ARTICLE 19. UTILITY UNDERGROUND PLANT DAMAGE PREVENTION SYSTEM

19.1 All excavations within public or private ways are subject to the requirements of Massachusetts General Law, Chapter 82, Section 40 included in PART II of the Supplementary Conditions.

ARTICLE 20. WAGE RATES

20.1 Minimum Wage Rates as determined by the Commissioner of Department of Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Section 26 to 27H, as amended, apply to this project. It is the responsibility of the Contractor, before bid opening, to request if necessary, any additional information on Minimum Wage Rates for those trades people who may be employed for the proposed work under this Contract.

20.2 The State schedule of minimum wage rates will be found on line at www.city.waltham.ma.us/open-bids. the schedule is too large to attach here.

ARTICLE 21. COMPETITIVE BIDDING

21.1 The bidding and award of the Contract shall be in full compliance with Section 39 M inclusive of Chapter 30 of the General Laws of the Commonwealth of Massachusetts as last revised.

ARTICLE 22. GUARANTEE

22.1 The Contractor guarantees 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.

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

ARTICLE 23 READ ALL DOCUMENTS.

Bidders should familiarize themselves with all the documents contained herein; it is mandatory that all Bids be in compliance with all the provisions contained in said documents.

ARTICLE 24 PRINTED OR TYPED RESPONSE.
All information must be typewritten or printed in ink, including the price the bidder offers in the space as provided on the bid form.

ARTICLE 25 CORRECTIONS.

Bids that are submitted containing cross outs, white outs or erasures, will be rejected. All corrections or modifications to the original bid are to be submitted in a separate envelope, properly marked on the outside, "CORRECTION/ MODIFICATION TO BID (title)" and submitted prior to the bid opening.

ALL DOCUMENTS SUBMITTED WITH YOUR RESPONSE WILL BE INCORPORATED INTO THE CONTRACT.

ARTICLE 26 PRICE IS ALL INCLUSIVE.

Bid prices shall encompass everything necessary for furnishing all items, materials, supplies or services as specified, and in accordance with the specifications, including proper packing, cost of delivery, and in the case of services, completion of same, as per specifications.

ARTICLE 27 PRICE DISCREPANCY.

In the event of a discrepancy between the Unit Price and the Extension, the Unit Price shall prevail.

ARTICLE 28 TIME TO AWARD.

Bids will be awarded not later than (90) ninety days after the scheduled bid opening date, unless otherwise stated, in the specifications. Unless otherwise specified, bids will be evaluated on the basis of, completeness of your RFP response, responsiveness, responsibility, best price and experience.

ARTICLE 29 AWARD CRITERIA.

Qualified and responsive proposals will be evaluated based on the following rating, which will apply to all Price, Technical, and Compliance requirements

ARTICLE 30 DISCOUNTS.

Discounts for prompt payments, based on City Pay Day, will be considered when making awards.

ARTICLE 31 TAX EXEMPT.

Purchases by the City of Waltham is exempt from any Federal, State or Massachusetts Municipal Sales and/or Excise Taxes.

ARTICLE 31 FUNDS APPROPRIATION

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The contract obligation on behalf of the City is subject to prior appropriation of monies from the governmental body and authorization by the Mayor.

ARTICLE 32 THE AWARDING AUTHORITY RESERVES THE RIGHT TO REJECT ANY OR ALL BIDS, OR ANY PART OF ANY BID, WHICH IN THE OPINION OF THE AWARDING AUTHORITY, IS IN THE BEST INTERESTS OF THE CITY OF WALTHAM.

ARTICLE 33 THE TAX ATTESTATION CLAUSE, CERTIFICATION OF NON-COLLUSION AND THE CORPORATION INFORMATION,

are an integral part of the Invitation for Bid and must be completed and signed by the person submitting the Bid, or by the person/persons who are officially authorized to do so.

ARTICLE 34 ASSIGNMENT.

The final payment for work done under this Contract shall be made only after the Contractor has signed a statement under the penalty of perjury, certifying that he has completed the work described in the final estimate. Neither party hereto shall assign this Contract or sublet it in part or as a whole without the prior written consent of the other party hereto. The Contractor shall not assign any sum or sums due or becoming due to him hereunder without the prior written consent of the City.

ARTICLE 35 GUARANTEES.

Unless otherwise stipulated in the specifications, furniture, equipment and similar durable items shall be guaranteed by the contractor for a period of not less than one year from the date of delivery and acceptance by the receiving department. In addition, the manufacturer's guarantee shall be furnished. Any items provided under this contract which are or become defective during the guarantee period shall be replaced the contractor free of charge with the specific understanding that all replacements shall carry the same guarantee as the original equipment. The contractor shall make such replacement immediately upon receiving notice from the Purchasing Agent.

ARTICLE 36 CHANGE ORDERS.

Change orders are not effective until, if, as and when signed by the Mayor and no work is to commence until the change orders are fully executed.

ARTICLE 37 INSURANCE

A. WORKMAN'S COMPENSATION: The Contractor shall provide by insurance for the payment of compensation and furnishing of other benefits under Chapter 152 of the General Laws of the Commonwealth of Massachusetts to all persons to be employed under this contract, the premiums for which shall be paid by the Contractor.

B. COMPREHENSIVE GENERAL LIABILITY

Bodily Injury:	$1,000,000 Each Occurrence
	$2,000,000 Aggregate
Property Damage:	$1,000,000 Each Occurrence
	$2,000,000 Aggregate

C. AUTOMOBILE (VEHICLE) LIABILITY

Bodily Injury	$2,000,000 Each Occurrence
Property Damage	$1,000,000 Aggregate

D. UMBRELLA POLICY $2,000,000

Your bid response must include a Certificate of Insurance with the above limits as a minimum. In addition, the Certificate of Insurance must have the following text contained in the bottom left box of the Certificate: *"The City of Waltham is a named additional insured for all insurances under the contract, excluding Automobile and Workers Compensation coverage".* Failure by the contractor to provide a current and updated insurance policy, during the entire duration of the contract, may result in additional legal liability. The Certificate of Insurance must be mailed directly to:

Office of the Purchasing Agent
Purchasing Department
City of Waltham
610 Main Street
Waltham, MA 02452

ARTICLE 38 BREACH OF CONTRACT/ NON PERFORMANCE

If the Contractor shall provide services in a manner, which is not to the satisfaction of the City, the City may request that the Contractor refurnish services at no additional cost to the City until approved by the City. If the Contractor shall fail to provide services, which are satisfactory to the City, the City in the alternative may make any reasonable purchase or Contract to purchase services in substitution for those due from the Contractor. The City may deduct the cost of any substitute Contract for nonperformance of services together with incidental and consequential damages from the Contract price and shall withhold such damages from sums due or to become due to the Contractor. If the damages sustained by the City exceed sums due or to become due, the Contractor shall pay the difference to the City upon demand. The Contractor shall not be liable for any damages sustained by the City due to the Contractor's failure to furnish services under the terms of this Contract if such failure is in fact caused by the occurrence of a contingency the nonoccurrence of which was a basic assumption under which this Contract was made, including a state of war, embargoes, expropriation of labor strike or any unanticipated federal, state or municipal governmental regulation of order, provided that

the Contractor has notified the City in writing of such cause within seven (7) days after its occurrence.

ARTICLE 39 BID OPENING INCLEMENT WEATHER

If, at the time of the originally scheduled bid opening, City Hall is closed to inclement weather or another unforeseeable event, the bid opening will be extended until 2:00 PM on the next normal business day. Bids will be accepted until that date and time.

ARTICLE 40 TIE BREAK

In the event of a tie where both vendors were responsive and responsible the vendors with a tie agree to a coin toss to determine the winner. The Coin toss will be executed in the presence of both vendors and a witness from the Purchasing Office. The coin will be flipped by the Chief Procurement Officer in the presence of the two bidders. A written record of the process you used, including the results and the names of those participating. The low bidders shall sign an agreement stating that they will abide by the results of the tie breaker. As an alternative, you may allow for a "second round" between the tied vendors.

ARTICLE 41 ACTIVE REPARATION CLAIMS

Does your company or any of its Principals have an active reparation Claim with the City. A claim is any demand by a contract for the payment of disputed invoices, payment penalties, labor disputes, interest, etc. YES _____, NO_____ (*circle or check applicable).*
If YES Please explain the nature of the claim, date of the claim and City Department

_____

_____

_____

(Add an additional page if necessary)

ARTICLE 42 REVISED MBE/WBE GOALS FOR, *(if applicable)*, CERTAIN STATE FUNDED BUILDING PROJECTS ONLY

Pursuant to M.G.L. c 7, §40N and M.G.L. c. 7, §61, the Supplier Diversity Office ("SDO") (formerly SOMWBA) and the Division of Capital Asset Management ("DCAM") have set revised participation goals for Minority Business Enterprise ("MBE") and Women Business Enterprise ("WBE") participation for affected state funded building projects and state assisted municipal building projects as defined in the above referenced laws and related Executive Orders, including Executive Orders 524 and 526.
Effective January 1, 2012, and until such time as the goals may be revised, the MBE and WBE participation goals for building construction and design awards and expenditures on new projects advertised on or after the effective date will be a combined MBE/WBE goal as follows:
14.4% combined MBE/WBE participation on construction contract awards; and,
17.9% combined MBE/WBE participation on design contract awards.

Overall annual designations by awarding authorities, as well as MBE/WBE participation on individual projects with a combined MBE/WBE participation goal, must include a reasonable representation of both MBE and WBE firms that meets or exceeds the combined goal. Proposed MBE/WBE participation plans that include solely MBE or solely WBE participation, or do not include a reasonable amount of participation by both MBE and WBE firms to meet the combined goal, will not be considered responsive. Where the prime contractor or designer is an SDO certified MBE or WBE, the prime must bring a reasonable amount of participation by a firm or firms that hold the certification which is not held by the prime contractor or designer on the project. Proposed participation on construction projects or design projects which consists solely of either an MBE or WBE representing 100% of the overall combined goal will not be considered reasonable participation. The SDO and DCAM will determine whether there is reasonable participation by both MBE and WBE firms on individual projects under their respective oversight. Firms submitting MBE/WBE participation plans which do not provide reasonable participation by both MBE/WBE firms shall be provided an opportunity to revise and resubmit their plans within the time frame set by the awarding authority; however no price adjustments shall be permitted as a result of the revised plan. Firms failing to submit an MBE/WBE participation plan deemed reasonable and accepted by the awarding authority shall not be awarded the contract.

Participation by MBE and WBE firms must be documented, tracked and reported on separately as MBE participation and WBE participation by prime vendors, subcontractors and awarding authorities.

ARTICLE 43 THE CITY OF WALTHAM EQUAL EMPLOYMENT OPPORTUNITY AND AFFIRMATIVE ACTION POLICY

The City of Waltham is committed to a policy of equal employment opportunity and to a program of affirmative action in order to fulfill that policy. The City will accordingly recruit and hire into all positions the most qualified persons in light of job-related requirements, and applicants and employees shall be treated in employment matters without regard to unlawful criteria including race, color, religion, ancestry, national origin, sex, sexual orientation, disability, age, positive HIV-related blood test results, status as a disabled or Vietnam Era Veteran, genetic information, or gender identity or expression, as these terms are defined under applicable law, or any other factor or characteristic protected by law.

In addition, The City of Waltham recognizes that discriminatory harassment and sexual harassment are forms of unlawful discrimination, and it is, therefore, the policy of the City of Waltham that discriminatory harassment and sexual harassment will not be tolerated. The City of Waltham also prohibits unlawful harassment on the basis of other characteristics protected by law.

Further, employees and applicants will not be subjected to harassment or retaliation because they have engaged in or may engage in the following: filing a complaint or assisting or participating in an investigation regarding alleged discrimination or harassment as prohibited in the policy statement above; filing a complaint or assisting or participating in an investigation, compliance evaluation, or any other activity related to the administration of the Vietnam Era Veterans' Readjustment Assistance Act of 1974 ("VEVRAA"), Section 503 of the Rehabilitation Act of 1973 ("Rehabilitation Act"), or the Affirmative Action provisions of federal, state or local

law; opposing any act or practice made unlawful by VEVRAA requiring equal employment opportunities for individuals with disabilities, disabled veterans, or veterans of the Vietnam Era; or exercising any rights under VEVRAA or the Rehabilitation Act.

Sources: Titles VI and VII of the Civil Rights Act of 1964; the Immigration Reform and Control Act of 1986; Title IX of the Education Amendments of 1972; the Equal Pay Act of 1963; the Age Discrimination in Employment Act of 1967; the Age Discrimination Act of 1975; Sections 503 and 504 of the Rehabilitation Act of 1973; the Americans with Disabilities Act of 1990; Section 402 of the Vietnam-Era Veterans Readjustment Assistance Act of 1974; Executive Order 11246 as amended; The Genetic Information Nondiscrimination Act of 2008 and such other federal, state and local non-discrimination laws as may apply.

ARTICLE 44 BUY RECYCLING REQUIREMENTS

The City of Waltham's Buy Recycling Procedure follows the EPA's Comprehensive Procurement Guideline (CPG) program promoting the use of materials recovered from solid waste. Buying recycled-content products ensures that the materials collected in recycling programs will be used again in the manufacturing of new products. The City requires that the purchase of products and material supplied by subcontractors originate, as often as practical, from the recycling of previously used materials.

BY: JOSEPH P. PEDULLA, MCPPO
CHIEF PROCUREMENT OFFICER
CITY OF WALTHAM, MASSACHUSETTS

SECTION 00300

FORM FOR GENERAL BID

CITY OF WALTHAM, MASSACHUSETTS
CEDAR STREET AND OAK STREET
STORM DRAIN AND SURFACE IMPROVEMENTS

The following Bid is submitted to: City of Waltham Purchasing Department.
Attn: Joseph Pedulla, Chief Procurement Officer
Waltham City Hall.
610 Main Street
Waltham, Massachusetts 02452.

By (Contractor Name): _____.
(Address for Giving Notice): _____.
_____.
_____.
(Telephone): _____.
(FAX): _____.

A. The Undersigned proposes to furnish all labor and materials required for Water Main Improvements Project in Waltham, Massachusetts, in accordance with the accompanying plans and specifications prepared by Wright-Pierce for the contract price specified below, subject to additions and deductions according to the terms of the specifications.

B. This bid includes addenda

Number	_____	_____	_____	_____	_____
Dated	_____	_____	_____	_____	_____

C. The proposed contract price for the Base Bid including Bid Items 1 through 41 complete is

_____

_____ dollars ($_____).
(in Words) (in Figures)

D. The subdivision of the proposed contract price is as follows:

Item No.	Quantity*	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
1	1 LS	Mobilization (Maximum 5% of total Bid) The Sum of $_____ _____ Per Lump Sum	$_____	$_____
2	100 LF	Relocate Ductile Iron Water Main, All Sizes The Sum of $_____ _____ Per Linear Foot	$_____	$_____
3	4 EA	Remove and Relocate Hydrant Assemblies The Sum of $_____ _____ Per Each	$_____	$_____
4	1,320 LF	Sewer Service Connections The Sum of $_____ _____ Per Linear Foot	$_____	$_____
5	23 EA	Furnish & Install 4' Dia. Catch Basins The Sum of $_____ _____ Per Each	$_____	$_____
6	14 EA	Furnish & Install 4' Dia. Storm Drain Manhole The Sum of $_____ _____ Per Each	$_____	$_____
7	3 EA	Furnish and Install 5' Dia. Storm Drain Manhole The Sum of $_____ _____ Per Each	$_____	$_____

Item No.	Quantity*	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
8	350 LF	12-inch RCP Storm Drain The Sum of $_____ _____ Per Linear Feet	$_____	$_____
9	1,000 LF	15-inch RCP Storm Drain The Sum of $_____ _____ Per Linear Feet	$_____	$_____
10	700 LF	18-inch RCP Storm Drain The Sum of $_____ _____ Per Linear Feet	$_____	$_____
11	350 LF	24-inch RCP Storm Drain The Sum of $_____ _____ Per Linear Feet	$_____	$_____
12	825 LF	Abandon & CDF 12-inch Pipe The Sum of $_____ _____ Per Linear Feet	$_____	$_____
13	530 LF	Abandon & CDF 15-inch Pipe The Sum of $_____ _____ Per Linear Feet	$_____	$_____
14	480 LF	Abandon & CDF 18-inch Pipe The Sum of $_____ _____ Per Linear Feet	$_____	$_____
15	15 EA	Abandon & CDF Drainage Structures The Sum of $_____ _____ Per Each	$_____	$_____
16	100 LF	Removing/Relaying Existing Utilities The Sum of $_____ _____ Per Linear Feet	$_____	$_____

Item No.	Quantity*	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
17	50 CY	Ledge Excavation The Sum of $_____ _____ Per Cubic Yard	$_____	$_____
18	100 CY	Excavation Below Trench Grade and Replacement Backfill The Sum of $_____ _____ Per Cubic Yard	$_____	$_____
19	100 CY	Replacement of Unsuitable Material above Trench Grade The Sum of $_____ _____ Per Cubic Yard	$_____	$_____
20	3,255 CY	Aggregate Subbase The Sum of $_____ _____ Per Cubic Yard	$_____	$_____
21	3,260 CY	Aggregate Base The Sum of $_____ _____ Per Cubic Yard	$_____	$_____
22	1,560 TN	Permanent Binder Course The Sum of $_____ _____ Per Ton	$_____	$_____
23	835 TN	Permanent Top Course The Sum of $_____ _____ Per Ton	$_____	$_____
24	870 LF	Remove and Reset Curb The Sum of $_____ _____ Per Linear Foot	$_____	$_____
25	6 EA	Remove and Reset Curb Corners The Sum of $_____ _____ Per Each	$_____	$_____

Item No.	Quantity*	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
26	3,025 LF	New Vertical Granite Curb VA-4 The Sum of $_____ _____ Per Linear Foot	$_____	$_____
27	385 LF	New Vertical Granite Transition Curb The Sum of $_____ _____ Per Linear Foot	$_____	$_____
28	190 LF	New Granite Inlet Curb The Sum of $_____ _____ Per Linear Foot	$_____	$_____
29	133 EA	New Granite Curb Corners The Sum of $_____ _____ Per Each	$_____	$_____
30	2,400 SY	Cement Concrete Sidewalks (4-inch) The Sum of $_____ _____ Per Square Yard	$_____	$_____
31	1,385 SY	Cement Concrete Sidewalk @driveways and HCP Curb Ramps (6-inch) The Sum of $_____ _____ Per Square Yard	$_____	$_____
32	240 SF	Detectable Warning Devices The Sum of $_____ _____ Per Square Foot	$_____	$_____
33	1 LS	Erosion and Sediment Control The Sum of $_____ _____ Per Lump Sum	$_____	$_____
34	15 EA	Tree Plantings The Sum of $_____ _____ Per Each	$_____	$_____

Item No.	Quantity*	Brief Description of Item with Unit Bid Price in Words	Unit Bid In Figures	Amount In Figures
35	20 EA	Test Pit Excavation The Sum of $_____ _____ Per Each	$_____	$_____
36	1 LS	Utility Coordination The Sum of $_____ _____ Allowance	$ 20,000.00	$ 20,000.00
37	1 Allow	Uniformed Police Detail The Sum of $_____ _____ Allowance	$165,000.00	$165,000.00
38	1 Allow	Price Adjustment Allowance The Sum of $_____ _____ Allowance	$10,000.00	$10,000.00
39	1 Allow	Utility Repairs The Sum of $_____ _____ Allowance	$50,000.00	$50,000.00
40	1 LS	Management of Contaminated Soils/Fill The Sum of $_____ _____ Lump Sum	$_____	$_____
41	400 CY	Removal and Disposal of Soil (Class A-1) The Sum of $_____ _____ Cubic Yard	$_____	$_____
42	1 Allow	Removal and Disposal of Excess Contaminated Soils The Sum of $_____ _____ Allowance	$ 100,000.00	$ 100,000.00
43	71 EA	Furnish & Install New Signs The Sum of $_____ _____ Per Each	$_____	$_____

* Indeterminate quantities assumed for comparison of bids. Quantities are not guaranteed. Payment will be based on actual quantities installed/constructed.

E. The undersigned agrees that, if selected as general contractor, he/she will within five days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the awarding authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price.

The undersigned declares that the only persons or parties interested in this Bid as principals are as stated; that the Bid is made without any collusion with other persons, firms, or corporations; that all, the Contract Documents as prepared by Wright-Pierce, 40 Shattuck Road, Suite 305, Andover, MA 01810 and dated JUNE 2015 have been carefully examined; that the undersigned is fully informed in regard to all conditions pertaining to the Work and the place where it is to be done, and from them the undersigned makes this Bid. These prices shall cover all expenses incurred in performing the Work required under the Contract Documents, of which this Bid Form is a part.

The time period for holding bids, where Federal approval is not required is 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids.

The Bid Security accompanying this Bid shall be in the amount of 5 percent of the Bid. The Bid Security shall be sealed in a separate envelope from the Bid and then attached to the envelope containing the Bid.

If a Notice of Award accompanied by at least six unsigned copies of the Agreement and all other applicable Contract Documents is delivered to the undersigned within thirty days, excluding Saturdays, Sundays, and legal holidays after the actual date of the opening of the General Bids, the undersigned will within five days, excluding Saturdays, Sundays, and legal holidays, after the date of receipt of such notification, execute and return all copies of the Agreement and all other applicable Contract Documents to OWNER. The premiums for all Bonds required shall be paid by CONTRACTOR and shall be included in the Contract Price. The undersigned Bidder further agrees that the Bid Security accompanying this Bid shall become the property of OWNER if the Bidder fails to execute the Agreement as stated above.

The undersigned hereby agrees that the Contract Time shall commence twenty days following the Effective Date of the Agreement and that the Work will be substantially complete and completed and ready for final payment in accordance with paragraph 14.07 of the General and Supplementary Conditions on or before the dates or within the number of calendar days indicated in the Agreement. Work will be substantially complete within 220 calendar days after the date of the Notice to Proceed. The undersigned further understands that delays in completion of the Work will cause the OWNER to suffer damages and incur substantial costs, and will expose the OWNER to other substantial liabilities, and that if the selected Contractor shall neglect, fail or refuse to achieve Substantial Completion or final completion of the Work within the times specified above, as such times may be extended pursuant to the provisions of the Contract Documents, the OWNER will hold the selected Contractor strictly liable for all such damages and any other damages, costs, expenses or liabilities sustained or incurred by the OWNER arising out of such delays, as further provided in the Agreement, or for any delay in achieving

any other milestones set forth in the Contract Documents in accordance with the terms of the Agreement. The undersigned accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work on time in the amount of $1,000 per day after substantial completion time limits.

In accordance with the above understanding, the undersigned proposes to perform the Work, furnish all materials and complete the work in its entirety in the manner and under the conditions required.

The OWNER shall select the low responsive and responsible bidder based on the Base Bid and available funding.

The undersigned agrees that extra work, if any, will be performed in accordance with Article 10 of the General Conditions of the Contract and will be paid for in accordance with Article 16 of the General Conditions of the Contract.

The bidding and award of this Contract will be in accordance with M.G.L. Chapter 30, Section 39M.

The undersigned must furnish a 100 percent Performance Bond and a 100 percent Payment Bond with a surety company acceptable to OWNER.

Where indicated for amounts to be shown in both words and figures, in case of discrepancy, the amount shown in words shall govern.

CERTIFICATIONS

Pursuant to M.G.L. Ch. 62C, sec. 49A, I certify under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that he/she will comply fully with all laws and regulations.

The undersigned further certifies under the 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 subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section Twenty-nine F of Chapter Twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Social Security Number or Federal Identification Number		Individual or Corporate Name (Print or Type)
	For Certifications By:	(Signature of Authorized Person)
Signatures for Joint Ventures	For Certifications By:	(Signature of Authorized Person)
	For Certifications By:	(Signature of Authorized Person)

Form **W-9**
(Rev. December 2011)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give Form to the requester. Do not send to the IRS.

Fill Out This Section

Print or type
See Specific Instructions on page 2.

Name (as shown on your income tax return)

Business name/disregarded entity name, if different from above

Check appropriate box for federal tax classification:
☐ Individual/sole proprietor ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶

☐ Other (see instructions) ▶

☐ Exempt payee

Address (number, street, and apt. or suite no.)

City, state, and ZIP code

Requester's name and address (optional)
Chief Procurement Officer
Purchasing Department, City of Waltham
610 Main Street
Waltham, MA 02452

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number
☐☐☐ - ☐☐ - ☐☐☐☐

Employer identification number
☐☐ - ☐☐☐☐☐☐☐

Fill out this sect. either SS or FID

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 4.

Sign & Date

Sign Here | **Signature of U.S. person** ▶ | **Date** ▶

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

CERTIFICATE OF VOTE OF AUTHORIZATION

Date:
I _____, Clerk of_____hereby certify that at a meeting of the Board of Directors of said Corporation duly held on the_____day of_____at which time a quorum was present and voting throughout, the following vote was duly passed and is now in full force and effect:

VOTED: That _____(*name*) is hereby authorized, directed and empowered for the name and on behalf of this Corporation to sign, seal with the corporate seat, execute, acknowledge and deliver all contracts and other obligations of this Corporation; the execution of any such contract to be valid and binding upon this Corporation for all purposes, and that this vote shall remain in full force and effect unless and until the same has been altered, amended or revoked by a subsequent vote of such directors and a certificate of such later vote attested by the Clerk of this Corporation.

I further certify that_____ is duly elected/appointed_____
_____of said corporation

SIGNED:

(Corporate Seal)

_____
Clerk of the Corporation:

Print Name: _____

COMMONWEALTH OF MASSACHUSETTS

County of_____ Date:

Then personally appeared the above named and acknowledged the foregoing instrument to be their free act and deed before me,_____

Notary Public;

My Commission expires: _____

CORPORATION IDENTIFICATION

The bidder for the information of the Awarding Authority furnishes the following information.

If a Corporation:

Incorporated in what state _____

President _____

Treasurer _____

Secretary _____

Federal ID Number_____

If a foreign (out of State) Corporation – Are you registered to do business in Massachusetts?

Yes _____, No _____

If you are selected for this work you are required under M.G.L.ch. 30S, 39L to obtain from the Secretary of State, Foreign Corp. Section, State House, Boston, a certificate stating that you Corporation is registered, and furnish said certificate to the Awarding Authority prior to the award.

If a Partnership: (Name all partners)

Name of partner _____

Residence _____

Name of partner _____

Residence _____

If an Individual:

Name _____

Residence _____

If an Individual doing business under a firm's name:

Name of Firm _____

Name of Individual _____

Business Address _____

Residence _____

Date _____

Name of Bidder _____

By _____

Signature _____

Title_____

_____

Business Address (POST OFFICE BOX NUMBER NOT ACCEPTABLE)

_____

City State Telephone Number Today's Date

WEEKLY PAYROLL RECORDS REPORT & STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided, A Payroll Form has been printed on the reverse of this page and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract. In addition, every contractor and subcontractor is required to submit, on a weekly basis, a copy of his or her weekly payroll records to the awarding authority. For every week in which an apprentice is employed, a photocopy of the apprentice's identification card must be attached to the payroll report. Once collected, the awarding authority is also required to preserve those reports for three years. In addition, each such contractor, subcontractor, or public body shall furnish to the awarding authority directly, within fifteen days after completion of its portion of the work, a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

_____

STATEMENT OF COMPLIANCE

_____, 201__

I_____, _____
(Name of signatory party) (Title)

I do hereby state that I pay or supervise the payment of the persons employed by

_____On the_____
(Contractor, subcontractor or public body) (Building or project)

.
and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of sections twenty-six and twenty-seven of chapter one hundred and forty nine of the General Laws.

Signature_____, Title _____

Print _____, Date _____

WEEKLY PAYROLL REPORT FORM

Company Name: _____

Project Name: _____

Awarding Auth.: _____

Work Week Ending: _____

☐ Final Report

☐ Prime Contractor

☐ Subcontractor
List Prime Contractor: _____

Employer Signature: _____

Print Name & Title: _____

Employee Name & Address	Work Classification	Hours Worked							(A) Tot. Hrs.	(B) Hourly Base Wage	Employer Contributions			(F) [B+C+D+E] Hourly Total Wage (prev. wage)	(G) [A*F] Weekly Total Amount
		S	M	T	W	T	F	S			(C) Health & Welfare	(D) Pension	(E) Supp. Unemp.		

NOTE: Every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority.

RIGHT TO KNOW LAW

Any vendor who receives an order or orders resulting from this invitation agrees to submit a Material Safety Data Sheet (MSDS) for each toxic or hazardous substance or mixture containing such substance, pursuant to M.G.L. c. 111F, §§8,9 and 10 and the regulations contained in 441 CMR 21.06 when deliveries are made. The vendor agrees to deliver all containers properly labeled pursuant to M.G.L. c. 111F §7 and regulations contained in 441 CMR 21.05. Failure to furnish MSDS and/or labels on each container may result in civil or criminal penalties, including bid debarment and action to prevent the vendor from selling said substances, or mixtures containing said substances within the Commonwealth. All vendors furnishing substances or mixtures subject to Chapter 111F or M.G.L. are cautioned to obtain and read the laws, rules and regulations referenced above. Copies may be obtained from the State House Bookstore, Secretary of State, State House, Room 117, Boston, MA (617) 727-2834.

Authorized Signature Indicating Compliance with the Right-to-know laws:

Signature Date

Print Name

NOTE

Failure to submit any of the required documents, in this or in other sections, with your bid response package may cause the disqualification of your proposal.

10 HOURS OSHA TRAINING CONFIRMATION

Chapter 306 of the Acts of 2004

CONSTRUCTION PROJECTS

AN ACT RELATIVE TO THE HEALTH AND SAFETY ON PUBLIC

The undersigned hereby certifies that all employees to be employed at a worksite for construction, reconstruction, alteration, remodeling, repair, installation, demolition, maintenance or repair of any public work or any public building estimated to cost more than $10,000.00 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 payroll report for each employee and will comply with all laws and regulations applicable to awards of subcontracts subject to section 44F.

Company Name: _____

Address: _____

Signature:_____

Title: _____

Print Name _____

Date _____

See following Chapter 306 of the Acts of 2004

NOTE

Failure to submit any of the required documents, in this or in other sections, with your bid response package will be cause for the disqualification of your company.

PROOF OF CONTRACTOR'S RESPONSIBILITY

Before a contract will be awarded to any bidder, he/she will be required to furnish evidence satisfactory to the City that he/she has all of the following qualifications:

A. Ability, equipment, organization, and financial resources sufficient or enable him/her to construct and complete the work successfully within the time required.

B. Experience during the past three (3) years in the successful completion of turf restoration projects, the magnitude of which shall be not less than one-half (1/2) the work herein specified. In this connection, the attention of the bidder is directed to the "Bidder's Experience" attached hereto, which shall be used in determining the responsibility of the bidder. The City may require additional information as necessary to determine the responsibility of the bidder.

C. An experienced bidder shall be construed to mean that the bidder has an individual within his/her organization with the experience to supervise a job of this nature.

In the event the bidder fails, refuses, or neglects to submit any required information within the reasonable time stated in any request or fails to qualify as a responsible bidder, his/her bid guaranty shall be forfeited to the use of the owner, not as a penalty, but as liquidated damages.

The determination of whether a bidder is responsible shall rest solely with the City.

BIDDER'S EXPERIENCE

The following is a list of the projects similar in character and scope to the work specified under this contract, which have been successfully completed by this bidder during the past three years.

This information must be furnished by each bidder. A completed project is one that has been accepted and the final payment received from the City or authorized representative.

_____

_____ _____

Bidder's Signature Date

SECTION 01010

SUMMARY OF WORK

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. The purpose of this Contract shall consist of drainage replacement of existing trunk line pipes, catch basin lateral pipes, manholes and catch basins with new RCP, precast manholes and catch basins; replacement of sewer laterals from the sewer trunk line to the apparent Right Of Way with new PVC pipe; full depth roadway reconstruction; new cement concrete sidewalks meeting ADA compliance, pavement markings and new street signs in Oak Street and Cedar Street in the City of Waltham, Massachusetts. The project requires all work necessary or incidental to this purpose including providing all necessary supervisors, personnel, equipment and materials.

B. The Contractor shall comply with all applicable performance and safety requirements specifically related to the work under this Contract. In addition, all things not expressly mentioned in these Specifications but involved in carrying out their intent are required by these Specifications, and the Contractor shall perform the same as though they were specifically delineated and described.

C. It is the Contractor's responsibility to verify physical conditions and components of the work at each specific location of Work.

D. Work performed under this contract is located on property owned by the City of Waltham, Massachusetts.

1.2 VISITS TO THE SITE

Before submitting a bid, the Contractor shall visit the various sites, examine their conditions and thoroughly acquaint himself with the conditions for performing the work. He shall also study the drawings and compare the same with the information gathered during his examination of the sites, as no extra compensation will be authorized for extra work caused by his unfamiliarity with the sites and/or drawings or the conditions peculiar to this job.

1.3 PERSONNEL REQUIREMENTS

A. The Contractor (and any subcontractor) shall furnish sufficiently trained and competent personnel to perform the Work required of the Contractor under this Contract.

B. The Contractor shall provide adequate contract orientation for all staff to be assigned on a permanent, temporary, or call-in basis. This shall include familiarization of equipment type and the respective locations of work. All staff involved in executing this Contract should be familiar with their contractual responsibilities pertaining to security, safety, inspection guidelines, and activities around all work locations.

C. If any Contractor's personnel is deemed unsatisfactory or does not perform the services to be furnished hereunder in a proper manner and satisfactory to the City, or in the determination of the City has taken action which constitutes a conflict of interest or which is inconsistent with the highest level of honesty, ethical conduct or public trust or which the City determines is adverse to the public interest or to the best interest of the City, the Contractor shall remove any such personnel and replace them with personnel satisfactory to the City within twenty-four (24) hours following the Contractor's receipt of a request for such replacement.

1.4 PERMITS, FEES AND BONDS

A. The Contractor shall obtain and comply with all required permits, pay all fees and provide all bonds necessary to complete the work as specified.
B. A City of Waltham Water Connection Permit must be issued before work is started.

1.5 FIELD LAYOUT

The Engineer shall be responsible for the initial layout of control (if required). The Contractor shall be responsible for layout of the proposed work and appurtenances as shown on the drawings. Site and grading adjustments may be made in the field, subject to review and approval by the Engineer.

1.6 SAFETY

The Contractor shall be responsible for compliance with all applicable regulations of OSHA.

1.7 TRAFFIC DETOURS AND ROAD ACCESSIBILITY

A. Traffic Management Plan - The Contractor shall prepare, and submit a plan that shows the routing of traffic during construction. The plan shall show the area and dimensions of the roadway pavement available for traffic during each stage of the work. The plan shall include all temporary barriers, signs, pavement markings, drums and other traffic control devices required to maintain traffic together with the limits of temporary pavement and necessary steel plates. The plan shall include all the requirements contained in the City of Waltham Policy on Street Opening Permits.
B. The Contractor shall contact the responsible heads of the Fire, Police, Highway, Sewer, School and other appropriate governing bodies of the municipality in order to obtain necessary permits and determine the requirements of said departments with respect to traffic control, alternate vehicular access routes, etc. Wherever detours are permitted the size, construction and location of signs shall conform to local and state requirements and/or standards. Detour routes shall be adequately posted to assist the motorist to return to his route of travel. Where the roadway under construction is the only means of vehicular access to a particular area, the Contractor shall provide continual access to the area for residents and emergency vehicles.
C. When Work is performed along roadways, all operations shall be planned so as to cause minimum interference with traffic and with maximum precautions at all times.
D. The Contractor shall have due regard to the location of detours and to the provisions for handling traffic, and shall not open up Work to the prejudice or detriment of Work already started. When it is required under the Contract that traffic be detoured around the Work, the Contractor shall provide and maintain suitable detours in accordance with the Contract Documents, and as approved by the City.
E. The Contractor shall be responsible for the maintenance of traffic over, through or around the Work during the life of the Contract, and whether or not work thereon has been suspended temporarily. The Contractor shall take all precautions for preventing injuries to persons or damage to property in or about the Work. The Contractor shall provide and maintain temporary bypasses as may be necessary to accommodate traffic on the roadway under construction or repair.
F. All Work sites and adjacent areas shall be adequately protected. Roadways shall be closed to traffic only as approved by the City. Whenever the closing of any lane is permitted by the City, the Contractor shall comply with all pertinent provisions of the Contract Documents.
G. All personnel shall observe safety rules and regulations and shall wear suitable safety equipment, at all times. Personnel who disregard safety regulations will be barred from the

Work by the City and the Contractor shall be without recourse.

H. All vehicles and construction equipment shall be properly registered and comply with the City's Rules and Regulations. All vehicles shall be equipped with such safety devices as flags, markings, beacons, strobes, and lights, in good working order. No separate compensation will be allowed for this work or equipment.

I. At the end of each work day, the Contractor shall remove its equipment from the roadway, and if applicable, shall store such equipment in areas as approved by the City. No equipment shall be stored on the roadway during non-work periods. Construction or repair materials shall not be stored on the roadway except as approved by the City.

1.8 PUBLIC SAFETY - POLICE DETAILS AND FLAGGERS

A. In general, local police details or certified traffic flaggers will be required on all local streets for public safety and for maintaining two-way traffic during construction.

B. The use of police details or flaggers shall be at the sole discretion of the City. The need for uniformed police officers will be made by the City prior to the start of work.

C. Flaggers will be used in accordance with Mass regulation 701 CMR 7.00.

1.9 HOURS of WORK

A. No work shall be started before 7:00 A.M. and no work shall be performed on restricted roads between the hours of 7:00 A.M. and 9:00 A.M. and between 4:00 P.M. and 6:00 P.M. Also, no construction vehicles shall be parked waiting to perform work during these hours on restricted roads.

The following roads located within the project limits of work are classified as restricted roads:

1. Newton Street
2. High Street

B. No work shall be done on Saturday or Sunday or Holidays observed by the City of Waltham.

C. All work shall be completed by the time stipulated by the City. These hours include the time for clean-up of the site and restoration of the roads to normal traffic flow.

D. The work areas are located in close proximity to private homes. The Contractor will need to pay particular attention to noise generation during early and late times of day, traffic flow, erosion control and dust generation to abutting properties, and the removal of soils, placement of stockpiles, etc. in order to maintain access through the work area. Any detours, if required, must be arranged through the local Police and Fire Departments and the Massachusetts Department of Transportation.

1.10 SCHEDULE

A. Prior to beginning operations, the Contractor shall submit a schedule of the proposed work for review and approval. The schedule shall show the work broken down into logical and specifically executable tasks necessary to meet the completion date.

B. All tasks shall include estimated time duration and be shown on a timeline type chart. In addition, tasks shall be depicted in terms of their relationship to tasks before and after.

C. The schedule shall be developed in Microsoft Project format or other approved schedule software and shall be submitted in either electronic or hardcopy form.

D. The schedule shall be updated bi-monthly and updated more frequently whenever the project schedule changes. In addition, the schedule shall be submitted with the monthly payment

requisition.

E. The Contractor may deviate from the above sequence provided he can demonstrate to the Engineer that the continuity of the project will not be adversely affected.

1.11 DIG SAFE

Prior to commencing excavation work, the Contractor shall notify Dig-Safe (1-800-322-4844) to have all existing public and private utility lines and underground structures marked out.

1.12 OPERATION OF EXISTING WATER INFRASTRUCTURE

The Contractor shall not operate any hydrants, valves, curb stops or corporations, nor shall they draw any water from the system without specific approval of the City of Waltham Engineering Department. Only City personnel will operate valves, hydrants corporations and curb stops unless otherwise directed by the City. Should operation of such items be necessary, the Contractor shall contact the City a minimum of 48 hours in advance of such facility to coordinate this work.

1.13 HANDLING OF ASBESTOS PRODUCTS

If the Contractor should encounter asbestos products during construction, the Contractor shall conform with all applicable provisions of OSHA, Federal, State and Local Regulations regarding the handling and/or disposing of asbestos products.

1.14 SOILS MANAGEMENT PLAN

A. The Contractor shall prepare and submit prior to the start of work, a SOILS MANAGEMENT PLAN detailing the contractors procedures for handling suitable and unsuitable materials transported to and from the work area(s).
   1. At a minimum, the plan is to include:
      a. Sampling requirements
      c. Requirements for handling soil with no analyte concentrations detected
      d. Analyte concentrations detected between laboratory detection limits and reportable limits
      e. Concentrations above reportable limits.
   2. Soil Management plan shall be signed by a Massachusetts Licensed Site Professional.

B. All surplus unsuitable material removed from the excavations shall remain the property of the Contractor and shall be properly disposed by the Contractor with approval by the ENGINEER. The Contractor is responsible for the disposal fees for the deposition of all waste, unsuitable and hazardous materials from the work performed.

C. All surplus suitable material removed from the excavations may be incorporated into the project upon approval. Surplus suitable material not used in the work, is the responsibility of the Contractor including disposal fees.

1.15 REMOVALS, RELOCATIONS AND REARRANGEMENTS

A. Examine the existing site for the work of all trades which will influence the cost of the work under the general bid. This work shall include removals, relocations and rearrangements which may interfere with, disturb or complicate the performance of the work under the general bid involving systems, equipment and related service lines, which shall continue to be utilized as part of the finished project. The Contractor is responsible for all coordination in this regard.

B. Include all removals, relocations, rearrangements and reconnections herein specified, necessary or required to provide approved operation and coordination of the combined new and existing systems and equipment.

1.16 RESTORATION OF DISTURBED AREAS

The Contractor is responsible for the restoration of all areas disturbed by the work to an equal or better condition than that encountered prior to construction. This requirement is especially important to the City and will be enforced.

1.17 EXISTING UTILITIES, MAINTAINING SERVICE AND ACCESS

A. The Contractor is advised that protection of the existing utilities in the vicinity of the project, and the assurance of uninterrupted service during the contract period is of the essence. Existing utilities must remain in service throughout the entire project, except in the case of tying in services and/or making connections to existing equipment. This is particularly critical in the case of cutting over existing utilities.
B. Interruptions in service will be allowed only during scheduled shutdowns approved in advance.
C. The location and size of some existing underground facilities such as sewers, drains, culverts, water mains, gas mains, cables, service pipes, etc., are shown on the plans, based on results of surveys and existing records, and are shown as approximate only. The plans do not show the exact location and depth of all utilities, nor do they show all utilities that may be encountered.
D. The Contractor shall assume that there are existing underground utility connections to each and every building or structure along the line of work, whether they appear on the drawings or not. The Contractor shall notify the proper utility companies and obtain and preserve the locations as marked for all existing gas, electric and other utilities that may be encountered along the line of work, until such time as such markings are no longer required.
E. Experimental trench excavations are to be made prior to commencing pipe laying operations. The experimental trench locations shall be where requested by the Contractor and/or as directed by the Engineer, and shall be paid for under the applicable bid item.
F. The Contractor shall dig by hand in advance of the trenching machinery to determine the exact location and depth of each utility to be encountered. Excavating machinery shall be stopped at least two feet away from each side of the utility to be crossed and the Contractor shall tunnel by hand under these utilities after he has ascertained their exact location and depth.
G. The use of steel plates will be permitted by the City. Should the Contractor choose to use steel plates to cover trenches during the daytime or at night, the plates must be keyed into the surrounding pavement and the edges secured with spikes.

1.18 BLASTING

In the event that blasting or other operations undertaken by the Contractor under this contract result in damages to, all necessary repairs to water piping, valves, hydrants, fittings, cables, etc., shall be done by the Contractor. The Contractor shall provide, at no extra cost to the Owner, all necessary materials, equipment and labor necessary to satisfactorily excavate backfill, repair, etc., in conjunction with such repair work.

1.19 TRASH REMOVAL

A. The Contractor shall arrange to dispose of all liquid and solid refuse in a lawful, safe and efficient and anti-pollutant manner subject to the prior approval of the City.

B. The Contractor shall remove daily from the Location(s) of Work by means provided by the Contractor, all garbage, debris, and other waste materials (whether solid or liquid) arising out of or in connection with its operations hereunder, and any such garbage, debris and other waste materials not immediately removed shall be temporarily stored in a clean and sanitary condition, approved by the City, in suitable garbage and waste receptacles, also approved by the City and shall be kept covered except when filling and emptying them.
C. The Contractor shall exercise care in removing such garbage, debris and other waste materials from the Location(s) of Work. The manner of such storage and removal shall always be subject in all respects to the continual approval of the City. No equipment or facilities of the City shall be used in such removal unless prior written consent is given by the City. No such garbage, debris, or other waste materials shall be or be permitted to be thrown, discharged or disposed into or upon waters or bounding the Location(s) of Work.

1.20 CHANGES IN AMOUNT OF WORK

The Owner reserves the right to increase or decrease the amount of any item of the work listed as may be found desirable or necessary during the carrying out of this contract and the unit prices quoted in the Proposal shall apply without change to such variation in the quantity of each of the Items.

1.21 SEQUENCE OF CONSTRUCTION

A. For the protection of life and property all backfill operations shall follow closely behind pipe laying. The Contractor shall insure that no excavation be left open, unguarded, or water filled during any period of time when work is not actually in progress. It is the purpose and intent that all excavations and backfill, including consolidation operations, the installation of service connections and temporary surfacing and pavements within an area be accomplished expeditiously before proceeding to other work areas. Construction scheduling and methods will be discussed at the pre-construction conference.
B. The Owner reserves the right to schedule the Contractor to construct at any locations within the project area. At the same time the Owner may order the suspension of construction at any location. Construction in seasonally heavily traveled roads shall be avoided during the peak traffic periods.
C. Staging of Construction material outside of the trench prior to installation may be required while working within heavily traveled intersections in order to minimize traffic disruptions and maintain emergency vehicle access, particularly at the intersections of Cedar St. & Oak St.; Cedar St. & High St.; and Oak St. & Newton St.

1.22 PROGRESS OF WORK

The Contractor shall promptly start pipe installation and continue actual construction work under this contract with the necessary crews and equipment to properly execute and complete this contract in the specified time. No cessation of Contractor's operations will be allowed without the approval of the Owner. The rate of progress shall be satisfactory to the Owner.

1.23 TECHNICAL SPECIFICATIONS

All technical specifications such as ASTM, AWWA, AASHTO, etc, referred to in these specifications refer to the latest revision of such technical specifications.

1.24 STATE AND LOCAL HIGHWAY BOUNDS AND PROPERTY MARKERS

When encountered, the Contractor shall engage a Professional Land Surveyor to provide permanent reference points for all bounds and private property markers along the line of the

work, which in the opinion of the Engineer, may be disturbed during construction. The Contractor shall submit copies of all ties to the bounds and property markers to the Engineer prior to excavation at the site. Any bounds or markers disturbed by the Contractor shall be replaced utilizing the services of a Professional Land Surveyor. The cost of replacing markers negligently disturbed shall be at the Contractor's expense.

1.25 TWENTY-FOUR (24) HOUR EMERGENCY SERVICE

A. The Contractor shall maintain a 24-hour, 7-day a week telephone service and a local facility to handle emergency requirements such as settled trenches, clogged drains, rain damage, etc. The Contractor's emergency personnel shall be able to respond to emergency calls within thirty minutes. A list of the personnel and their telephone numbers shall be submitted to the Engineer and Owner. This requirement shall apply during the entire length of the project.
B. This list shall be submitted on the Contractor's letterhead and shall state that should an emergency arise during the implementation of this project, these people are to be contacted. The Contractor shall submit this letter at the Pre-Construction Conference.

1.26 CONTRACTORS LAYDOWN/STORAGE

The Contractor is responsible for securing property for his operations including storage of materials and equipment.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 COORDINATION

A. Utility location and coordination shall be the responsibility of the Contractor. Dig Safe shall be contacted prior to the layout or excavation of any work.
B. The Contractor shall coordinate his schedule such that construction does not affect local school bus schedules. If it is expected that a construction event may impact the ability of the school bus to maintain their schedule, the Contractor shall notify the School Department 48 hours prior to the event.
C. The Contractor shall contact the responsible heads of the Fire, Police, and other appropriate governing bodies of the municipality in order to obtain necessary permits and determine the requirements of said departments with respect to traffic control, alternate vehicular access routes, and other requirements. Wherever detours are permitted, traffic plans, procedures and signage shall conform with local and state requirements and/or standards. Detour routes shall be adequately posted to assist the motorist to return to the primary route of travel. Where the roadway under construction is the only means of vehicular access to a particular area, the Contractor shall provide continual access to the area for residents and emergency vehicles.

3.2 WORK CONDITIONS

Contractor shall utilize extreme care to prevent any contamination when working in proximity to natural water bodies. No oil, fuel, solvents, chemicals, or other type of potential liquid contaminants shall be stored on site. All equipment shall be checked daily for any type of fluid leak. Contractor shall immediately notify Owner and Engineer of any type of leak or spill. Contractor shall take all necessary measures to contain and clean up any type of leak or spill.

3.3 MAINTAIN EXISTING WORKS

A. Maintain Flows:

1. The responsibility of the Contractor shall be to provide, maintain and operate all temporary facilities required to maintain sewerage flows and drainage collection and flow such as pumping equipment, piping, and all other labor and equipment necessary to maintain flows.

B. Minimize Interference

1. The Contractor shall at all times conduct his operations so as to interfere as little as possible with existing works. The Contractor shall develop a program, in cooperation with the Owner, which shall provide for the construction and putting into service of the new works in the most orderly manner possible. This program shall be adhered to except as deviations there-from are expressly permitted.
2. Work of connecting with, cutting into and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest possible time and when the demands on the facilities best permit such interference. It may be necessary to work outside of normal working hours to minimize interference. Before starting work which will interfere with the operation of existing facilities, the Contractor shall do all possible preparatory work and shall see that all tools, materials, and equipment are made ready and at hand.

END OF SECTION

SECTION 01050

COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Contractor is required to work in close proximity to Owner's existing facilities. The Contractor, under this Contract, will be responsible for coordinating construction activities with Owner to ensure that services, facilities, and safe working conditions are maintained.

B. The Contractor shall coordinate construction under this Contract with homeowners, utilities and roadway owners.

C. Any damage to existing structures, equipment and property, accepted equipment or structures, and property or work in progress by others; as a result of the Contractor's or his subcontractor's operations shall be made good by the Contractor at no additional cost to the Owner.

D. All work shall be in accordance with the Standards of the City of Waltham, Massachusetts and shall meet all state and local standards.

E. A minimum of 48 hours advanced notice is required for all coordination.

1.2 COORDINATION WITH OTHERS

A. City of Waltham:

1. Contractor shall coordinate access, egress, detours and traffic control, if required, at each site with the City of Waltham Police Department. The Contractor shall notify Waltham Police, Fire Department and Rescue Squad at least 24 hours in advance of any street closings or detours.
2. The Contractor shall be responsible for coordinating and maintaining public services to all public and private properties.
3. The Contractor shall not operate any hydrants, valves, curb stops and corporations without specific approval of the City of Waltham Engineering Department.

B. Waltham Department of Public Works (WDPW)

1. Contractor shall be responsible for coordinating all work in the vicinity of water lines, sewer lines and drain lines with the Waltham Department of Public Works. Contractor shall bear all costs for the WDPW's inspection requirements, temporary facilities, utility adjustments and other requirements.

C. NStar Electric:

1. The Contractor shall be responsible for coordinating and providing power to all construction sites both temporary and permanent services. The Contractor shall be responsible for coordinating all work in and around NStar facilities with NStar and bear all costs for NStar inspection, temporary facilities relocation and all other requirements.

D. National Grid Gas:

1. The Contractor shall be responsible for coordinating all work around gas mains and gas services with National Grid Gas. The Contractor shall bear all costs for National Grid inspection, temporary facilities relocation and all other requirements.

E. Other Public Services:

1. The Contractor shall be responsible for coordinating and maintaining public services to all properties.

END OF SECTION

SECTION 01070

ABBREVIATIONS & SYMBOLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Where any of the following abbreviations are used in these Specifications, they shall have the meaning set forth opposite each.

AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current
ACI	American Concrete Institute
ACP	Asbestos Cement Pipe
AGA	American Gas Association
AIC	Ampere Interrupting Capacity
AGMA	American Gear Manufacturers Association
AIEE(IEEE)	American Institute of Electrical Engineers (Institute of Electrical and Electronics Engineers, Inc.)
AISC	American Institute of Steel Construction
amp	Ampere 125-16
Amer. Std.	American Standard for Cast Iron Pipe Flanges and Flanged Fittings, Class l25 (ASA Bl6 ll960)
ANSI	American National Standards Institute
API	American Petroleum Institute
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American or Brown and Sharpe Wire Gage
AWWA	American Water Works Association
BOD	Biochemical Oxygen Demand
c.f.	Cubic Foot
c.f.m.	Cubic Foot Per Minute
c.f.s.	Cubic Foot Per Second
CI	Cast Iron
CIPRA	Cast Iron Pipe Research Association
CSI	Construction Specifications Institute
c.y.	Cubic Yards
DC	Direct Current
DEP	Department of Environmental Protection
DI	Ductile Iron
DOT	Department of Transportation
EDR	Equivalent Directional Radiation
EPA	U.S. Environmental Protection Agency
fps	Feet Per Second
ft.	Feet
gal.	Gallons
gpd	Gallons Per Day

gpm	Gallons Per Minute
HP	Horsepower
IBR	Institute of Boiler and Radiator Manufacturers
in.	Inches
inter.	Interlock
ISA	Instrument Society of America
kva	Kilovolt-ampere
kw	Kilowatt
lb.	Pound
max.	Maximum
MCB	Master Car Builders
MGD	Million Gallons Per Day
Min.	Minimum
NBS	National Bureau of Standards
NEC	National Electrical Code, Latest Edition
NEMA	National Electrical Manufacturers Association
NEWWA	New England Water Works Association
NPT	National Pipe Thread
OS&Y	Outside Screw and Yoke
PCA	Portland Cement Association
ppm	Parts Per Million
%	Percent
psi	Pounds Per Square Inch
psig	Pounds Per Square Inch Gage
PVC	Polyvinyl Chloride
rpm	Revolutions Per Minute
RUS	Rural Utility Service
s.f.	Square Foot
STL. W.G.	U.S. Steel Wire, Washburn and Moen, American Steel and Wire Cos., or Roebling Gage
s.y.	Square yard
TDH	Total Dynamic Head
USAS	Standards of the United States of America Standards Institute (formerly American Standards Association)
USS GAGE	United States Standard Gage
VC	Vitrified Clay
WSP	Working Steam Pressure
Fed. Spec.	Federal Specifications issued by the Federal Supply Service of the General Service Administration, Washington, D.C.

END OF SECTION

SECTION 01150

MEASUREMENT AND PAYMENT

PART l - GENERAL

1.1 DESCRIPTION

A. For lump sum items, payment shall be made to the contractor in accordance with an accepted progress schedule and schedule of values on the basis of actual work completed.

B. For unit-price items, payment shall be based on the actual amount of work accepted and for the actual amount of materials in place, as shown by final measurements.

1. All units of measurement shall be standard United States convention as applied to the specific items of work by tradition and as interpreted by the Engineer.
2. At the end of each day's work, the Contractor's Superintendent or other authorized representative of the Contractor shall meet with the Resident Project Representative and determine the quantities of unit price work accomplished and/or completed during the work day.
3. The Resident Project Representative will then prepare two "Daily Progress Reports" which shall be signed by both the Resident Project Representative and Contractor's Representative.
4. Once each month the Resident Project Representative will prepare two "Monthly Progress Summation" forms from the month's accumulation of "Daily Progress Reports" which shall also be signed by both the Resident Project Representative and Contractor's Representative.
5. These completed forms will provide the basis of the Engineer's monthly quantity estimate upon which payment will be made. Items not appearing on both the Daily Progress Reports and Monthly Progress Summation will not be included for payment. Items appearing on forms not properly signed by the Contractor will not be included for payment.
6. After the work is completed and before final payment is made, the Engineer will make final measurements to determine the quantities of various items of work accepted as the basis for final settlement.

1.2 SCOPE OF PAYMENT

A. Payments to the Contractor will be made for the actual quantities of the Contract items performed and accepted in accordance with the Contract Documents. Upon completion of construction, if these actual quantities show either an increase or decrease from the quantities given in the Proposal Form, the Contract Unit Prices will still prevail.

B. The Contractor shall accept in compensation, as herein provided, in full payment for furnishing all materials, labor, tools, equipment, and incidentals necessary to the completed work and for performing all work contemplated and embraced by the Contract; also for all loss or damage arising from the nature of the Work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work and until its final acceptance by the Engineer, and for all risks of every description connected with the prosecution of the work, except as provided herein, also for all expenses incurred in consequence of the suspension of the Work as herein authorized.

C. The payment of any partial estimate or of any retained percentage except by and under the approved final invoice, in no way shall affect the obligation of the Contractor to repair

or renew any defective parts of the construction or to be responsible for all damage due to such defects.

1.3 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

A. When alterations in the quantities of work not requiring supplemental agreements, as hereinbefore provided for, are ordered and performed, the Contractor shall accept payment in full at the Contract price for the actual quantities of work done. No allowance will be made for anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as stipulated in such agreements.

1.4 OMITTED ITEMS

A. Should any items contained in the bid form be found unnecessary for the proper completion of the work contracted, the Engineer may eliminate such items from the Contract, and such action shall in no way invalidate the Contract, and no allowance will be made for items so eliminated in making final payment to the Contractor.

1.5 PARTIAL PAYMENTS

Partial payments shall be made monthly as the work progresses. Partial payments shall be made subject to the provisions of the Supplemental and General Conditions.

1.6 PAYMENT FOR MATERIAL DELIVERED

A. When requested by the Contractor and at the discretion of the Owner, payment may be made for all or part of the value of acceptable, non-perishable materials and equipment which are to be incorporated into bid items, have not been used and have been delivered to the construction site, or placed in storage places acceptable to the Owner. Payment shall be subject to the provisions of the General and Supplemental Conditions.

B. No payment shall be made upon fuels, supplies, lumber, false work, or other materials, or on temporary structures of any kind which are not a permanent part of the Contract.

1.7 FINAL PAYMENT

A. The Engineer will make, as soon as practicable after the entire completion of the project, a final quantity invoice of the amount of the Work performed and the value of such Work. Owner shall make final payments of the sum found due less retainages subject to provisions of the General and Supplemental Conditions.

1.8 INCIDENTAL WORK

A. Incidental work items for which separate payment will not be made includes, but is not limited to, the following items:
   1. Construction schedules, bonds, insurance, shop drawings, warranties, guarantees, certifications, and other submittals required by the Contract Documents.
   2. Permits not otherwise paid for or provided by the Owner.
   3. Clearing, grubbing, and stripping.
   4. Visits to the Project site or elsewhere by personnel or agents of the Contractor, including manufacturer's representatives, as may be required.
   5. Preconstruction Photos and Videos.
   6. Coordination with the Owner, Utilities and others, including related inspection cost (refer to Section 01050)
   7. Earthwork (except ledge)

8. Dust control. Contractor shall have watering equipment on site for the duration of the construction. Watering shall take a place a minimum of two times per day or at the direction of the Engineer.
9. Dewatering and disposal
10. Temporary utilities for construction and to maintain existing service during construction, payment is otherwise made.
11. Temporary construction and other facilities not to be permanently incorporated into the Work necessary for construction sequencing and maintenance of operations.
12. Steel and/or wood sheeting as required, including that left in place
13. Materials testing
14. Quality assurance testing
15. Utility crossings and relocations, unless payment is otherwise made
16. Traffic Regulation except uniformed police detail and Certified Flaggers.
17. On-site and other facilities acceptable to Engineer for the storage of materials, supplies and equipment to be incorporated into the Work
18. Pipe Markings
19. Utility crossings and relocations, unless payment is otherwise made.
20. Engineer's Temporary Field Office.
21. Weather protection, winter construction equipment and fuel.
22. Restoration of property, and replacement of fences, curbs, structures and other minor items disturbed by the construction activities.
23. Repair and replacement of utilities damaged by construction activities and corresponding proper disposal of removed materials.
24. Clean-up.
25. Loam and seeding.
26. Potable water for cleaning, disinfection and testing.
27. Facilities start-up services required by the Contract Documents.
28. Construction Administration and Insurance.
29. GPS location of all structures
30. Demobilization
31. Project record documents.
32. Rebuilding/reconstruction/modification of tables and inverts where new sewer is constructed into an existing sewer.

1.9 DESCRIPTION OF PAY ITEMS

A. The following sections describe the measurement of and payment for the work to be done under the respective items listed in the Bid Form.

B. Each unit or lump-sum price stated in the Bid Form shall constitute full compensation, as herein specified, for each item of the work completed.

Item No. 1 - Mobilization

Payment of the lump sum amount for Item No.1 in the Bid Schedule shall be full compensation for mobilization costs. The amount bid for Item No. 1 shall not exceed 5% of the sum of all other bid items.

Item No. 2 - Relocate Ductile Iron Water Main, All Sizes

A. Method of Measurement: The quantity to be paid for under this item is the actual number of linear feet of pipe as measured along the pipe centerline as laid including all fillings. Mains to be paid for under this item shall be pipe repaired due to direct conflicts with existing or proposed underground utilities only as approved by Engineer. Water mains repaired for other reasons are not paid for

under this item. This includes all existing water mains relocated to avoid line and grade conflicts with drainage structures and pipes.

B. Basis of Payment:
   1. Relocated water main shall be paid for at the unit price per linear foot stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all pipes, pipe fittings (except valves), bronze wedges, polywrap, labor, equipment, tools, and other materials required for the installation of the pipelines; for installing the pipelines; for installing the polywrap; for excavating, laying, setting, and jointing all pipes and fittings; for dewatering; for furnishings and placing all bedding, haunching and initial backfill; for backfilling; for thrust blocks and supports; for restraining joints; for furnishing and placing all temporary sheeting and bracing; for patching and repairing sidewalks not included under other pay items; for removal and disposal of existing water lines being replaced; for all labor, tools and construction equipment; and for all other work and expenses incidental thereto for which payment is not provided under other items.
   2. Payment for this work on interim requisitions shall be according to the following percentages:
      a. Water main successfully set in place and backfilled - 80 percent.
      b. Water main pressure tested and disinfected - 20 percent.

Items No. 3 - Remove and Relocate Hydrant Assemblies

A. Method of Measurement: Remove and Relocate Hydrants measured for payment shall be the actual number of hydrants relocated complete in place.
B. Basis of Payment: Remove and Relocate Hydrant assemblies shall be paid for at the unit price each stated in the Bid Schedule. Said unit price shall be full compensation for removing and relocating hydrants, labor, equipment, and tools; for relocating, setting and jointing; for excavation (except rock excavation); for all thrust blocks; restraining joints; for additional pipe and or soild sleeves, and for all other work and expenses incidental thereto.

Items No. 4 - Sewer Service Connections

A. Method of Measurement: Sewer service connections measured for payment shall be linear feet of PVC pipe measured from the top of the tee or wye to the edge of right-of-way measured along the centerline of the pipe.
B. Basis of Payment:
   1. Payment for furnishing and installing service connection lines will be made for the unit bid price in the Bid Schedule. The unit price shall include, but not be limited to, furnishing and installing PVC pipe, providing tees or wyes, excavating (except rock excavation), backfilling, compaction, replacement of aggregate base and subbase material, temporary pavement, adequately capping service connection and marking location as specified and shown on the Drawings.

Item No. 5 - Furnish and Install 4-foot Diameter Catch Basins

A. Method of Measurement: Quantity of catch basins to be paid for under these items shall be per each structure installed and accepted complete in place.
B. Basis of Payment: Catch basins shall be paid for at the unit price per each as stated in the Bid Schedule. Said unit price shall be full compensation for all labor, materials and equipment necessary to complete the installation including excavation, dewatering, bedding, furnishing and installing precast sections, hoods, furnishing and installing frames and grates at proper grade for the binder course and again for the wearing course pavement, backfilling, compaction, removal and disposal of existing storm drain pipes, catch basins, and drain manholes being replaced, patching and repairing sidewalks not included under other pay items, cleaning and all else incidental thereto for which payment is not provided under other items.

Item Nos. 6 and 7 - Furnish and Install 4-foot Diameter, 5-foot Diameter Storm Drain Manholes

A. Method of Measurement: The quantity of storm drain manholes to be paid for under these items shall be per each structure installed and accepted complete in place.
B. Basis of Payment: Storm drain manholes shall be paid for at the unit price per each as stated in the Bid Schedule. Said unit price shall be full compensation for all labor, materials and equipment necessary to complete the installations including excavation, dewatering, bedding, furnishing and installing precast sections, hoods, furnishing and installing frames and covers, including locking frames and covers where called for in the plans, at proper grade first for the binder course and again for the wearing course pavement, constructing inverts, backfilling, compaction, removal and disposal of existing storm drain pipes, catch basins, and drain manholes being replaced, cleaning and all else incidental thereto for which payment is not provided under other items.

Item Nos. 8, 9, 10 and 11 - Furnish and Install 12-inch, 15-inch, 18-inch and 24- inch RCP Storm Drain Pipe

A. Method of Measurement: Storm drain pipe measured for payment under these items shall be the number of linear feet installed measured along the center line of the pipe as laid, regardless of materials of construction. Pipes shall be measured between centers of manholes or structures minus half the inside diameter of each structure. Pipe installed into the structure will not be measured for payment.
B. Basis of Payment: The contract unit price per linear foot for storm drain pipe installed shall be full compensation for all labor, materials, and equipment necessary to complete this work including excavation, dewatering, bedding, furnishing and installing pipe and fittings, backfill, compaction, cleaning pipes and sumps, impervious clay and concrete dams, removal and disposal of existing storm drain pipes, catch basins, and drain manholes being replaced, connection to existing piping and structures as required, restoration of surfaces, temporary pavement and all else incidental thereto for which payment is not provided under other items.

Item Nos. 12, 13 and 14 – Abandon and Controlled Density Fill of existing Drain Pipe 12’, 15” and 18”

A. Method of Measurement: The quantity of abandoned and filled existing drainage pipe to be paid for under these items shall be the linear foot of pipes abandoned and filled complete in place as measured by the engineer from the beginning of the abandonment to the end.
B. Basis of Payment: Abandon and Controlled Density Fill of existing Drainage pipes shall be paid for at the unit price per linear foot as stated in the Bid Schedule and as required by the engineer. Said unit price shall be full compensation for all labor, materials and equipment necessary to complete the pipe abandonment and filling including excavation, dewatering, Controlled Density Fill (CDF), masonry plugs and bulkheads and all else incidental thereto for which payment is not provided under other items.

Item No. 15– Abandon and Controlled Density Fill of existing Drain Structures

A. Method of Measurement: The quantity of abandoned and filled existing drainage structures to be paid for under these items shall be per each structure abandoned and filled complete in place.
B. Basis of Payment: Abandon and Controlled Density Fill of existing Drainage Structures shall be paid for at the unit price per each as stated in the Bid Schedule and as required by the engineer. Said unit price shall be full compensation for all labor, materials and equipment necessary to complete the structure abandonment and filling including saw cutting, removing and disposing of castings, removing and disposing of the top 3’ from finished grade of the structure, excavation, dewatering, Controlled Density Fill (CDF), masonry plugs and bulkheads, providing 2-2” min. holes at the structure invert or sump and all else incidental thereto for which payment is not provided under other items.

Items No. 16 - Removing and Relaying Existing Utilities

A. Method of Measurement: The quantity to be paid shall be based on the length in feet of the utility to be replaced.

B. Basis of Payment:

1. Payment for removing and relaying drains, sewer, water mains, gas mains, electrical and communication ducts and other utilities shall be made at the unit price bid per linear foot as stated in the Bid Schedule. Only such utilities which directly conflict with the new drain main or sewer or utilities removed as deemed necessary by the Owner shall be measured and paid for under this item. Utilities shall only be removed and relayed and paid for when such lines cross the proposed utilities main at an elevation that conflicts with the grade of the proposed work; when a long angle crossing exists which may hinder the work and result in damage to the utilities and structures; where shown on the drawings; or when requested by the Owner. Utilities running parallel to the proposed pipeline shall be properly braced or otherwise protected to prevent displacement.
2. Payment for removing and relaying existing utilities shall be made at the unit price bid per linear foot as stated in the Bid Schedule. Said unit price shall be full compensation for coordination with the affected utility; for furnishing labor, tools, and equipment; for disposal of existing pipe; for furnishing and placing replacement borrow material; for repairing all pavement damage outside the payment widths for paving; and for all other work and expenses incidental thereto.

Items No. 17- Ledge Excavation, Disposal and Replacement Backfill

A. Method of Measurement: The quantity of ledge excavation to be paid for shall be the actual number of cubic yards of ledge removed within the limits of normal excavation. For pipelines, the limits are defined by the vertical planes at a distance three feet apart and to a depth of six inches below the bottom of the pipe. For structures, the limits are defined as 2 feet beyond (horiz) the finished structure footing and 1 foot below the bottom of the footing or floor. Field measurements for computing ledge volumes shall be determined by one of the following methods as selected by the Engineer.

1. From ledge profile of exposed surface.
2. By field measurements of the length of the trench ledge excavated and the average depth of ledge excavation as determined by the field representative.
3. The volume of rocks shall be determined from their average length, width, and depth as measured by the field representative. Boulders more than 2 cubic yards in volume shall be paid for as ledge.

B. Basis of Payment: Ledge excavation and disposal shall be paid for at the unit price per cubic yard as stated in the Bid Schedule (Min. $50.00 C.Y. - Max. $120.00 C.Y.). Said unit price shall be full compensation for furnishing all materials, labor, tools, and equipment; for disposal of ledge; for furnishing and placing replacement granular borrow material; for conducting all preblast surveys and investigations; for repairing all overblast; for repairing all pavement damage outside the payment widths for paving; and for all other work and expenses incidental thereto.

Items No. 18 - Earth Excavation below Grade and Replacement Backfill

A. Method of Measurement: Earth excavation below grade (below the bottom of the bedding layer by order of the Engineer) and replacement backfill below grade accepted for payment shall be the actual number of cubic yards installed and accepted complete in place.

B. Basis of Payment: The Contract unit price per cubic yard for earth below grade and replacement backfill below grade furnished and installed shall be full compensation for labor, materials, tools and

equipment necessary to complete this work including; excavation and disposal of unsuitable materials including muck, crib work, trees, stumps and all other buried refuse; replacement suitable fill, compaction, dewatering and all else incidental thereto for which payment is not provided under other items.

Item No. 19 - Furnishing and Placing of Suitable Material Above Trench Grade to Replace Unsuitable Material

A. Method of Measurement: The quantity of suitable material placed above trench grade to be paid for shall be the actual number of cubic yards of material placed as required by and/or authorized by the Engineer as measured following excavation.
B. Basis of Payment: Placement of Suitable Material shall be paid for at the unit price per cubic yard stated in the Bid Schedule. Said unit price shall be measured from a point fifteen inches below the road surface to twelve inches above the top of the pipe and to a width of two feet plus the inside pipe diameter.
C. Bedding material placed from a point six inches below the bottom of the pipe to a point of one foot above the top of the pipe shall be covered under the respective Bid Item for installing water main.

Item Nos. 20 and 21 - Furnish and Install Aggregate Subbase and Aggregate Base

A. Method of Measurement: Placement of aggregate measured for payment shall be the number of cubic yards of aggregate placed for roadways, driveways and sidewalks measured and calculated within the limits indicated on the plans, complete and in place.
B. Basis for Payment:
1. The contract unit price per cubic yard for placement of aggregate subbase and base shall constitute full compensation for all materials, labor and equipment necessary to complete this work including excavation, saw cutting, milling and grinding of existing pavement, transportation of existing bituminous pavement and existing base material to approved stockpiling sites, furnishing and transporting aggregate subbase and base to the project site, preparing subgrade, placing, grading, compaction, dust control and all else incidental thereto for which payment is not provided under other items.

Items Nos. 22 and 23- Bituminous Concrete Pavement Binder Course and Wearing Course

A. Method of Measurement - Bituminous concrete pavement accepted for payment shall be the number of tons of pavement placed at the direction of the Engineer, calculated as described below, within the payment limits shown on the Drawings.
    1. Actual widths will be used in computing area wherever the width of pavement removed and replaced is less than the limits indicated on the Drawings.
    2. The conversion factor to change volume of bituminous concrete pavement measured in place to tons will be 0.055 tons per square yard per inch of thickness.
B. Basis of Payment: Pavement shall be paid for at the Contract unit price per ton stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all materials, labor, equipment and tools necessary for the placement and removal of pavement, preparation of base material, application of tack coat, placement and grading of gravel shoulder material to back up overlay pavement, adjusting castings to final grade (includes private utilities) and installation of pavement markings. No additional payment will be made to the contractor for repair work done by him in maintaining bituminous concrete pavement.

Items No. 24 - Remove and Reset Curb

A. Method of Measurement: Curb measured for payment shall be the actual linear footage of curb installed and accepted complete and in place.

B. Basis of Payment: The Contract unit price per linear foot for removing and resetting curb shall constitute full compensation for all labor, equipment and materials necessary to complete this work including carefully labeling removing curb, safely storing curb for reuse, re-installing curb, subgrade preparation, placement of concrete fill, backfill, compaction, and all labor and appurtenances incidental thereto for which payment is not provided under other items.

Item No. 25 – Remove and Reset Granite Curb Corners

A. Method of Measurement: Granite curb corners measured for payment shall be the actual number of curb corners removed and reset and accepted complete and in place.
B. Basis of Payment: The Contract unit price per each of granite curb corner shall include full compensation for any and all additional labor, equipment and materials necessary to install curb corners, including furnishing and installing curb corners, subgrade preparation, placement of concrete fill, backfill and all labor and appurtenances incidental thereto for which payment is not provided under other items.

Item Nos. 26, 27 and 28 - Furnish and Install Vertical Granite Curb, Transition Curb and Curb Inlets

A. Method of Measurement: Granite curb measured for payment shall be the actual linear footage of curb installed and accepted complete and in place.
B. Basis of Payment: The Contract unit price per linear foot of vertical granite curb shall include full compensation for any and all additional labor, equipment and materials necessary to install vertical granite curb, including furnishing and installing curbing, transition curb, inlet curb cuts, subgrade preparation, placement of concrete fill, backfill and all labor and appurtenances incidental thereto for which payment is not provided under other items.

Item No. 29 – Furnish and Install Granite Curb Corners

A. Method of Measurement: Granite curb corners measured for payment shall be the actual number of curb corners furnished and installed and accepted complete and in place.
B. Basis of Payment: The Contract unit price per each of granite curb corner shall include full compensation for any and all additional labor, equipment and materials necessary to install curb corners, including furnishing and installing curb corners, subgrade preparation, placement of concrete fill, backfill and all labor and appurtenances incidental thereto for which payment is not provided under other items.

Item No. 30 - Furnish and Install Portland Cement Concrete Sidewalks, (4-inch thick)

A. Method of Measurement: The quantity of concrete sidewalks to be paid for under this item shall consist of the number of square yards of 4-inch thick sidewalk, placed at the direction of the Engineer within the payment limits shown on the drawings.
B. Basis of Payment: Pavement shall be paid for at the Contract Unit Price per square yard stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all materials, labor, equipment and tools necessary for furnishing and placement of Portland cement concrete sidewalks to the depths indicated on the Drawings, including forming, curing, screeding, finishing, testing, form removal and joints, sealing and removal of existing bituminous and concrete walkways, sidewalks and driveways, and all else incidental thereto for which payment is not provided under other items.

Item No. 31 - Furnish and Install Portland Cement Concrete Sidewalks at Driveways and Pedestrian Curb Ramps, (6-inch thick)

A. Method of Measurement: The quantity of concrete sidewalks at driveways and pedestrian curb ramps to be paid for under this item shall consist of the number of square yards of 6-inch thick

sidewalk with welded wire mesh, placed at the direction of the Engineer within the payment limits shown on the drawings.

B. Basis of Payment: Pavement shall be paid for at the Contract Unit Price per square yard stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all materials, labor, equipment and tools necessary for furnishing and placement of Portland cement concrete sidewalks at driveways and pedestrian curb ramps to the depths indicated on the Drawings, including forming, placement of welded wire mesh, curing, screeding, finishing, testing, form removal and joints, sealing and removal of existing bituminous and concrete walkways, sidewalks and driveways, and all else incidental thereto for which payment is not provided under other items.

Item No. 32 - Furnish and Install Detectable Warning Devices

A. Method of Measurement: Detectable warning devices will be paid for under this item shall consist of the number of square feet of detectible warning device plates installed at the direction of the Engineer.

B. Basis of Payment: The Contract unit price for each detectable warning device shall constitute full compensation for all labor, equipment and materials necessary to complete this work including furnishing and installing rectangular and radial plates, layout, subgrade preparation, anchors, backfill and all labor and appurtenances incidental thereto for which payment is not provided under other items.

Items No. 33 - Erosion Control

A. Method of Measurement: Payment for erosion control shall be on a lump sum basis.

B. Basis of Payment: Payment of the lump sum amount for erosion control shall be full compensation for installation, maintenance and removal of the type and quantity of erosion control devices as required and shown on the drawings.

Item Nos. 34 - Tree Plantings

A. Method of Measurement: Tree plantings shall be measured by the actual number of trees planted by the contractor and accepted by the Engineer.

B. Basis of Payment: The unit price for each tree shall be full compensation for furnishing all labor, materials, and equipment required to plant trees as indicated on the plans and as directed by the Engineer. Trees, shrubs and other flora disturbed for the Contractor's convenience shall be restored at no additional cost to the Owner.

Item No. 35 - Test Pit Excavation, Backfill and Restoration

A. Method of Measurement - Test pit excavation measured for payment shall be per each unit completed as ordered by the Engineer and as indicated on the Drawings.

B. Basis of Payment - The contract unit price for each test pit excavation shall be full compensation for all labor, materials, tools and equipment necessary to complete this work including cutting existing pavement, hand and machine excavation, repairing damage to pipes, utilities, structures and property backfilling, compaction, maintenance and all else incidental thereto for which payment is not provided under other items.

Item No. 36 - Utility Coordination

A. Method of Measurement – Payment for utility repairs as directed by City shall be based on time and materials and actual invoices submitted.

B. Basis of Payment: Coordination with Utilities costs are those costs of working with utilities (gas, power, telecommunication, sewer, water, etc.), including but limited to timely communication and consultation with companies, public entities, and agencies; utility services (utility pole holding, utility

pole relocation, gas line relocation, contacting Dig-Safe etc.); including working around utility poles prior to relocation. The contract allowance price shall be full compensation for all labor, materials and equipment necessary to complete this work. The contract allowance price shall be paid in a series of equal partial payments made to cover all Coordination with Utilities costs throughout the entire contract.

Items No. 37 - Uniformed Police Traffic Control

A. Method of Measurement – Uniformed police details will be paid based on actual invoices submitted by the Contractor and will be paid from the Bid Item allocation.
B. Basis of Payment: Cash allowance as compensation for fees associated with providing uniformed police officer in accordance with the requirements of the City of Waltham Police Department. The cost associated, MUTCD signage, and other traffic control requirements shall be considered incidental to the work. Adjustment to the final cost for this item will be made as follows. Prior to final payment, Contractor shall present all receipts for this work (if not previously presented to the Engineer), and the amount due will be deducted from the allowance.

Item No. 38– Price Adjustment Allowance

A. Method of Measurement - An allowance is included in the bid schedule for price adjustments for fuel (diesel and gasoline), Liquid Asphalt and Portland Cement contained in cast-in-place concrete, as defined in Section 01151.
B. Basis of Payment: Payment shall be paid based on receipts provided by the Contractor and shall be deducted from the allowance stated in the Bid Schedule.

Item No. 39 – Utility Repair Allowance

A. Method of Measurement – Payment for utility repairs as directed by City shall be based on time and materials and actual invoices submitted.
B. Basis of Payment: The contract allowance for utility repairs to existing sewer and drainage piping and structures shall be full compensation for labor, materials, tools and equipment necessary to the complete the work including: gravity sewer pipe replacement/repair, sewer manhole replacement/repair, drainage pipe replacement/repair, drainage manhole replacement/repair, and catchbasin replacement/repair. It is the intent of the work to repair and/or replace any existing sewer or drainage utility as required based on field observations of the existing condition of utilities during construction. At the time of bidding it is unknown how many existing structures or piping will need to be replaced/repaired. Work for this item will be identified in the field during construction and as directed by the City. A time extension to the contract will be incorporated equal to the amount of time spent performing the work under this item only. All work for this item shall paid based on time and materials and actual invoices submitted. The amounts submitted will be paid from the allocation.

Item No. 40 – Management of Contaminated Soils/Fill

A. Method of Measurement: Management of contaminated soils/fill measured for payment shall be based on the lump sum price stated in the Bid Schedule.
B. Basis of Payment: Management of contaminated materials and soil/fill shall be paid for at the lump sum price stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all labor, materials, tools, equipment, and incidentals required for managing contaminated materials and soil/fill; segregating, handling, staging, testing, and characterization of all soil and fill material suspected of being contaminated as well as the costs associated with characterizing the destination site as required to assess background conditions; all controls necessary to maintain compliance with regulatory requirements relative to handling contaminated soils and materials; submittal and

approval of all required and specified Plans; analytical testing and characterization of all excavated soil and fill material handled; development of a template URAM; health and safety equipment; securing a staging area for stockpiling soil pending analytical testing, reuse, or disposal; protecting the excavation and stockpile areas. All costs related to transporting soils to and, if not disposed of offsite, and reused, from the staging area shall be included for payment in this item; air monitoring; controlling the spread of airborne contaminants; all notifications, fees, permits, and taxes; and all other requirements specified in other sections of the Contract Documents; and all other requirements specified in other sections of the Contract Documents and any other work not covered by other bid items.

Item No. 41 – Removal and Disposal of Soil (Class A-1)

A. Method of Measurement: Removal and Disposal of Soil (Class A-1) measured for payment shall be based on each cubic yard of soil removed and disposed of as measured in place prior to excavation.
B. Basis of Payment:
    1. Soil (Class A-1) removed and disposed of shall be paid for at the unit price per cubic yard stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all labor, materials, tools, equipment, and incidentals required for removal, transportation and disposal of soil (Class A-1); all other requirements specified in other sections of the Contract Documents; and any other work not covered by other bid items.
    2. Contractor will not be paid any additional costs under this item resulting from improper removal activities that result in soil contamination.
    3. Disposal of material excavated outside of the pay limits as defined elsewhere in the Contract Documents shall be done at the Contractor's expense, at no additional cost to the Owner.

Item No. 42 – Removal and Disposal of Excess Contaminated Soil and Waste Materials

A. Payment from the Allowance amount for the final transport of excess contaminated soil and waste material shall be full compensation for all labor, equipment, and materials necessary to complete the work including environmental controls to safely handle the material, and disposal of the material offsite in accordance with all federal, state, and local regulations. Contractor shall take all reasonable efforts to reuse excavated soils within the project in accordance with 310 CMR 40.0000 Massachusetts Contingency Plan.
B. Basis of Payment: All work for this item shall be paid based on Contractor's actual costs based on actual invoices submitted plus a markup of 15% for the final transport and disposal of excess soil and waste materials. The amounts submitted will be paid from the Allowance. Contractor will not be paid any additional costs under this item resulting from improper removal activities that result in soil contamination. Disposal of material excavated outside of the pay limits as defined elsewhere in the Contract Documents shall be done at the Contractor's expense, at no additional cost to the Owner. Disposal of Class A-1 soils is not included in this item, and will be paid for under the appropriate pay item.

Item No. 43 - Furnish and Install New Signs

A. Method of Measurement: The quantity to be paid for under this item shall be the actual number of new sign posts with signs supplied and installed and as measured in place and accepted by the Engineer. Each new sign post will be counted as one sign, regardless of the number of signs mounted on it. Existing posts or poles that nave new signs installed on them will be measured for payment as one sign, regardless of the number of new signs installed on them.
B. Basis of Payment: Signs shall be paid for at the unit price per each as stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all materials, labor, tools,

and construction equipment; for excavation, foundations, anchors, concrete, signs, hardware, posts, alignment, backfilling, and for all other work and expenses incidental thereto for which payment is not provided under other items.

C. Removal and delivery to the City of all existing signs to be replaced or removed is incidental to Contract.

END OF SECTION

SECTION 01151

SPECIAL PROVISIONS – PRICE ADJUSTMENTS

PART I - GENERAL

1.1 DESCRIPTION

A. In accordance with Massachusetts General Law (MGL) Chapter 30, Section 38A, contracts for water and sewer projects awarded under MGL Chapter 30 Section 39M shall include price adjustment clauses for fuel (both diesel and gasoline), liquid asphalt and Portland cement contained in cast-in-place concrete.

B. The work under this Contract includes price adjustments for hot mix asphalt, Portland cement, diesel fuel, and gasoline. Base Prices for hot mix asphalt, Portland cement, diesel fuel, and gasoline under this Project are defined as the Price presented on the Massachusetts Department of Transportation (MassDOT) website. MassDOT posts Price Adjustments on their Highway Division's website at http://www.massdot.state.ma.us/Highway/ under the following link sequences:

Website: massdot.state.ma.us
Tab1: Highway
Link1: Doing Business With Us
Link2: Construction
Link3: Price Adjustments

Prices may not be available for the month in which the project is Bid at the time the project is advertised for Bid. The Base Price will be established at Contract Award. For this project, the recent Base Price History for the specified items is presented within Table 1.

Table 1 –Base Price History

Description	Unit	March 2015	April 2015	May 2015
Diesel Fuel	per gallon	$2.365	$2.279	2.418
Gasoline	per gallon	$2.011	$2.128	2.348
Hot Mix Asphalt	per ton	$570.00	$542.50	$535.00
Portland Cement	per ton	$123.78	$123.78	$123.78

N/A = Not Available

1.2 MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE

A. Method of Measurement: Price adjustments for fuel consumption will be paid for out of the Price Adjustment Allowance Item on the Bid Form. In order to comply with the MGL, compensation for fluctuations in fuel prices will be made based on monthly quantities of the designated work items completed during the payment period and the Fuel Use Factors presented in Table 5.

B. Basis of Payment: The Contractor shall include a separate line item in the Payment Application for Price Adjustments for Diesel Fuel and Gasoline; which will be subtracted

from the Price Adjustment Bid Allowance (Item 20). The Price Adjustment will be based on the variance in price for diesel fuel and gasoline from the Base Price to the Period Price only. Since the posted Prices may not be available before the end of the active work month for inclusion in the Payment Application, the Price Adjustment will be assessed in the following month's Payment Application once pricing information for the period is available.

1. Base Price: The Base Price of Diesel Fuel and Gasoline will be the price as indicated on the MassDOT website (www.massdot.state.ma.us) for the month in which the contract was bid, which includes State Tax.
2. Period Price: The Period Price will be the average of prices charged to the State, including State Tax for the bulk purchases made during each month as posted on the MassDOT website.
3. The adjustment will be based on fuel usage factors for various items of work developed in the National Cooperative Highway Research Program Report 744 (Transportation Research Board, 2013). These factors will be multiplied by the quantities of work completed under the designated Work Item during each monthly period and further multiplied by the variance in price from the Base Price to the Period Price.
4. The fuel Price Adjustment will apply only to the items of work listed in Table 5 at the fuel factors shown and for the quantities of those work items during that month.
5. The Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases for either a 5% upward or 5% downward adjustments.
6. No Price Adjustment will be allowed beyond the Substantial Completion Date of this Contract, unless an extension of time beyond the contractual Substantial Completion Date has been issued and approved by the Owner.

1.3 MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT MIXTURES

A. Method of Measurement: The quantity of the hot mix asphalt (HMA) mixtures will be measured under the respective Bid Item(s) in the Contract. The Price Adjustment will be made based on the quantity installed during the monthly payment period.

B. Basis of Payment: The Contract Price of the hot mix asphalt (HMA) mixtures will be paid under the respective Bid Item(s) in the Contract. The Contractor shall include a separate line item in the Payment Application for Price Adjustments for Hot Mix Asphalt Mixtures; which will be subtracted from the Price Adjustment Bid Allowance (Item 20). The Price Adjustment will be based on the variance in price for the liquid asphalt component only from the Base Price to the Period Price only. The adjustment shall not include transportation or other charges. Since the posted Prices may not be available before the end of the active work month for inclusion in the Payment Application, the Price Adjustment will be assessed in the following month's Payment Application once pricing information for the period is available.

1. Base Price: The Base Price of Hot Mix Asphalt Mixtures will be the price as indicated on the MassDOT website (www.massdot.state.ma.us) for the month in which the contract was bid.
2. Period Price: The MassDOT website lists two sets of period prices. The "New Asphalt Period Price Method" applies to this Contract.

3. The “New Asphalt Period Price Method” presents the Period Price of liquid asphalt for each monthly period as determined by MassHighway using the average selling price per standard ton of PG64-28 paving grade (primary binder classification) asphalt, FOB manufacturer's terminal, as listed under the "East Coast Market - New England, Boston, Massachusetts area" section of the Poten & Partners, Inc. "Asphalt Weekly Monitor". This average selling price is listed in the issue having a publication date of the second Friday of the month and will be posted as the Period Price for that month. MassHighway will post this Period Price on their website within two business days following their receipt of the relevant issue of the "Asphalt Weekly Monitor". Poten and Partners has granted MassHighway the right to publish this specific asphalt price information sourced from the Asphalt Weekly Monitor.
4. The Contract Price of the hot mix asphalt mixture will be paid under the respective item in the Contract. The Price Adjustment, as herein provided, upwards or downwards, will be made after the work has been completed and accepted, using the monthly period price for the month during which the work was performed and will be paid under the designated Price Adjustment line item in the Payment Application.
5. The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the Contract Documents.
6. The Price Adjustment will be determined using the following formula; the quantity of tons of hot mix asphalt mixture placed during each monthly period multiplied by the liquid asphalt content percentage multiplied by the variance in price between Base Price and Period Price of liquid asphalt. The liquid asphalt content, for the purpose of this adjustment, will be 5.5% (0.055) for each ton of bituminous concrete mixture regardless of percentages established in the Massachusetts Job Mix Formula (M3.11.03) of the Standards.
7. The Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases for either a 5% upward or 5% downward adjustments.
8. No Price Adjustment will be allowed beyond the Substantial Completion Date of this Contract, unless an extension of time beyond the contractual Substantial Completion Date has been issued and approved by the Owner.

1.4 MONTHLY PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES

A. Method of Measurement: The quantity of the Portland Cement Concrete Mixes will be measured under the respective items in the Contract. The Price Adjustment will be made based on the quantity installed during the monthly payment period.

B. Basis of Payment: The Contract Price of the Portland Cement Concrete Mixes will be paid under the respective item(s) in the Contract. The Contractor shall include a separate line item in the Payment Application for Price Adjustments for Portland Cement Concrete Mixes; which will be subtracted from the Price Adjustment Bid Allowance (Item 20). The Price Adjustment will be based on the variance in price for the Portland cement component only from the Base Price to the Period Price only. It shall not include transportation or other charges. Since the posted Prices may not be available before the end of the active work month for inclusion in the Payment Application, the Price Adjustment will be assessed in the following month’s Payment Application once pricing information for the period is available.

1. The Base Price of Portland cement will be the price as indicated on the MassDOT website (www.massdot.state.ma.us) for the month in which the contract was bid, which includes State taxes.
2. The Period Price of Portland cement will be determined by using the latest published price, in dollars per ton (U.S.), for Portland cement (Type I) quoted for Boston, U.S.A. in the Construction Economics section of ENR Engineering News-Record magazine or at the ENR website http://www.enr.com under Construction Economics. The Period Price will be posted on the MassHighway website the Wednesday immediately following the publishing of the monthly price in ENR, which is normally the first week of the month.
3. The Contract Price of the Portland cement concrete mix will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been completed and accepted, using the monthly period price for the month during which the work was performed and will be paid under the designated Price Adjustment line item in the Payment Application.
4. The price adjustment applies only to the actual Portland cement content in the mix placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M4.02.01. No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag.
5. The Price Adjustment will be determined using the following formula; the quantity of cubic yards of Portland cement concrete placed during each monthly period multiplied by the Portland cement content percentage multiplied by the variance in price between the Base Price and Period Price of Portland cement.
6. This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases for either a 5% upward or 5% downward adjustments.
7. No Price Adjustment will be allowed beyond the Substantial Completion Date of this Contract, unless an extension of time beyond the contractual Substantial Completion Date has been issued and approved by the Owner.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 PREPARATION OF MONTHLY PAYMENT APPLICATION

A. Payment Applications shall be submitted monthly. Table 2 presents an example calculation for determining Price Adjustments for the specified items.

Note: The Payment Application for June will be submitted at the end of June or early in July and shall include all of the work performed during the month of June and Price Adjustments for the work performed in May.

For this example, 1,000 linear feet of 12-inch diameter water main was installed and 400 tons of full-width final bituminous pavement over 1,000 feet of roadway were completed in May. No concrete was installed during the Month of May.

Table 2 – Example Project Related Prices

Description	Unit	Base Price	May 2013	June 2013
Diesel Fuel	per gallon	$3.25	$3.50	N/A
Gasoline	per gallon	$3.00	$3.20	N/A
Hot Mix Asphalt	per ton	$600.00	$625.00	N/A
Portland Cement	per ton	$100.00	$90.00	N/A

Based on the example Prices presented in Table 2, an assessment of whether or not Price Adjustments are required for this example will be performed as presented in Table 3.

Table 3 – Example Price Adjustment Assessment

Item	Base Price	Period Price	Price Difference	% Change	Price Adjustment Required
Diesel Fuel	$3.25	$3.50	$0.25	7.7%	Yes, >5%
Gasoline	$3.00	$3.20	$0.20	6.7%	Yes, >5%
Hot Mix Asphalt	$600.00	$625.00	$25.00	4.2%	No, <5%
Portland Cement	$100.00	$90.00	-$10.00	-10%	Yes, >5%

As indicated in Table 3, Price Adjustments for this example are required for Diesel Fuel, Gasoline and Portland cement if work items were performed during the Month of May.

Table 4 presents the Price Adjustment calculations for this example.

Table 4 – Example Diesel Fuel and Gasoline Price Adjustment					
Work Item	Quantity	Unit	FUF[1]	Price Difference	Price Adjustment
12-inch Water Main					
Diesel Fuel	1,000	L.F	0.610	$0.25	$152.50
Gasoline	1,000	L.F	0.261	$0.20	$52.20
Asphalt Hauling/Placement					
Diesel Fuel	400	Ton	1.104	$0.25	$210.40
Gasoline	400	Ton	0.502	$0.20	$40.16
TOTAL PRICE ADJUSTMENT					$455.26

1. FUF = Fuel Use Factor

Note: The example indicates that a Price Adjustment will be applied for the payment period for fuel associated with asphalt hauling and placement, but no Price Adjustment would be applied for Hot Mix Asphalt Mixtures as the Price difference for the material was less than 5%. Also, no Price Adjustment is included for Portland cement as no quantity of concrete was completed during the pay period. If concrete had been installed, it would have resulted in a negative Price Adjustment or deduction.

B. Table 5 presents the Fuel Use Factors to be used for this project.

Table 5 – Fuel Use Factors		
Work Items	Diesel Use Factor	Gasoline Use Factor
Pipe Installation – including excavation, backfill, pipe installation, fittings, valves, insulation, and incidentals	0.610 gallons per Linear Foot	0.261 gallons per Linear Foot
Water Service – including excavation, backfill, pipe installation, valves, insulation, and incidentals	0.610 gallons per Linear Foot	0.261 gallons per Linear Foot
Temporary Asphalt Pavement – including haul, placement and compaction, etc.	2.104 gallons per Ton[1]	0.502 gallons per Ton[1]
Permanent Asphalt Pavement – including haul, placement and compaction for trench and sidewalk, and incidentals	2.104 gallons per Ton[1]	0.502 gallons per Ton[1]
Curbing – including removal, replacement or reinstallation of either asphalt of granite, and incidentals	0.106 gallons per Linear Foot	0.046 gallons per Linear Foot
Rock Excavation – including ledge and boulder removal and disposal, and material replacement, and incidentals	0.326 gallons per Cubic Yard	0.140 gallons per Cubic Yard
Unsuitable Material Excavation – including excavation and disposal, and material replacement, and incidentals	0.207 gallons per Cubic Yard	0.112 gallons per Cubic Yard

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: To enable orderly review during progress of the work, and to provide for systematic discussion of problems, the Engineer will conduct project meetings throughout the construction period.

B. The Contractor's relations with his subcontractors and materials suppliers and discussions relative thereto, are the Contractor's responsibility and are not part of project meetings content.

1.2 QUALITY ASSURANCE

A. Persons designated by the Contractor to attend and participate in the project meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.3 SUBMITTALS

A. Agenda items: To the maximum extent practicable, advise the Engineer at least 24 hours in advance of project meetings regarding all items to be added to the agenda.

B. Minutes: The Engineer will compile minutes of each project meeting and will furnish a copy to the Contractor.

PART 2 - PRODUCTS

(No products are required in this Section.)

PART 3 - EXECUTION

3.1 MEETING SCHEDULE

A. Except as noted below for Preconstruction Meeting, project meetings will be held monthly. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.2 MEETING LOCATION

A. Meetings will be held at a mutually agreeable location.

3.3 PRECONSTRUCTION MEETING

A. Preconstruction meeting will be scheduled within twenty days after the Effective Date of the Agreement, but before the Contractor starts work at the site. Provide attendance by authorized representatives of the Contractor and all major subcontractors. The Engineer will advise other interested parties and request their attendance.

B. Minimum agenda: Distribute data on, and discuss:

1. Identification of key project personnel for Owner, Engineer, Contractor, funding/regulatory Agencies.
2. Responsibilities of Owner, Engineer, Resident Project Representative, Contractor.
3. Channels and procedures for communications.
4. Construction schedule, including sequence of critical work.

5. Easements, permits.
6. Contract Documents, including distribution of required copies of original documents and revisions.
7. Processing of Shop Drawings and other data submitted to the Engineer for review.
8. Processing of field decisions and Change Orders.
9. Rules and regulations governing performance of the Work, including funding/regulatory Agency requirements.
10. Procedures for safety and first aid, security, quality control, housekeeping, and other related matters.

3.4 PROJECT MEETINGS

A. Attendance: To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work. The Superintendent shall attend. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspects of the Work are involved.

B. Minimum agenda:
   1. Review, revise as necessary, and approved minutes of previous meeting.
   2. Review progress of the Work since last meeting, including status of submittals for approval.
   3. Review schedule of work to be accomplished prior to next meeting.
   4. Discuss monthly partial payment request.
   5. Review status of change order requests and Work Directive Changes.
   6. Identify problems which impede planned progress.
   7. Develop corrective measures and procedures to regain planned schedule.
   8. Complete other current business.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Within ten (10) days after the effective date of the Agreement between Owner and Contractor submit to the Engineer an estimated progress schedule as specified herein.

B. Form of Schedules:
   1. Narrative: Completely describe the construction methods to be employed.
   2. Network Analysis System (Gantt Chart):
      a. Provide a separate horizontal schedule line for each trade or operation and show concurrent and preceding activities.
      b. Present in chronological order the beginning of each trade or operation showing duration and float time.
      c. Scale: Identify key dates and allow space for updating and revision.
   3. Mathematical Analysis:
      a. A mathematical analysis shall accompany the network diagram. A computer printout will be acceptable.
      b. Information shall be included on activity numbers, duration, early start, late start, etc. and float times.
   4. The schedule shall be developed using Microsoft Project or other scheduling software approved by the ENGINEER and OWNER.

C. Content of Schedules:
   1. Provide complete sequence of construction by activity:
      a. Shop Drawings, Project Data and Samples:
         1) Submittal dates.
         2) Dates reviewed copies will be required.
      b. Decision dates for:
         1) Products specified by allowances.
         2) Selection of finishes.
      c. Estimated product procurement and delivery dates.
      d. Dates for beginning and completion of each element of construction.
   2. Identify work of separate phases and logically grouped activities.
   3. Show the projected percentage of completion for each item of work as of the first day of each month.
   4. Provide separate sub-schedules, if requested by the Engineer, showing submittals, review times, procurement schedules, and delivery dates.

D. Updating:
   1. Show all changes occurring since previous submission.
   2. Indicate progress of each activity, show completion dates.
   3. Include:
      a. Major changes in scope.
      b. Activities modified since previous updating.
      c. Revised projections due to changes.
      d. Other identifiable changes.
   4. Provide narrative report, including:

a. Discussion of problem areas, including current and anticipated delay factors.
b. Corrective action taken, or proposed.
c. Description of revisions that may affect schedules.

1.2 SUBMITTALS

A. Submit schedules in electronic format and hard copy as follows:
   1. Prior to start of work
   2. Bi-weekly
   3. When there are changes in the schedule
   4. With each progress payment request
B. Submit 4 copies of initial and updated schedules to the Engineer.

END OF SECTION

SECTION 01320

SAFETY AND HEALTH PLAN

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work, as outlined herein and in the General and Special Conditions of the Contract Documents. Within (10) days after the effective date of the Agreement between Owner and Contractor, submit to the Engineer a Safety and Health Plan as specified herein.
2. Contractor shall comply with all applicable Laws and Regulations related to the safety of persons or property, or for the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
3. Contractor shall designate a qualified and experienced safety representative (OSHA defined "Competent Person") at the site whose duties and responsibilities shall be the prevention of accidents and maintaining and supervising of safety precautions and programs, including a "Job Hazards Analysis".
4. The Contractor shall be solely responsible to provide all labor, equipment, and utilities sufficient to ensure no construction noise, particulates, or odors, are allowed to accumulate to levels which adversely affect health or work in, or near the construction area.

B. Content of Safety and Health Plan:

1. Prepare complete safety and health plan in accordance with the requirements of CFR Title 29 Part 1926 - Safety and Health Regulations for Construction.
   a. Provide documentation that Contractor's hazardous communication program is up to date.
   b. Provide documentation that Contractor's safety training is up to date.
   c. Prepare a project specific Safety and Health Plan addressing construction safety issues, including but not limited to excavations, fall protection and egress, excavation adjacent to existing utilities, traffic and pedestrian safety, materials handling, and other potential safety issues.
2. Safety provisions for confined space entry shall follow General Industry Standard CFR Title 29 Part 1910.146 and will be incorporated into the Safety and Health Plan.
   a. The Contractor shall be responsible for all aspects of construction site safety including development of appropriate confined space entry procedures. The plan shall include, but not necessarily be limited to, the following:
      - Definitions
      - Confined Space Evaluations
      - Equipment Selection
      - Confined Space Entry Training Documentation
      - Permit Required Confined Space Entry Requirements
      - Testing (Monitoring) and Ventilation
      - Confined Space Entry Permit Form
      - Rescue and Emergency Procedures
      - Emergency Contact Information

b. The Contractor shall inform the Owner and Engineer's representative whenever work will be performed in a confined space and the permit space program that the Contractor will follow.
c. The Contractor shall inform the Owner and Engineer's representative of any hazards confronted or created during entry operations, either through a briefing or during the entry operation.
d. The Contractor will coordinate entry operations with the Owner when both Owner personnel and Contractor personnel will be working in or near permit spaces.
e. The Owner, Engineer, their representatives, independent testing laboratories and government agencies, when inspecting the site, shall be supplied by the Contractor proper safety equipment when entry into a confined space is required.

C. Updating:
1. Contractor shall be responsible for updating the Safety and Health Plan as appropriate throughout the course of the construction period.

1.2 SUBMITTALS

A. Contractor shall be responsible for all aspects of construction site safety. Provide 3 copies of the Contractor's site specific Safety and Health Plan to the Engineer. The Safety and Health Plan is provided for information only to inform the Owner, Engineer (and Resident Project Representative) of the project specific safety program requirements. The Contractor will overview the plan with the Owner (and staff), Engineer (and Resident Project Representative) at the beginning of the project, and subsequently when the safety plan is updated.
B. Provide updated Safety and Health Plans as necessary during the course of the project.
C. Contractor's most current Safety and Health Plan shall be available at the construction site throughout the construction project.

1.3 ON-SITE COORDINATION MEETINGS

A. Contractor shall review key aspects of Safety and Health Plan at the Pre-Construction Meeting, and subsequent on-site safety informational meeting.
B. Contractor shall report to Engineer and Owner at each progress meeting concerning compliance with the Safety and Health Plan for the most recent construction period and new considerations and requirements for the upcoming period.

END OF SECTION

SECTION 01340

SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Submit to the Engineer, Shop Drawings, Manufacturers' Certificates, Project Data, and Samples required by the Specification Sections.

1.2 SHOP DRAWINGS

A. Shop Drawings are required for each and every element of the work. Each shop drawing shall be assigned a sequential number for purposes of easy identification, and shall retain its assigned number, with appropriate subscript, on required resubmissions.

B. Shop Drawings are generally defined as all fabrication and erection drawings, diagrams, brochures, schedules, bills of material, manufacturers data, spare parts lists, and other data prepared by the Contractor, his subcontractors, suppliers, or manufacturers which illustrate the manufacturer, fabrication, construction, and installation of the work, or a portion thereof.

C. The Contractor shall submit to the Engineer a minimum of 6 copies of Shop Drawings and approved data and 1 electronic copy. The Engineer will retain 3 copies (for Owner's, Engineer's and Field Representative's files) and return 3 copies to the Contractor for distribution to subcontractors, suppliers and manufacturers. If the Contractor requires more than 3 then the number of copies submitted shall be adjusted accordingly. All shop drawing comments will be summarized on the Submittal Review Form.

D. The Contractor shall provide a copy of the completed Submittal Certification Form (copy provided for Contractor's use at the end of this Specification Section) which shall be attached to every copy of each shop drawing. Shop Drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawing. 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 the work.

E. Shop Drawings shall be submitted as a complete package by specification section, unless otherwise reviewed and approved by the Engineer. It is the intent that all information, materials and samples associated with each specification section be included as a single submittal for the Engineer's review. Any deviation from this requirement, such as submitting miscellaneous metals grouped by structure, shall be requested in writing with an anticipated shop drawing breakdown/schedule prior to any associated submittal.

F. The Contractor shall be responsible for the prompt and timely submittal of all shop and working drawings so that there shall be no delay to the work due to the absence of such drawings.

G. No material or equipment shall be purchased or fabricated especially for the Contract until the required shop and working drawings have been submitted as hereinabove provided and reviewed for conformance to the Contract requirements. All such materials and equipment and the work involved in their installation or incorporation into the Work shall then be as shown in and represented by said drawings.

H. Until the necessary review has been made, the Contractor shall not proceed with any portion of the work (such as the construction of foundations), the design or details of

which are dependent upon the design or details of work, materials, equipment or other features for which review is required.

I. All shop and working drawings shall be submitted to the Engineer 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. Shop drawings shall be of standardized sizes to enable the Owner to maintain a permanent record of the submissions. Approved standard sizes shall be: (a) 24 inches by 36 inches; (b) 11 inches by 17 inches, and (c) 11 inches by 8-1/2 inches. Provision shall be made in preparing the shop drawings to provide a binding margin on the left hand side of the sheet. Shop drawings submitted other than as specified herein may be returned for resubmittal without being reviewed.

J. Only drawings which have been checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Drawings and Specifications in all respects. All drawings which are correct shall be marked with the date, checker's name, and indication of the Contractor's approval, and then shall be submitted to the Engineer.

K. If a shop drawing shows any deviation from the Contract requirements, the Contractor shall make specific mention of the deviations in his letter of transmittal. Shop Drawings that contain significant deviations that are not brought to the attention of the Engineer may be subject to rejection.

L. Should the Contractor submit equipment that requires modifications to the structures, piping, electrical conduit, wires and appurtenances, layout, etc., detailed on the Drawings, he shall also submit details of the proposed modifications. If such equipment and modifications are accepted, the Contractor, at no additional cost to the Owner, shall do all work necessary to make such modifications.

M. A maximum of two submissions of each Shop Drawing will be reviewed, checked, and commented upon without charge to the Contractor. Any additional submissions which are ordered by the Engineer to fulfill the stipulations of the Drawings and Specifications, and which are required by virtue of the Contractor's neglect or failure to comply with the requirements of the Drawings and Specifications, or to make those modifications and/or corrections ordered by the Engineer in the review of the first two submissions of each Shop Drawing, will be reviewed and checked as deemed necessary by the Engineer, and the cost of such review and checking, as determined by the Owner, and based upon Engineer's documentation of time and rates established for additional services in the Owner-Engineer Agreement for this Project, may be deducted from the Contractor to make all modifications and/or corrections as may be required by the Engineer in an accurate, complete, and timely fashion. Resubmittals for the sole purpose of providing written responses to review comments will not be considered a resubmittal counting towards the two submission limit.

1.3 SAMPLES

A. The Contractor shall submit samples when requested by the Engineer to establish conformance with the specifications, and as necessary to define color selections available.

1.4 MANUFACTURER'S CERTIFICATES

A. Prior to accepting the installation, the Contractor shall submit manufacturer's certificates for each item specified.

B. Such manufacturer's certificates shall state that the equipment has been installed under either the continuous or periodic supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, and that it is operating in accordance with the specified requirements, to the manufacturer's satisfaction. All costs for meeting this requirement shall be included in the Contractor's bid price.

1.5 SUBMISSION REQUIREMENTS

A. Accompany submittals with transmittal letter, containing:
   1. Sequential Transmittal Number
   2. Date.
   3. Project title and number.
   4. Contractor's name and address.
   5. The sequential shop drawing number (called the Engineer's Shop Drawing number) of each shop drawing, project data and sample submitted.
      i. Engineer's shop drawing number shall start at 001 for the first shop drawing in the first transmittal and continue sequentially until the last shop drawing is submitted.
      ii. Resubmissions shall be denoted with a letter following the number. For example the first resubmission of Shop Drawing 001 shall be numbered 001A, a second resubmission of shop 001 shall be numbered 001B, and that sequence shall continue for any subsequent resubmissions.
   6. The Contractor's Shop Drawing number (if a different numbering system to the Engineer's number is used by the Contractor).
   7. Notification of deviations from Contract Documents.
   8. Other pertinent data.

B. A completed Submittal Certification Form shall be attached to each copy of each shop drawing and must include:
   1. Identification of deviations from Contract Documents.
   2. Contractor's stamp, initialed or signed, certifying review of the submittal, verification of field measurements and compliance with Contract Documents.
   3. Where specified or when requested by the Engineer, manufacturer's certification that equipment, accessories and shop painting meet or exceed the Specification requirements.
   4. Where specified, manufacturer's guarantee.

C. Requirements for Electronic Submittals:
   1. Each individual shop drawing shall be contained in one PDF.
   2. The first page of the PDF shall be the Submittal Certification Form, which clearly identifies the submittal, specification section and shop drawing number. File names shall also identify the submittal contained in the PDF. Example file name: 02444-(Shop Drawing No.).pdf
   3. The electronic copy in PDF form shall be exactly as submitted in the hard copy. Electronic copies in PDF form shall be submitted on a CD or DVD and shall accompany the hard copies.
   4. PDF versions of 24x36 drawings shall be converted to 24 x 36 PDFs so as not to lose the clarity of the original drawing.
   5. Electronic submittals that are not submitted in accordance with the requirements stated above will not be reviewed by the Engineer.

1.7 RESUBMISSION REQUIREMENTS

A. Revise initial drawings as required and resubmit as specified for initial submittal.

B. Indicate on drawings any changes which have been made other than those required by Engineer. All renumbering of shop drawings, relabeling of individual pieces or assemblies or relocating of pieces or assemblies to other Drawings within the submittal shall be clearly brought to the attention of the Engineer.

1.8 ENGINEER'S REVIEW

A. The review of shop and working drawings hereunder will be general only, and nothing contained in this specification shall relieve, diminish or alter in any respect the responsibilities of the Contractor under the Contract Documents and in particular, the specific responsibility of the Contractor for details of design and dimensions necessary for proper fitting and construction of the work as required by the Contract and for achieving the result and performance specified thereunder.

B. The Engineer's review comments will be summarized on a Submittal Review Form, which includes an action code. A description of each action code is provided below.

1. No Exceptions Taken (Status 0 on shop drawing log). The shop drawing complies with the Contract Document requirements. No changes or further information are required. Where appropriate, the submittal review form will be used to alert the Contractor, Owner and Field personnel of remaining items within that specification section that still needs to be submitted.
2. Make Corrections Indicated (Status 1 on shop drawing log). The shop drawing complies with the Contract Document requirements except for minor changes, as indicated. Resubmittal is not required unless it is specifically called for; however, Engineer requires that all comments will be addressed by the Contractor, unless otherwise notified in writing prior to execution of the relevant work.
3. Conditional to Remarks (Status 2 on shop drawing log). The shop drawing potentially complies with the Contract Document requirements, contingent upon satisfactory resolution of review comments. Remarks will explicitly list what information needs to be resubmitted. Resubmittal from the Contractor should include a cover letter or summary which indicates how each review comment has been addressed.
4. Revise and Resubmit (Status 3 on shop drawing log). The shop drawing does not comply with the Contract Document requirement as submitted, but may with changes indicated and/or submission of additional information. The entire package must be resubmitted with the necessary information and a cover letter which indicates how each review comment has been addressed and where to find the information in the resubmittal.
5. Rejected (Status 4 on shop drawing log). The shop drawing does not comply with the Contract Document requirements, for the reasons indicated in the remarks, and is unacceptable.
6. In Review (Status 5 on shop drawing log). The shop drawing is currently under review.
7. For Information Only (Status 6 on shop drawing log). The shop drawing review was informational only. No comments are provided.

SUBMITTAL CERTIFICATION FORM

PROJECT: _____ CONTRACTOR'S PROJ. NO: _____

CONTRACTOR: _____ ENGINEER'S PROJ. NO: _____

ENGINEER: _____

TRANSMITTAL NUMBER: _____ SHOP DRAWING NUMBER:_____

SPECIFICATION SECTION OR DRAWING NO: _____

DESCRIPTION: _____

MANUFACTURER:_____

The above referenced submittal has been reviewed by the undersigned and I/we certify that the material and/or equipment meets or exceeds the project specification requirements with

☐ NO DEVIATIONS

or

☐ A COMPLETE LIST OF DEVIATIONS AS FOLLOWS[a]:

_____
_____
_____
_____
_____

By:_____ By:_____

Contractor[b] Manufacturer[c]

Date: _____ Date: _____

[a] Any deviations not brought to the attention of the Engineer for review and concurrence shall be the responsibility of the Contractor to correct, if so directed.

[b] Required on all submittals

[c] When required by specifications Page ___ of ___

General Contractor's Stamp

SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Extent of Work:

1. Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.

B. Related Work Specified Elsewhere:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, and Sections of these Specifications.
2. Schedule of values is required under the General Conditions.
3. Schedule of values is required to be compatible with applications for progress payment.

1.2 QUALITY ASSURANCE

A. Use required means to assure arithmetical accuracy of the sums described.

B. When so required by the Engineer, provide copies of the subcontracts or other data acceptable to the Engineer substantiating the sums described.

1.3 SUBMITTALS

A. Prior to first application for payment, submit a proposed schedule of values to the Engineer.

1. Secure the Engineer's approval of the schedule of values prior to submitting first application for payment.

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Pre-Construction Record: Contractor shall utilize digital photographs and video to obtain a visual record of the project area; copies of same shall be given to the Engineer and Owner.
2. Notify Engineer at least three (3) working days prior to photographing or videoing the project area so Engineer may, at his option, observe.

1.2 QUALITY

A. Pre-Construction Record: Quality shall be such that the condition of existing pavement, curbing, driveway entrances, sidewalks, etc. can be readily determined.

1.3 SUBMITTAL OF PRINTS

A. Pre-Construction Record: Submit hard copy prints and electronic files on CD ROM, and video electronic files on DVD to the Engineer and Owner prior to any construction work.

B. The quality of the photos and video are subject to approval by the Engineer prior to the start of construction work in the areas shown by the photos.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. General Quality Control.
B. Workmanship.
C. Manufacturer's Instructions.
D. Manufacturer's Certificates.
E. Manufacturer's Field Services.
F. Testing Laboratory Services.

1.2 RELATED REQUIREMENTS

A. Section 00700 - General Conditions: Inspection and testing required by governing authorities.
B. Section 01340 - Submittals: Submittal of Manufacturer's Instructions.
C. Section 02200 - Earthwork.
D. Section 03300 – Cast-in-Place Concrete

1.3 QUALITY CONTROL

A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.4 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
B. Perform work by persons qualified to produce workmanship of specified quality.
C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.5 MANUFACTURERS' INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

1.6 MANUFACTURERS' CERTIFICATES

A. When required by individual Specifications Section, submit manufacturer's certificate that products meet or exceed specified requirements.

1.7 MANUFACTURERS' FIELD SERVICES

A. When specified in respective Specification Sections, require supplier and/or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.
B. Representative shall submit written report to Engineer listing observations and recommendations.

1.8 TESTING LABORATORY SERVICES

A. Owner will employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services wherever an Independent Testing Laboratory is required by individual specification sections listed in paragraph 1.2 above, unless otherwise indicated.

B. Services will be performed in accordance with requirements of governing authorities and with specified standards.

C. Reports will present observations and test results and indicate compliance or non-compliance with specified standards and with Contract Documents. Independent Testing Laboratory will submit one copy of each report directly to each of the following: Engineer, Resident Project Representative, Contractor. Reports will be mailed within 5 days of obtaining test results. If test results indicate deficiencies, Independent Testing Laboratory shall telephone or FAX results to Engineer, Resident Project Representative and Contractor within 24 hours.

D. Contractor shall cooperate with Independent Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.

E. Contractor shall coordinate all testing work and shall notify Engineer and Independent Testing Laboratory at least 24 hours prior to performing work requiring testing services. If scheduled tests or sampling cannot be performed because the work is not ready as scheduled, testing costs associated with the delay will be determined by Engineer and invoiced by Owner to Contractor. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price. If adequate notice is not provided, Contractor shall suspend work on that portion of the Project until testing can be performed. Such suspension will not be grounds for a claim against the Owner for delay, nor will it be an acceptable basis for an extension of time.

F. Payment for Independent Testing Laboratory services shall be as follows:

1. General: Where testing is the Owner's responsibility, payment will be made as stated below unless other requirements are given in Specification Sections. Testing which is the responsibility of the Contractor will be considered an incidental item unless otherwise indicated in Section 01150, Measurement and Payment.
2. Initial Testing: Owner will pay for initial tests.
3. Retesting: Costs of retesting due to non-compliance will be paid by Owner. The cost of retesting will be determined by Engineer and Owner will invoice Contractor for this cost. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price.
4. Contractor's Convenience Testing: Inspections and tests performed for Contractor's convenience will be paid for by Contractor.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide and pay for all temporary applicable utilities required to properly perform the Work at no additional cost to the Owner including the placement and removal of the utilities.
2. Completely remove all temporary equipment and materials upon completion of the Work and repair all damage caused by the installation of temporary utilities.
3. Make all necessary applications and arrangements for electric power, light, water and other utilities with the local utility companies. Notify the local electric power company if unusually heavy loads, such as welders, will be connected.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Obtain permits as required by local governmental authorities.
2. Obtain easements, when required, across private property other than that of the Owner for temporary power service.
3. Comply with the latest National Electrical Code.
4. Comply with all local, State and Federal codes, laws, and regulations.

B. All temporary utilities are subject to the approval of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Electrical:

1. The General Contractor shall make necessary arrangements with the local power company for connection to the existing power supply and shall provide and pay for all temporary light and power requirements except as otherwise specified hereunder. In general, the temporary electrical service shall include all necessary switches, poles, wiring, cables, conduit, raceways, panelboards, fixtures, lamps and receptacles to supply construction power of adequate capacity for the project. Temporary transformers and meters shall be furnished and installed by the appropriate power authority, but paid for by the General Contractor, who shall be responsible for making all arrangements for their installation prior to using any existing power for temporary purposes.
2. The General Contractor will pay for the cost of energy consumed by all trades, including cost of lamp replacement. The General Contractor and Subcontractors of all trades shall furnish their own extension cords and such additional lamps as may be required for their work, shall pay for the cost of temporary wiring of a special nature for light and power required, other than that above mentioned.
3. All temporary work shall be furnished and installed in conformity with the National Electrical Code and in accordance with local ordinances and requirements of the municipal power authority. All temporary wiring and accessories shall be removed after it has served its purpose.

B. Heating:
   1. The General Contractor shall furnish, install, and maintain a complete temporary heating system, including fuel therefore, which will provide heat and ventilation as required by the trades and for the protection of stored and installed materials from injury as can be caused by dampness and cold. The General Contractor shall employ, within the terms of the General Contract, a competent watchman who will maintain and operate the systems, as required. The General Contractor shall bear all costs incurred from the temporary heating and ventilation from the time the systems are first required until the date of Substantial Completion of the General Contract, as defined in the General Conditions and Supplementary Conditions.

C. Water and Sanitary:
   1. The General Contractor shall make necessary arrangements for connection to the municipal water supply and shall provide, at his own expense, any extensions as required for the operation of this project. The General Contractor shall bear all costs incurred for the temporary water services, including the costs of the water itself.
   2. All lines, temporary or permanent, shall be protected and maintained by the General Contractor. Temporary lines shall be removed by the General Contractor when the temporary service is no longer required.
   3. The General Contractor shall provide an adequate drinking water supply, satisfactorily cooled, for his employees.
   4. See Site Plan for nearest water hook-up.
   5. The General Contractor shall furnish, install, maintain and pay for adequate temporary chemical type toilet accommodations, for all persons employed on the work and located where approved by the Engineer. The accommodations shall be in proper enclosures and in accordance with Municipal Ordinances and shall be maintained in proper, safe and sanitary conditions and suitably heated when requested.
   6. Relocate temporary toilet facilities as required to facilitate the construction.
   7. Remove all temporary facilities at completion of work when directed by the Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Electrical:
   1. Provide electrical energy to:
      a. All necessary points on the construction site so that power can be obtained at any desired point with extension cords no longer than 100 feet.
      b. Construction site offices.
      c. Lighting as required for safe working conditions at any location on the construction site.
      d. Night security light.
      e. When applicable, Owner's present facilities during the changeover of electrical equipment.
   2. Capacity:
      a. Provide and maintain adequate electrical service for construction use by all trades during the construction period at the locations necessary, as specified

herein.

3. Installation:
    a. Install all work with a neat and orderly appearance.
    b. Have all installations performed by a qualified electrician.
    c. Modify service as job progress requires.
    d. Locate all installations to avoid interference with cranes and materials handling equipment, storage areas, traffic areas and other work.

B. Heating:
1. Maintain a heated environment for the work at the temperature and for the length of time specified or as directed by the Engineer.
2. Precaution:
    a. Operate temporary heating apparatus in such a manner that finished work will not be damaged.
    b. Repair all damage, caused by temporary heating operations, to the complete satisfaction of the Engineer.

C. Water:
1. Provide and maintain water for drinking and construction purposes as required for the proper execution of the Work.

D. Sanitary Accommodations:
1. Provide and maintain sanitary accommodations for the use of the employees of the General Contractor, subcontractors, and Engineer.
2. Sanitary accommodations shall meet the requirements of all local, State and Federal health codes, laws and regulations.

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTIONS

A. Work Included:

1. Contractor to have watering equipment on site throughout construction duration.
2. Furnish and apply water on the road surfaces within the construction site, at a minimum of two times per day, to control dust and when directed by the Engineer.
3. When dust control is not included as a separate item in the Contract, the work shall be considered incidental to the appropriate items of the Contract.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Water for Sprinkling:

B. Clean, free of salt, oil, and other injurious matter.

PART 3 - EXECUTION

3.1 APPLICATION

A. Water:

1. Apply water by methods approved by the Engineer.
2. Use approved equipment including a tank with gauge equipped pump and spray bar.

END OF SECTION

SECTION 01570

TRAFFIC REGULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Provide all materials and perform all work necessary to completely regulate traffic in the area of Work.
   2. Perform all work in such a manner as to provide safe passage at all times for the public and with a minimum of obstruction to traffic.
   3. Do not close roads or streets to passage of the public without the permission of the proper authorities.
   4. Refer to Section 01010 Summary of Work for additional requirements.

B. The local police department will decide if safe passage is being maintained and shall have the authority to require the Contractor to take any additional steps necessary to maintain safe passage.

C. Minimize the length of delays or traffic stoppage to the extent practicable. Maximum traffic stoppage time shall be 10 minutes.

1.2 SCHEDULING WORK

A. Schedule all work so that two adjacent parallel streets are not closed to passage by the public at any one time, if at all possible.

B. Revise the plan of work if it will create a traffic hazard or an unreasonably long detour. All detours shall be approved by the local police department.

C. Do not start work in any new location without the permission of the Engineer.

D. Notify all police and fire departments of all scheduled detours and when streets are reopened.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND BARRICADES

A. Provide adequate warning signs, barricades, signal lights, watchmen and take other necessary precautions for the safety of the public.

B. Provide and illuminate suitable warning signs to show where construction, barricades or detours exist.

C. Provide barricades of substantial construction and painted with a finish that increases visibility at night.

D. Keep signal lights illuminated at all barricades and obstructions from sunset to sunrise.

E. Maintain all necessary signs, barricades, lights, watchmen and other safety precautions during authorized suspension of the Work, weekends, holidays or other times when the Work is not in progress.

F. Traffic control signs for construction work shall be located and of the size and type as outlined in Manual on Uniform Traffic Control Devices for Streets and Highways as published by U. S. Department of Transportation.

2.2 UNIFORMED POLICE OFFICER

A. A uniformed police officer is a police officer (local, county or state) on regular or special duty dressed in uniform with the necessary high visibility vest and apparel needed for traffic control.
B. Arrange the police detail with the local Chief of Police, County Sheriff, or State Police Captain depending on jurisdiction.

2.3 FLAG PERSON

A. A flag person is a trained and certified individual assigned specifically to the task of directing traffic and is outfitted in the necessary high visibility vest and apparel needed for traffic control.
B. Flag persons shall be provided by the Contractor.

PART 3 - EXECUTION

3.1 DETOURS

A. Provide, identify and maintain suitable detours when the project, or any part thereof, is closed to public travel.
B. When the closed part of the project is reopened, restore the detour area and any other disturbed areas to the original condition.

3.2 INCONVENIENCE TO RESIDENTS OF VICINITY

A. Whenever a traveled way is closed, perform the Work in such a manner that local travel and residents in the vicinity of the Work will be inconvenienced as little as possible.
B. Allow access to residents and abutting land owners along the project to driveways and other normal outlets from their property.

3.3 TRAFFIC CONTROL OFFICERS

A. Where required by the local, county or state police departments and/or when specified, traffic control officer shall be Uniformed Police Officers.
B. Where the local, county or state police departments do not wish to or are unable to furnish traffic control officers and/or when specified, the traffic control officers shall be flag person.

END OF SECTION

SECTION 01710

PROJECT CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Maintain premises, private, and public properties free from accumulations of waste, debris, and rubbish, caused by operations.
   2. At completion of work, remove waste materials, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces. Leave project clean and ready for use.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Conduct cleaning and disposal operations in accordance with all applicable local and state laws, ordinances, and code requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.
B. Use cleaning materials only on surfaces recommended by cleaning material manufacturers.
C. Mechanical sweeper – the sites shall be swept on a daily basis at the conclusion of each work day. Sweeping shall be performed by a mechanical power sweeper.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Cleaning During Construction:
   1. Execute cleaning operations to ensure that buildings, grounds, private, and public properties are maintained free from accumulations of waste materials and rubbish.
   2. Entirely remove and dispose of material or debris during the progress of the work that has washed into or has been placed in watercourses, ditches, lawns, gutters, drains, catch basins, or elsewhere as a result of the Contractor's operations.
   3. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
   4. At reasonable intervals during the progress of work, clean the site and dispose of waste materials, debris, and rubbish.
   5. When applicable, schedule cleaning operations so that dust and other contaminants resulting from the cleaning process will not fall on wet, newly painted surfaces.
B. Control of Hazards:
   1. Store volatile wastes in covered metal containers, and remove from premises daily.
   2. Prevent accumulation of wastes which may create hazardous conditions.
   3. Provide adequate ventilation during use of volatile or noxious substances.
C. Disposal:
   1. Do not burn or bury rubbish and waste materials on project site.
   2. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.

3. Do not dispose of wastes into streams or waterways.

D. Final Cleaning:
   1. Employ experienced workmen, or professional cleaners, for final cleaning.
   2. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from all sight-exposed interior and exterior finished surfaces.
   3. Repair, patch and touch up marred surfaces to specified finishes.
   4. Rake clean non-paved surfaces of the project site.
   5. Restore to their original condition those portions of the site not designated for alterations by the Contract Documents.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART l - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Keep accurate record documents for all additions, substitutions of material, variations in work, and any other additions or revisions to the Contract.

1.2 MAINTENANCE OF DOCUMENTS

A. Maintain at job site, one copy of:

1. Contract Drawings
1. Specifications
2. Addenda
3. Reviewed Shop Drawings
4. Change Orders
5. Any other modifications to the Contract
6. Field Test Reports

B. Store documents in files and racks specifically identified for this use that are apart from documents used for construction.

C. File documents in a logical manner indexed for easy reference.

D. Maintain documents in clean, dry, legible condition.

E. Do not use record documents for construction purposes.

F. Make documents available at all times for inspection by the Engineer and Owner, and by the end of the project, transmit these documents to the Engineer.

1.3 RECORDING

A. Label each document "PROJECT RECORD" in large high printed letters.

B. Keep record documents current and do not permanently conceal any work until required information has been recorded.

C. General Field Recording Issues:

1. All ties should be taken from existing, permanent features such as utility poles, corners of houses and hydrants. Porches, sheds or other house additions should be avoided for they could be torn down. A minimum of two ties should be taken.
2. Stations should be recorded to the nearest foot.
3. Inverts should be recorded to the nearest hundredth of a foot.
4. Elevations should be recorded to the nearest hundredth of a foot.
5. Building dimensions should be recorded to the nearest 1/4".

D. Project Record Drawings - Legibly mark Contract Drawings to record existing utilities and actual construction of all work, including but not limited to the following (where applicable):

1. Existing Utilities

a. Water mains and services, water main gate valves, sewer mains and services, storm drains, culverts, steam lines, gas lines, tanks and other existing utilities encountered during construction must be accurately located and shown on the Drawings. In congested areas supplemental drawings or enlargements

may be required.

b. Show any existing utilities encountered in plan and profile and properly labeled showing size, material and type of utility. Ties should be shown on plan. Utility should be drawn to scale in section (horizontally and vertically) and an elevation should be called out to the nearest hundredth of a foot.

c. When existing utility lines are broken and repaired, ties should be taken to these locations.

d. If existing water lines are replaced or relocated, document the area involved and pipe materials, size, etc. in a note, and with ties.

2. Manholes, Catch Basins, Valve Pits and other structures.

a. Renumber structure stationing to reflect changes.

b. Show ties to center of structure covers or hatches.

c. In general, show inverts at center of structures. However, for manholes with drop structures, or steep channels (greater than 0.2' change on slope), show inverts at face of manhole.

d. Show inverts for other structures at the face of the structure.

e. Draw any new structures that are added on plan and profile.

f. Show any field or office redesigns.

g. Redraw plan if the structure's location is moved more than 5 feet in any direction. [Note: It is important to show existing utilities, as outlined in Paragraph 1 above, especially if they were one reason for relocating the sewer, manholes and other structures.]

h. Redraw profile if inverts changed by more than 6 inches.

3. Gravity Sewer Line

a. Change sewer line slopes indicated on Drawings if inverts are changed.

b. Draw any new gravity lines that are added on plan and profile.

c. Show any field or office redesigns.

d. Redraw the sewer line profile if manhole inverts are redrawn.

e. Redraw the sewer line on plan corresponding to relocated manholes.

4. Water Mains and Force Mains

a. Show ties to the location of all valves, bends (horizontal and vertical), tees and other fittings. The use of thrust blocks should be recorded.

b. Revise elevations indicated on the Drawings to reflect actual construction.

5. House Services

a. Draw all house services (even to empty lots) on plan, and show ties.

b. Show ties or distances to wyes from manhole.

c. Show chimneys heights in the profile.

d. The Wright-Pierce "Sanitary Sewer Service Location" forms shall be used to record sewer service information. A copy of these forms should be provided to the Owner, along with the Record Drawing Set.

6. Septic Tanks

a. Show ties to center of tank covers.

b. Label size of septic tanks that are other than standard 1000 gallon capacity.

c. The Wright-Pierce "Sanitary Sewer Service Location" forms shall be used to record septic tank information. A copy of these forms should be provided to the Owner, along with the Record Drawing Set.

7. Ledge

a. Ledge profiles should be shown. Note whether the plotted ledge profile

reflects undisturbed or expanded conditions.

8. Yard Piping and Buried Electrical Conduit
    a. Site piping should be drawn to reflect the installed locations, with ties and elevation of all bends (horizontal and vertical).
    b. Show routing for electrical conduits and pull boxes, especially in close proximity to buildings and when the conduits change direction or cross process piping.
9. Roads
    a. Show centerline road profile and level spot elevations.
    b. Show pavement widths.
    c. On road cross sections, show the pavement cross slope.
    d. Show any deviations from the design plans.
10. Buildings
    a. In general, small changes to structures should not be redrawn. If any dimensional changes were made in the field, the numerical change should be made on the Drawing and be properly labeled. Update dimensions and elevations on Drawings.
    b. Show finished concrete elevations (top of slab, top of wall, top of footing, etc.). Redraw any foundation, frost wall, etc. that was modified, deepened, or altered during construction.
    c. Adjust finished concrete horizontal dimensions that are shown on the Drawings.
    d. Adjust structural steel elevations and horizontal dimensions that are shown on the Drawings.
    e. Show location of anchors, construction and control joints, and waterstops, when they are different from those shown on Drawings.
    f. Any additions or major changes should be shown in both plan and elevation (i.e. relocated doors, opposite door swings, change in wall location, relocation of floor drains).
    g. Show approximate location and routing of electrical conduits in walls, slabs and ceilings. Most conduits are run in groups, therefore, use range of measurements to define location for entire section of conduits.
    h. Special circuits for computers, alarms and instrumentation should be shown.
    i. Show any changes in location and elevation of ductwork and devices, fuel piping and equipment, and heat piping and equipment.
    j. Location of gravity sewer system below slabs in buildings should be shown, if changes are made in the configuration.
    k. If wall mounted electrical switches, control boxes, thermostats, etc. have been relocated significantly, (other side of door, or to a wall other than indicated diagrammatically on electrical plans) make the revision accordingly.

E. Specifications and Addenda - Legibly mark up each section to record:
    1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
    2. Changes made by Change Order, Field Order, or other method.

1.4 SUBMITTALS

A. At the completion of the project, deliver record documents to the Engineer.
B. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date, project title and number.
2. Contractor's name and address.
3. Title and number of each record document with certification that each document is completed and accurate.
4. Signature of Contractor, or his authorized representative.

C. Failure to supply all information on the Project Record Drawings as specified in Part 1.3 may result in additional retainage from monthly partial payment requests, and in non-approval of final payments of the Contract and/or if contract time (as specified in accordance with the Standard General Conditions of the Construction Contract) has elapsed, this shall be grounds for the enactment of the liquidated damages as specified.

END OF SECTION

Section 01730
COST ESTIMATES

City of Waltham, MA
Cedar Street and Oak Street Storm Drain and Surface Improvements
100% Cost Estimate
July 2015

Item	Description	Quantity		Total	Unit	Unit Price	Total
		Cedar	Oak				
1	Mobilization/Demobilization	0.5	0.5	1	LS	$94,016.25	$94,016
2	Relocate Water Main	0	100	100	LF	$100.00	$10,000
3	Remove and Relocate Hydrant	4	0	4	EA	$2,000.00	$8,000
4	Sewer Service Connections	650	670	1,320	LF	$60.00	$79,200
5	Catch Basin, 4-Ft	12	11	23	EA	$3,000.00	$69,000
6	Manhole, 4-Ft	7	7	14	EA	$2,000.00	$28,000
7	Manhole, 5-Ft	1	2	3	EA	$2,200.00	$6,600
8	12" RCP Drain	200	150	350	LF	$60.00	$21,000
9	15" RCP Drain	300	700	1,000	LF	$70.00	$70,000
10	18" RCP Drain	700	0	700	LF	$80.00	$56,000
11	24" RCP Drain	0	350	350	LF	$100.00	$35,000
12	12" Abandon & CDF Fill pipe	325	500	825	LF	$40.00	$33,000
13	15" Abandon & CDF Fill pipe	530	0	530	LF	$50.00	$26,500
14	18" Abandon & CDF Fill pipe	480	0	480	LF	$65.00	$31,200
15	Abandon & CDF Fill Drain Structure	10	5	15	EA	$125.00	$1,875
16	Removing/Relaying Existing Utilities	50	50	100	LF	$50.00	$5,000
17	Ledge Excavation	25	25	50	CY	$125.00	$6,250
18	Excavation Below Grade and Replacement Backfill	50	50	100	CY	$20.00	$2,000
19	Replacement of Unsuitable Material above Trench Grade	50	50	100	CY	$20.00	$2,000
20	Aggregate Subbase	1885	1370	3,255	CY	$25.00	$81,375
21	Aggregate Base	1705	1555	3,260	CY	$35.00	$114,100
22	Permanent Binder Course	960	600	1,560	TON	$120.00	$187,200
23	Permanent Top Course	500	335	835	TON	$120.00	$100,200
24	Remove & Reset Vertical Granite Curb	90	780	870	LF	$35.00	$30,450
25	Remove & Reset 2' Curb Coners	1	5	6	EA	$50.00	$300
26	New Vertical Granite Curb	1925	1100	3,025	LF	$45.00	$136,125
27	New Granite Transition Curb	185	200	385	LF	$65.00	$25,025
28	New Granite Curb Inlet	80	110	190	LF	$80.00	$15,200
29	New Granite Curb Corner	69	64	133	EA	$100.00	$13,300
30	Cement Conc. Sidewalk (4-inch)	1425	975	2,400	SY	$55.00	$132,000
31	Cement Conc. Sidewalk @ Drives & HCP Ramps(6-inch)	700	685	1,385	SY	$65.00	$90,025
32	Detectable Warning Devices	120	120	240	SF	$50.00	$12,000
33	Erosion and Sedimentation Control	0.5	0.5	1	LS	$2,500.00	$2,500
34	Proposed Trees	0	15	15	EA	$500.00	$7,500
34	Test Pit Excavation	10	10	20	EA	$1,000.00	$20,000
35	Utility Coordination	0.5	0.5	1	Allowance	$20,000.00	$20,000
36	Uniformed Police Detail	0.5	0.5	1	Allowance	$165,000.00	$165,000
37	Price Adjustment	0.5	0.5	1	Allowance	$10,000.00	$10,000
38	Utility Repairs	0.5	0.5	1	Allowance	$50,000.00	$50,000
40	Management of Contaiminated Soils/Fill	0.5	0.5	1	LS	$40,000.00	$40,000
41	Removal and Disposal of Soil (Class A-1)	200	200	400	CY	$35.00	$14,000
42	Removal and disposal of Excess Contaminated Soil	0.5	0.5	1	Allowance	$100,000.00	$100,000
43	Furnish and Install New Sign	37	34	71	EA	$300.00	$21,300
						Subtotal	$1,972,241.25
						10% Contingency	$197,224.13
						TOTAL	**$2,169,465.38**

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The Contractor shall furnish all labor, materials, tools, equipment and apparatus necessary and shall do all work required to complete the demolition, removal, and alterations of existing facilities as indicated on the Drawings, as herein specified, and/or as directed by the Engineer.
2. Demolition and alteration work within occupied areas shall be accomplished with minimum interference to the occupants and to the plant which shall be in continuous operation during construction.
3. All equipment, piping, and other materials that are not to be relocated or to be returned to the Owner shall become the property of the Contractor and shall be disposed of by him, away from the site of the work and at his own expense.
4. All demolition or removal of existing structures, utilities, equipment, and appurtenances shall be accomplished without damaging the integrity of existing structures, equipment, and appurtenances to remain, to be salvaged for relocation or stored for future use.
5. Such items that are damaged shall be either repaired or replaced at the Contractor's expense to a condition at least equal to that which existed prior to the start of his work.
6. Unless otherwise indicated, all items labeled to be "removed", "demolished" or "remove/demolish" shall be removed and disposed of off site in accordance with all Local, State and Federal Regulations.

1.2 JOB CONDITIONS

A. Condition of Structures:

1. The Owner assumes no responsibility for the actual condition of structures to be demolished.
2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner as far as practicable. However, variations within the structures may occur due to Owner's removal and salvage operations prior to the start of demolition work (where applicable).

1.3 UTILITIES

A. Utility Locations:

1. Utility locations shown on the plans are approximate only.
2. The Contractor shall make all necessary arrangements and perform any necessary work to the satisfaction of affected utility companies and governmental divisions involved with the discontinuance or interruption of affected public utilities and services.

1.4 SUBMITTALS

A. Schedule - Demolition:

1. Submit two (2) copies of proposed methods and operations of demolition to the Engineer for review prior to the start of work. Include in the schedule the coordination for shut-off, capping and continuation of utility services as required.
2. Provide a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Owner's operations.
3. Provide detailed work plan including location of material disposal.

1.5 PROTECTIONS

A. Ensure the safe passage of persons around the area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities and persons. Erect temporary, covered passageways as required by authorities having jurisdiction.
B. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

1.6 DAMAGES

A. The Contractor shall promptly repair damages caused by demolition operations to adjacent facilities at no cost to the Owner.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Remove and dispose of non-salvageable material in accordance with all applicable local and state laws, ordinances and code requirements.
B. Dispose of material daily as it accumulates.
C. Carefully remove, store and protect from damage all materials to be salvaged.
D. Buildings and Adjacent Property:
    1. Protect all buildings and property adjacent to equipment to be removed from damage by erecting suitable barriers or by other suitable means.
    2. Leave such buildings in a permanently safe and satisfactory condition.
F. Mechanical/Process Demolition:
    1. Mechanical/Process demolition in general shall consist of the dismantling and removal of existing piping, tanks, pumps, motors, equipment and other appurtenances as specified, and indicated on the Drawings.
    2. It shall also include, where necessary, the cutting of existing piping for the purpose of making connections thereto.
    3. Piping not indicated to be removed but which may interfere with construction shall be removed to the nearest solid support, capped and left in place. Where piping that is to be removed passes through the wall of existing structures, it shall be cut off and properly capped on each side of the wall.
    4. When piping is to be altered or removed underground, the remaining piping shall be properly capped or plugged.
    5. Abandoned underground piping shall be left in place unless it interferes with new structures or unless otherwise noted on the Drawings.
H. Salvage:

1. Salvaged items shall be stored on site for the Owner in an acceptable location and manner.

I. Demolition Sequence:

1. The demolition sequence is to conform the reviewed and approved project schedule, and restrictions outlined in Section 01310, Construction Schedules.

END OF SECTION

SECTION 02080

SOIL AND WASTE MANAGEMENT

PART 1 - GENERAL

1.1 QUALIFICATIONS

A. The Contractor shall demonstrate the necessary skills, experience, training, and qualifications to conduct the work as specified herein.

B. The Contractor shall possess all required licenses, insurance, permits and trained employees to properly execute the work as specified herein.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.3 OBJECTIVE AND OVERVIEW

A. This Section includes furnishing all labor, equipment, and materials, and performing all operations in connection with the handling, stockpiling, and disposal and/or in-project reuse of soil and associated fill and waste material resulting from the construction operations as specified. In-project reuse shall be defined as material that is reused within the project, such as replacement of soil back into the excavation trench after installation of new utilities.

B. The soil management practices specified herein apply to all soil excavated during the course of this contract, including potentially contaminated soil and fill material. The objective of soil management practices detailed herein is to manage all soil excavated at the site during the course of this contract in compliance with applicable Federal, state and local laws and regulations and in a cost-effective manner.

C. This Section includes proper handling and management of waste materials, including, but not limited to, construction debris building demolition, municipal waste, boulders, soil, fill, ash, rubble, materials containing asbestos, and empty or crushed drums and/or drum parts.

D. Activities conducted under this Section shall be implemented in compliance with the Contractor's Site-Specific Health and Safety Plan (HASP).

E. This Section describes the general parameters and requirements for testing (including field screening and laboratory chemical analysis), excavation, handling, storage, tracking, transport, and disposal and/or in-project reuse of natural and fill soils.

F. In the course of the work, it may be necessary to excavate and handle potentially contaminated soil/solid waste. The soil/solid waste management practices specified herein apply to all soil/solid waste excavated during the course of this contract. The Contractor shall reuse geotechnically suitable excavated material prior to using imported backfill to reduce the volume of material to be disposed off-site. Imported backfill shall be used only as accepted by the Engineer. Historic fill soils and roadway base/subbase shall be re-used to the maximum extent before reusing naturally occurring soils. If off-site disposal is required, natural soils shall be preferentially disposed or reused.

G. To the extent possible, the Contractor shall reuse geotechnically suitable contaminated (B) or impacted (A-2) excavated material prior to using background (A-1) material to reduce the volume of impacted or contaminated soil to be disposed of off-site. The Contractor shall segregate fill from natural soils during excavation and shall segregate fill and natural

soil stockpiles to avoid mixing impacted and background soils prior to in-project reuse. Contamination at the disposal site shall not be exacerbated as a result of a URAM or as the result of structures placed within the area of identified contamination.

H. All work shall be conducted in compliance with the following Contractor-prepared plans:
   1. Site-Specific Health and Safety Plan;
   2. Soil and Waste Management Plan;
   3. Dust, Vapor and Odor Control Plan;
   4. Air Monitoring Plan;
   5. Dewatering Plan;
   6. Stormwater Handling Plan;
   7. Equipment and Personnel Decontamination Plan;
   8. Quality Control Plan;
   9. Spill and Discharge Control Plan
   10. Asbestos Work Plan; and
   11. Template URAM

1.4 DEFINITIONS

A. Asphalt, Brick and Concrete (ABC): Asphalt, Brick and Concrete material that is waste from construction or found in fill material during excavation. ABC material found in clean, reusable fill may be reused onsite to the greatest extent possible. All excess ABC generated during construction shall be disposed of offsite at an appropriate, licensed facility that will accept ABC waste.

B. Area of Excavation: For the purposes of reusing soil/fill on-site, the *area of excavation* is considered to be the approximate area in which the soil/fill was removed provided that area is consistent in soil strata, color, texture, geotechnical properties and has substantially similar visual and olfactory characteristics. Soil/fill returned to the *area of excavation* shall be returned to approximately the same horizontal and vertical location from which it originated provided that it is not placed in an area that differs substantially in physical or chemical characteristics as can be observed and measured during excavation.

C. Authorized Excavation: Earth Excavation or "Excavation" consists of removal of materials encountered to the elevations and widths indicated in the Contract Drawings, Specifications, or as directed by the Engineer.

D. Background: (see Section 1.4-K-1)

E. Competent Person: for purposes of this Specification, the term shall mean one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them [29 CFR 1926.32(f)].

F. Fill (Historic Fill): Fill, also known as urban, historic, or miscellaneous fill, is defined as a mixture of soil and other materials which have been located in the area through man-made processes primarily for the purpose of grading, backfilling or filling in low areas. Material commonly associated with historic fill includes, but are not limited to; coal, glass, brick, ash, wood fragments and other similar granular materials. Historic fill shall not include boulders, ledge, consolidated rock, asphalt, concrete, railroad timbers, rail, cobblestones or any other abandoned building materials.

G. Hazardous Waste:
   1. Hazardous waste as defined 310 CMR 40.0006; or
   2. Hazardous waste as defined in 40 CFR 261.3.
   3. A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. Cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or
b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

H. Peat: A substance of vegetable origin, consisting of roots and fibers, moss, etc., in various stages of decomposition, and found, as a kind of turf or bog. Peat shall be considered natural soil when it is encountered in small amounts (layers 1-foot (304.8 mm) or less in thickness) and when it is impractical to separate the peat from the natural soil or urban fill strata. Otherwise, peat shall be considered a distinctive stratum.

I. Liquid Waste: materials generated onsite due to work performed and are waste or excess including but not limited to collected groundwater, collected stormwater, non-aqueous phase liquids, Contractor-supplied fuels and fluids, and drummed liquids.

J. Solid Waste (Waste): materials generated on site due to work performed and are waste or excess, including but not limited to asphalt, brick and concrete (ABC) waste, demolition waste, decontamination waste, dredging spoils (dewatered), metal waste, plaster/drywall, plastic waste, rock, rubber waste, sediment, tar waste, trash, vegetation debris, wood waste.

K. Soil Classification Categories: Unless specifically stated otherwise, terms used in this specification are as defined in the Massachusetts Contingency Plan (MCP), 310 CMR 40.0006. The following definitions and soil classifications apply to these specifications:

1. (Class A-1) Background: Any soil or fill material which meets the regulatory definition of "background" as defined in 310 CMR 40.0006 may be reused as common fill/ordinary borrow provided it also meets the physical requirements as specified herein and as specified in Section 02200. For record keeping purposes soil/fill that meet the definition of background, shall be transported under a Material Shipping Record (MSR).

   Class A-1 soil may also be re-used off-site without restriction provided it is re-used in an area where soil concentrations are equal to or greater than the Class A-1 soil being re-used (MCP “Similar Soils” provision). The Contractor is responsible for determining the background levels at the point of excavation. It is also the Contractor’s responsibility to identify one or more disposal facilities/locations with background levels appropriate to receive the material to be disposed or reused. It is the Contractor’s responsibility to determine these background levels in advance so as to comply with 310 CMR 40.0032(3)(b) and so as not to delay or adversely affect construction operations.

2. (Class A-2) Impacted: Any soil or fill material which contains oil or hazardous materials (OHM) at concentrations greater than background levels but less than release notification thresholds established by 310 CMR 40.0300 and 40.1600. Impacted soil may be reused in the area of excavation or as fill provided it is reused in an area of equal or greater contamination and meets the physical requirements as specified herein and as specified in Section 02200. Class A-2 soils requiring off-site transportation and disposal/reuse shall be transported using a Material Shipping Record (MSR).

3. (Class B) Contaminated: Any soil or fill material which contains oil or hazardous materials at concentrations equal to or greater than a release notification threshold established by 310 CMR 40.0300 and 40.1600, except where the presence of the

material is consistent with the regulatory definition of "background" as defined in 310 CMR 40.0006.

Any soils which contain either petroleum or chemical odor or visual indications of oil or hazardous materials shall be handled as potentially contaminated soils. Suitable soil which does not have any evidence of contamination may be reused within the area of excavation without first performing laboratory analyses. Soil/fill that may be contaminated shall be set aside by the Contractor for assessment by the Owner's environmental professional. Soil/fill that is staged and characterized can be reused within the area of excavation or elsewhere on site provided the material has been tested and has equal or less contamination than the point where it is to be reused and it is not reused beneath a permanent structure such as a building foundation. Any excavated soil/fill material not reused within the area of excavation must be characterized prior to non-project reuse. After analytical results are available, soil/fill shall be handled in accordance with the type and degree of contamination (if any) present in the soil/fill.

Class B soil that cannot be reused on site shall be reused off-site, recycled, or disposed as a solid waste at an appropriately permitted facility unless it also meets the regulatory definition of hazardous waste as defined in 40 CFR Part 261 or contains detectable asbestos. Subcategories of Class B soil are defined as follows:

a. Class B-1: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for off-site reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state unlined landfills. Note: per COMM 97-001, sediments may not be re-used as Class B-1.
b. Class B-2: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for off-site reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state lined landfills.
c. Class B-3: Soil and Fill that meet all applicable criteria for instate recycling at an asphalt batching plant and/or the specific licensing requirements for the proposed in-state recycling facility.
d. Class B-4: Soil and Fill that contain concentrations of contaminants that exceed in-state, lined, and unlined landfill reuse criteria as well as in-state recycling acceptance criteria, but meet the criteria for regional thermal treatment facilities or out-of-state recycling facilities, and are not classified as a Resource Conservation and Recovery Act (RCRA) Hazardous Waste.
e. Class B-5: Soil and Fill that contain concentrations of contaminants that require removal to regional disposal facilities and are not classified as RCRA Hazardous Waste.
f. Class B-6: Soil and fill which does not meet one of the designations above due to excessive foreign materials and/or debris that are not classified as a hazardous waste.

4. (Class C) Hazardous Waste: A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Also included within the definition of hazardous waste is hazardous waste as defined 310 CMR 40.0006 and 40.CFR 261.3. Hazardous waste as defined in 40 CFR 261.3 is a solid waste that exhibits any of the characteristics of hazardous waste in excess of regulation levels presented in 40 CFR 261, subpart C

and/or that is listed in 40 CFR 261, subpart D; that is a mixture of solid and hazardous waste; or that is derived from a listed waste. Subcategories of Class C soils shall be as follows:

a. Class C-1: Soils classified as hazardous waste that can be readily treated on-site to eliminate the toxicity characteristic (e.g., for lead).
b. Class C-2: Material determined to contain "listed" or "characteristic" hazardous waste constituents which cannot be readily treated on-site. This material must be transported to an out-of-state approved RCRA Subtitle C hazardous waste disposal or treatment facility under a Uniform Hazardous Waste Manifest.

L. Special Waste: Any waste that is determined not to be a hazardous waste pursuant to 310 CMR 30.000 and that exists in such quantity or in such chemical or physical state, or any combination thereof, so that particular management controls are required to prevent an adverse impact from the collection, transport, transfer, storage, processing, treatment or disposal of the waste. Asbestos and PCB-contaminated soils/fill are examples of special waste categories. Refer to Section 02076.

M. Soil (Natural Soils): Soil, otherwise known as natural soil, is defined for the purposes of the Contract as unconsolidated sand, gravel, silt and clay, and the organic material which has become part of the unconsolidated soil matrix. For this section only, soil may include broken and fragmented rock.

N. Unauthorized Over Excavation: Consists of removal of materials beyond indicated elevations and width limits indicated in the Contract Documents without direction of the Engineer. Over-excavation material handling, transportation and disposal, backfilling and compaction shall be at the Contractor's expense. Over-excavations shall be backfilled and compacted as specified for excavations of the same class, unless otherwise directed by the Engineer.

O. Unauthorized Excavation: Consists of removal of materials beyond indicated sub-grade elevations or Contract-defined limits as shown in the Contract documents without specific direction of the Engineer. Unauthorized excavation, handling material, transportation and disposal, backfilling and compaction shall be at the Contractor's expense. Unauthorized excavations shall be backfilled and compacted as specified for excavations of the same class, unless otherwise directed by the Engineer.

P. Unknown Materials: Any material, that is not readily identifiable as nonhazardous waste, and which has not been previously characterized or encountered during site investigation activities. The Unknown Material classification is to be used in the event that an unexpected, unusual material is encountered for which special handling procedures shall be required in order to handle the material safely. Such wastes include but are not limited to:

1. Unlabelled drums or containers containing material which is not readily identifiable as a non-hazardous substance.
2. Any material, which varies significantly from material previously observed on site and which cannot be readily identified as a nonhazardous.
3. Waste material of unusual color or odor or material with indications of hazardous levels (e.g. exceeding OSHA permissible exposure limits) of contaminants as evidenced on an organic vapor monitor or other similar instrument.

The Owner reserves the right to apply generator knowledge to classify and profile the material as a previously encountered waste or as a known waste. In the event that a material is encountered which the Contractor is uncertain as to its nature, the Owner or their representative shall assess the material with the Contractor and inform the Contractor as to the nature of the material (known or unknown).

1.5 WORK INCLUDED

A. Managing excavated soil, wastes, asphalt, brick and concrete (ABC), and fill material. For Asbestos-containing Material or Asbestos Cement Pipe, also see Section 02076.

B. Characterization of soil, fill, and unknown material for disposal/ off-site reuse purposes; field screening and soil management/segregation; temporary storage/staging; and characterization (as may be necessary for unknown materials and/or for compliance with receiving facility requirements); and disposal and/or off-site reuse of excavated soil and fill material.

All laboratory chemical analyses conducted shall utilize currently accepted U.S. EPA and applicable state agency analytical protocols and procedures.

C. Management of contaminated groundwater: If groundwater potentially impacted by oil and hazardous material (OHM), based on visual or olfactory evidence, is encountered in the course of the work, construction dewatering and discharge permits and groundwater treatment may be necessary depending upon the discharge method(s) and/or location(s) utilized by the Contractor. The Owner and Engineer shall be notified by the Contactor if groundwater potentially impacted by OHM is identified. REFER TO SECTION 02140 DEWATERING.

D. All work at the site must be performed in accordance with all applicable federal, state, and local regulations, permits and licenses, including, but not limited to:

1. The applicable parts of the Code of Federal Regulation (CFR) Title 40: Protection of Environment, pertaining to the Comprehensive Environmental Response and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA), RCRA, and the National Emission Standards for Hazardous Air Pollutants (NESHAPS) as regulated by the U.S. Environmental Protection Agency (U.S. EPA);
2. State regulations specified in the Massachusetts Contingency Plan (MCP) (310 CMR 40.0000), and Massachusetts General Law 21E - Massachusetts Oil and Hazardous Materials Release Prevention and Response Act, and applicable Massachusetts Department of Environmental Protection (MassDEP) guidelines and policies;
3. MassDEP Technical Update. Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil (2002);
4. Department of Transportation (DOT) regulations 49 CFR, and state transportation licenses and permits;
5. OSHA regulations (including, but not limited to, 29 CFR 1910.1000, 29 CFR 1926, and CFR 1910.120), 40-hour Occupational Safety and Health Administration (OSHA) training (plus 8-hour refresher training) and all other applicable state and federal regulations regarding health and safety requirements;
6. NIOSH/OSHA/USCG/EPA: “Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities” October 1985, DHHS (NIOSH). Publ. No. 85-1 15;
7. Department of Transportation training;
8. U.S. Army Corps of Engineers 404 permit;
9. General Contractor's license;
10. National Pollutant Discharge Elimination System (NPDES) Notice of Intent (NOI) to discharge and associated general permits;
11. Massachusetts Water Resources Authority pretreatment and construction dewatering requirements and permits;
12. Excavation and/or grading permits;
13. Special use permits;
14. Special waste haulers certificate;
15. Massachusetts Wetlands Protection Act and associated Order of Conditions;

16. Town of Framingham wetland regulations and bylaws; and The Contractor's Soil and Waste Management Plan (SWMP) and Health and Safety Plan to protect the workers and the public.

E. Implementation of the submitted HASP and other applicable includes establishing work zones (e.g., support zone, contamination reduction zone, exclusion zone), preparing a decontamination pad(s) and staging area(s), performing the appropriate environmental monitoring, training and medical monitoring of personnel, coordinating waste disposal and waste characterization as needed, etc.

F. The Contractor shall characterize all excavated and stockpiled soil and fill material prior to off-site reuse or disposal. Characterization requirements may vary depending on the source/location of the excavated soil/fill, the site selected to receive soil suitable for off-site reuse, or the disposal facility permits and policies. The Contractor is responsible for final waste characterization and shall determine if any additional waste characterization is required at no additional cost to the Owner.

G. The Contractor shall develop, implement, maintain, supervise, and be responsible for all soil management practices during the course of this contract. An OSHA Competent Person, with demonstrated experience in clean and contaminated soil and hazardous waste handling, shall be present during all excavation, backfilling, field screening, segregating, handling, and characterization of all soils excavated in the course of completing this contract to ensure that soil is managed in accordance with applicable laws, regulations, and this Section.

Soil management activities shall include and be conducted as specified herein:

1. Providing and constructing a secure soil staging area sized to adequately segregate soils in accordance with the conditions specified without impeding construction-related activities. The Contractor is to use existing information and obtain additional information as may be needed to minimize the need for a staging area. If a staging area is required to characterize unknown or excess material for any reason, the Contractor is responsible for locating, selecting, preparing and securing the area.
2. If the soil storage area consists of an unimproved or otherwise pervious surface, the Contractor shall install a lining of 6-mil (or greater) polyethylene, to protect the soil from the potential of intermixing with existing subsurface soils.
3. Stockpiles shall be no greater than 250 cubic yards in volume. If space constraints, etc. make it infeasible to maintain separate stockpiles of soils to 350 cubic yards, the Waste Management Plan shall include a map with the locations of the composite samples for each stockpile shall be provided to the Resident Engineer prior to the submittal of the samples to the off-site analytical laboratory. This will allow any portion of the stockpile, which came back as contaminated soil to be properly segregated and managed separately
4. Stockpiles shall be established and maintained as per EPA requirements under the Construction General Permit Section 2.1.2.4. Requirements include the following.
    a. Locate the piles outside of any natural buffers and physically separated from other stormwater controls;
    b. Protect from contact with stormwater (including run-on) using a temporary perimeter sediment barrier;
    c. For all soils, provide cover or appropriate temporary stabilization to minimize sediment discharge and to contain and securely protect from wind; nevertheless, the Contractor shall provide cover for any stockpiles containing contaminated soils (>RCS-1 or containing asbestos containing material – see Item 1.5.G.5);

d. Do not hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance (unless connected to a sediment basin, sediment trap, or similarly effective control), storm drain inlet, or surface water; and
e. Unless infeasible, contain and securely protect from wind.

5. Excavated soil/fill that is contaminated or hazardous, or may be suspected to be contaminated or containing hazardous materials shall be stockpiled and covered prior to characterization and off-site reuse or disposal. Since individual disposal facilities will have different permit conditions and specific pre-characterization data requirements the Contractor is responsible for final soil characterization prior to transport and disposal. The Contractor is hereby made aware that for the purposes of disposal, final soil characterization is the responsibility of the Contractor and costs for securing a staging area and conducting waste characterization shall be incorporated into the Contractor's bid price for construction. Contractor's operations shall meet all stockpiling requirements established in the MCP (310 CMR 40.0036)
6. Prior to off-site soil disposal, excavated materials removed adjacent to asbestos pipe removal as per Contract Documents for asbestos pipe removal that cannot be re-used on site shall be tested to ensure no asbestos is present in the soil. This shall include at a minimum, visual screening of all soil for suspect asbestos or debris and one asbestos soil test for every 250 cubic yards of material and a minimum of one test per project, or whatever is required by the receiving facility (even if greater than once every 250 cubic yards). Samples shall be collected and analyzed by California Air Resources Board (CARB) Method 435 titled Determination of Asbestos Content of Serpentine Aggregate by Polarized Light Microscopy (PLM). Any material which exceeds 1% asbestos content must be disposed of at a licensed asbestos disposal facility in accordance with the Soil Management Plan (S/WMP) and applicable regulatory requirements.
7. During construction activities, excavated soil/fill waste shall be field-screened by the Contractor and either loaded directly for off-site disposal (provided the excavated material is consistent with previously conducted investigations) or stockpiled in a soil/fill waste staging area located by the Contractor and approved by the Owner and Engineer. Stockpiles of Class A, B, and C soils shall be minimized to reduce the amount of waste material stored onsite. Stockpiled materials that are to be disposed of shall remain onsite for only as long as it would reasonably take to characterize (if not done in advance), load and transport offsite to an approved disposal facility. Stockpiles of Class B soil must be removed within 120 days of being generated per the MCP (310 CMR 40.0031). Stockpiles of Class C soil must be removed within 90 days of being generated per RCRA and the MCP. Soils that are to be re-used as fill material shall be stockpiled and maintained as specified herein.
8. Soil suspected of having the characteristics of a hazardous waste or of containing a listed hazardous waste shall not be removed from the excavation except at the direction of the Engineer.
9. Soil/fill waste shall not be staged within 100 feet (30.5 meters) of a reservoir, wetland or Area of Critical Environmental Concern or in a 100-year floodplain. Soil/fill waste shall not be staged in the work area over night. Contaminated material requiring additional waste characterization due to waste disposal facility requirements or in order to assess unknown materials, shall be staged securely pending analytical sampling and characterization by the Contractor.

10. The Contractor shall reuse excavated soil at the point of origin to the maximum degree possible. Soil/fill which cannot be reused immediately at the point of origin shall either have been pre-characterized for off-site reuse or disposal by the Contractor and directly loaded for off-site transport (provided the excavated soil/fill is consistent in visual, olfactory and field screening characteristics with subsurface investigation conducted prior to construction pursuant to the MCP) or it shall be staged at a location determined and secured by the Contractor pending analytical characterization.
11. Excavating unknown, previously uncharacterized material which may be classified as RCRA hazardous waste and disposing of it at an approved facility.
12. Excavating soil, fill and waste containing potential asbestos-containing material (e.g., transite board) shall conform to Section 02076.
13. Removing characterized on-site materials for off-site re-use or disposal.
14. Placing and grading of certified clean fill (including fill from on-site which is determined to be suitable for re-use). The Contractor is to maximize the in-project reuse of on-site materials by using soil suitable for such reuse prior to importing material on site.
15. Demobilizing the site, including, but not limited to, removing and disposing of excess or waste soils, rock, solid waste, demolition waste, construction-related equipment and materials used for personnel and equipment decontamination and related waste such as personal protective equipment (PPE), decontamination water/solids, temporary covers, and wash-water storage tanks; disconnection of temporary utilities; and final clean-up to pre-construction conditions.
16. In the event that a previously uncharacterized, unknown material is encountered the Contractor shall manage the material separately and will temporarily stage the material pending characterization as specified herein.

H. All Investigation Derived Wastes are the property and responsibility of the Contractor and are to be disposed of by the Contractor under a Uniform Hazardous Waste Manifest and/or by a Bill of Lading, as appropriate. All samples and laboratory by-products will be returned to the Contractor for disposal. The parties understand and agree that any consultant or sub-consultant (at any tier) is not, and has no responsibility as, a generator, treater, storer, transporter, or disposer of hazardous or toxic substances found or identified at the project site, and that the Contractor agrees to assume responsibility for and indemnify and hold any consultant or sub-consultant (at any tier) harmless from the foregoing.

I. The Contractor is responsible for being aware of potential hazards at the site and reviewing all existing information which provides evidence of contamination within the limit of the work.

1.6 EXISTING CONDITIONS

A. Refer to the documents referenced as part of this Section. The Contractor is obligated to review existing environmental assessment reports and manage the soil and groundwater in accordance with applicable state and federal regulations.

1.7 SUBMITTALS

A. The Contractor shall prepare a Soil and Waste Management Plan (S/WMP) that generally describes the work to be performed under 02080 Part 3 (Execution). The Soil Management plan shall include, but not be limited to detailing the submittal and implementation of the following:
   1. Soil and Waste Management Plan;

2. Site-Specific Health and Safety Plan;
3. Dust, Vapor and Odor Control Plan;
4. Air Monitoring Plan;
5. Dewatering Plan;
6. Stormwater Handling Plan;
7. Equipment and Personnel Decontamination Plan
8. Quality Control Plan;
9. Spill and Discharge Control Plan
10. Asbestos Work Plan, and
11. Template URAM.
12. The Soil and Waste Management Plan (S/WMP) shall be submitted at least three weeks prior to the beginning of any intrusive work at the site. All other required plans shall be submitted to the Owner or Engineer and/or their representative for review and approval at least two weeks prior to beginning any intrusive work at the site. Plans shall be consolidated provided the requirements of each plan are fully incorporated therein.

B. Soil and Waste Management Plan (S/WMP): The S/WMP shall outline measures for soil and fill sampling, field screening, laboratory chemical analysis, and disposal/ off-site reuse. The S/WMP shall be prepared by a Massachusetts Licensed Site Professional (LSP). The S/WMP shall be implemented prior to the commencement of any excavation activities. At a minimum, this plan shall address the following:

1. Methods, procedures, and equipment used for excavating, handling, characterizing, segregating, reusing/backfilling, loading, and transportation of contaminated soil/solid waste materials encountered during excavation operations;
2. A list of all transporters and waste facilities, complete with license numbers, permit numbers, contact person, and address and telephone number that the Contractor utilizes for waste disposal. In addition, a copy of a memorandum of understanding between the Contractor and each disposal facility shall be attached to the Soil and Waste Management Plan. The memorandum of understanding shall detail that the disposal facility agrees to accept a specified quantity of waste as characterized in the contract specifications and detail what if any restrictions may apply. The Contractor shall provide copies of the permits held by each disposal facility which the Contractor plans to use to dispose of non-hazardous solid waste, hazardous waste, PCB-impacted waste and asbestos-containing waste;
3. A summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history;
4. Procedures for securing the staging area, controlling dust and soil/solid waste migration, air monitoring procedures, and methods of preventing damage to uncontaminated areas via contaminant migration and for decontaminating vehicles and personnel exiting the staging area;
5. The means and methods for decontaminating all equipment and personnel, including provisions for installing an equipment decontamination pad if required or specified;
6. Methods and procedures for identifying stockpiled material (e.g., labeling, marking containers) and procedures for identification and tracking;

7. Methods, procedures, and equipment used for obtaining the necessary information needed to satisfy the off-site reuse/disposal facility requirements specified herein and/or by the facility;
8. Methods, procedures, and equipment proposed for assessing and handling Unknown Materials. The S/WMP shall indicate which laboratory(ies) the Contractor shall utilize for chemical analysis soil, groundwater and unknown materials.
    a. An Unknown Materials information sheet shall be developed as part of the Contractor's S/WMP, upon which the Contractor shall record information such as container type, size, and condition; and, any identifying characteristics of the unknown material. The format of the information sheet shall be as accepted by the Owner and/or its representatives;
    b. The Contractor's plan for notifying the Owner and Engineer in the event that an unknown material as defined in this specification is encountered. The plan shall include the phone numbers and names of the Owner's representative(s) that the Contractor would contact in such an event.
9. Provisions for separation of incompatible materials and segregation of different class of soil;
10. Procedures for consolidating (i.e., bulking) compatible materials for disposal;
11. Procedures for dewatering as well as handling, characterization, storing, treating and disposing of groundwater due to dewatering. Refer to Section 02140;
12. Procedures for diverting and handling site stormwater. This would include handling, treatment and discharge of stormwater;
13. Provisions, procedures and equipment used for control of dust, vapor and odor; including measures to control objectionable dust, vapors, and odors originating from the site (Section 3.7). This shall describe procedures to minimize the creation of dust, and the control of objectionable vapors and odors originating from the site;
14. Provisions, procedures and equipment used to monitor air at the site (Section 3.6). This shall include site specific monitoring for potential hazards in the air; including the proposed instrument(s) to be used, the expected hazards (e.g., dust, VOCs), the monitoring frequency, the monitoring locations, and the reporting procedures.

C. Soil Management/Tracking Documentation:
1. Prior to off-site disposal or reuse, the Contractor shall provide to the Engineer a letter from the disposal facility indicating that the facility has reviewed the available data relative to the soil/solid waste to be delivered and agrees that the soil/solid waste meets their acceptance criteria. The letter shall be signed by a duly authorized representative of the receiving facility.
2. Within the time constraints established in state and/or Federal laws and regulations, the Contractor shall submit to appropriate authority(ies) and the Owner, as applicable, Uniform Hazardous Waste Manifests, Material Shipping Records, and/or Bills of Lading for all soils and associated fill, rock, ABC and waste disposed or reused of off-site utilizing such documents. Copies of all manifests, Bills of Lading, and all other documents used to track and/or permit off-site transportation of soils shall be submitted to the Owner and Engineer within ten (10) days of shipment. All manifests and Bills of Lading shall be signed by the transporter and receiving/disposal facility. The Contractor is responsible for preparation of all manifests, Bills of Lading, Material Shipping Records, and all other related documents completely and accurately prior to submitting them to the Owner and/or its representative for generator and LSP signatures. The Contractor shall be responsible for paying for any and all fines associated with inaccurate, incorrect, or improperly completed

manifests, Bills of Lading and all other related documents, including fines resulting from late or untimely submittals.

D. Stormwater Handling Plan: The Stormwater handling plan shall provide provisions to ensure compliance with Section 3.10, other portions of the Contract Documents, and all applicable local, state and federal permits.

E. Quality Control Plan: The Contractor shall prepare a Quality Control plan for the development, implementation, and maintenance of a quality control system to ensure that the specified quality is achieved for all materials and work performed.

F. Spill and Discharge Control Plan (SDCP): The SDCP shall provide contingency measures and reporting responsibilities for potential uncontrolled spills and discharges of contaminated and/or hazardous materials, including, but not limited to: fuels, oils, contaminated groundwater, granular solid waste, leachate, decontamination water, sewage, and other on-site waste materials. In addition to the above listed items, the SDCP shall specifically contain: procedures for containing dry and liquid spills; absorbent material available on site; storage of spilled materials; governmental reporting (i.e., notification) procedures; decontamination procedures; discharges of sanitary or combined sewers into storm drains either by flow handling/bypassing or accidental or unintentional discharge; and procedures for protecting wetlands and surrounding public and private property.

   The Spill and Discharge Control Plan shall indicate the location and quantity of the materials to be staged on site and the basis for the quantities (i.e. indicate the vessel which will be on site containing the greatest volume of oil or hazardous materials). No fuel or oil tanks or drums may be temporarily staged on site unless they are stored within a secondary containment system. Fuel deliveries shall be performed in a designated area which has either secondary spill containment or an impervious surface with absorbent berms located around the point of fuel delivery. The Spill and Discharge Plan shall indicate the location of the fueling area and the nature of secondary containment which the Contractor intends on utilizing.

   1. Notification Procedures: The Contractor shall prepare in advance of work activities a notification list, complete with phone numbers, addresses, and contact names for all parties to be notified in the event of a spill. This list shall be posted on-site at all times and shall include:
      a. Owner's designated representatives;
      b. Owner;
      c. Fire Department;
      d. Engineer; and
      e. Massachusetts Department of Environmental Protection (as required per 310 CMR 40.0000). The Owner shall be notified immediately of an uncontrolled spill or discharge. If human health or the environment are potentially threatened, the Contractor shall take immediate action to abate the conditions and notify emergency personnel.
   2. Spill Incident Report(s): In the event of an uncontrolled spill or discharge, a written report detailing each uncontrolled spill or discharge shall include, at a minimum, the cause and resolution of incident, outside agencies involved, and date of occurrence. The report shall be submitted to the Owner within 48 hours of the incident. The Contractor shall document all spills on the as-built Drawings and submit the Drawings to the Owner at project completion. The Contractor shall be responsible for remediating any spills or releases of oil or hazardous materials as a result of the Contractor's activities. The site shall be remediated to pre-release conditions at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 DUST CONTROL

A. Dust suppression may be achieved by applying controlled amounts of water or dust suppression chemicals to the project site, and through covering of soil stockpiles, etc. Dust suppression shall be carried out in accordance with the approved SWMP.

2.2 SPILL CONTROL

A. At a minimum, the Contractor shall maintain on-site absorbent pads, booms and absorbent materials in sufficient quantity to address a release of fuel oil, hydraulic oil or other OHM that the Contractor intends to use or store on site, including fuel oil and hydraulic oil that is used within earth moving equipment. The quantity of spill containment materials maintained on site shall be sufficient to respond to a catastrophic release from the vessel containing the greatest quantity of oil or hazardous material on-site.

PART 3 - EXECUTION

3.1 GENERAL

A. All work in this section will be performed in accordance with the Contractor's Work Plan, S/WMP and Site-Specific HASP that have been approved by the Owner and Engineer.

B. The primary concern of the Contractor in the excavating, handling, sampling, bulking, and on-site storage of soil/solid waste and/or drummed material (if encountered) will be to protect the health and safety of the site workers, the public, and the environment.

C. The Contractor shall keep a copy of the Health and Safety Plan (HASP) on site during all operations and shall conduct daily health and safety meetings. Failure to keep a copy of the HASP on-site, or any other breach of the Contractor's Plan, may be cause for stopping work at the cost of the Contractor. Delays caused by the Contractor's failure to comply with the health and safety regulations or any health and safety plan shall not entitle the Contractor to recover any additional costs or time lost. The Contractor shall not be allowed to resume activities until corrective measures are accepted by the Engineer and/or their representative and implemented.

D. Medical surveillance records, OSHA 40-hour training forms, accident forms, and all other documentation requirements of the Contractor's safety and health program for personnel working on the site (who are subject to exposure to potentially contaminated soil) shall be up-to-date and kept on file at the site. The Contractor shall provide documentation of employee status upon request of the Engineer and/or their representative.

3.2 SOIL/SOLIDS FILL WASTE MANAGEMENT

A. Soil and fill material that is managed under a Utility-Related Abatement Measure (URAM) Plan pursuant to the MCP, and which is staged off-site may be re-used within fourteen (14) calendar days of excavation. Any material which is suitable for re-use as ordinary borrow, based on analytical results and could have been placed on site, but was not, due to Contractor delay (i.e. analytical results were not available within 10 days following excavation) will be disposed in accordance with the applicable regulations by the Contractor at no cost to the Owner.

B. Soil and fill material that is managed under a Utility-Related Abatement Measure (URAM) Plan pursuant to the MCP, which is staged off-site and which is determined at the staging area to be characteristically hazardous may be treated (stabilized) within the “Area of Contamination” only and must be reused with 14 days or disposed of within ninety (90)

calendar days of excavation. No treatment may occur at the staging area. Pursuant to the MCP and RCRA, hazardous Remediation Waste (e.g., Class C soils) shall be removed from the site within 90 days. All other Remediation Waste (e.g., Class B soils) shall be removed within 120 days unless exceptions identified at 310 CMR 40.0031(7) apply.

C. Class B and C excavated soils shall be completely covered with a minimum 10-mil thick layer of plastic tarp. Soils exhibiting evidence of potential contamination including but not limited to odors and/or staining shall be covered prior to characterization and off-site reuse or disposal. Stockpiled soils determined to be Class B or C, as described herein, shall be securely covered at the close of each day and continuously when not being added to or otherwise being handled by the Contractor. Stockpiles shall also be covered at times as directed by the Engineer. All stockpiling activities shall meet the MCP requirements for management of Remediation Waste (310 CMR 40.0036).

3.3 SOIL/FILL WASTE CHARACTERIZATION

Soil and fill material shall be classified based on the criteria established in the accepted SWMP.

A. Initial Characterization of Soil/Fill Waste Material: A summary of existing conditions and investigation findings performed by the Engineer during design, including a summary of analytical results, shall be available to the Contractor.

B. The Contractor shall review all the existing conditions information supplied by others. The Contractor shall use the information and shall either perform independent sampling and characterization of soil/fill waste strata to be encountered during construction in advance of excavation such that excavated soil can be segregated and directly transported to an appropriate facility or the contractor shall make the necessary arrangements to secure a staging area(s) suitable for storing soil stockpiles pending analyses, at no additional cost to the Owner.

C. Soil shall be preliminarily segregated based on the Soil Classification Categories detailed in Sub-section 1.4, except as indicated below.

1. Potential Asbestos Containing Material (PACM). If soil/fill waste suspected of containing asbestos is encountered during excavation, the Contractor shall immediately contact the Engineer to discuss the nature and extent of the PACM and to assess potential hazards and appropriate handling procedures. Prior to handling and removing the PACM, MassDEP shall be contacted for approval. Discovery and management of PACM shall be documented in the S/WMP. Evidence of PACM includes but is not limited to the presence of suspect asbestos-containing building debris such as cementitious (transite) piping, vinyl floor tiling, roofing paper or paper-like insulation materials or any other suspect asbestos containing material observed in the soil/fill waste. Following MassDEP approval, such soil/fill waste shall be segregated and stockpiled pending confirmatory analysis to determine appropriate disposal requirements.

2. Unknown Material. If unknown material is encountered during excavation, the Contractor shall immediately contact the Owner and Owner's representative to discuss the nature and extent of the unknown material and to assess potential hazards and appropriate handling procedures. Prior to handling and removing the unknown material from the excavation area, the Contractor and Owner and/or its representatives, shall visually assess the material and its potential hazards. Drums shall be assessed to determine whether they are leaking, bulging (evidence of reactive waste), crushed, or empty. Crushed, empty, and/or skeletal parts of drums shall be handled as solid waste, as specified. The Contractor shall record any identification or markings on the drummed material(s). Discovery and management of unknown materials shall be documented as required in the S/WMP.

D. Final Waste Characterization: Final waste characterization shall be the responsibility of the Contractor. The Contractor shall be responsible for determining the characterization requirements of each disposal facility in advance to facilitate timely disposal and to adequately estimate the disposal costs. The Contractor shall perform additional segregation based on disposal requirements. Disposal or off-site reuse of the material shall depend on sampling and characterization analytical results. At the request of the Engineer or Owner, the Contractor shall provide a split sample. The Contractor shall perform or observe all sampling and shall provide notice in advance to the Engineer so that the Engineer may observe the sampling procedure.

1. Stockpiles within the staging area shall be sampled and characterized within a timely manner so as not to impede construction activities or preclude the reuse of soil/fill on site. If soil/fill cannot be reused on site due to the Contractor's delay in sampling material, the Contractor shall dispose of the soil/fill at no additional cost to the Owner including the additional cost of imported fill material used in its place to meet project requirements.

3.4 STAGING AREAS

A. The Contractor's staging area shall be large enough to store equipment, materials and all stockpiled soils. The contractor shall protect the staging area from contamination due to excavating, handling, storing and disposing of hazardous materials.

B. Stockpiles of soils that are known or suspected to be hazardous within the soil staging areas shall be placed on a 20-mil HDPE liner/filter fabric and bermed to minimize the potential for contamination release. Each soil category shall be staged in separate areas with barriers to keep different soil types from mixing. Waste characterized as RCRA hazardous waste will not be stored on site for a period greater than ninety (90) days. All other waste must be disposed of off-site within 120 days of excavation unless otherwise approved by the Owner. At the end of each working day, contaminated soils will be covered with 10-mil polyethylene to minimize the potential for release of contaminants. All stockpiling activities shall meet the MCP requirements for management of Remediation Waste (310 CMR 40.0036).

C. Covers on stockpiles of soils that are known or suspected to be hazardous shall be secured with tires, ropes, anchors or equivalent material. The cover system shall be capable of resisting actual wind gusts at the site, with a minimum wind capacity of 40 miles per hour. The stockpile covers shall be installed and secured at the end of each working day and at all times when earthwork is not taking place on site. Stockpile covers shall be immediately re-covered should wind forces expose any of the excavated materials. Failure to adequately protect the stockpiles may result in non-payment.

D. Stockpiles are to be segregated based on visual, olfactory, and field screening results. Similar material may be stockpiled together. Each stockpile must be clearly separated from adjacent stockpiles. A temporary construction fence with visual screen shall be maintained around the perimeter of the stockpile area at all times.

E. Stockpiles will be clearly designated by a sign post or marker which can be cross-referenced with samples collected from the pile for characterization purposes. The signs/markers are not to be moved, except by authorized personnel and not until the soil is ready to be either reused on site or loaded for off-site disposal.

F. Unknown, potentially hazardous soils/debris and drummed materials encountered during the project shall be located in a separate bermed location. The Contractor's Soil and Waste Management Plan shall provide construction details of the dimensions and protective measures proposed for the staging area(s). The construction details and protective measures are subject to the approval of the Owner and/or its representatives. The

Contractor shall select the area to facilitate handling of the material and to minimize interference with other ongoing construction activities. The Owner or Engineer must agree with the location prior to construction. In the event that excavation is conducted near storm water drainage basins or inlet manholes, the Contractor must protect the drainage structures with filter fabric or provide similar protection to prevent sediment loading and migration of contaminated soils and sediments.

3.5 EQUIPMENT AND PERSONNEL DECONTAMINATION

A. Equipment and personnel decontamination facilities shall be provided by the Contractor when hazardous materials are expected to the encountered and handled onsite. Equipment and personnel decontamination area(s), conforming with the Contractor's HASP and these Specifications, will be constructed in such a manner to protect existing site surfaces, materials, and structures from contamination. The equipment decontamination area(s) will be sized adequately to provide for the decontamination of the largest piece of equipment to be decontaminated. Filter fabric will be placed over an impermeable liner to protect the liner from rips, punctures, or tears from traffic and heavy equipment.

B. The Contractor shall establish a site-specific decontamination protocol and decontamination areas for personnel and equipment utilized at the subject site. Personnel and equipment decontamination shall be conducted in compliance with the HASP.

C. The decontamination protocol shall include (i) the means, methods, and materials for the proposed decontamination procedures; (ii) the procedures employed to contain and store the wash or rinse liquids/sludges; (iii) procedures used to sample, analyze, and characterize the contaminated wash or rinse liquids/sludges; (iv) procedures to contain or clean contaminated equipment and PPE; and (v) the procedures for handling and disposing of solid wastes generated from site decontamination activities. All sample analysis or sample compositing shall be completed by a certified laboratory. The Contractor shall be responsible for the cost of this analytical work. The Contractor shall submit a copy of the analytical results and laboratory certifications to the Owner for review prior to proceeding with disposal. The Contractor shall be responsible to properly manifest and dispose of all residual wastes generated from on-site activities in conformance with federal, state, and local environmental and transportation regulations. The Contractor shall be responsible for the manifests and procedures to be used to package and dispose of contaminated solid wastes, wash, or rinse liquids at an EPA or state-approved treatment or disposal facility. The Contractor shall be responsible for any releases from site or decontamination activities due to its work, and will remediate any release for which the Contractor is responsible to pre-existing conditions at the Contractor’s expense.

D. Provisions for collecting decontamination water will be incorporated into the maintenance of the decontamination pad and will include placing an impermeable liner over a sloped surface such that water is directed, if necessary, into an area for subsequent pumping to 55-gallon drums or other appropriate tankage. Following completion of the work, the wash water shall be characterized by the Contractor and disposed off-site, in accordance with federal, state, and local regulations.

3.6 ENVIRONMENTAL FIELD MONITORING / DUST CONTROL

A. Refer to related Section 01562 – Dust Control.

B. Air monitoring shall occur when excavating or handling soils that are known or suspected to be hazardous or contain hazardous materials pursuant to the MCP. The Contractor shall keep accurate documentation of all air monitoring, which will be made available to the Engineer or Owner upon request.

1. Air monitoring shall include headspace analyses in a jar or plastic bag performed using a portable photoionization detector or other appropriate instrument for the anticipated conditions. The Contractor shall be responsible for properly calibrating the instrument each day and recording the calibration in a daily log which shall include the following information:
   a. Name of device or instrument calibrated.
   b. Date of calibration.
   c. Results of calibration.
   d. Name of person performing the calibration.
   e. Identification of the calibration gas.
2. The Contractor is responsible for providing fully charged instrument(s) at the start of each work day.
3. When applicable, field screening samples shall be taken from numerous locations within the excavation. Samples shall be taken from any area that appears to be visibly contaminated or where an odor is noted.

C. If there are indications of contamination, the frequency of air monitoring will be determined by an Industrial Hygienist or competent environmental health professional. The Contractor's Site Health and Safety Officer and Superintendent will be responsible for assuring that monitoring is conducted in an appropriate manner, and that work practices, engineering controls and/or Personal Protective Equipment are proper for the conditions.

D. The air monitoring program is to be designed to protect public health and the environment from the potential generation of dust and contaminant release during work. At a minimum, the air monitoring shall include daily monitoring and documentation of one upwind, and two downwind conditions during periods of activity on the site and when there is a potential for dust being generated on the site. The air monitoring information including air monitoring in the vicinity of all site activities shall also be utilized for establishing levels of personal protection measures in the Contractor's Site Specific Health and Safety Plan. The Contractor shall submit his/her air quality monitoring program for review and approval prior to commencement of site activities.

E. Air monitoring shall be performed by the Contractor during all soil handling operations. In contaminated areas, detectors for organic contaminants and dust should be utilized to monitor on-site and off-site breathing zones and possible sources of potentially hazardous material (e.g. excavations, regrading, etc.). All personnel shall be made aware of the potential hazards and be informed of air monitoring information by the Contractor. Particular attention to air quality shall be made in the work area during earthwork activities to ensure that contaminants do not escape to the atmosphere and affect off-site population, on-site control, working conditions and personnel protection measures.

F. Dust shall be controlled during excavation of soil/fill waste material to limit potential spread of contaminants and potential exposure of contaminants to workers and the public.

G. During construction, real-time dust monitoring shall be conducted under windy and/or excessively dry working conditions or when directed by the Engineer. The monitoring shall consist of total dust testing using MIE, INC. MINIRAM PDM-3 DUST MONITORS, or like instruments. The total dust criteria at the site shall conform to the requirements of the HASP. Should fugitive dust quantities exceed 20 percent of the ambient level or action levels indicated within the HASP, the Contractor shall perform additional measures to reduce the total dust concentrations.

H. Nuisance dust levels shall be reduced by pre-wetting the surface soils and by establishing and maintaining clean access roads. The Contractor's Dust, Vapor, and Odor Control Plan shall describe the procedures and materials to minimize dust. At a minimum, the Contractor shall provide clean water, free from salt, oil, and other deleterious materials.

I. Areas of exposed earth to be excavated shall be lightly sprayed with water before excavation if there is potential for nuisance dust generation. Additional water spray may be utilized only when any indication of excessive dust is observed. To the extent feasible, the Contractor shall minimize the use of water within the limits of excavation.

J. Unimproved access roads shall be sprayed with water on a regular basis to minimize the generation of dust.

K. All containers temporarily storing waste material shall be covered at all times except as necessary to place waste material into the container. The Contractor shall monitor the covers daily to ensure the covers are in place and effectively eliminating the generation of dust and make appropriate notes in the site log.

3.7 VAPOR AND ODOR CONTROL

A. Unimproved access roads shall be sprayed with water on a regular basis to minimize the generation of dust. The Contractor shall provide the materials and labor to control objectionable vapors and odor in accordance with the Contractor's S/WMP. The Contractor shall limit the exposure area and shall cover the exposure area with synthetic reusable covers, lime, foam suppressants, or other methods to reduce off-site odors to acceptable levels. The Contractor shall not use soil suitable for on-site reuse as cover to control vapor and odors.

3.8 BULKING

A. Following characterization and compatibility testing of waste material, the Contractor shall place compatible materials into common containers to reduce transport and disposal costs, when practicable and with the approval of the Engineer. In addition, materials that are improperly contained shall be transferred into the appropriate containers. Drums and containers used during this project shall meet the appropriate DOT, OSHA, and U.S. EPA regulations for the materials contained. The Contractor shall describe the bulking procedures in the Soil and Waste Management Plan.

3.9 CONTAMINATED LIQUIDS

A. The Contractor shall collect and properly dispose of contaminated liquids and other liquids generated or encountered on site during construction. Contaminated liquid sources include decontamination water, and drummed liquids encountered during excavation. The Contractor shall be responsible for treating and disposing of contaminated groundwater as required by applicable regulations and SECTION 02140 DEWATERING.

3.10 STORMWATER CONTROL

A. The Contractor shall protect all work from erosion while onsite. The Contractor shall divert all stormwater from work areas that may contain oil or hazardous materials (OHM). Stormwater that may contact OHM, polychlorinated biphenyls (PCBs), lead, asbestos or other types of impacted soil shall be collected within the immediate area of the contact, treated (as determined by sampling and testing) and disposed of in accordance with all local, state and federal regulations. Stormwater that is collected, stored onsite and sampled shall be tested and characterized for determining proper transportation, disposal and/or discharge in accordance with SECTION 02140 DEWATERING.

3.11 BACKFILLING AND COMPACTION

A. Excavated areas shall be backfilled with appropriate backfill material (including excavated material suitable for reuse and, when necessary, imported off-site material). Imported

backfill used in excavated areas shall have been analyzed and certified as free of contaminants and as specified in SECTION 02200 - EARTHWORK.

3.12 CLEANUP

A. During the course of the work, the Contractor shall keep the Site and his operations clean and neat at all times. He shall dispose of all residue resulting from the site clearing operations; and at the conclusion for the day's Work, he shall remove and haul away any surplus materials, lumber, equipment, temporary structures, and any other refuse remaining from the site clearing operations and shall leave the entire site in a neat and orderly condition.

END OF SECTION

SECTION 02095

TRANSPORTATION AND DISPOSAL OF SOIL AND WASTE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Furnish all labor, materials, equipment, and incidentals required to transport waste material off site, and dispose, reuse or recycle excess soil (defined herein as including sediments) or waste materials at a licensed facility approved by the Owner.

B. All personnel involved in the transportation of waste from the site shall have the required Department of Transportation (DOT) and Occupational Safety and Health Administration (OSHA) training.

1.2 SUBMITTALS

A. Submit the following:

1. A list of all transporters, destination/receiving sites and waste facilities, complete with license numbers and permit numbers (as appropriate), contact person, and address and telephone number that the Contractor utilizes for soil management and waste disposal. The transporters shall have adequate financial insurance and liability insurance mechanisms to handle any accidents, and associated third-party compensation.

2. A summary of the history of compliance for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. The Owner reserves the right to reject any facility on the basis of poor compliance history.

3. If hazardous wastes are to be transported, Contractor shall have or obtain a valid EPA identification number to transport hazardous materials and any other permits or licenses as required by federal, state, and local laws, regulations, ordinances, and procedures.

4. Where appropriate the Contractor shall submit waste manifests and bills of lading for all non-hazardous waste disposed off-site to the appropriate authority, agency, facility, or person within the time constraints specified by state and federal regulations. Originals of all waste manifests shall be provided to the Owner within five (5) days. The Contractor shall complete all waste manifests, bills of lading (BOL) and Material Shipping Records (MSR) completely and accurately prior to submitting them to the Owner. The Contractor shall be responsible for preparing draft Licensed Site Professional (LSP) opinion letters for each disposal facility and coordinating disposal documentation with all parties. The Contractor's LSP and the Owner shall the sign the LSP Opinion Letter, MassDEP BOL and MSR. The Contractor shall reimburse the Owner for any and all fines associated with inaccurate, incorrect, or improperly completed waste manifests, including fines resulting from late or untimely submittals.

5. The Contractor shall submit waste manifests and bills of lading for all hazardous waste disposed off-site to the appropriate authority, agency, facility, or person within the time constraints specified by state and federal regulations. Contractor shall provide the original copy of manifests signed by the hazardous waste transporter and the receiving facility to the Owner immediately.

6. Prior to transporting any soils or fill material to a disposal facility the Contractor shall submit a letter from the disposal facility indicating that the facility has reviewed the available data and the generator's profile of the material and the facility agrees that it meets the facility's acceptance criteria.

1.3 DEFINITIONS

A. Asphalt, Brick and Concrete (ABC): Asphalt, Brick and Concrete material that is waste from construction or found in fill material during excavation. ABC material found in clean, reusable fill may be reused onsite to the greatest extent possible. All excess ABC generated during construction shall be disposed of offsite at an appropriate, licensed facility that will accept ABC waste.

B. Bill of Lading (BOL): A document signed by a waste transporter or the transporter's representative and issued to a waste generator that evidences the receipt of waste to a specified disposal facility or location.

C. Fill (Historic Fill): Fill, also known as urban, historic, or miscellaneous fill, is defined as a mixture of soil and other materials which have been located in the area through man-made processes primarily for the purpose of grading, backfilling or filling in low areas. Material commonly associated with historic fill includes, but are not limited to; coal, glass, brick, ash, wood fragments and other similar granular materials. Historic fill shall not include boulders, ledge, consolidated rock, asphalt, concrete, railroad timbers, rail, cobblestones or any other abandoned building materials which would preclude the disposal of the fill as landfill daily cover.

D. Generator: Party Per 40 CFR 260.10 Generator means any person, by site, whose act or process produces hazardous waste identified or listed in Part 261 or whose act first causes a hazardous waste to become subject to regulation.

E. Hazardous Waste:

1. Hazardous waste as defined 310 CMR 40.0006; or
2. Hazardous waste as defined in 40 CFR 261.3.
3. A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:
    a. Cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or
    b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

F. Liquid Waste: materials generated on the site due to work performed and are waste or excess including but not limited to: collected groundwater, collected stormwater, non-aqueous phase liquids, contractor-supplied fuels and fluids, and drummed liquids.

G. Solid Waste (Waste): materials generated on the site due to work performed and are waste or excess, including but not limited to: asphalt, brick and concrete (ABC) waste, demolition waste, decontamination waste, dredging spoils (dewatered), metal waste, plaster/drywall, plastic waste, rock, rubber waste, sediment, tar waste, trash, vegetation debris, and wood waste.

H. Soil Classification Categories: Unless specifically stated otherwise, terms used in this specification are as defined in the MCP, 310 CMR 40.0006. The following definitions and soil classifications apply to these specifications:

1. (Class A-1) Background: Any soil or fill material which meets the regulatory definition of "background" as defined in 310 CMR 40.0006 may be reused as common fill/ordinary borrow provided it also meets the physical requirements as specified

herein and as specified in Section 02200. For record keeping purposes soil/fill that meet the definition of background, shall be transported under a Material Shipping Record (MSR).

Background soil may also be re-used off-site without restriction provided it is reused in an area where background concentrations area equal to or greater than the site-specific background determined at the off-site reuse location. The Contractor is responsible for determining the background levels at the point of excavation. It is also the Contractor's responsibility to identify one or more disposal facilities/locations with background levels appropriate to receive the material to be disposed or reused. It is the Contractor's responsibility to determine these background levels in advance so as to comply with 310 CMR 40.0032(3)(b) and so as not to delay or adversely affect construction operations.

2. (Class A-2) Impacted: Any soil or fill material which contains oil or hazardous materials (OHM) at concentrations greater than background levels but less than release notification thresholds established by 310 CMR 40.0300 and 40.1600. Impacted soil may be reused in the area of excavation or as fill provided it is reused in an area of equal or greater contamination and meets the physical requirements as specified herein and as specified in Section 02200. Class A-2 soils requiring off-site transportation and disposal/reuse shall be transported using a Material Shipping Record (MSR).
3. (Class B) Contaminated: Any soil or fill material which contains oil or hazardous materials at concentrations equal to or greater than a release notification threshold established by 310 CMR 40.0300 and 40.1600, except where the presence of the material is consistent with the regulatory definition of "background" as defined in 310 CMR 40.0006.

   Any soils which contain either petroleum or chemical odor or visual indications of oil or hazardous materials shall be handled as potentially contaminated soils. Soil which does not have any evidence of contamination can be reused within the area of excavation without first performing laboratory analyses. Soil/fill that may be contaminated should be set aside by the Contractor for assessment by the Owner's environmental professional. Soil/fill that is staged and characterized can be reused within the area of excavation or elsewhere on site provided the material has been tested and has equal or less contamination than the point where it is to be reused and it is not reused beneath a permanent structure such as a building foundation. Any excavated soil/fill material not reused within the area of excavation must be characterized prior to reuse. After analytical results are available, soil/fill shall be handled in accordance with the type and degree of contamination (if any) present in the soil/fill.

   Class B soil that cannot be reused on site shall be reused off-site, recycled, or disposed as a solid waste at an appropriately permitted facility unless it also meets the regulatory definition of hazardous waste as defined in 40 CFR Part 261 or contains detectable asbestos. Subcategories of Class B soil are defined as follows:

   a. Class B-1: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state unlined landfills. Note: per COMM 97-001, sediments may not be re-used as Class B-1.
   b. Class B-2: Soil and Fill that meet all applicable criteria (i.e., COMM 97-001 and/or facility-specific permit requirements) for reuse as daily cover, intermediate cover, or pre-cap contouring material at in-state lined landfills.

c. Class B-3: Soil and Fill that meet all applicable criteria for instate recycling at an asphalt batching plant and/or the specific licensing requirements for the proposed in-state recycling facility.

d. Class B-4: Soil and Fill that contain concentrations of contaminants that exceed in-state, lined, and unlined landfill reuse criteria as well as in-state recycling acceptance criteria, but meet the criteria for regional thermal treatment facilities or out-of-state recycling facilities, and are not classified as a Resource Conservation and Recovery Act (RCRA) Hazardous Waste.

e. Class B-5: Soil and Fill that contain concentrations of contaminants that require removal to regional disposal facilities and are not classified as RCRA Hazardous Waste.

f. Class B-6: Soil and fill which does not meet one of the designations above due to excessive foreign materials and/or debris that are not classified as a hazardous waste.

4. (Class C) Hazardous Waste: A waste, or combination of wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or cause or significantly contribute to an increase in a serious irreversible or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Also included within the definition of hazardous waste is hazardous waste as defined 310 CMR 40.0006 and 40.CFR 261.3. Hazardous waste as defined in 40 CFR 261.3 is a solid waste that exhibits any of the characteristics of hazardous waste in excess of regulation levels presented in 40 CFR 261, Subpart C and/or that is listed in 40 CFR 261, Subpart D; that is a mixture of solid and hazardous waste; or that is derived from a listed waste. Subcategories of Class C soils shall be as follows:

a. Class C-1: Soils classified as hazardous waste that can be readily treated on-site to eliminate the toxicity characteristic (e.g., for lead). On site treatment of soils will not be permitted for this project.

b. Class C-2: Material determined to contain "listed" or "characteristic" hazardous waste constituents which cannot be readily treated on-site. This material must be transported to an out-of-state approved RCRA Subtitle C hazardous waste disposal or treatment facility under a Uniform Hazardous Waste Manifest.

I. Material Shipping Records (MSR): See Bill of Lading (BOL).

J. Special Waste: Any waste that is determined not to be a hazardous waste pursuant to 310 CMR 30.000 and that exists in such quantity or in such chemical or physical state, or any combination thereof, so that particular management controls are required to prevent an adverse impact from the collection, transport, transfer, storage, processing, treatment or disposal of the waste. Asbestos and PCB-contaminated soils/fill are examples of special waste categories.

K. Soil (Natural Soils): Soil, otherwise known as natural soil, is defined for the purposes of the Contract as unconsolidated sand, gravel, silt and clay, and the organic material which has become part of the unconsolidated soil matrix. For this section only, soil may include broken and fragmented rock.

L. Unauthorized Excavation: Consists of removal of materials beyond indicated sub-grade elevations or Contract-defined limits without specific direction of the Engineer. Unauthorized excavation, handling material, transportation and disposal, backfilling and compaction shall be at the Contractor's expense. Unauthorized excavations shall be

backfilled and compacted as specified for excavations of the same class, unless otherwise directed by the Engineer.

M. Waste Manifests: the hazardous waste shipping documentation required to ship all hazardous waste and subject to provisions in 49 CFR 172 Subpart C.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide completed Bills of Lading, Material Shipping Records, manifests, certificates of disposal, weight slips and all other documentation relative to disposal, reuse, treatment or recycling of soil and waste material.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall reuse, recycle or dispose of all excess soil and wastes resulting from excavation activities in accordance with federal, state and local regulations and these specifications. Transport shall be by a permitted and licensed waste transporter. The Contractor shall be responsible for supplying the proper manifests to be approved and signed by a representative of the Owner.

B. Prior to disposal, the Contractor shall maintain segregated waste stockpiles in conformance with all applicable federal, state, and local waste disposal regulations and as specified in Section 02080.

C. The Contractor shall be responsible for preparing and keeping in proper order all waste manifests, BOLs, MSRs , and shall designate one person who shall be made available to sign all transportation documentation. The Contractor shall be responsible for obtaining the generator's signature and all other signatures required for the proper completion of the manifests. The Contractor shall allow a minimum of five working days from the date of the submittal for any documents requiring the signature of the Owner and the Contractor's LSP. The manifests shall document the handling of the waste from the time it is generated until the time it is properly disposed.

D. The Contractor shall be responsible for obtaining all federal, state, and local permits and variances to allow transport of materials and wastes on public roadways.

E. The Contractor shall be responsible to inform the Owner if hazardous waste disposal will not be performed within 90 days of hazardous waste characterization. This notification shall take place a minimum of 30 days prior to the 90-day deadline. No hazardous waste stockpiled at the site shall remain on site more than 90 days after it is characterized. In accordance with 310 CMR 40.0031, all other Remediation Waste shall not remain on site more than 120 days from initial date of generation. The Contractor shall be responsible to inform the Owner if Remediation Waste disposal will not be performed within 120 days of characterization. This notification shall take place a minimum of 30 days prior to the 120-day deadline.

F. The Contractor shall obtain certificates of disposal for all disposed wastes.

G. Transportation of wastes shall be in compliance with any relevant federal, state and local requirements, and such as to assure that waste material is not released during transit.

3.2 SOLID WASTES

A. Transporters of solid wastes that include, but are not limited to, contaminated soil/fill (including oil-contaminated soil/fill), construction and demolition debris, non-hazardous laboratory wastes, bottles, tires, metal parts, tree stumps, brush, and grass cuttings will

utilize trucks or dumpsters specifically designed to ensure that material, dust, or liquid is not released in transit. No truck shall be allowed to exit the site until all free liquids are drained from soil/fill being transported off-site. Moisture content of the soil/waste shall be reduced by the Contractor, to or below the maximum acceptance limits required by the disposal facility. Material shall be covered at all times. The vehicle in which the waste is transported shall be driven directly to the intended destination without any stops or detours in between, except those necessary in response to road conditions, vehicle service needs, or emergencies. Discharge or release of material during transport shall be immediately reported to the Owner. Transporters shall clean up any discharge that occurs in transit, at the Contractor's expense.

B. The disposal site shall be permitted by the state in which the facility is located to receive and dispose of solid waste, and shall be approved for use by the Owner. The Contractor shall provide copies of the disposal facility's operating permit. No materials shall leave the site unless a disposal facility willing to accept all of the material being transported has agreed in writing to accept the type and quantity of waste.

C. Manifesting of solid waste shall be required and shall include at a minimum: vehicle identification; date of loading and disposal; tonnage, as measured at the disposal site; and signature of the Owner and/or its representative, transporter, and disposal facility's representative. Transportation of the wastes shall be accompanied by the appropriate manifests such as a MassDEP Bill of Lading, as required in the Code of Massachusetts Regulations (CMR) 310 CMR 40.0030, a Material Shipping Record or by a Uniform Hazardous Waste Manifest. The original shall be returned to the Owner, and/or their representative, within ten (10) working days of disposal.

D. All solid waste shall be disposed in accordance with all applicable federal, state and local laws and regulations, as well as all other state laws through which the waste material is being transported.

E. Transport of soils in which asbestos containing materials have come to be located shall be transported and disposed of in accordance with Section 02080 – SOIL AND WASTE MANAGEMENT and all applicable local, state and federal laws and regulations.

3.3 HAZARDOUS WASTES

A. Transporters of hazardous wastes shall be in conformance with Code of Federal Regulations (CFR) 40 CFR, Part 171, all other federal laws and regulations and 310 CMR 30.400, and all other state laws through whose boundaries the waste material is being transported. The transporter shall provide copies of its EPA identification number, Massachusetts transporter's license, and proof of driver training in transporting hazardous waste.

B. The disposal site shall be in conformance with 40 CFR, Part 264 and relevant laws of the state in which the facility is located. The Contractor shall provide copies of the disposal facility's EPA and state treatment and disposal permit.

C. Manifesting of hazardous wastes shall be in conformance with 40 CFR, Part 264, Subpart E, 310 CMR 30.310 and 310 CMR 30.405.

D. Actual quantities which are subject to unit rates shall be tabulated by the Contractor and verified by the Engineer on a daily basis. The Contractor shall not be reimbursed for unit rate work performed without the prior approval of quantities by the Engineer.

3.4 DUST CONTROL

A. Dust control measures shall be implemented during loading and transport of waste material from the site in accordance with the contractor's Dust Control Plan, as specified in Section 02080 – SOIL AND WASTE MANAGEMENT.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work described by this Section consists of all earth work encountered and necessary for construction of the project as indicated in the Contract Documents, and includes but is not limited to the following:
   1. Excavation
   2. Backfilling and Filling
   3. Compaction
   4. Embankment Construction
   5. Grading
   6. Providing soil material as necessary
   7. Disposal of excess suitable material and unsuitable materials

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. All work shall be performed and completed in accordance with all local, state and federal regulations.
   2. The General Contractor shall secure all other necessary permits unless otherwise indicated from, and furnish proof of acceptance by, the municipal and state departments having jurisdiction and shall pay for all such permits, except as specifically stated elsewhere in the Contract Documents.

B. Line and Grade:
   1. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain same to properly perform the work.

C. Testing Methods:
   1. Gradation Analysis: Where a gradation is specified the testing shall be in accordance with ASTM C-117-90 and ASTM C-136-93 (or latest revision).
   2. Compaction Control:
      a) Unless otherwise indicated, wherever a percentage of compaction for backfill is indicated or specified, it shall be the in-place density divided by the maximum density and multiplied by 100. The maximum density shall be the density at optimum moisture as determined by ASTM Standard Methods of Test for Moisture-Density Relations of Soil Using 10-lb. Hammer and 18-in. Drop, Designation D-1557-91 (Modified Proctor), or latest revision, unless otherwise indicated.
      b) The in-place density shall be determined in accordance with ASTM Standard Method of Test for Density of Soil in Place by the Sand Cone method, Designation D 1556-90, (or latest revision) or Nuclear method Designation D2922.
      c) Wherever specifically indicated, maximum density at optimum moisture may be determined by ASTM Standard Methods of Test for Moisture Density Relations of Soils, ASTM D-698-91 (Standard Proctor).

d) An Independent Testing Laboratory will be retained by the Owner to conduct all laboratory and field soil sampling and testing, and to observe earth work and foundation construction activities. Laboratory testing will consist of sieve analyses, natural water content determinations, and compaction tests. Field testing will consist of in-place field density tests and determination of water contents.

1.3 SUBMITTALS

A. Collection of samples and testing of all materials for submittals shall be performed by the Independent Testing Laboratory and paid for by the Owner.
B. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.
C. Submit test results (including gradation analysis) and source location for all borrow material to be used at least 10 working days prior to its use on the site. Contractor shall identify and provide access to borrow sites.
D. Submit moisture density curve for each type of soil (on site or borrow material) to be used for embankment construction or fill beneath structures or pavement.
E. Submit Soils Management Plan detailing procedures for handling suitable and unsuitable materials.

1.4 TESTS

The Independent Testing Laboratory shall conform to the following procedures and standards:

A. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.
B. Field density tests on embankment materials shall be as follows:
    1. Tests shall be taken on every 200 cubic yards of embankment material.
C. Paved Areas: Make at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case less than 3 tests. In each compacted fill layer, make one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests.
D. Trenches: Field density test in trenches shall be taken at 75 linear foot intervals on every third lift.
E. In addition to the above tests the Independent Testing Laboratory may perform additional density tests at locations and times requested by the Engineer.
F. Additional density testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the Contractor's compaction operation.
    1. If the test results fail to meet the requirements of these specifications, the Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required compaction. The cost of retesting will be paid by Contractor.
    2. If the test results pass and meet the requirements of these Specifications, the cost of the testing service will be borne by the Owner, but no allowance will be considered for delays in the performance of the work.

1.5 JOB CONDITIONS

A. Site Information:
    1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood

that Owner and Engineer will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data are made available for the convenience of Contractor.

2. Additional test borings and other exploratory operations may be made by Contractor at no additional cost to Owner.

B. Existing Utilities and Structures:

1. The locations of utilities and structures shown on the Drawings are approximate as determined from physical evidence on or above the surface of the ground and from information supplied by the utilities. The Engineer in no way warranties that these locations are correct. It shall be the responsibility of the Contractor to determine the actual locations of any utilities or structures within the project area.

PART 2 - PRODUCTS

2.1 SOIL MATERIAL

A. Aggregate Base and Subbase (M1.03.0 and M1.03.1 or M2.01.7):

Gravel Borrow (M1.03.0) for aggregate base shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings, and deleterious materials. Gradation requirements for gravel shall conform to the following:

Sieve Designation	Percent by Weight Passing
½ in.	50-85
No. 4	40-75
No. 50	8-28
No. 200	0-10

Maximum size of stone in gravel shall be as follows:

M1.03.0 Type a 6 inches largest dimension
M1.03.0 Type b 3 inches largest dimension
M1.03.0 Type c 2 inches largest dimension

Processed Gravel (M1.03.1) or Dense-Graded Crushed Stone for subbase shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. Gradation shall meet the following requirements:

Processed Gravel (M1.03.1)

Sieve Designation	Percent by Weight Passing
3 inch	100
1 ½ inch	70-100
1 ¼ inch	50-85
No. 4	30-60
No. 200	0-10

Dense-Graded Crushed Stone (M2.01.7)

Sieve Designation	Percent by Weight Passing
2 inch	100
1 ½ inch	70-100
¾ inch	50-85
No. 4	30-55
No. 50	8-24
No. 200	3-10

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 and 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.

B. Aggregate Leveling Course and Untreated Surface Course: Shall be screened or crushed gravel consisting of hard durable particles which are free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the material shall meet the grading requirements of the following table:

Sieve Designation	Percent by Weight Passing
1 inch	95-100
¾ inch	90-100
No. 4	40-65
No. 10	10-45
No. 200	0-7

C. Common Borrow: Shall consist of approved material required for the construction of the work where designated. Common borrow shall be free from frozen material, perishable rubbish, peat, organic, and other unsuitable material.

Sieve Designation	Percent by Weight Passing
6 inch	100
No. 200	0-50

D. ½ Inch Crushed Stone (M2.01.1 and M2.01.2):
Crushed stone shall consist of durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered natural rock, and free from detrimental quantity of thin, flat, elongated or other objectionable pieces. A detrimental quantity will be considered as any amount in excess of 15% of the total weight. The crushed stone shall be reasonably free from clay, loam or deleterious material. The crushed stone shall be uniformly blended according to the following grading requirements:

Sieve Designation	Percent by Weight Passing
2 inch	100

1 ½ inch	95-100
1 inch	35-70
¾ inch	0-25

E. ¾ Inch Screened Stone (M2.01.4):
Screened stone shall consist of durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered natural rock, and free from detrimental quantity of thin, flat, elongated or other objectionable pieces. A detrimental quantity will be considered as any amount in excess of 15% of the total weight. The screened stone shall be reasonably free from clay, loam or deleterious material. The screened stone shall be uniformly blended according to the following grading requirements:

Sieve Designation	Percent by Weight Passing
1 inch	100
¾ inch	90-100
½ inch	10-50
3/8 inch	0-20
No. 4	0-5

F. Select Fill: Shall consist of well graded granular material free of organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable material and having no rocks with a maximum dimension of over 4 inches and meeting the following gradation requirements, except where it is used for pipe bedding in which case the maximum size shall be 2 inches.

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
4 inch	100
3 inch	90-100
½ inch	25-90
No. 40	0-30
No. 200	0-5

G. Sand Borrow (M1.04.0): Sand borrow shall consist of clean inert, hard, durable grains of quartz or other hard durable rock, free from loam or clay, surface coatings and deleterious materials. The maximum particle size for Sand Borrow shall be as follows:

M1.04.0 Type a 1/4 inch
M1.04.0 Type b 3/8 inch

2.2 FILTER FABRIC

A. Refer to Section 02260.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions under which excavating, backfilling, filling, compaction and grading are to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 EXCAVATION

A. General:
   1. Excavation consists of removal and disposal of all material encountered when establishing line and grade elevations required for execution of the work.
   2. The Contractor shall make excavations in such manner and to such widths as will give suitable room for laying and jointing the piping; shall furnish and place all sheeting, sandbags, bracing, and supports; shall do all cofferdamming, pumping, and draining; and shall render the bottom of the excavations firm, dry and acceptable in all respects.
   3. All excavation shall be classified as either earth or ledge.
      a) Earth Excavation shall consist of the removal, hauling and disposal of all earth materials encountered during excavation including but not limited to native soil or fill, pavement (bituminous or concrete), existing sewers and manholes, ashes, loam, clay, swamp muck, debris, soft or disintegrated rock or hard pan which can be removed with a backhoe, or a combination of such materials, and boulders measuring less than one cubic yard.
      b) Ledge Excavation: Shall consist of the removal, hauling, and disposal of all ledge or rock encountered during excavation. "Ledge" and "rock" shall be defined as any natural compound, natural mixture that in the opinion of the Engineer can be removed from its existing position and state only by drilling and blasting, wedging, sledging, boring or breaking up with power operated tools. No boulder, ledge, slab, or other single piece of excavated material less than one cubic yard in total volume shall be considered to be rock unless, in the opinion of the Engineer it must be removed from its existing position by one of the methods mentioned above.
   4. The Contractor shall not have any right of property in any materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the Engineer. This provision shall in no way relieve the Contractor of his obligations to remove and dispose of any material determined by the Engineer to be unsuitable for backfilling. The Contractor shall dispose of unsuitable and excess material in accordance with the applicable sections of the Contract Documents.

B. Additional Excavation: When excavation has reached required subgrade elevations, notify the Engineer and Resident Project Representative who will observe the conditions.
   1. If material unsuitable for the structure or paved area or pipeline (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, screened stone, crushed stone, or concrete as directed by the Engineer.
   2. All excavated materials designated by the Engineer as unsuitable shall become the property of the Contractor and disposed of at locations in accordance with all State and local laws and the provisions of the Contract Documents.

C. Unauthorized Excavation: Shall consist of removal of materials beyond indicated subgrade elevations or dimensions without specific authorization of Engineer. Unauthorized excavation, as well as remedial work required by the Engineer shall be at the Contractor's expense. Remedial work required is as follows:
   1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation with select fill or screened stone compacted to 95%. Provide 12" minimum select fill or screened stone directly under footings. Concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
   2. If the bottom of a trench is excavated beyond the limits indicated, backfill the resulting void with thoroughly compacted screened stone, unless otherwise indicated.
   3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Engineer.

D. Structural Excavation:
   1. Shall consist of the removal, hauling, disposal, of all material encountered in the excavation to permit proper installation of structures.
   2. Excavations for structures shall be carried to the lines and subgrades shown on the Drawings.
   3. Excavate areas large enough to provide suitable room for building the structures.
   4. The extent of open excavation shall be controlled by prevailing conditions subject to any limits designated by the Engineer.
   5. Provide, install, and maintain sheeting and bracing as necessary to support the sides of the excavation and to prevent any movement of earth which could diminish the width of the excavation or otherwise injure the work, adjacent structures, or persons and property in accordance with all state and OSHA safety standards.
   6. Erect suitable fences around structure excavation and other dangerous locations created by the work, at no additional cost to the Owner.
   7. Exposed subgrade surfaces shall remain undisturbed, protected, and maintained as uniform, plane areas and shape to receive the foundation components of the structure.
      a. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
      b. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade and trim bottoms to required lines and grades to leave solid base to receive the structure.
      c. If a structure is to be constructed within the embankment, the fill shall first be brought to a minimum of 3 feet above the base of the footing. A suitable excavation shall then be made as though the fill were undisturbed earth.

E. Trench Excavation: Shall consist of removal, hauling and disposal of all material encountered in the excavation to the widths and depths shown on the Drawings to permit proper installation of underground utilities.
   1. Excavate trenches to the uniform width shown on the Drawings sufficiently wide to provide sufficient space for installation, backfilling, and compaction. Every effort should be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.

2. Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation one foot above the top of the pipe.
3. Grade bottoms of trenches as indicated for pipe and bedding to establish the indicated slopes and invert elevations, notching under pipe joints to provide solid bearing for the entire body of the pipe, where applicable.
4. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least two feet above the top of the pipe, whichever is the lesser. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall be excavated as though in undisturbed material.
5. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer and storm lines and proceed upgrade.
6. Perform excavation for force mains and water mains in a logical sequence.
7. The extent of open excavation shall be controlled by prevailing conditions subject to any limits prescribed by the Engineer.
8. As the excavation progresses, install such shoring and bracing necessary to prevent caving and sliding and to meet the requirements of the state and OSHA safety standards, as outlined in the appropriate section of this Specification.

F. Protection of Persons, Property and Utilities:
1. Barricade open excavations occurring as part of this work and post with warning lights in compliance with local and State regulations.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations. Exercise extreme caution and utilize sheeting, bracing, and whatever other precautionary measures that may be required.
3. Rules and regulations governing the respective utilities shall be observed in execution of all work. Active utilities and structures shall be adequately protected from damage, and removed or relocated only as indicated or specified. Inactive and abandoned utilities encountered in excavation and grading operations shall be removed, plugged or capped only with written authorization of the utility owner. Report in writing to the Engineer, the locations of such abandoned utilities. Extreme care shall be taken when performing work in the vicinity of existing utility lines, utilizing hand excavation in such areas, as far as practicable.
4. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional expense to the Owner, to the complete satisfaction of the Engineer, the utility, the property owner, and the Owner.

G. Use of Explosives:
1. Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.
2. All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.

H. Stability of Excavations:

1. Slope sides of excavations to comply with all codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

I. Shoring and Bracing:
1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
2. Provide trench shoring and bracing to comply with local codes and authorities having jurisdiction.
3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Install shoring and bracing as excavation progresses.

J. Material Storage:
1. Stockpile excavated materials which are satisfactory for use on the work until required for backfill or fill. Place, grade and shape stockpiles for proper drainage and protect with temporary seeding or other acceptable methods to control erosion.
2. Locate and retain soil materials away from edge of excavations.
3. Dispose of excess soil material and waste materials as herein specified.

K. Dewatering:
1. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations (including surface and subsurface waters).
2. Excavations shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.

L. Cold Weather Protection:
1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.
2. No frozen material shall be used as backfill or fill and no backfill shall be placed on frozen material.

M. Separation of Surface Material:
1. The Contractor shall remove only as much of any existing pavement as is necessary for the prosecution of the work.
2. Prior to excavation, existing pavement shall be cut, where in the opinion of the Engineer, it is necessary to prevent damage to the remaining road surface.
3. Where pavement is removed in large pieces, it shall be disposed of before proceeding with the excavation.
4. From areas within which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish, as directed, loam and topsoil at least equal in quantity and quality to that excavated.

N. Dust Control:
1. 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, staging areas, all other areas as necessary, so as to minimize the creation and dispersion of dust. Refer to Specification Section 01562.
2. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the contractor shall furnish and spread the material, as directed.

3.3 BACKFILL AND FILL

A. General:
1. Backfilling shall consist of replacing material removed to permit installation of structures or utilities, as indicated in the Contract Documents.
2. Filling shall consist of placing material in areas to bring them up to grades indicated on the Drawings.
3. The Contractor shall provide and place all necessary backfill and fill material, in layers to the required grade elevations.
4. Backfill excavations as promptly as work permits, but not until completion of the following:
   a. Acceptance by Engineer of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
   b. Inspection, approval, and recording locations of underground utilities.
   c. Removal of concrete formwork.
   d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Temporary sheet piling driven below bottom of structures shall be removed in manner to prevent settlement of the structure or utilities, or cut off and left in place if required.
   e. Removal of trash and debris.
   f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
   g. Density testing having results meeting requirements specified herein.
5. In general, and unless otherwise indicated, material used for backfill of trenches and excavations around structures shall be suitable excavated material which was removed in the course of making the construction excavation. Unless otherwise specified or allowed by the Engineer the backfill and fill shall be placed in layers not to exceed 8 inches in thickness.
6. All fill and backfill under structures and pavement, and adjacent to structures, shall be compacted crushed stone or select fill as specified or as indicated on the Drawings. The fill and backfill materials shall be placed in layers not exceeding 12 inches in thickness.
7. Suitable excavated material shall meet the following requirements:
   a. Free from large clods, silt lumps or balls of clay.
   b. Free from stones and rock fragments with larger than 12 inch max. dimension.
   c. Free from organics, peat, etc.
   d. Free from frozen material.
8. If sufficient suitable excavated material is not available from the excavations, and where indicated on the Drawings, the backfill material shall be select fill or common borrow, unless otherwise indicated, as required and as directed by the Engineer.
9. Do not backfill with, or on, frozen materials.

10. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
11. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet.
12. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.
13. The nature of the backfill materials will govern the methods best suited for their placement and compaction. Compaction methods and required percent compaction is covered in Compaction section.
14. Before compaction, moisten or aerate each layer as necessary to provide a water content necessary to meet the required percentage of maximum dry density for each area classification specified.
15. Do not allow large masses of backfill material to be dropped into the excavation in such a manner that may damage pipes and structures.
16. Place material in a manner that will prevent stones and lumps from becoming nested.
17. Completely fill all voids between stones with fine material.
18. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
19. Deposit backfill and fill material evenly on all sides of structures to avoid unequal soil pressures.
20. Keep stones or rock fragments with a dimension greater than two inches at least one foot away from the pipe or structure during backfilling.
21. Leave sheeting in place when damage is likely to result from its withdrawal.
22. Completely fill voids left by the removal of sheeting with screened stone which is compacted thoroughly.

B. Pipe Bedding, Initial Backfill and Trench Backfill

1. Place bedding and backfill in layers of uniform thickness specified herein, and as shown on the Drawings.
2. Thoroughly compact each layer by means of a suitable vibrator or mechanical tamper.
3. Install pipe bedding and initial backfill in layers of uniform thickness not greater than eight (8) inches.
4. Deposit the remainder of the backfill in uniform layers not greater than eight inches.
5. Provide underground sewer marking tape for the full length of sewer trenches as shown on the Drawings. Marking tape shall be SETON #210 SEW or equivalent.
6. Where soft silt and clay soils are encountered the trench shall be excavated six inches below the normal bedding and backfilled with 6-inches of compacted sand.
7. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below the bottom of such footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footings.
8. The following schedule gives the bedding requirements for various types of pipe. Distances refer to vertical thickness below the pipe.

BEDDING REQUIREMENTS

DI or Concrete Pipe	6 inches min. below to 6” above top of pipe

PVC, CMP or HDPE Pipe	6 inches min. below to 6” above top of pipe

9. The following schedule gives the initial backfill requirements for various types of pipes.

INITIAL BACKFILL REQUIREMENTS

DI or Concrete, Pipe	¾ inch Screened stone or select fill 12 inches min. over top of pipe.
PVC, CMP or PE Pipe	12 inches min. ¾ inch screened stone over the top of the pipe.

10. Special bedding and backfill requirements shown on the Drawings supersede requirements of this section.
11. Where pipes or structures pass through or under the impervious core of the lagoon embankments, bedding and backfill material shall consist of the impervious embankment material. Extra care should be given to properly and thoroughly compact the bedding material around the pipe.

C. Improper Backfill:
1. When excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required, as directed by the Engineer.
2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.
3. Excavation, backfilling, and compacting work performed to correct improper backfilling shall be performed at no additional cost to the Owner.

D. Ground Surface Preparation:
1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, scarify or break-up sloped surface steeper than 1 vertical to 4 horizontal.
2. When existing ground surface has a density less than that specified under "compaction" for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

3.4 COMPACTION:

A. General:
1. Control soil compaction during construction to provide not less than the minimum percentage of density specified for each area classification.

B. Percentage of Maximum Density Requirements:
1. Compact soil to not less than the following percentages of maximum dry density determined in accordance with ASTM D1557 as indicated.
a. Structures: Compact each layer of backfill or fill material below or adjacent to structures to at least 95% of maximum dry density (ASTM D1557).
b. Walkways: Compact each layer of backfill or fill material to at least 93% of maximum dry density (ASTM D1557).

d. Roadways, Drives and Paved Areas: Compact each layer of fill, subbase material, and base material to at least 95% of maximum dry density (ASTM D1557).
e. Pipes: Compact bedding material and each layer of backfill to at least 90% maximum dry density (ASTM D1557). Where backfilling with excavated material, compact to native field density.
f. Embankments: Compact each layer of embankment material to at least 95% of maximum dry density (ASTM D1557).

C. Moisture Control:
1. Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, in quantities controlled to prevent free water appearing on surface during or subsequent to compaction operations.
2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory level.

D. Embankment Compaction:
1. After each embankment layer has been spread to the required maximum 8-inch thickness and its moisture content has been adjusted as necessary, it shall be rolled with a sufficient number of passes to obtain the required compaction. One pass is defined as the required number of successive trips which by means of sufficient overlap will insure complete coverage and uniform compaction of an entire lift. Additional passes shall not be made until the previous pass has been completed.
2. When any section of an embankment sinks or weaves excessively under the roller or under hauling units and other equipment, it will be evident that the required degree of compaction is not being obtained and that a reduction in the moisture content is required. If at any place or time such sinking and weaving produces surface cracks which, in the judgment of the Engineer are of such character, amount, or extent to indicate an unfavorable condition, he will recommend operations on that part of the embankment to be suspended until such time as it shall have become sufficiently stabilized. The ideal condition of the embankment is that attained when the entire embankment below the surface being rolled is so firm and hard as to show only the slightest weaving and deflection as the roller passes.
3. If the moisture content is insufficient to obtain the required compaction, the rolling shall not proceed except with the written approval of the Engineer, and in that event, additional rolling shall be done to obtain the required compaction. If the moisture content is greater than the limit specified, the material of such water content may be removed and stockpiled for later use or the rolling shall be delayed until such time as the material has dried sufficiently so that the moisture content is within the specified limits. No adjustment in price will be made on account of any operation of the Contractor in removing and stockpiling, or in drying the materials or on account of delays occasioned thereby.
4. If because of insufficient overlap, too much or too little water, or other cause attributable to defective work, the compaction obtained over any area is less than that required, the condition shall be remedied, and if additional rollings are ordered, they will be done at no cost to the Owner. If the material itself is unsatisfactory or if

additional rolling or other means fails to produce satisfactory results, the area in question shall be removed down to material of satisfactory density and the removal, replacement, and re-rolling shall be done by the Contractor, without additional compensation.

5. Material compaction by hand-operated equipment or power-driven tampers shall be spread in layers not more than 6 inches thick. The degree of compaction obtained by these tamping operations shall be equal in every respect to that secured by the rolling operation.

E. Compaction Methods: The Contractor may select any method of compaction that is suitable to compact the material to the required density.
   1. General: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. All voids left by the removal of sheeting shall be completely backfilled with suitable materials and thoroughly compacted.
   2. Tamping or Rolling: If the material is to be compacted by tamping or rolling, the material shall be deposited and spread in uniform, parallel layers not exceeding the uncompacted thicknesses specified. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass. Care shall be taken that the material close to the excavation side slopes, as well as in all other portions of the fill area, is thoroughly compacted. When the excavation width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe or structure, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping or rolling, the rate at which backfilling material is deposited shall not exceed that permitted by the facilities for its spreading, leveling, and compacting as furnished by the Contractor.

F. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.5 GRADING

A. General:
   1. Grading shall consist of that work necessary to bring all areas to the final grades.
   2. Uniformly grade areas within limits of work requiring grading, including adjacent transition areas.
   3. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Compaction:
   1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

C. Protection of Graded Areas:
   1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
   2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

3.6 BASE COURSE AND LEVELING COURSE

A. General:
   1. Base course consists of placing the specified materials in layers to support a leveling course or paved surface, as indicated in the Drawings.

B. Grade Control:
   1. During construction, maintain lines and grades including crown and cross-slope of base course and leveling course.

C. Placing:
   1. Place base course on prepared subbase conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base materials.
   2. Place leveling course on prepared base course, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compaction.

D. Shaping and Compacting:
   1. All layers of aggregate base course and leveling course shall be compacted to the required density immediately after placing. As soon as the compaction of any layer has been completed, the next layer shall be placed.
   2. The Contractor shall bear full responsibility for and make all necessary repairs to the base leveling courses and the subgrade until the full depth of the base leveling courses is placed and compacted. Repairs shall be made at no additional cost to the Owner.
   3. If the top of any layer of the aggregate base or leveling course becomes contaminated by degradation of the aggregate or addition of foreign materials, the contaminated material shall be removed and replaced with the specified material at the Contractor's expense.

END OF SECTION

SECTION 02225

FLOWABLE FILL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install flowable fill material in authorized excavation(s) as shown on the Drawings and/or as specified herein.

B. Related Work Specified Elsewhere:

1. Earthwork, excavation, backfilling, compaction, piping, manholes, testing and pavement are specified in the appropriate sections of this Division.

1.2 QUALITY ASSURANCE

A. Perform work in accordance with ACI 229, Controlled Low-Strength Materials, or as specified here-in.

1.3 SUBMITTALS

A. Submit Mix designs for each mixture to be provided at least 15 days prior to production.

1.4 TESTING

A. Flowability: Reference ASTM D 6103

1. A 3 inch diameter by 6 inch long open ended cylinder is placed vertically on a level surface and filled to the top with flowable fill. The cylinder is then lifted vertically to allow the material to flow out onto the level surface. The test is considered passing when the material spread is at least 7 inches in diameter and there is no noticeable segregation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Materials shall meet the following requirements:

1. Portland Cement, Type I or II - ASTM C150.
2. Fly Ash (LOI limits do not apply) - ASTM C618.
3. Fine Aggregate/Mineral Filler – ASTM C 33, ASTM or non-ASTM sands or mineral fillers with 100% passing the 1/2" sieve may be considered which produce an acceptable flow and desired performance characteristic. Soils with fine clays will not be considered. All other than ASTM C 33 materials must receive prior approval from the Engineer.
4. Air Entraining Admixtures - As Per Manufacturer's Specifications.
5. Light Weight Cellular Admixture - As Per Manufacturer's Specifications.
6. Water – Potable or ASTM C 94.
7. Preformed Foam – Procedures for evaluation ASTM C 796 and ASTM C 869.

B. Standard Flowable Fill:

1. Compressive strength at 28 days less than 1200 psi

C. Excavatable Flowable Fill:

1. Compressive strength at 28 days between 100-200 psi.

2. Mix:
    a. Portland Cement: 50-100 lb/yd^3
    b. Fly Ash: up to 350 lb/yd^3, lime content not to exceed 10% by weight.
    c. Fine Aggregate/Mineral Filler: 2000-3000 lb/yd^3
    d. Water: 325-600 lb/yd^3, for Class F fly ash and cement-only mixtures up to 1000 lb/yd^3 may be acceptable.

D. Low Density Flowable Fill:
1. The preformed foam shall produce stable air cells capable of resisting the chemical and physical forces imposed during mixing, placing and setting.
2. Submit the foaming agent Manufacturer's recommended mixing procedures and approved mixing equipment to the Engineer.
3. Methods of placement must not cause a change in density due to loss of air content beyond predictable ranges.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Flowable fill shall be produced and delivered using standard concrete construction equipment and practices.
B. Placing flowable fill shall be by chute, pumping, or other method approved by the Engineer.
C. The flowable fill shall be discharged directly from the mixer truck into the space to be filled.
D. No flowable fill shall be placed on frozen ground.
E. At the time of placement the flowable fill shall have a temperature of at least 40 degrees F.
F. When flowable fill is placed in freezing temperatures, the material should be covered with blankets and protected from freezing until hardening.
G. The Contractor shall provide all necessary means to confine the material within a designated space.
H. Formed walls or other bulkheads shall be constructed to withstand hydrostatic pressure exerted by flowable fill where necessary and as determined by the Engineer.
I. The Contractor is responsible to ensure underground utilities, including but not limited to pipes, tanks, structures, cables, etc. are secured to prevent floating.
J. No compaction or vibration of the material is required.
K. Where flowable fill is being used as pipe bedding it shall be placed in lifts to ensure lateral support of the pipe develops along the side of the pipe before continuing with the backfilling.
L. When paving over flowable fill in cold weather, any frozen material on the surface shall be scraped off and removed prior to paving.
M. The flowable fill shall be left undisturbed until the material obtains sufficient strength. Sufficient strength for paving is achieved when the flowable fill can support the weight of foot traffic without apparent deformation. Sufficient strength for supporting vehicular traffic is 2.5 tons per square foot as measured by a pocket penetrometer.
N. Trenches shall be covered and barricaded until hardening occurs.

END OF SECTION

SECTION 02260

FILTER FABRIC

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish all materials and install filter fabric of the types, dimensions and in the location(s) shown on the Drawings and specified herein.

1.2 QUALITY ASSURANCE

A. A competent laboratory must be maintained by the manufacturer of the fabric at the point of manufacture to insure quality control.

B. During all periods of shipment and storage, the fabric shall be wrapped in a heavy duty protective covering to protect the fabric from direct sunlight, ultraviolet rays, and temperatures greater than 140^{O}F, mud, dirt, dust and debris.

1.3 SUBMITTALS

A. Manufacturer shall furnish certified test reports with each shipment of material attesting that the fabric meets the requirements of this Specification.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Filter fabric for use in stabilization, drainage, underdrains, erosion control, landscaping and beneath structures shall be formed in widths of not less than six (6) feet and shall meet the requirements below. Both woven and non-woven geotextiles are acceptable where applicable; however, "slit-tape" woven fabrics will not be permitted for drainage, underdrain, and erosion control applications. The geotextile shall have property values expressed in "MARV" values that meet or exceed the values stated in the tables below as determined by the most recent test methods specified above. Filter fabric for use in underdrains and beneath structures shall be Mirafi 140 by Fiber Industries or equal.

Table 1 (Underdrain and Tank Subgrade)

Geotextile Mechanical Property	Test Method	Minimum Permissible Value
Grab Tensile Strength (both directions)	ASTM D4632	205 pounds
Grab Elongation	ASTM D4632	50 percent
Mullen Burst Strength	ASTM D3786	350 psi
Puncture Strength	ASTM D4833	110 pounds
Trapezoid Tear Strength	ASTM D4533-85	85 pounds
Water Flow Rate	ASTM D4491	110 gal/min/sf
Equivalent Opening Size (EOS)	ASTM D4751	80

Coefficient of Permeability	ASTM D4491	0.38 cm/sec

C. Silt Fence (woven or unwoven fabric)

Table 2 (Silt Fence)

Geotextile Mechanical Property	Test Method	Minimum Permissible Value
Grab Tensile Strength (both directions)	ASTM D4595-86	120 pounds
Grab Elongation	ASTM D4632-86	50 percent
Mullen Burst Strength	ASTM D3786-87	210 psi
Puncture Strength	ASTM D3787	60 pounds
Trapezoid Tear Strength	ASTM D4533-85	50 pounds
Water Flow Rate	ASTM D4491-85	120 gal/min/sf
Equivalent Opening Size (EOS)	ASTM D4751	80
Coefficient of Permeability	ASTM D4491-85	0.2 cm/sec

The geotextile shall meet or exceed the "typical" values stated above as determined by the most recent test methods specified above.

D. Filter Fabric for use in siltation fencing shall be the following:

1. Environfence 100X (Mirafi)
2. Supac 4NP (Phillip 66)
3. Exxon 180 Siltfence
4. Amoco 1380 Silt Stop
5. Harris Siltfence
6. Or equivalent

PART 3 - EXECUTION

3.1 A. Install filter fabric as shown on the drawings or as directed in appropriate specifications in this division or in accordance with manufacturer's instructions or as directed by the Engineer.

B. Underdrain filter fabric (geotextile) shall be placed over and around the crushed stone dewatering layer at the locations shown in the Drawings or as directed by the Engineer. The fabric shall be placed on crushed stone subgrade. Filter fabric (geotextile) shall be placed with the long dimension parallel to the underdrain piping unless otherwise directed by the Engineer. Filter fabric (geotextile) shall be overlapped parallel to the underdrain piping.

C. (All applications) At the time of installation, fabric shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage. The filter fabric shall be unrolled and laid smooth and free of tension, stress,

folds, wrinkles, or creases except, in curved sections and corners. Filter fabric (geotextile) shall be overlapped a minimum width of 6 inches at each joint. Overlap joints and seams shall be measured as a single layer of cloth. All filter fabric (geotextile) shall be turned down at all exterior limits. Filter fabric (geotextile) overlaps shall be field sewn using UV resistant thread with seam material properties the same as the material with contrasting color, have a stitch density of 4 to 6 stitches/foot of seam an a double row of lock stitches. Heat bonding of the seams along the edges is an acceptable alternative, except over underdrains; heat bonding of seams is not an acceptable alternative to seaming filter fabric.

END OF SECTION

SECTION 02270

TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. The work under this section shall include provision of all labor, equipment, materials and maintenance of temporary erosion control devices, as specified herein, as shown on the Drawings and as directed by the Engineer.
   2. Erosion control measures shall be provided as necessary to correct conditions that develop prior to the completion of permanent erosion control devices, or as required to control erosion that occurs during normal construction operations.
   3. Construction operations shall comply with all federal, state and local regulations pertaining to erosion control.
   4. Erosion control measures shall be in accordance with the Massachusetts Department of Environmental Protection's - Stormwater Management Standards - (referred to hereafter as MassDEP SMS) and "Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas," *Franklin*, *Hampden*, *Hampshire Conservation Districts*, *2003.*
   5. After awarding of or after being awarded the Contract, prior to commencement of construction activities, the Contractor will meet with the Engineer to discuss erosion control requirements and develop a mutual understanding relative to details of erosion control.

B. Design Criteria:
   1. Conduct all construction in a manner and sequence that causes the least practical disturbance of the physical environment.
   2. Stabilize disturbed earth surfaces in the shortest time and employ such temporary erosion control devices, as may be necessary, until such time as adequate soil stabilization has been achieved.

1.2 SUBMITTALS

A. The Contractor shall furnish the Engineer, in writing, his work plan giving proposed locations for storage of topsoil and excavated material, before beginning construction. A schedule of work shall accompany the work plan. Acceptance of this plan will not relieve the Contractor of his responsibility for completion of the work as specified.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fiber Rolls:
   1. The owner has a preference for fiber rolls (a.k.a. straw wattles) over hay bales for erosion control. Fiber rolls shall be minimum 9-inch diameter cylinders of agricultural straw or rice straw wrapped in photodegradable black synthetic netting.

B. Silt Fencing
   1. Polyethylene, polypropylene, nylon, or polyester fabric supported by stakes spaced no greater than 6-feet apart.

C. Silt Sacks:

1. Silt Sacks (or equivalent) shall be placed in downgradient catch basins to prevent sediment from entering the drainage system. Silt sacks shall be periodically cleaned while in use and must be cleaned prior to and after precipitation events. Applicants are advised they may be required to respond immediately for repair and maintenance at the request of the Town within two hours of notification.

D. Mulches:
   1. Straw or Salt Marsh Hay. Loose hay mulching is prohibited.

E. Mats and Nettings:
   1. Twisted Craft paper, yarn, jute, excelsior wood fiber mats, glass fiber and plastic film.
   2. Type and use shall be as specified in the SMS.

F. Baled Straw:
   1. At least 14" by 18" by 30" securely tied to form a firm bale, staked as necessary to hold the bale in place.

G. Sand Bags:
   1. Heavy cloth bags of approximately one cubic foot capacity filled with sand or gravel.

H. Permanent Seed:
   1. Conservation mix appropriate to the predominant soil conditions as specified in the SMS and subject to approval by the Engineer.

I. Temporary Seeding:
   1. Use species appropriate for soil conditions and season as specified in the SMS and subject to approval by the Engineer.

J. Water:
   1. The Contractor shall provide water and equipment to control dust, as directed by the Engineer.

K. Filter Fabrics:
   1. Filter fabric shall be of one of the commercially available brands such as Mirafi, Typar or equivalent. Fabric types for particular applications shall be approved by the Engineer prior to installation.

2.2 CONSTRUCTION REQUIREMENTS

A. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in ditches and other locations as necessary.
   2. Fiber rolls or siltation fence may be used in an arrangement to fit local conditions.

B. Temporary Berms:
   1. Temporary barriers shall be constructed along the toe of embankments when necessary to prevent erosion and sedimentation.

C. Temporary Seeding:
   Areas to remain exposed for a time exceeding 3 weeks shall receive temporary seeding as indicated below:

Season	Seed	Rate
April 1 to June 1 Aug. 15 to Sept. 15	Annual Ryegrass	40 lbs/Acre
May 1 to June 30	Foxtail Millet	30 lbs/Acre
April 1 to July 1 Aug. 15 to Sept. 15	Oats	80 lbs/Acre
Aug. 15 to Oct. 15	Winter Rye	120 lbs/Acre
Nov. 1 to April 1	Mulch w/ dormant seed	80 lbs/Acre @ 50% seed rate increase

D. Mulch All Areas Receiving Seeding:
Use either wood cellulose fiber mulch (750 lbs/acre); or straw mulch with chemical tack (as per manufacturer's specifications). Wetting for small areas may be permitted. Biodegradable netting is recommended in areas to be exposed to drainage flow.

E. Erosion control matting for slopes and ditches shall be anchored with pegs and/or staples per manufacturer's recommendations. Contractor shall provide matting along the flowline of all ditches and swales having a longitudinal slope in excess of 0.01 ft/ft, and on all slopes in excess of 3(H) to 1(V).

F. Gravel aprons shall be installed at the entrance of construction sites where disturbance is over 4,000 square feet to prevent sediment from the construction site entering the roadway. Aprons shall be a minimum of 15 feet in length, and extend the width of the entrance.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fiber Rolls (Straw Wattles):
Fiber rolls shall be staked securely into the ground and oriented perpendicular to the slope using wood takes. A minimum of 3 inches of the stake should stick out above the roll. Stakes shall be spaced 3 to 4 feet apart.

B. Silt Fencing:
Silt fence shall be erected in a continuous fashion from a single roll of fabric. The bottom of the fabric fence shall be buried sufficiently below the ground surface to prevent gaps from forming, usually 4 to 6 inches below ground surface. The fabric shall be installed on the upstream side of the stakes. Stakes shall be strong enough and tall enough to securely anchor the fabric to the ground. Stake spacing shall be no more than 10 feet apart for extra-strength fabric and 6 feet apart for standard strength fabric. Maintenance of the fence is required during construction. Material shall be based on the synthetic fabric requirements as follows:
1. Filtering efficiency: 75% (minimum)
2. Tensile strength: Standard strength: 30lb/linear inch (minimum), Extra strength: 50 lb/linear inch (minimum)

3. Elongation: 20% (maximum)
4. Ultraviolet radiation: 90% (minimum)
5. Slurry flow rate: 0.3 gal/ft2/min (minimum)

C. Temporary Erosion Checks:
   1. Temporary erosion checks shall be constructed in ditches and at other locations designated by the Engineer. The Engineer may modify the Contractor's arrangement of silt fences, bales and bags to fit local conditions.
   2. Fiber rolls, baled straw, silt fences, or some combination, may be used in other areas, as necessary, to inhibit soil erosion.
   3. Siltation fence shall be located and installed as shown on plans or as required to comply with all Federal, State and Local Regulations.
   4. Sedimentation ponds shall be sited and constructed to the grades and dimensions as shown on the Drawings and will include drainage pipe and an emergency spillway.

D. Erosion control matting for slopes and ditches shall be installed where indicated on the Drawings and as required to stabilize the soil until permanent vegetative stabilization is established.

E. Maintenance:
   Erosion control features shall be installed prior to excavation wherever appropriate. Temporary erosion control features shall remain in place and shall be maintained until a satisfactory growth of grass is established. The Contractor shall be responsible for maintaining erosion control features throughout the life of the construction contract. Maintenance will include periodic inspections by the Owner or Engineer for effectiveness of location, installation and condition with corrective action taken by the Contractor, as appropriate.

F. Removing and Disposing of Materials:
   1. When no longer needed, material and devices for temporary erosion control shall be removed and disposed of upon approval by Engineer.
   2. When removed, such devices may be reused in other locations, provided they are in good condition and suitable to perform the erosion control for which they are intended.
   3. When dispersed over adjacent areas, the material shall be scattered to the extent that it causes no unsightly conditions nor creates future maintenance problems.
   4. Sedimentation basins, if no longer required, will be filled in, the pipe removed, the surface loamed and grass cover shall be established.

END OF SECTION

SECTION 02401

DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Furnish, operate and maintain, as incidental to the project, dewatering equipment to lower and control ground water table levels and hydrostatic pressures to permit excavation, backfill, and construction to be performed in the dry; collect and dispose of ground and surface water where necessary to complete the work.

1.2 SUBMITTALS

A. Provide submittals in accordance with Specification Section 01340.

B. Submit design calculations, description and complete layout drawings of the proposed dewatering system, stamped and sealed by a Professional Engineer registered in the State of Massachusetts. Such review shall not relieve the Contractor of sole responsibility for the dewatering system as necessary to prevent damage and settlement to adjacent structures, utilities, streets adjacent to excavations and for the safety of persons working within the excavated areas.

C. Submittal shall include: location, depth and size of wellpoints, headers, sumps, ditches; size and location of discharge lines; capacities of pumps and standby units, and detailed description of dewatering methods to be employed to convey the water from site to adequate disposal.

D. Submit letter from dewatering system design engineer that the design of the dewatering system has been fully coordinated with the design of the excavation support system.

1.3 DESIGN

A. Dewatering system shall be designed by a Professional Engineer registered in the State of Massachusetts who is experienced in the design of Dewatering systems

B. Dewatering system shall be of sufficient size and capacity necessary to lower and maintain ground water table to an elevation at least one foot below the lowest foundation subgrade or bottom of pipe trench to allow material to be excavated in a dry condition. Materials to be removed shall be sufficiently dry to permit excavation to grades shown and to stabilize excavation slopes where sheeting is not required. Operate dewatering system continuously until backfill work has been completed.

C. Control of surface and subsurface water is part of dewatering system requirements. Maintain adequate control so that:

1. The stability of excavated and constructed slopes are not adversely affected by saturated soil, including water entering prepared subbase and subgrades where underlying materials are not free draining or are subject to swelling or freeze-thaw action.
2. Erosion is controlled.
3. Flooding of excavations or damage to structures does not occur.
4. Surface water drains away from excavations.
5. Excavations are protected from becoming wet from surface water, or insure excavations are dry before additional work is undertaken
6. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.

7. Maintain stability of sides and bottom of excavation. Construction operations are performed in the dry.
8. Any existing dewatering wells that can affect dewatering and excavation shall be sealed below the excavation subgrade.

D. Design shall include an assessment of how the dewatering operations will affect the stability of all adjacent structures

E. Contractor is responsible to perform whatever additional geotechnical investigations are needed to design the dewatering system to allow for proper construction of new facilities while protecting adjacent structures from damage due to settlement, and in accordance with this specification.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:
1. Prior to any excavation below the ground water table, place system into operation to lower water table as required and operate it continuously 24 hours a day, 7 days a week until utilities and structures have been satisfactorily constructed, which includes the placement of backfill materials and dewatering is no longer required.
2. Keep work areas dewatered until the structures, pipes, and appurtenances to be built there have been completed to such an extent that they will not be damaged by water.
3. Thoroughly brace or otherwise protect against flotation all pipelines and structures which are not stable.
4. Maintain standby backup equipment and power supply throughout the duration of the dewatering operation.
5. Prevent soil particles from entering the discharge points.
6. Ground water level shall be maintained at least one foot below the bottom of the excavation.

B. Disposal of Water:
1. Dispose of water pumped or drained from the construction site in a suitable manner to avoid siltation of adjacent drainage structures and piping, wetlands or water bodies, injury to public health, damage to public and private property, and damage to the work completed or in progress.
2. Provide suitable temporary channels for water that may flow along or across the construction site.
3. Provide treatment as necessary to prevent discharge of contaminated ground water caused by Contractor's operations, or any contaminated ground water that may pass through the excavation support system selected by the Contractor.
4. Contractor must obtain all necessary regulatory approvals for the disposal of dewatering flows. These may include, among others, approval by the USEPA under the National Pollutant Discharge Elimination System (NPDES) program for construction activities.

C. Damage:
   1. Avoid damage to and settlement of adjacent buildings, roads, structures, utilities and other facilities.
   2. Any damage to or settlement of structures resulting from the dewatering operations, or the failure of the Contractor to maintain the work in a suitably dry condition shall be repaired by the Contractor at no additional cost to the Owner.

D. Temporary Underdrains:
   1. When necessary, temporary underdrains may be placed in excavations.
   2. Underdrain pipe shall be perforated corrugated metal, polyethylene or P.V.C. pipe.
   3. Entirely surround the underdrain and fill the space between the underdrain and the pipe or structure with free draining material.

E. Excavation Sump Pumping:
   1. When necessary and where appropriate to the geotechnical conditions encountered, excavations may be over excavated 6 to 12 inches and filled with screened stone to allow sump pumping of groundwater.
   2. The system shall be installed with suitable screens and filters so that pumping of fines does not occur.

F. Well and Wellpoint System:
   1. If necessary, dewater the excavations and trenches with an efficient well or wellpoint system to drain the soil and prevent saturated soil from flowing into the excavated wells and area.
   2. Wellpoint and well system shall be of the type designed for dewatering work and shall be installed with suitable screens and filters so that pumping of fines does not occur.
   3. Pumping units shall be capable of maintaining sufficient suction to handle large volumes of air and water at the same time.

G. Corrective Action:
   1. If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system (loosening of the foundation strata, or instability of slopes, or damage to foundations or structures), perform work necessary for reinstatement of foundation soil and damaged structure resulting from such inadequacy or failure by Contractor, at no additional cost to Owner.

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END OF SECTION

SECTION 02431

CATCH BASINS, GRATES AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Construct catch basins, grates, frames and brick masonry in conformance with the dimensions and locations shown on the Drawings.

B. Related Work Specified Elsewhere: (Where applicable)

1. Pipe, trench excavation and backfill, paving and dewatering are specified in the appropriate Sections in this Division.

1.2 QUALITY ASSURANCE

A. Precast Catch Basin Base, Barrel and Top Sections:

1. Conform to ASTM C478-97 except as modified herein, on the Drawings, or as directed by the Engineer.
2. Average strength of 4,000 psi at 28 days
3. Testing:
   a. Determine concrete strength by tests on 6 inch by 12 inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
   b. Have tests conducted at manufacturer's plant or at an approved testing laboratory.
   c. Have not less than 2 tests made for each 100 vertical feet of precast catch basin sections.

B. Frames and Grates:

1. Acceptable Manufacturers:
   a. Etheridge Foundry Company
   b. Neenah Foundry Company
   c. East Jordan Iron Works Company
   d. Or equivalent.

C. Masonry:

1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick.
2. Cement: ASTM C-150.
3. Hydrated Lime: ASTM C-207.
4. Sand: ASTM C144.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop Drawings and manufacturer's literature in conformance with the Standard General Conditions of the Construction Contract.

B. Bases, Barrel Sections and Tops: Submit test results and receive approval from the Engineer prior to delivery to the site.

PART 2 - PRODUCTS

2.1 PRECAST CATCH BASIN SECTIONS

A. Dimensions, as shown on the Drawings.

B. Use flat tops or eccentric cones as appropriate. Exterior face of cone sections shall not flare out beyond the vertical.
C. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
D. Constructed to support an HS-20 wheel loading.
E. Openings:
    1. Provide openings in the risers to receive pipes entering the catch basin of the types and materials approved by the Engineer.
    2. Make openings at the manufacturing plant or cut openings in the field.
    3. Size: To provide a uniform annular space between the outside wall of pipe and the riser.
    4. Location: To permit setting of the entering pipes at the correct elevations.
F. Joints:
    1. Joint gaskets to be flexible self seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer.
    2. Acceptable Materials:
        a. Kent-Seal No. 2
        b. Ram-Nek
        c. Or equivalent.
    3. Joints between precast sections shall conform to related standards and manufacturer's instructions.

2.2 FRAMES AND GRATES

A. All essential details of design shall conform to the Drawings. Standard castings differing in non-essential details may be approved by the Engineer.
B. All frames and grates shall be made of cast iron and shall have machined bearing surfaces to prevent rocking under traffic.
C. Grate castings will be smooth with no sharp edges.
D. Constructed to support an HS-20 wheel loading.

2.3 MASONRY

A. Brick:
    1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
    2. Immediately remove rejected brick from the work.
B. Mortar:
    1. Composition (by volume):
        a. 1 part portland cement.
        b. 1/2 part hydrated lime.
        c. 4-1/2 parts sand.
    2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.
C. Cement:
    1. Shall be Type II portland cement.
D. Hydrated Lime:

1. Shall be Type S.

E. Sand:
   1. Shall consist of inert natural sand.
   2. Grading:

Sieve	Percent Passing
No. 4	100
No. 8	95-100
No. 16	70-100
No. 30	40-75
No. 50	10-35
No. 100	2-15
No. 200	0-5

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Catch Basin Sections:
   1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
   2. Install barrels and tops level and plumb.
   3. Make all joints water tight.
   4. Solidly fill annular spaces around pipes entering the catch basin with non-shrink grout or other material approved by the Engineer.
   5. Cut openings (as required) carefully to prevent damage to barrel sections and tops. Damaged barrel sections and tops shall be replaced by the Contractor at no additional expense to the Owner.

B. Pipe Connections to Catch Basins: Connect pipes to catch basins with joint design and materials approved by the Engineer.

C. Masonry:
   1. Laying Brick:
      a. Use only clean bricks in brickwork for catch basins.
      b. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar or so wet as to be slippery when laid.
      c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
      d. Construct all joints in a neat workmanlike manner, construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
   2. Curing:
      a. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or by other approved means.
      b. Protect brick masonry from the weather and frost as required.

D. Frames and Grates:
   1. Set all frames in a full bed of mortar, true to grade and concentric with the catch basin opening.

2. Completely fill all voids beneath the bottom flange to make a watertight fit.
3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the catch basin all around its circumference.
4. Clean the frame seats before setting the covers in place.

E. No Dump Plaques
1. "No Dump" plaques will be provided by the City.
2. "No Dump" plaques are to be set in the newly placed concrete sidewalks at all catch basin locations.
3. The contractor shall install "No Dump" plaques per the manufacturers recommendation.

F. Bedding and Backfilling:
1. Bedding material of catch basin shall be 6 inches of screened stone (see Section 02200).
2. Backfill 18 inches all around catch basin with gravel borrow.

END OF SECTION

SECTION 02435

CULVERTS AND STORM DRAINS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Provide and install culvert or storm drain pipe and sections of the type(s), size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere:
   1. Excavation and backfill, dewatering, catch basins, pavement, Earthwork material are specified in the appropriate sections in this division.

1.2 SUBMITTALS

A. Submit, in duplicate, sworn certificates of inspections and tests performed at the location of manufacturers.

B. Submit shop drawings in accordance with the General Conditions of the Construction Contract.

1.3 DELIVERY, STORAGE AND HANDLING

A. Exercise care when handling pipe to prevent damage of any nature to pipe and finish.

B. Immediately remove damaged materials and replace at no additional cost to the Owner.

C. Store materials above ground on platforms, skids or other adequate supports.

1.4 FIELD QUALITY CONTROL

A. Acceptance will be on the basis of tests of materials and inspection of the complete product.

B. Inspection may be made at the place of manufacture or on the construction site after delivery, or both, and the pipe shall be subject to rejection at any time due to failure to meet all of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture.

C. Immediately remove from the project site all rejected pipe.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe shall be one of the following as specified on the Drawings or at the option of the Contractor and with the approval of the Engineer.
   1. Corrugated Aluminum Alloy Pipe
   2. Aluminum Coated (Type 2) Corrugated Steel Pipe
   3. Zinc-Coated (Galvanized) Corrugated Steel Pipe
   4. Steel Structural Plate Pipe
   5. Aluminum Alloy Structural Plate Pipe
   6. Polymer Precoated, Galvanized Corrugated Steel Pipe
   7. Polyvinyl Chloride (PVC) Pipe
   8. Corrugated Polyethylene (PE) Pipe
   9. Reinforced Concrete Pipe

B. Materials for pipes shall conform to AASHTO Standards.

1. Corrugated Aluminum Alloy Pipe. This pipe and special fittings such as elbows, tees and wyes shall conform to the requirements of AASHTO M196, Type I or II. Special sections, such as elbows and metal end sections, shall be of the gage called for on the plans and shall conform to the applicable requirements of AASHTO M196. Steel sheet shall conform to the requirements of AASHTO M197.
2. Aluminum Coated (Type 2) Corrugated Steel Pipe. This pipe shall conform to the requirements of AASHTO M36 using steel sheet conforming to AASHTO M274.
3. Zinc - Coated (Galvanized) Corrugated Steel Pipe. This pipe shall conform to the requirements of AASHTO M36 using steel sheet conforming to AASHTO M218.
4. Steel Structural Plate Pipe. Plates, bolts, nuts and other accessories shall conform to the requirements of AASHTO specification M167 and the following additional requirements:
    a. All shop welding shall meet the requirements of the latest edition of AWS D1.1, Structural Welding Code - Steel.
    b. Annually the fabricator shall have quality control tests performed on uncoated random samples of the lightest and heaviest gage plates produced by welding. The sampling and testing shall be done by a recognized independent testing agency and copies of the test reports, including all welding parameters, shall be submitted to the Engineer as requested.
    c. No field welding will be allowed.
5. Aluminum Alloy Structural Plate Pipe. Plates, bolts and nuts for this pipe shall conform to the requirements of AASHTO M219.
6. Polymer Precoated, Galvanized Corrugated Steel Pipe. This pipe and special fittings such as elbows, tees and wyes shall conform to the requirements of AASHTO M245, Type I, with Type B coating for the pipe as specified in AASHTO M246 with the thinner coating on the outside.
7. PVC (Polyvinylchloride) Pipe. This pipe and fittings shall conform to the requirements of AASHTO M278. All pipe shall be supplied with gasket type joints meeting the requirements of ASTM D3212.
8. Corrugated polyethylene pipe. This pipe and fittings shall conform to the requirements of AASHTO M252 and AASHTO M294. The pipe joint system shall be watertight (WT) and shall meet or exceed the current ASTM D3212 Lab Test Requirements and the current ASTM F1417 Watertight Field Test Requirements.
9. Reinforced Concrete Pipe. This pipe shall conform to the requirements of AASHTO M170, (ASTM C76) except paragraph 6.2. Elliptical pipe shall conform to the requirement of AASHTO M207, except paragraph 6.2. Unless otherwise specified, pipe wall design and use of elliptical reinforcement in circular pipe are optional. Pipe arch shall conform to the requirements of AASHTO M206, except paragraph 6.2.

    Aggregates shall meet the requirements of section 02200 – Earthwork for backfill material.

    Precast reinforced concrete special sections shall conform to the requirements of the cited specifications to the extent to which they apply.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas to receive piping for the following:
   1. Obstructions that adversely affect the installation and quality of the work.
   2. Deviations beyond allowable tolerances for clearances.
B. Examine pipe and fittings before installation to assure no defective materials are incorporated.
C. Start the work only when conditions are satisfactory.
D. Remove and replace all defective materials at no additional cost to the Owner.

3.2 INSTALLATION

A. Do not install pipe, nor backfill, between December 15 and April 1 without the written permission of the Engineer.
B. Begin laying the pipe at the downstream end.
C. Place metal pipe with the longitudinal laps of seams at the sides and the outside laps of circumferential joints pointing up grade.
D. Lay paved or partially lined pipe with the lining on the bottom.
E. Join flexible pipe sections and metal end sections by coupling bands.
F. Assemble the plates for structural plate arches according to the manufacturer's assembly instructions and as shown on the Drawings.

END OF SECTION

SECTION 02453

TRAFFIC SIGNS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: The work shall consist of installing traffic signage and equipment as shown on plans and specified herein.

B. Related work specified elsewhere: Traffic regulation and control.

1.2 QUALITY ASSURANCE

A. Acceptable Manufacturers:

1. Telespar, Allied Tube & Conduit, Harvey, IL
2. Lyle Signs, Eden Prairie, MN.
3. Or equal

1.3 SUBMITTALS

A. Shop Drawings: Manufacturer's catalogue cuts indicating dimensions, details, and finishes of posts and accessories.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Traffic signal equipment

1. All traffic sign equipment installed under this specification shall conform to the Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridge Construction, latest version.
2. Any traffic sign equipment that is not reused shall be delivered to the Waltham Department of Consolidated Public Works. The work shall be done in a workmanlike manner so as to salvage all usable parts.
3. Hardware for signs shall conform to the MassDOT Standard Plans for Highway and Bridge Construction.
4. Traffic Signs shall be extruded aluminum plank traffic signs with retro-reflective sheeting background and retro-reflectorized, demountable cut-out copy.
5. All parts used in constructing signs shall be designed to withstand a wind loading of 35 pounds per square foot (1.7 kPa) on the sign surface, unless otherwise noted on the plans.
6. Flat aluminum sheets for sheet signs shall be one piece and conform to ASTM B 209 (ASTM B209 M), Alloy 6061-T6 or Alloy 5052-H38.The minimum thickness of the sheets up to 36 in (900 mm) wide shall be 0.080 in (2 mm). Signs greater than 36 in (900 mm) shall be a minimum of 0.100 in (2.5mm).
7. Square steel tube posts shall conform to ASTM A570, Grade 50 and unless otherwise shown on the plans, shall be galvanized in accordance with ASTM A653, G-90.
8. Square steel tube posts shall be of 12 gauge steel. The posts shall have 7/16 inch holes pre-punched, along the center line of all four sides of the post. The holes shall begin 1 inch from the top of the post and continue at 1 inch centers for the entire length of the posts.

9. The bolt and post assemblies shall be in conformance with all applicable MassDOT and ASTM standards and specifications for type, material, coating and durability. The post bolts shall be installed as shown on the plans.
10. The letters, numerals, symbols, shields, and borders of retro-reflective sheeting permanently adhered to flat sheet aluminum backing shall be adhesive coated Type III retro-reflective sheeting conforming to the MUTCD.
11. All background sheeting shall be retro-reflective sheeting conforming to MUTCD.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Traffic sign details not shown on the plans shall conform to the MUTCD. Traffic sign supports and framing members shall be in accordance with the AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals."
B. Prior to the application of the retro-reflective sheeting, the aluminum sheet shall be one piece and have been cut to the required sizes, with the corners at the prescribed radii, with true and smooth edges, and shall be free of burrs or breaks.
C. The retro-reflective sheeting shall be of the colors provided in the MUTCD, Standard Highway Signs book, MassDOT Standard Plans for Highways and Bridge Construction or as shown on the plans.
D. Any chipping or bending of signs panels shall be cause for replacement at the Contractor's expense.
E. Ground-mounted signs shall be erected to face 2 degrees away from the direction of approaching traffic.
F. The minimum sign height for a conventional road sign in a rural or urban district shall be in accordance with the MUTCD.
G. The post shall be set in anchor base, which is directly embedded in the ground. Posts are bolted to the anchor base with a corner bolt. All posts shall be plumb and properly oriented with the roadway.
H. When rock is encountered in erecting posts, the depth to be drilled into the rock and any required grouting shall be as directed and subsidiary to the item.
I. Sign panels shall be mounted horizontally on the posts as shown on the plans. The back of the panels shall be flush with the posts after the mounting is completed.
J. When signs are to be removed, the entire assembly including the footings down to 1 ft below ground level shall be removed. Unless otherwise shown on the plans, the steel and sign panels shall remain the property of the Owner and delivered to the owner at no additional cost.
K. When signs are to be relocated, new steel posts and all necessary mounting hardware shall be provided unless otherwise shown on the plans. Unless otherwise shown on the plans, removed steel shall remain the property of the Owner.

END OF SECTION

SECTION 02480

LANDSCAPING

PART I - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Perform the following items of work as required to complete the work of this section as shown on the Drawings and as specified hereunder:
   a. Spread stockpiled topsoil and furnish and spread any additional topsoil, required to meet the requirements of this section.
   b. Furnish and sow grass seed/or sod in all areas within the work area to the extent indicated on the Drawings, and in existing grass areas which have been damaged or disturbed by the work of this Contract.
   c. Furnish and install plant materials in all areas within the work area as indicated on the Drawings.
   d. Provide maintenance services as specified hereunder.
2. Examine all other sections of the Specifications and all Drawings for the relationship of the work under this section and the work of other trades. Cooperate with all trades in performing the work under this section.

1.2 SUBMITTALS AND TESTING

A. Seed:

1. Furnish the Engineer with duplicate signed copies of a statement from the vendor, certifying that each container of seed delivered to the project site is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements.
2. This certification shall appear in, or with, all copies of invoices for the seed.
3. Each lot of seed shall be subject to sampling and testing, at the discretion of the Engineer, in accordance with the latest rules and regulations under the Federal Seed Act.

B. Topsoil:

1. Inform the Engineer, within 30 days after the award of the Contract, of the sources from which the topsoil is to be furnished. It is the intent of this section that all topsoil which can be recovered from the site shall be used. Furnish additional topsoil as required.
2. Obtain representative soil samples, taken from several locations in the area under consideration for topsoil removal, to the full stripping depth.
3. Have soil samples tested by an independent soils testing laboratory, approved by the Engineer, at the Contractor's expense.
4. Have soil samples tested for physical properties and pH (or lime requirement), for organic matter, available phosphoric acid, and available potash, in accordance with standard practices of soil testing for agricultural use.
5. Approval, by the Engineer, to use topsoil for use in the work will be dependent upon the results of the soils tests.

C. Lime and Fertilizer:

1. Furnish the Engineer with duplicate copies of invoices for all lime and fertilizer used on the project showing the total minimum carbonates and minimum percentages of the material furnished that pass the 90 and 20 mesh sieves and the grade furnished.
2. Each lot of lime and fertilizer shall be subject to sampling and testing at the discretion of the Engineer.
3. Sampling and testing shall be in accordance with the official methods of the Association of Official Agricultural Chemists.
4. Upon completion of the project, a final check may be made comparing the total quantities of fertilizer and lime used to the total area seeded. If the minimum rates of application have not been met, the Engineer may require the Contractor to distribute additional quantities of these materials to meet the minimum rates.

1.3 DELIVERY, STORAGE AND HANDLING

A. Seed:
   1. Furnish all seed in sealed standard containers, unless exception is granted in writing by the Engineer.
   2. Containers shall be labeled in accordance with the United States Department of Agriculture's rules and regulations under the Federal Seed Act in effect at the time of purchase.

B. Fertilizer:
   1. Furnish all fertilizer in unopened original containers.
   2. Containers shall be labeled with the manufacturer's statement of analysis.

1.4 JOB CONDITIONS

A. Topsoil:
   1. Do not place or spread topsoil when the subgrade is frozen, excessively wet or dry, or in any condition otherwise detrimental, in the opinion of the Engineer, to the proposed planting or to proper grading.

B. Seeding and Planting:
   1. Work Seasons - Perform seeding and planting work only between the dates of 1 May to 20 June and 15 August to 1 October, except as otherwise directed in writing by the Engineer.
   2. Weather Conditions:
      a. Do not perform seeding work when weather conditions are such that beneficial results are not likely to be obtained, such as drought, excessive moisture, or high winds.
      b. Stop the seeding work when, in the opinion of the Engineer, weather conditions are not favorable.
      c. Resume the work only when, in the opinion of the Engineer, conditions become favorable, or when approved alternate or corrective measures and procedures are placed into effect.

PART 2 - PRODUCTS

2.1 MATERIALS FOR GRADING AND SEEDING

A. Topsoil:
1. Fertile, friable, natural topsoil typical of the locality, without admixture of subsoil, refuse or other foreign materials and obtained from a well-drained site. Mixture of sand, silt, and clay particles in equal proportions.
2. Free of stumps, roots, heavy of stiff clay, stones larger than 1-inch in diameter, lumps, coarse sand, weeds, sticks, brush or other deleterious matter.
3. Not less than 4 percent nor more than 20 percent organic matter.
4. Topsoil depth shall be 4-inches, unless otherwise indicated.

B. Fertilizer:
1. Fertilizer shall be used to counteract soil deficiencies as indicated by the soil analysis and as approved by the Engineer. It should be a complete fertilizer, a standard product complying with the state and federal fertilizer laws, part of the elements of which are derived from organic sources, containing the following percentages by weight:

Nitrogen	10N - Minimum 75 percent organic
Phosphorus	6 P -
Potash	4 K -

The fertilizer shall be delivered to the site in the original unopened containers bearing the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Engineer. The fertilizer shall be spread at the rate of 17 to 20 lbs/1000 sq-ft.

C. Lime:
1. Provide lime which is ground limestone containing not less than 85 percent of total carbonate and of such fineness that 90 percent will pass a No. 20 sieve and 50 percent will pass a No. 100 sieve.
2. Coarser materials will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing a No. 100 sieve. No additional payment will be made to the Contractor for the increased quantity.

D. Soil Enrichers:
1. They shall be one of the following materials:
   a. Peat Moss - Finely shredded and consisting of not less than 90 percent organic matter.
   b. Sawdust - rotten.
2. They shall be natural and suited to horticultural use. They shall not contain lumps, roots or other foreign matter over two inches in diameter. They shall be free from noxious weeds, seeds and other elements harmful to lawns. They shall be subject to inspection approval by the Engineer at the source and upon delivery and shall contain not more than 35 percent moisture by weight at the time of incorporation into the soil.

E. Mulch for Hydro Seeding:
1. Mulch material shall meet the following requirements:
   a. Hay or straw - Hay or straw mulch shall consist of long fibered hay or straw, reasonably free from noxious weeds or other undesirable material. No

material shall be used which is so wet, decayed, or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings or other short fibered material shall be used unless directed.

b. Wood cellulose fiber - Wood cellulose fiber mulch shall consist of natural wood cellulose fiber containing no materials which will inhibit seed germination or plant growth. Sufficient non-toxic water soluble green dye shall be added to provide a definite color contrast to the ground surface to aid in even distribution. Wood fiber mulch shall be supplied in uniform packages not exceeding 100 pounds each. Each package shall be marked to show the air dry weight.

F. Mulch Binder for Hydroseeding:

1. Material for mulch binder shall be emulsified asphalt.

a. Emulsified asphalt mulch binder shall be a type acceptable to the Engineer and may be diluted with water to assure even distribution.

G. Grass Seed Mixture

1. Fresh, clean, new crop seed. Seed may be mixed by an approved method on the site, or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers which shall bear the dealer's guaranteed statement of the composition of the mixture and the percentage of purity of each variety. The Dealers Guarantee Statement shall be delivered to the Engineer.

2. Grass seed shall be composed of the following varieties which shall be mixed in the proportions and shall test to 80 percent minimum purity, and 80 percent germination.

Percent Proportion by Weight:

a. MDOT Park Mixture:

1)	Creeping red fescue	50 percent
2)	Kentucky Bluegrass	30 percent
3)	Annual Rye Grass	20 percent

NOTE: Add 1 pound White or Dutch Clover per acre.

b. MDOT Roadside Mixture (Slopes):

1)	Creeping Red Fescue	40 percent
2)	Kentucky Bluegrass	25 percent
3)	Kentucky 31 Fescue	30 percent
4)	White Clover	5 percent

NOTE: Add 1 pound White or Dutch Clover per acre.

c. Lawn Areas:

1)	Kentucky 31 Fescue	25 percent
2)	Chewing Fescue	15 percent
4)	Creeping Red Fescue	15 percent
5)	Pennfine Perennial Rye	25 percent
6)	Lynn Perennial Rye	10 percent
7)	Common Annual Rye	10 percent

H. Sod:

1. Preferable two year growth, at least 85 percent weed-free, solid landscaping sod composed of perennial fescues, Kentucky bluegrass's. Submit one 12 by 12 inch piece of sod, with source location, for approval of the Engineer, before ordering sod for the work.

2.2 MATERIALS FOR PLANTING

A. Water:
   1. The Contractor shall arrange and pay for water required for the planting. Water shall be clean and suitable for domestic consumption.

B. Manure:
   1. Manure shall be well rotted, unleached, horse or cow manure or a combination of both. It shall be free from any chemicals used to hasten decomposition artificially, or any other injurious substance.
   2. Manure shall be at least nine months old and not more than two years old, free from sawdust, hay, tanbark or wood shavings, or refuse of any kind. Manure shall consist of not more than 25 percent straw or other acceptable material.

C. Stakes shall be white cedar or approved equal, of size and length as shown on the Drawings.

D. Hose for guying shall be new black or green two-ply fiber garden hose, not less than 1/2 inch inside diameter. Seconds rejected by the factory are acceptable.

E. Burlap for wrapping shall be first quality burlap at least eight ounces in weight and six inches in width.

F. Wire for tree guys shall be galvanized annealed steel wire, No. 14 gauge, as detailed.

G. Tree paint shall be waterproof, adhesive and elastic, free from kerosene, coal tar creosote or any other material injurious to the life of the trees. Tree paint shall contain an antiseptic.

H. Pine bark mulch shall be clean, shredded, free of weeds, seeds, insects and extraneous materials.

I. Plant Materials:
   1. Plant materials shall conform to American Standard for Nursery Stock (April 15, 1951), sponsored by the American Association of Nurserymen, Inc., Standard Plant Names (1942) shall be the authority for plant names. Plant materials shall be of standard quality true to name and type and first class representatives of their species or variety.
   2. All plants shall conform to the varieties specified in the Plant List. No substitutions will be permitted unless approved in writing by the Engineer. Each bundle of plants and all separate plants shall be properly identified by name on legible, waterproof labels, securely attached thereto before delivery to the site.
   3. Plant materials shall be free of damage as a result of handling and transportation.
   4. All plant material shall be certified by the supplier to be free of disease and infestation.
   5. All plants shall be subject to approval at their source prior to shipment. The Contractor shall accompany the Engineer to inspect the materials, and shall request such inspection at least one week in advance.
   6. All plants shall be typical of their species or variety and shall have a normal habit of growth. They shall be first quality, sound, healthy, vigorous, well branched and densely foliated. They shall be free of disease, insect pests, eggs or larvae, and shall have healthy, well furnished root systems. Plants lacking compactness or proper proportions, and plants injured by too close planting in nursery rows will not be accepted.
   7. All plants shall conform to the measurements specified in the Plant List. Measurements specified shall be the minimum acceptable for each variety. Plants that meet these requirements specified, but do not possess a normal

balance between height and spread, will not be accepted. Plants shall not be pruned prior to delivery.

8. All plants and all tree trunks shall be measured when the branches are in their normal position. Dimensions noted for height and spread refer to the main body of the plant, and not from branch tip to branch tip. Height is defined as the approximate dimension from ground to top of last year's growth. Top spread is defined as the approximate spread to top or principal width. The height of tree trunks need not be specified if the required height can be obtained by pruning the lower branches without leaving unsightly scars or otherwise damaging the trunk. Shade trees shall be free of branches up to five feet, with a single leader, well branched and reasonably straight stems. No trees which have had their leaders cut, or are so damaged that cutting is necessary, will be accepted. Trees which had their tops cut off some years previous will only be acceptable if the scar has not decayed. No trees with cut off tops will be accepted unless corrective surgery has been performed so as to effect a complete healing of the stem.
9. Caliper of trees shall be measured one foot above ground.
10. Plants larger in size than those specified in the Plant List may be provided if approved by the Owner or the Engineer, but the use of larger plants shall not increase the cost of the Contract. If the use of larger plants is approved, the ball of earth or spread of roots shall be increased in proportion to the size of the plant. If plants required to be bare rooted are furnished in sizes greater than specified, they shall be balled and burlapped.
11. All trees shall have straight trunks with single leader intact. There shall be no abrasion of the bark and no fresh cuts of limbs over 1-1/4 inch which have not completely callused over.
12. All plants shall be grown in nurseries and cultivated, sprayed, pruned, and fertilized annually in accordance with good horticultural practice. All plants shall have been grown under climatic conditions similar to those in the locality of the project, or shall have been acclimated to the conditions of the locality for at least two years.
13. All plants shall be freshly dug; neither heeled in plants nor plants from cold storage will be accepted. All plants shall have been transplated or root pruned at least once in the past three years. Balled and burlapped plants shall come from soil which will hold a firm ball.
14. Plants marked "B&B" in the Plant List shall be adequately balled and burlapped with firm natural balls of soil, of diameter of sufficient depth to include all the roots. No plant required to be balled and burlapped shall be accepted if the ball is cracked or broken either before or during the process of planting, or when burlap, stakes, ropes or platform required in this connection have been removed.
15. All plants shall be handled so that the roots are adequately protected at all times. During shipment all plants shall be properly protected by a tarpaulin or other suitable covering.

    No plants shall be so bound with rope or wire at any time so as to damage the bark, break branches, or destroy its natural shape. All balled and burlapped plants which cannot be planted immediately on delivery shall be set on the ground and well protected with soil or other acceptable material including watering. Until planted, all material shall be properly maintained.

2.3 STORAGE OF MATERIAL

A. Materials such as fertilizers, ground limestone, etc. shall be stored in weatherproof storage areas and in such a manner that their effectiveness will not be impaired.

PART 3 - EXECUTION

3.1 PREPARATION

A. Equipment:
   1. Provide all equipment necessary for the proper preparation of the ground surface and for the handling and placing of all required materials.
   2. Demonstrate to the Engineer that the equipment will apply materials at the specified rates.

B. Subsoil Preparation:
   1. Before spreading topsoil, the subgrade shall be raked by approved means. Remove all stones greater than four inches and all debris or rubbish to a depth of six inches. Such materials shall be removed from the site.

C. Screening:
   1. All topsoil shall be screened clear of all stones greater than one inch, sticks, plants, and all other foreign materials before being spread.
   2. During the screening of topsoil, commercial fertilizers and lime as required by the soil analysis shall be mixed with the topsoil so that they are evenly distributed throughout the screened topsoil.
   3. At the completion of this operation, topsoil is referred to as improved topsoil for the purpose of this specification and the Drawings.

3.2 SEED AND SOD BED PREPARATION

A. Spread improved topsoil uniformly over subgrade and all areas where the existing grade has been changed and areas disturbed by construction operations except for those areas indicated on the site plans to be paved. No subsoil, topsoil, or improved topsoil shall be handled in any way when in a wet or frozen condition.

B. Fine rake surface to receive seed or sod.

C. After natural settlement and a light rolling, the completed work shall conform to the lines, grades, pitches, and spot elevations shown on the plans.

D. Seeding may be done immediately thereafter, provided the seed bed has remained in a good friable condition and has not become wet.

3.3 SEASON

A. Do all seeding work within the dates herein specified.

B. If special conditions exist which may warrant a variance in the above dates, submit a written request to the Engineer stating the conditions and proposed variance. Permission for the variance will be given if, in the opinion of the Engineer, the variance is warranted.

C. If seeding is authorized between May 15 and August 15, annual rye shall be sown separately in addition to the specified seed mix. Sow at the rate of six to eight pounds per 1000 square feet.

3.4 SEEDING AND SODDING

A. Immediately before seeding and sodding, the ground shall be restored as necessary to a loose friable condition by discing or other approved method to a depth of not less than

two inches. The surface shall be cleared of all debris and of all stones one inch or more in diameter.

B. Seed all areas to be seeded with the specified grass seed, sowing evenly with an approved mechanical seeder at the rate specified in the seed mix schedule. Sow one half the seed in one direction and the other half at right angles to the first seeding. Cultipacker or approved similar equipment may be used to cover the seed and to firm the seed bed in one operation. In areas inaccessible to Cultipacker, the seeded ground shall be lightly raked and rolled in two directions with a water ballast roller. Extreme care shall be taken during seeding and raking to insure that no change shall occur in the finished grades and that the seed is not raked from one spot to another.

C. The hydraulic spray method of sowing seed may be used where approved by the Engineer. This work shall be done with an approved machine operated by a competent crew. Seed and fertilizing materials shall be mixed with water in the tank of the machine and kept thoroughly agitated so the materials are uniformly mixed and suspended in the water at all times during operation. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates. If the Engineer finds the application uneven or otherwise unsatisfactory, he may require the hydraulic spray method to be abandoned and the balance of the work done as specified herein. Seed must be lightly raked into the surface of the soil unless seeding is to be followed within 24 hours by mulching.

1. Applying Mulch - At the option of the Contractor, any of the following types of mulch material may be applied.
    a. Hay or straw mulch shall be spread evenly and uniformly over the designated areas. Unless other directed, mulch shall be applied to a thickness of 1". Too heavy application of mulch shall be avoided and lumps and thick spots shall be thinned. Unless otherwise authorized, the mulch shall be anchored in place by uniformly applying an asphalt mulch binder. Application of a concentrated stream of mulch binder will not be allowed. Asphalt mulch binder may be omitted when authorized by the Engineer and when there is a danger of the asphalt contaminating the surface of nearby structures, houses, vehicles, or other objects. Other methods of anchoring mulch may be used subject to the approval of the Engineer.
    b. Wood fiber mulch shall be applied as a water-borne slurry. The wood fiber and water shall be thoroughly mixed and sprayed on the area to be covered so as to form a uniform mat of mulch at the rate of not less than 30 pounds per 1,000 square feet unit of area. Wood fiber mulch may be mixed with the proper quantities of seed, fertilizer and lime as required in this section, or may be applied separately after seeding has been carried out. In the latter case, it must be applied within 24 hours after seeding.
2. Maintenance - The Contractor shall maintain the mulch by repairing any damaged mulch and by correcting any shifting of the mulch due to wind, water or other causes, until an acceptable growth of grass has been achieved, regardless of the acceptance status of the seeding. He shall supply additional mulch necessary as a result of damage or seed failure. Repairs to mulched areas and furnishing of additional mulch shall be incidental to this item. If wood fiber is used, any reseeding will require additional wood fiber mulch.

D. Do not perform broadcast seeding work during windy weather.

E. Compacting:

1. Compact the entire area immediately after the seeding operations have been completed.
2. Compact by means of a cultipacker, roller, or other equipment approved by the Engineer weighing 60 to 90 pounds per linear foot of roller.
3. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, use a pneumatic roller (not wobbly wheel) that has tires of sufficient size to obtain complete coverage of the soil.
4. When using a cultipacker or similar equipment, perform the final rolling at right angles to the prevailing slopes to prevent water erosion, or at right angles to the prevailing wind to prevent dust.

F. Thoroughly wet soil surfaces before sodding. Place sod pieces tightly together, tamping gently into position as the work progresses. After each area of sodding is completed, roll the entire surface in two directions with a water ballast roller, and soak the newly sodded areas.

G. After the grass has started, all of the areas greater than five square feet which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass.

H. At the time of the first cutting, set mower blades two inches high. All lawns shall receive at least two mowings before acceptance. Schedule for mowing shall be coordinated with the Engineer.

I. Maintenance shall also include all temporary protection fences, barriers and signs and all other work incidental to proper maintenance.

J. Maintain grass areas until a full stand of grass is indicated, which will be a minimum of 45 days after all seeding or sodding work is completed, and shall not necessarily relate to Substantial Completion of the General Contract.

K. Protection and maintenance of grass areas shall consist of watering, weeding, cutting, repair of any erosion and reseeding as necessary to establish a uniform stand of the specified grasses, and shall continue until Acceptance by the Engineer of the work of this section. It shall also include the furnishing and applying of such pesticides as are necessary to keep grass areas free of insects and disease. All pesticides shall be approved by Engineer prior to use.

3.5 SEEDING AND SODDING INSPECTION FOR PROVISIONAL ACCEPTANCE

A. The Engineer shall inspect all work for Provisional Acceptance upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.

B. Upon completion and reinspection of all repairs or renewals necessary in the judgment of the Engineer, the Engineer shall certify in writing to the Owner as to the Provisional Acceptance of the work of this section.

C. Upon approval of the Provisional Acceptance by the Owner, the Owner will assume maintenance of the lawn areas.

3.6 GUARANTEE

A. The Contractor shall submit a written guarantee to the Engineer, after Provisional Acceptance of grass, covering reseeding of grass areas which do not survive through one full growing season after the date of Provisional Acceptance, at no cost to the Owner.

3.7 CLEAN-UP

A. Any soil or similar material which has been brought on to paved areas by hauling operations or otherwise shall be removed promptly, keeping these areas clean at all time.

B. Upon completion of work under this section all excess stones, debris, and soil resulting from work under this section, which have not previously been cleaned up, shall be removed from the project site.

3.8 PLANTING METHOD

A. The Contractor shall excavate plant pits, furnish and place all plants, and then maintain them in a satisfactory manner until final acceptance.

B. All pits shall be of size and shape as shown on the Drawings.

C. For tree and shrub planting, soil used for backfilling shall be improved topsoil as recommended by soil analysis, with the following additions:

1. For deciduous plants use a mixture of four parts topsoil and one part of manure.
2. For evergreen plants use a mixture of four parts topsoil and one part of peat moss as specified under Soil Enrichers.

D. Plant pits within or near paved areas shall be prepared prior to the laying of the pavement. Where tree pits in paved areas are to be covered with mulch, trees shall be placed at sufficient depth below finished grade to allow for the depth of the mulch.

E. Plants shall be set plumb and straight, and at such a level that after settlement, a normal or natural relationship of the crown of the plant with the ground surface is established. Each plant shall be planted in the center of the pit. When balled, burlapped and platformed plants are set, the platform shall first be removed from the pit and the soil shall be carefully tamped under and around the base of each ball to fill all voids. All burlap, ropes, and wires shall be removed from the sides and tops of balls, but no burlap shall be pulled out from under the balls, except for plastic burlap, which shall be completely removed from the pit.

F. All seals shall remain unbroken and visible on plant material until final inspection by Engineer. The Contractor shall remove all seals immediately after final inspection.

3.9 PLANTING SEASON

A. Do all planting work within the dates herein specified.

3.10 PRUNING, PAINTING, SPRAYING

A. Pruning:

1. Each tree and shrub planted shall be pruned to preserve the natural character of the plant and in a manner appropriate to the particular requirements of the landscape design. In general, approximately one third of the wood shall be removed by thinning or shortening branches, but no leaders shall be cut.
2. All pruning shall be done with sharp tools. All pruning cuts shall be made flush and clean, especially where lower branches have been removed from collected trees.

B. Painting:

1. Pruning cuts over one-half inch in diameter shall be painted with tree paint specified under "Materials" on all exposed cambium as well as other exposed living tissues.

3.11 STAKING

A. All staking shall be done immediately after wrapping. Stakes shall be driven perpendicular into the ground around the periphery of the ball of the tree. Plants shall stand plumb after staking.

3.12 WATERING

A. Plantings shall be watered in a satisfactory manner during and immediately after planting, not less than twice per week, until provisional acceptance.

B. Suitable water for maintaining plants shall be provided by the Owner. The Contractor shall furnish the hose and hose connections from the outlets where water is furnished. Contractor is responsible for all watering until provisional acceptance.

3.13 MAINTENANCE

A. Maintenance shall begin immediately after each plant is planted. Plants shall be watered, mulched, weeded, fertilized, cultivated and otherwise maintained and protected until provisional acceptance.

B. Guys shall be tightened and repaired. Defective work shall be corrected as soon as possible after defects become apparent, and weather and season permit.

3.14 TREE SURGERY

A. Existing trees shall be trimmed of all dead and diseased limbs at the direction of the Engineer. All cuts shall be made close to the trunk and those over one inch in diameter shall be covered with an acceptable tree paint manufactured for this specific purpose. In the case of important large trees where a small amount of cavity work would prolong their lives, such work should be done. The services of a qualified tree surgeon are recommended.

3.15 INSPECTION AND PROVISIONAL ACCEPTANCE

A. The Engineer will inspect all planting work for provisional acceptance upon request of the Contractor.

B. The Contractor shall furnish full and complete written instructions for maintenance of the planting to the Owner at the time of provisional acceptance.

C. After all necessary corrective work has been completed and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the planting.

3.16 GUARANTEE PERIOD

A. All plants shall be guaranteed by the Contractor for a period of not less than one full year from time of provisional acceptance.

B. At the issuance of provisional acceptance, the Owner shall take over maintenance of the planting. Nevertheless, the guarantee of all plant material will remain with the Contractor. The Contractor shall ascertain that the Owner properly waters and maintains all planting during the one year guarantee period.

C. At the end of the guarantee period, any plant that is missing, dead, not true to name or size as specified, or not in satisfactory growth, as determined by the Engineer, shall be replaced. In case of reasonable doubt or question regarding the condition and satisfactory establishment of a rejected plant, the Engineer may allow such a plant to remain through another complete growing season, at which time the rejected plant, if found to be dead, in an unhealthy or badly impaired condition, shall be replaced at once. The

Contractor will not be required to replace an inspected and accepted plant more than once.

D. Replacements shall be plants of the same kind and size as specified in the Plant List. They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor, except where it can be definitely shown that loss resulted from Owner's failure to maintain planting as instructed.

3.17 FINAL INSPECTION AND FINAL ACCEPTANCE

A. At the end of the guarantee period, inspection will be made by the Engineer, at the request of the Contractor.

B. After all necessary corrective work has been completed, the Engineer will certify in writing the final acceptance of the planting.

3.18 CLEAN UP

A. Upon completion of work under this section, all excess stones, debris and soil resulting from planting work shall be removed from project site. The site shall be restored to a better condition than was present prior to construction.

END OF SECTION

SECTION 02510

CEMENT CONCRETE SIDEWALKS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: This work shall consist of the construction of new cement concrete sidewalks and driveways including curb ramps in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the Drawings or established by the Engineer.

B. Related Work Specified Elsewhere: (When Applicable) Earthwork, aggregate base and subbase, bituminous concrete paving, cast-in-place concrete and granite curbs are specified in the appropriate sections in this Division.

1.2 RELATED DOCUMENTS

A. State of Massachusetts Department of Transportation Standard Specifications for Highways and Bridges, latest edition, herein after referred to as MassDOT Specifications.

1.3 QUALITY ASSURANCE

A. Materials: Use only materials furnished by a bulk cement concrete producer regularly engaged in the production of portland cement concrete.

B. Submittals: A certificate of compliance shall be furnished to the Engineer that the materials supplied comply with the specification requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The portland cement concrete shall conform to the requirements of AASHTO M85 Type II with a moderate heat of hydration and with the following exceptions:

1. The autoclave expansion shall be limited to a maximum of 0.20 percent.
2. There will be no requirements for tensile strength.

Only one brand of cement shall be used on any one contract unless otherwise permitted, in writing, be the Engineer.

B. The welded wire fabric for reinforcement shall be installed at all driveways and curb ramps and shall conform to the requirements of AASHTO M55-73, unless otherwise specified.

C. The premolded expansion joint material shall be non-extruding and resilient bituminous type and shall conform to the requirements of AASHTO M213.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavation shall be to the depth and width that will permit the installation and bracing of the forms. The foundation shall be shaped and compacted to a firm even surface conforming to the section shown on the plan. All soft and yielding material shall be removed and replaced with acceptable material.

3.2 FORMS

A. Forms shall be of wood or metal and shall extend for the full depth of the concrete. All forms shall be true, free from warp and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.

3.3 PLACING CONCRETE

A. The foundation shall be thoroughly moistened immediately prior to placing the concrete. The proportioning, mixing and placing of the concrete shall be in accordance with good construction practices, as stated in the requirements of the MassDOT specifications Section 701 - Sidewalks, Wheelchair Ramps and Driveways.

B. Driveways and curb ramps shall be constructed to a 6-inch depth with welded wire fabric extending 2-feet beyond the driveway and curb ramp flares and ramps.

3.4 FINISHING

A. The surface shall be finished to produce a broom like pattern.

B. No plastering of the surface with mortar will be permitted.

3.5 JOINTS

A. Joints shall be located as shown on the plans. Slabs shall be placed alternately and the joints coated with an approved bituminous material before placing the adjacent slab.

B. When a concrete sidewalk is constructed adjacent to a curb, building, retaining wall, light pole base or other fixed structure, a 1/4 inch thick premolded joint filler shall be used between the slab and the structure.

3.6 CURING

A. Concrete shall be cured for at least 72 hours. Curing shall be by moist burlap or mats, white pigmented curing compound or by other approved methods. During the curing period, all traffic, both pedestrian and vehicular, shall be excluded. Vehicular traffic shall be excluded for such additional time as may be directed.

END OF SECTION

SECTION 02513

BITUMINOUS CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Furnish all plant, labor, equipment and materials required to install bituminous concrete pavement courses, including sidewalks, driveways, temporary and permanent trench paving and restoration of pavement markings as shown on the Drawings and as specified herein.
   2. Remove bituminous asphaltic and/or Portland cement pavement, and replace bituminous asphaltic pavement, base, binder courses and surface courses, including temporary pavement, within the area(s) shown on the Drawings and as directed by the Engineer.
   3. Keep pavement removal to a minimum width suitable for the required construction.
   4. Apply pavement markings to the permanent paving as specified.

B. Work Not Included: Removal and replacement of paving for the convenience of the Contractor will not be considered for payment.

C. Related Work Specified Elsewhere (When Applicable):
   1. Excavation, backfill, aggregate base and subbase.

1.2 QUALITY ASSURANCE

A. Materials: Use only materials furnished by a bulk bituminous concrete producer regularly engaged in the production of hot mixed, hot laid bituminous concrete.

B. Equipment: Provide, maintain and operate pavers, dump trucks, tandem, 3-wheel and pneumatic tired rollers well suited to the mixtures being placed. Provide, maintain and operate hand equipment as required. When applicable, provide, maintain and operate trimming equipment and materials.

C. Mix Requirements, Method of Placement and Compaction: The Commonwealth of Massachusetts, Department of Transportation Standard Specifications - Highways and Bridges, 1988 hereinafter called Massachusetts D.O.T. Standards, for mixing, placing and compacting bituminous concrete surfaces are applicable to this work.

1.3 SUBMITTALS

A. A certificate of compliance shall be furnished to the Engineer that the materials supplied comply with the specification requirements.

B. Delivery slips shall be furnished with each load of mix delivered to the project. Information shall include:
   1. Vehicle identification.
   2. Date.
   3. Project.
   5. Identification of material.
   6. Gross, tare and net weights.
   7. Signed by the bituminous concrete producer.
   8. Stamped by a licensed public weighmaster.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Class 1 Bituminous Concrete.

1. General - These mixtures shall be composed of mineral aggregate, mineral filler, if required, and bituminous material.
2. Composition of the mixture - The mineral aggregates, filler, if required, and bituminous material shall be proportioned and mixed as hereinafter specified to conform with the composition by weight tabulated in Table A, herein. Sufficient approved mineral filler shall be used to correct any deficiencies in grading of fine aggregate.
3. Job Mix Formula - The composition limits in Table A are master ranges of tolerances of materials in general. In order to obtain standard texture, density and stability, the Contractor will furnish to the Engineer a specific job mix formula for the particular uniform combination of materials and sources of supply to be used on each project. The job mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size, a single percentage of bituminous material to be added to the the aggregate and the number of seconds for dry mixing time and the number of seconds for wet mixing time. AASHO-T195 (Ross Count) with a coating factor of 98% will be used when necessary to evaluate proper mixing time. The job mix formula shall also specify a single source of uniform blend of particular sources for fine aggregate, a single source of supply for mineral filler and for asphalt. Two or more job mix formula may be approved for a particular plant; however, only material conforming to one job mix formula will be permitted to be used on any given calendar day. The job mix formula shall bind the Contractor to furnish paving mixtures not only within the master ranges, but also conforming to the exact formula thus set up for the project, within allowable tolerances as follows:

Asphalt	±0.4%
No. 4 and larger sieves	±7.0%
No. 8 and smaller sieves*	±4.0%
*Except passing No. 200 sieve	±2.0%

4. Asphalt cement shall be:
   AC-5
   AC-10
   AC-20
   AC-40

TABLE A
*PERCENT BY WEIGHT
PASSING
SQUARE OPENING SIEVES

Standard Sieves	Base Course	Binder Course	Surface Course	**Dense Mix	Surface Treatment	***Patching Mix
2"	100					
1½"	90-100					
1"	65-90	100				
¾"	55-80	80-100				
½"	40-65	55-80	100	100		100
3/8"		80-100	80-100	100	90-100	
No. 4	20-45	28-50	50-76	55-80	80-100	50-65
8	15-33	20-38	37-54	48-63	64-85	24-36
16			26-40	36-49	46-68	14-28
30	8-17	8-22	17-31	24-38	26-50	8-25
50	4-12	5-15	10-23	14-27	13-31	5-21
100			6-16	6-18	7-17	3-15
200	0-4	0-5	2-7	4-8	3-8	2-8
Bitumen	4-5	4.5-5.5	5.5-7.0	7-8	7-8	4-6

* Percentages shown in table above for aggregate sizes are stated as proportional percentages of integral total aggregate for the mix.

** Dense mix including approved anti-stripping compound shall be furnished and used for protective (bottom) courses of pavement on bridges, and elsewhere shown on the plans.

*** Patching mix shall include 1% of hydrated lime based on weight of total aggregate.

No job mix formula will be approved which specifies:
More than 45% passing No. 8 for Top Course.
More than 55% passing No. 8 for Dense Mix.
Less than 4% passing No. 200 for Top Course.

Should a change of sources of materials be made, a new job mix formula shall be established by the Contractor before the new material is used. When unsatisfactory results or other conditions make it necessary, the Engineer may establish a new job mix formula.

The aggregate will be accepted in stockpile at the plant site. The bituminous material will be accepted on certification.

If the Contractor elects to furnish bituminous concrete from more than one plant, the job mix formula must be adhered to be all plants.

B. Mineral Filler:
   1. Limestone dust, portland cement, or other inert material complying with ASTM D 242 or AASHTO M 17.

C. Tack Coat:
   1. Emulsified type, Grade RS-1, CRS-1, HFMS-1, CSS-1, 1h

D. Pavement markings shall conform to AASHTO Desingation M248-74 for ready-mixed white and yellow traffic paints.

PART 3 - EXECUTION

3.1 GENERAL

A. Grade Control:
   1. The Contractor shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

B. Trench areas shall receive initial paving as the work progresses where trenches are in paved streets. Not more than 300 linear feet of backfill trench shall be left unpaved.

C. Reset all existing manholes to finished grade as required at no additional cost to the Owner.

3.2 PAVEMENT REMOVAL

A. General:
   1. Exercise extreme care in the removal of pavement so that pavement will not be unnecessarily disturbed or destroyed.
   2. Mechanically cut pavement to be removed to a straight line, unless otherwise directed by the Engineer.

3.3 SURFACE PREPARATION

A. Tack coats shall conform to the Mass. D.O.T. Standard Specifications.

B. Tack Coat:
   1. Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.05 to 0.15 gallons per square yard of surface.

3.4 PLACING THE MIX

A. General:
   1. Place asphalt concrete mixture on prepared surface. Minimum allowable temperature for placing is 250°F. Maximum shall be 325°F. Place in areas inaccessible to paving machine and small areas by hand. Place each course to required grade, cross-slope and compacted thickness.

B. Protection:
   1. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened to the extent that the pavement will not be damaged.

3.5 PAVEMENT MARKINGS

A. Material, approved by the Engineer, is to be furnished and applied after the installation of permanent paving.

B. Apply pavement markings in accordance with existing markings. Match paint color, marking dimensions, layout and other details with existing markings in the vicinity of the project.

END OF SECTION

SECTION 02525

GRANITE CURBS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: This work shall consist of furnishing and installing curb, curb corners, curb inlets or edging, or removing and relaying existing curbing, curb corners, curb inlets or edging in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the Drawings or established by the Engineer. The types of curbs are designated as follows:
VA-4 - Vertical granite curb
Sloped granite edging
Granite Curb Inlets
Granite Curb Corners

B. Related Work Specified Elsewhere: Excavation and Embankment, Aggregate Base and Subbase, Bituminous Concrete Paving and Landscaping are specified in the appropriate Sections of this Division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
1. The stone for curbing and edging shall be hard, durable, quarried granite.
2. It shall be gray in color, free from seams, cracks or other structural defects and shall be of smooth splitting character.
3. The curb may contain natural color variations that are characteristic of the granite source.
4. The dimensions, shape and other details shall be as shown on the Drawings.

B. Source:
1. The Contractor shall submit for approval the name of the quarry which is the proposed source of the granite for curb materials.
2. Samples shall be submitted for acceptance by the Engineer when requested.

C. Finish and Surface Dimensions:
1. Vertical Curb, VA-4:
a. The individual curb stones shall conform to the dimensions indicated on the Drawings and the MassDOT Standard Specification Section M9.04.
b. Individual stones shall be furnished in minimum lengths of 6 feet, unless otherwise specified.
c. The exposed face of the stone curb shall be free from indications of drill holes. Half drill holes not larger than 3/4 inches diameter will be permitted in the arris line in the plane of the back.
d. The top surface shall be sawed or dressed to an approximately true plane with no depression or projection on that surface of over 1/8 inch.
e. The top front arris line shall be pitched straight and true with no variations from a straight line greater than 1/4 inch.

f. The top back arris line shall meet the same requirement as the top front arris except that indentations of a maximum of 3/8 inch will be allowed.
g. There shall be no projection or depression on the back face which would exceed a batter of 1 horizontal on 3 vertical for a distance from the top of 3 inches.
h. The front face shall be at right angles to the top and shall be smooth split and have no projections greater than one inch or depressions greater than 1/2 inches, measured from the vertical plane of the face through the top arris line, for a distance down from the top of 8 inches. The remainder of the face shall have no projections or depressions greater than one inch measured in the same manner.
i. The ends of the curb shall be approximately square with the planes of the top, back and face and so finished that when the sections are placed end to end with the required minimum spacing of 1/4 inch no more than 5/8 inch space shall show in the joint for the full width of the top surface and for the entire exposed front face. The remainder of the end may extend back no more than 8 inches from the plane of the joint.
j. The bottom surface may be sawn or split.
k. Drill holes through the curb will be allowed providing they are at least 9 inches below the top and are mortared full with portland cement mortar before placing the stone.

1. When curbing is specified on the Drawings with a radius of 60 feet or less, it shall be cut on the specified radius.
2. Curb Inlets: Inlets used at catch basins shall conform to the applicable requirements of Vertical Curb, VA-4, and to the shape, dimensions and details as shown on the Drawings and the MassDOT Standard Specification Section M9.04.
3. Curb Corners: Curb corners shall be used at driveway locations and shall conform to the applicable requirements of Vertical Curb, VA-4, and to the shape, dimensions and details as shown on the Drawings and the MassDOT Standard Specification Section M9.04.
4. Sloped Edging, Type 5:
   a. The individual edging stones shall conform to the dimensions indicated on the Drawings and the MassDOT Standard Specification Section M9.04.
   b. Individual stones shall be furnished in minimum lengths of two (2) feet, unless otherwise specified.
   c. The exposed face shall be smooth split to an approximate true plane having no projections or depressions which will allow over one (1) inch to show between a two (2) foot straightedge and the face when the straightedge is placed as closely as possible on any part of the face.
   d. Half drill holes not more than three (3) inches in length and 3/4 inch in diameter will be permitted along the bottom.
   e. The arris line, top front shall be straight and true with no variation from a straight line greater than 1/8 inch.
   f. The arris lines at the bottom of the face shall be straight and true so that not over one (1) inch shall show between the stone and a straightedge for the full length of the stone.

g. The ends shall be square to the length at the face and so finished that when the stones are placed end to end, no space more than 1 1/2 inches will show in the joint for the width of the face.

h. When sloped edging is specified on the Drawings with a radius of thirty (30) feet or less, it shall be cut on the specified radius.

5. Terminal curb, Type 1: Shall meet the requirements of Vertical Curb, Type 1 as contained herein.

D. Joint Mortar:

1. Shall consist of one (1) part portland cement and two (2) parts sand and mixed with sufficient water to form a plastic composition.
2. The portland cement shall conform to AASHTO M85, Type II-A.
3. The sand shall consist of the following gradation:

100% Passing the No. 8 sieve
15-40% Passing the No. 50 sieve
0-10% Passing the No. 100 sieve
0-5% Passing the No. 200 sieve

PART 3 - EXECUTION

3.1 REMOVAL OF CURBING

A. The Contractor shall carefully remove, store and clean curb specified on the Drawings or designated for resetting.

B. Curbing damaged or destroyed, as a result of the Contractor's operations or because of his failure to store and protect it in a manner that would prevent loss or damage, shall be replaced with curbing of equal quality at the Contractor's expense.

3.2 EXCAVATION

A. Excavation shall be made to the required depth and base material upon which the curb is to be set shall be compacted to a firm, even surface.

B. All soft and unsuitable material shall be removed and replaced with suitable material which shall be thoroughly compacted.

3.3 INSTALLATION

A. The curb and sloped edging shall be set so that the front top arris line is in close conformity to the line and grade required.

B. All space beneath the curbing shall be filled and thoroughly tamped with material meeting the requirements of the bed course material.

3.4 JOINTS

A. The required spacing between stones shall be a minimum of 1/4 inch and a maximum of 5/8 inch for Type 1 curb.

B. The required spacing between stones shall be a maximum of 1/2 inch for Type 5 curb.

C. Joints between stones shall be carefully filled with mortar along the back portion of the joint to prevent loss of backfill material.

3.5 BACKFILLING

A. After the joints have set, any remaining excavated areas shall be filled and tamped with approved material placed in eight (8) inch layers.

3.6 CURB INLETS

A. Curb placed adjacent to curb inlets shall be installed with steel dowels cemented into each stone with epoxy grout.

END OF SECTION

SECTION 02577

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. This work shall consist of providing final reflective pavement lines and markings during paving operations to match existing conditions and/or as shown on the plans. It shall also consist of providing temporary pavement markings during construction.

1.2 SUBMITTALS

A. Submit shop drawings in accordance with general conditions of the construction contract.

PART 2 - PRODUCTS

2.1 MATERIALS -PAINT

A. Paint shall conform to Massachusetts Highway Department (MHD) specifications for Fast Drying White Water-borne Traffic Paint M7.01.23 and Fast Drying Yellow Water-borne Traffic Paint M7.01.24.

B. Glass spheres (beads) used to reflectorize paint shall conform to Massachusetts Highway Department (MHD) specifications Glass Beads M7.01.07.

PART 3 - EXECUTION

3.1 GENERAL

A. Contractor is to replace all pavement markings disturbed by the construction.

B. Markings shall be applied only in seasonable weather and in accordance with good painting practices. The surface shall be dry and free from sand, grease, oil or other foreign substances prior to application. Paint and pavement marking material shall be heated to the Manufacturer's recommended temperature. Ambient air temperature shall be a minimum of 45^{o}F and rising.

C. The paint shall be applied at the rate of between 300 and 350 linear feet per gallon for four (4) inch wide stripes and the glass spheres (beads) shall be applied by the drop-on method at the rate of six (6) pounds to each gallon of paint. Beads applied to reflectorized paint pavement arrows may require an increased application rate. The beads shall be distributed in even application over the entire paint surface.

D. The paint shall be done in a workmanlike manner, with lines well defined and without deviations. When repainting existing lines, the new line shall follow the exact pattern of the old lines and when new measurements are necessary, they shall be exact.

E. The Contractor shall provide all materials, equipment, labor, protective devices, and warning signs necessary to the safe and efficient performance of the work and the safety of the traveling public.

F. Contractor is to protect pavement markings from traffic until markings are sufficiently dry.

END OF SECTION

SECTION 02601

MANHOLES, COVERS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Construct manholes, covers, frames, brick masonry, inverts and apply waterproofing in conformance with the dimensions, elevations, and locations shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere (when applicable):
   1. Final sewer testing is specified in this Division.
   2. Pipe, excavation, backfill, paving and dewatering are specified in the appropriate Sections in this Division.
   3. Concrete and grout are specified in Division 3.

1.2 QUALITY ASSURANCE

A. Precast Manhole Base, Barrel and Top Sections:
   1. Conform to ASTM C478-97 except as modified herein, and on the Drawings.
   2. Average strength of 4,000 psi at 28 days.
   4. Testing:
      a. Determine concrete strength by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
      b. Have tests conducted at the manufacturer's plant or at a testing laboratory approved by the Engineer.
      c. Have not less than 2 tests made for each 100 vertical feet of precast manhole sections.

B. Manhole Steps
   1. Conform to ASTM C478-06 for load carrying capacity and pull out resistance.
   2. Acceptable Manufacturers:
      a. Parson Environmental Products, Inc.
      b. M. A. Industries, Inc.
      d. Or equivalent.

C. Frames and Covers:
   1. Acceptable Manufacturers:
      a. East Jordan Iron Works
      b. Neenah Foundry Company.
      c. Or equivalent.

D. Masonry:
   1. Brick: Shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick.
   2. Cement: ASTM C-150.
   3. Hydrated Lime: ASTM C-207
   4. Sand: ASTM C144

E. Waterproofing:
   1. Acceptable Manufacturers:
      a. Karnak #220 AF Fibered Emulsion Dampproofing, Karnak Corp., Clark, NJ.

b. PPS 922 Superseal, International Precast Supply.
c. Or approved equal.

1.3 SUBMITTALS TO THE ARCHITECT/ENGINEER

A. Submit shop drawings and manufacturer's literature in conformance with Section 01340 and the Standard General Conditions of the Construction Contract.
B. Precast Manhole Sections: Submit test results and receive approval from the Engineer prior to delivery to the site.

PART 2 - PRODUCTS

2.1 PRECAST MANHOLE SECTIONS

A. Dimensions, shall be as shown on the Drawings:
1. Base & Riser Sections:
a. Diameter: As shown on the Drawings.
b. Length: As required.
c. Wall Thickness: Not less than 5 inches.
d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
2. Tops:
a. Diameter: Eccentric cone type, 24 inches I.D. at top, 48 inches I.D. at bottom unless otherwise shown on the Drawings.
b. Length: 4 feet.
c. Wall thickness: Not less than 5 inches at the base, tapering to not less than 8 inches at the top.
d. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
e. Exterior face of cone sections shall not flare out beyond the vertical.
3. Flat Slab Tops:
a. Location: Where shallow installations do not permit the use of a cone-type top and where indicated on the Drawings.
b. Slab thickness: Not less than 6 inches.
c. Constructed to support an HS-20 wheel loading.

B. Openings:
1. Provide openings in the risers to receive pipes entering the manhole.
2. Make openings at the manufacturing plant.
3. Size: To provide a uniform annular space between the outside wall of pipe and riser.
4. Location: To permit setting of the entering pipes at the correct elevations.
5. Openings shall have a flexible watertight union between pipe and the manhole base.
a. Cast into the manhole base and sized to the type of pipe being used.
b. Type of flexible joint being used shall be approved by the Engineer. Install materials according to the Manufacturer's instructions.
1. Lock Joint Flexible Manhole Sleeve made by Interpace Corporation.
2. Kor N Seal made by National Pollution Control System, Inc.
3. Press Wedge II made by Press-Seal Gasket Corporation.

4. A-Lok Manhole Pipe Seal made by A-Loc Corporation.
5. Or equivalent.

C. Joints:
1. Joint gaskets to be flexible self seating butyl rubber joint sealant installed according to manufacturer's recommendations. Install a double row of joint sealants for every manhole joint. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer.
   Acceptable Materials:
   a. Kent-Seal No. 2
   b. Ram-Nek
   c. Or equivalent.
2. Joints between precast sections shall conform to related standards and manufacturer's instructions.
3. All manholes greater than 6 ft. diameter and all manholes used as wet wells, valve pits and other dry-pit type structures shall be installed with exterior joint collars. The joint collar shall be installed according to the manufacturer's instructions. Acceptable materials:
   a. MacWrap exterior joint sealer as manufactured by Mar-Mac Manufacturing Company.
   b. Or equivalent.

D. Waterproofing:
1. The exterior surface of all manholes shall be given two coats of waterproofing material at a application rate as recommended by the manufacturer.
2. The coating shall be applied after the manholes have cured adequately and can be applied by brush or spray in accordance with the manufacturer's written instruction.
3. Sufficient time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

E. Frost Protective Wrapping:
1. The frost protective wrap shall be constructed of an ultraviolet resistant polyethylene material and shall be a minimum thickness of 6 mils.

2.2 FRAMES AND COVERS

A. Standard Units:
1. Made of cast iron conforming to ASTM A48-76, Class 30 minimum.
2. Have machined bearing surfaces to prevent rocking.
3. Castings shall be smooth with no sharp edges.
4. Constructed to support an HS-20 wheel loading.
5. Dimensions and Style shall conform to the Drawings, Standard castings differing in non-essential details are subject to approval by the Engineer:

   a. Covers -solid with “SEWER” or “DRAIN” in 3-inch letters diamond pattern.
   b. Frame - 24-inch diameter clear opening, with flange bracing ribs.
6. Minimum weight of frame and cover shall be 370 lbs.

B. Water Tight Units:
1. Same features as above for Standard Units, with 22-inch diameter minimum clear opening.
2. Sealing features:

a. Inner lid held by a bronze tightening bolt in a locking bar.
b. Neoprene gasket
c. Water tight pick hole.

3. Minimum weight of frame and cover shall be 510 lbs.

2.3 MANHOLE STEPS

A. Polyethylene coated steel safety type designed with a minimum concentrated live load of 300 pounds.
B. Thoroughly clean all surfaces to be embedded with a suitable cleaning agent to ensure that the surfaces are free from all foreign matter such as dirt, oil and grease.
C. The steps shall become thoroughly dry before being placed into the concrete.
D. All steps shall be cast into walls of the precast section so as to form a continuous ladder with a distance of 12-inches between steps.

2.4 MASONRY

A. Brick:
   1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
   2. Immediately remove rejected brick from the work.
B. Mortar:
   1. Composition (by volume):
      a. 1 part portland cement.
      b. 1/2 part hydrated lime.
      c. 4-1/2 parts sand.
   2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.
C. Cement shall be Type II portland cement.
D. Hydrated lime shall be Type S.
E. Sand:
   1. Shall consist of inert natural sand.
   2. Grading:

Sieve	Percent Passing
No. 4	100
No. 8	95-100
No. 16	70-100
No. 30	40-75
No. 50	10-35
No. 100	2-15
No. 200	0-5

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Manhole Sections:

1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
2. Install riser sections and tops level and plumb.
3. Make all joints watertight.
4. When necessary, cut openings carefully to prevent damage to barrel sections and tops. Replace damaged manhole sections and tops at no additional cost to the Owner.
5. When manhole steps are included in the Work, install barrel sections and tops so that steps are in alignment.

B. Drop Manholes:
1. The difference in elevation between the invert of the inlet pipe and outlet pipe is to be either less than 6-inches (which does not require a drop manhole) or more than 24-inches (which does require a drop manhole).
2. Where difference in elevation between the invert of the inlet pipe to the invert of the outlet pipe exceeds 24 inches, construct a drop manhole as shown on the Drawings or as directed by the Engineer.

C. Adjust to Grade:
1. Adjust tops of manholes to grade with brick masonry.
2. Concrete rings are not acceptable for adjusting to grade.

D. Pipe Connections to Manholes: Connect pipes to manholes with joint design and materials approved by the Engineer.

E. Invert Channels:
1. After manhole and all pipes entering or exiting the manhole have been installed, construct the invert channels and shelf.
2. Channels to be smooth and semicircular in shape conforming to the inside of the adjacent sewer section.
3. Make changes in direction of flow with smooth curves having a radius as large as permitted by the size of the manhole.
4. Stop the pipes at the inside face of the manhole where changes of direction occur.
5. Form invert channels and shelf with brick.
6. The maximum change in elevation from the invert of the inlet pipe to the invert of the outlet pipe is 6-inches. Shape invert to make smooth transition in vertical grade.
7. Slope the floor of the manhole (shelf) to the flow channel, as shown on the Drawings.

F. Masonry:
1. Laying Brick:
   a. Use only clean bricks in brickwork for manholes.
   b. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.
   c. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
   d. Construct all joints in a neat workmanlike manner. Construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
   e. Outside faces of brick masonry shall be plastered with mortar from ¼-inch to 3/8-inch thick.

f. Completed brickwork shall be watertight.

2. Curing:
   a. Protect brick masonry from drying too rapidly by using burlaps which are kept moist, or by other approved means.
   b. Protect brick masonry from the weather and frost as required.

G. Frames and Covers:
1. Set all frames in a full bed of mortar, true to grade and concentric with the manhole opening.
2. Completely fill all voids beneath the bottom flange to make a watertight fit.
3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the manhole all around its circumference.
4. Clean the frame seats before setting the covers in place.

H. Plugging and Patching:
1. Fill all exterior cavities with non-shrink grout and with bituminous waterproofing once the concrete and mortar has set.
2. Touch up damaged water proofing.

I. Cleaning:
1. Thoroughly clean manholes, steps, frames and covers of all debris and foreign matter.

J. Bedding and Backfilling:
1. Bedding of manholes shall be 6 inches of 3/4" screened stone.
2. Backfill a minimum of 18 inches all around manhole with gravel borrow.

K. Frost Protective Wrap:
1. The Contractor shall comply with the manufacturer's instructions for the particular conditions of installations in each case.
2. Clean each manhole exterior of all dirt and remove any sharp protrusions.
3. Apply two (2) 6-inch wide vertical strips of bituminous waterproofing material and/or duct tape from the top to bottom of the manhole per layer.
4. Prior to installing pipe through each manhole or valve pit, wrap each manhole to the maximum depth of frost penetration, but not less than 5 feet below grade, with four (4) layers of the polyethylene material by beginning the wrap at the adhesive strip and proceeding around the manhole, valve pit, etc., continuously by overlapping the adhesive strip by 24 inches on the final layer. Cut the polyethylene wrap in areas where piping exits the manhole. The size of the cut is to be equivalent to the pipes outside diameter.
5. Tuck and pleat the polyethylene wrap at the top of each manhole in a continuous manner, minimizing the size of each fold. Extend the polyethylene wrap past the top of the manhole frame and temporarily tuck the remainder inside the frame, until final backfill and paving.
6. In paved areas, cut the polyethylene wrap flush with the manhole rim after the pavement is in place.
7. In unpaved areas, pull the polyethylene wrap together, and tie around frame with galvanized wire.
8. Protect the installed frost barrier from harmful weather exposures and from possible physical abuses, where possible by prompt installation of concealing work or, where that is not possible, by temporary covering or enclosure.

9. Backfill around the manhole/frost barrier with material as outlined in Section 02200 - Earthwork.

3.2 MANHOLE TESTING

A. General:
   10. Perform either a vacuum test or a combination of the exfiltration and infiltation tests on all manholes. All testing must be performed in the presence of the Engineer.
   11. Suitably plug all pipes entering each manhole and brace plugs to prevent blow out.

B. Exfiltration Tests After Backfilling:
   1. Fill each manhole with water to the top of the manhole frame.
   2. A period of up to 2 hours may be permitted, if the Contractor so wishes, to allow for absorption.
   3. At the end of the absorption period, refill each manhole with water to the top of the manhole frame and begin the 4-hour test period.
   4. At the end of the 4-hour test period, refill each manhole to the top of the manhole frame and measure the volume of water added. The leakage for each manhole shall not exceed 1/16 gallon per foot of diameter per vertical foot (above ground water) per 4-hour period.

C. Infiltration Tests:
   1. When the groundwater is above the bottom of the manhole, infiltration testing may be performed on that portion of the manhole below water level.
   2. After a 15-minute period, if no water is visibly moving down the interior surfaces of a manhole, the portion of the manhole below groundwater may be considered to be satisfactorily watertight.
   3. The remaining portion above the groundwater level must be tested for exfiltration as specified above.

D. Vacuum Test:
   1. The manhole shall be tested by a vacuum test after assembly of the manhole, connection piping and backfilling. Vacuum testing to be conducted prior to construction of invert channels.
   2. Plug all lifting holes completely with non-shrink grout.
   3. Properly tighten all boot clamps and brace all plugs to prevent them from being sucked into the manhole.
   4. Install the testing equipment according to the manufacturer's instructions.
   5. A vacuum of 10 inches of Hg shall be drawn on the manhole and the loss of 1 inch of Hg vacuum timed. The manhole shall be considered to have passed the test if the time for the loss of 1 inch of Hg vacuum is:
      a. Not less than 2 minutes for manholes less than 10-feet deep.
      b. Not less than 2.5 minutes for manholes 10 to 15-feet deep.
      c. Not less than 3 minutes for manholes more than 15-feet deep.
   6. If the manhole fails the initial test, the Contractor shall locate the leak(s) and make repairs. The manhole shall be retested until a satisfactory test result is obtained.

E. Manhole Repairs:
   1. Correct leakage by reconstruction, replacement of gaskets and/or other methods as approved by the Engineer.

2. The use of lead-wool or expanding mortar will not be permitted.

F. After the manholes have been backfilled and prior to final acceptance, any signs of leaks or weeping visible inside the manholes shall be repaired and the manhole made watertight.

END OF SECTION

SECTION 02610

PIPE & PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish, install, support, and test pipe and pipe fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Work and materials shall be performed in accordance with the State Plumbing Code when work is within ten (10) feet of buildings.

1.2 SUBMITTALS

A. Submit shop drawings in accordance with Section 01340 and the General Conditions of the Construction Contract.

B. Submit manufacturer's "Certification of Conformance" that pipe and fittings and other piping appurtenances meet or exceed the requirements of these Specifications.

1.4 DELIVERY, STORAGE AND HANDLING

A. Exercise care during loading, transporting, unloading, and handling to prevent damage of any nature to interior and exterior surfaces of pipe and fittings.

B. Do not drop pipe and fittings.

C. Store materials on the project site in enclosures or under protective coverings in accordance with manufacturer's recommendations and as required by the Engineer.

D. Assure that materials are kept clean and dry.

E. Do not store materials directly on the ground.

F. Follow manufacturer's specific instructions, recommendations and requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials are specified in the following Sections in this Division.

B. All materials used in the work must be certified “lead free”.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.

B. Carefully inspect all materials at the time of delivery and just prior to installation.

C. Carefully inspect all pipe and fittings for:

1. Defects and damage.
2. Deviations beyond allowable tolerances for joint dimensions.
3. Removal of debris and foreign matter.

D. Examine areas and structures to receive piping for:

1. Defects, such as weak structural components that adversely affect the execution and quality of work.
2. Deviations beyond allowable tolerances for pipe clearances.

E. All materials and methods not meeting the requirements of this Contract will be rejected.
F. Immediately remove all rejected materials from the project site.
G. Start work only when conditions are corrected to the satisfaction of the Engineer.

3.2 INSTALLATION

A. General:
   1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations and as specified herein.
   2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
   3. Install adapters, acceptable to the Engineer, when connecting pipes constructed from different materials.

B. Installation in Trenches:
   1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
   2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
   3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
   4. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
   5. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade.
   6. Set the pipe true to line and grade.
   7. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
   8. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.
   9. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
   10. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
   11. Take all necessary precautions to prevent floatation of the pipe in the trench.
   12. Bedding and backfill for all pipe materials shall be as specified in Section 02200, Earthwork, and as shown on the Drawings.

C. Temporary Plugs:
   1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
   2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
   3. Do not use the pipelines as conductors for trench drainage during construction.

3.3 CLEANING AND TESTING

A. All cleaning and testing shall be performed as specified in Division 2.

END OF SECTION

SECTION 02612

REINFORCED CONCRETE PIPE AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Furnish and install reinforced concrete pipe and fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere:
   1. Manholes, Catch Basins, Excavation and Backfill are specified in the appropriate sections in this division.
   2. Pipe & Pipe Fittings - General is specified in Division 2.

1.2 QUALITY ASSURANCE

A. Reinforced-concrete pipe and fittings shall be manufactured by a reputable manufacturer with a minimum of five years experience in the design and fabrication thereof.

B. Standards:
   1. Pipe: AASHTO M170-79I unless otherwise specified herein.
   2. Gasket: AASHTO M198-75.
   3. Steel reinforcement: AASHTO M55-75.
   4. Portland cement: AASHTO M85-79I.

1.3 SUBMITTALS

A. Submit shop Drawings in accordance with the Standard General Conditions of the Construction Contract showing pipe dimensions, reinforcement, joint and other details prior to fabrication.

B. Submit certified copies of mill test reports for all tests as outlined for concrete pipe under AASHTO M170-79I.

1.4 DELIVERY, STORAGE AND HANDLING

A. Do not ship pipe units until they have aged for at least five days at an average minimum temperature of 60°F.

B. Prevent earth, water, and other material from entering the pipe at all times.

C. Furnish devices to permit satisfactory support of the pipe unit when it is lifted and handle each unit in a manner and by such means as recommended by the manufacturer.

1.5 FIELD QUALITY CONTROL

A. Acceptance will be on the basis of tests of materials, absorption tests, plant load bearing tests, pressure tests, and inspection of the complete product.

B. Inspection may be made at the place of manufacture or on the construction site after delivery, or both, and the pipe shall be subject to rejection at any time due to failure to meet all of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture.

C. Immediately remove from the project site all rejected pipe.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe:
   1. Interior surfaces free from roughness, projections, indentations, offsets, or irregularities of any kind.
   2. Class and nominal diameter as shown on the Drawings.
   3. Minimum laying length: 8 feet, unless otherwise approved by the Engineer.
   4. Reinforcement: Welded steel wire fabric conforming to AASHTO M55-75. Elliptical reinforcement will not be permitted.
   5. Cured as specified under AASHTO M170-79I.

B. Joints:
   1. Sealed by rubber gaskets set into grooves in the spigot rings.
   2. Constructed to remain watertight during service and to allow movement due to expansion, contraction, and normal settlement.

C. Gaskets:
   1. Continuous rings of a composition and texture that will assure a watertight and permanent seal.
   2. Suitable in size to fill the groove on the spigot when pipe lengths are assembled.
   3. Smooth surfaces free from pitting, blisters, porosity, and other imperfections.

D. Concrete:
   1. Consist of cement, sand and crushed stone or crushed or uncrushed gravel accurately proportioned for density and strength.
   2. Minimum cement content 6 bags (564 pounds) per cubic yard.
   3. Aggregate: Hard, durable particles, clean and free from loam and organic materials.
   4. Water: Clean and free from deleterious amounts of acids, alkalis, and organic materials.
   5. Minimum strength: 3000 psi at 7 days, and 4500 psi at 28 days.

E. Fittings:
   1. Of the same strength as the pipe.
   2. Joints compatible with pipe.

2.2 MARKING

A. Clearly mark the following information on each unit of pipe.
   1. Class of pipe
   2. Date of manufacture
   3. Name of manufacturer

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspect all pipe prior to installation. Replace pipe discovered to be defective either before or after installation.

B. Install all pipe and fittings to the lines and grades shown on the Drawings and/or as directed by the Engineer.

C. Jointing:
   1. Thoroughly clean and check each joint before installing.

2. Thoroughly lubricate the bell and gasket with the lubricant supplied by the manufacturer.
3. Joint all lengths of pipe in accordance with the manufacturer's installation instructions.
4. Provide gasket feeler gages for use by the pipe layer and the Engineer for checking the position of the rubber gaskets in the completed joints.

D. During installation, close open ends of pipe with temporary, watertight plugs to prevent earth, water, and other material from entering the pipe.

END OF SECTION

SECTION 02615

DUCTILE IRON PIPE & FITTINGS
(BURIED APPLICATIONS)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide and install ductile iron pipe and fittings of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere:

1. Pipe and Pipe Fittings - General is specified in the appropriate Section in this Division.

2. Excavation, Bedding and Backfill are specified in this Division.

1.2 QUALITY ASSURANCE

A. Standards (As Applicable):

1. Cement-mortar lining for water: ANSI A2l.4 (AWWA C104).
2. Rubber gasket joints: ANSI A2l.ll (AWWA C111).
3. Ductile iron pipe thickness: ANSI A2l.50 (AWWA C150).
4. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A2l.5l (AWWA C151).
5. Pipe flanges and fittings: ANSI Bl6.l and ANSI A21.10 (AWWA C110).
6. Threaded, flanged pipe: ANSI A21.15 (AWWA C115).
7. Cast and ductile iron fittings: ANSI A2l.l0 (AWWA C110).
8. Ductile Iron Compact Fittings: ANSI 21.53 (AWWA C153).
   Acceptable Manufacturers:
   1. Tyler
   2. Griffin
   3. Union
   4. US Pipe
   5. Or equivalent.

1.3 DELIVERY, STORAGE & HANDLING

A. Exercise extra care when handling ductile iron pipe because it is comparatively brittle.

B. Exercise extra care when handling cement lined pipe because damage to the lining will render it unfit for use.

C. Protect the spherical spigot ends and the plain ends of all pipe during shipment by wood lagging securely fastened in place.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. General:

1. All exterior (buried) ductile iron pipe shall have push-on or mechanical joints unless otherwise specified or shown on the Drawings. Pipe within valve pits and other structures is considered interior pipe and shall be flanged.
2. Unless otherwise shown on the Drawings or in the pipe schedule, the minimum thickness of ductile iron pipe shall be:

a. For pipe 4 inches in diameter and smaller: Class 5l.
b. For pipe 6 inches in diameter and larger: Class 52.
c. Pipe with flanges: Class 53.

3. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.
4. Pipe shall be double thickness cement lined and seal coated unless noted otherwise on the Drawings, and except for air piping lines which shall be completely unlined.
5. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the manufacturer of the couplings.
6. Factory applied bituminous coatings (in accordance with AWWA C151) shall be furnished on the exterior of all underground piping unless specified otherwise.
7. The outside of pipe within structures and exposed shall not be coated with bituminous coating, but shall be thoroughly cleaned and given one shop coat of Intertol Rustinhibitive Primer 621 by Koppers Co.; Multiprime by PPG Industries; Chromox 13R50 Primer made by Mobil Chemical Co.; or equivalent.

B. Joints (as shown on Drawings or as specified):

1. Push-on and Mechanical Joint:
   a. The plain ends of push-on pipes shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
   b. Provide gaskets manufactured from a composition material suitable for exposure to the fluid to be contained within the pipe. On high temperature applications such as air lines, the gaskets shall be suitable for service from 40°F to 250°F.
   c. Bolts and nuts for buried mechanical joints shall meet the AWWA C-111 requirements and be made of high strength, low alloy steel.
2. Joint Restraint:
   a. Provide joint restraint to prevent the piping from pulling apart under pressure as required and as shown on the Drawings. Mechanical joint restraints shall be used for valves, fittings, hydrants, etc., and piping sections less than 50 feet in length.
   b. Types of restraints:
      (1) Pipe and fittings furnished with approved lugs or hooks cast integrally for use with socket pipe clamps, tie rods, or bridles. Bridles and tie rods shall be a minimum of 3/4 inch diameter except where they replace flange bolts of a smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The clamps, tie rods, and bridles shall be coated with bituminous paint in buried installations and shall be coated with the same coatings as the piping system in interior installations after assembly or, if necessary, prior to assembly.
      (2) Mechanical joint follower gland pipe restrainers.
         a. Ductile iron gland and restraining ring.
         b. Gasket shall be standard MJ gasket -ANSI/AWWA-C111/A21.11.
         c. Working pressure 350 psi, up to 8 inches; 250 psi, 10 inches to 16 inches.
         d. Test pressure two times working pressure.
         e. Grip Rings™, Romac Industries, or other equivalent as approved by Engineer.
      (3) Other types of bracing as shown on the Drawings.

2.2 FITTINGS

A. Standard Fittings:

1. Pressure rating of 350 psi for D.I. compact fittings and 250 psi for all others unless indicated otherwise on the Drawings or as specified.
2. Joints the same as the pipe with which they are used or as shown on the Drawings.
3. Cement lining and seal coat as specified for pipe.
4. Factory applied bituminous coatings shall be furnished for all underground fittings.

PART 3 - EXECUTION

3.1 INSPECTION

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
B. Carefully inspect all materials at the time of delivery and just prior to installation.
C. Carefully inspect all pipe and fittings for:
   1. Defects, such as weak structural components, that adversely affect the execution and quality of work.
   2. Deviations beyond allowable tolerances for pipe clearances.
D. Immediately remove all rejected materials from the project site.

3.2 INSTALLATION

A. General:
   1. Install in strict accordance with the pipe and fitting manufacturer's instructions and recommendations and as specified or as shown on the Drawings.
   2. Pipe shall be installed with a minimum of 4’-6” of cover. Where the specified cover cannot be attained, the pipe shall be insulated 8’ beyond the section in question.
   3. Concrete thrust blocks or other acceptable thrust resistant system is required at all fittings on pressure pipe. Where thrust blocks are used, these shall be placed against undisturbed soil or screened gravel compacted to 95 percent and shall be placed so that the joints are accessible for repairs.
B. Separation:
   1. When a water pipe crosses above or below a sewer pipe, the following procedures shall be utilized.
      a. Horizontal Separation: Whenever possible, water pipe shall be laid at a minimum of at least 10 feet horizontally from any existing or proposed sewer. Should local conditions prevent a lateral separation of 10 feet, a water pipe may be laid closer than 10 feet to a sewer pipe, if:
         i. It is laid in a separate trench, or if
         ii. It is laid in the same trench with the sewer located at one side on a bench of undistributed earth, and if
         iii. In either case, the elevation of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main.
      b. Vertical Separation: Whenever water mains must cross under sewers, the water main shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be

varied to meet the above requirements, the water main shall be relocated to provide this separation or reconstructed with mechanical-joint pipe for a distance of 10 feet on each side of the sewer. One full length of the water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

i. When it is impossible to obtain horizontal and/or vertical separation as stipulated above, both the water main and sewer shall be constructed of mechanical-joint cement lined ductile iron pipe or other equivalent based on watertightness and structural soundness. Both pipes shall be pressure tested by an approved method to assure watertightness or both pipes shall be encased in concrete.

2. Assembling Joints:
   1. Push-on Joints:
      a. Insert the gasket into the groove of the bell.
      b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.
      c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.
   2. Bolted Joints:
      a. Remove rust preventive coatings from machined surfaces prior to assembly.
      b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.
      c. After jointing coat all bolts with bituminous material compatible with the pipe coating required herein and/or in Section 09900.
   3. Flanged Joints:
      a. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.
      b. Execute care when tightening joints to prevent undue strain upon valves, pumps, and other equipment.
   4. Mechanical Joints:
      a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.
      b. Lubricate the gasket, bell, and spigot by washing with soapy water.
      c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly seated.
      d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.
      e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joint to the proper tension with a torque wrench.
      f. The correct range of torque (as indicated by a torque wrench) and the length of wrench (if not a torque wrench) shall not exceed:
         (1) Range or Torque: 60-90 ft.-lbs.
         (2) Length of Wrench: l0 inches.
      g. If effective joint sealing is not attained at the maximum torque specified above, disassemble, thoroughly clean, and reassemble the joint. Do not overstress the bolts to tighten a leaking joint.
   5. Bell and Spigot Joints:

a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.
b. Insert the spigot firmly into place and hold securely until the joint has been properly completed.

3. Fabrication:
   1. Tapped Connections:
      a. Make all tapped connections as shown on the Drawings or as required by the Engineer.
      b. Make all connections watertight and of adequate strength to prevent pullout.
      c. Drill and tap normal to the longitudinal axis of the pipe.
      d. Taps in fittings shall be located where indicated by the manufacturer for that particular type of fitting.
      e. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANS A2l.5l based on 2 full threads for ductile iron and 3 full threads for cast iron.
   2. Cutting:
      a. Perform all cutting as set forth in AWWA C600.
      b. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.
4. Pipe Deflection:
   1. Push-on and Mechanical Joints:
      a. The maximum permissible deflection of alignment at joints shall be limited to that given in AWWA C600.
   2. Flexible Joints:
      a. The maximum deflection in any direction shall not exceed the manufacturer's instructions and recommendations.

END OF SECTION

SECTION 02622

POLYVINYL CHLORIDE (PVC) NON-PRESSURE PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Provide and install PVC non-pressure pipe and fittings of the size(s) and type(s) and in the location(s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere: (When Applicable)
   1. Excavation and backfill, dewatering, pavement, borrow and bedding material, and cleaning and testing requirements are specified in the appropriate sections of this division.
   2. Pipe & Pipe Fittings - General is specified in Division 2.

1.2 QUALITY ASSURANCE

A. Manufacturers:
   1. Certain-Teed.
   2. J-M Manufacturing.
   3. Or equivalent.

1.3 SUBMITTALS TO THE ENGINEER

A. Submit shop drawings in accordance with the General Conditions of the Construction Contract.

B. Submit manufacturer's "Certification of Conformance" that pipe and fittings meet or exceed the requirements of these Specifications.

C. Submit other documents as specified in the appropriate Sections of this Division.

1.4 DELIVERY STORAGE AND HANDLING

A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets and other materials.

B. Carefully inspect all materials at the time of delivery and just prior to installation.

C. Carefully inspect all pipe and fittings for:
   1. Defects and damage
   2. Deviations beyond allowable tolerances for joint dimensions.
   3. Removal of debris and foreign matter.

D. Examine area and structures to receive piping for:
   1. Defects, such as weak structural components that adversely affect the execution and quality of work.
   2. Deviations beyond allowable tolerance for pipe clearances.

E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.

F. Immediately remove all rejected materials from the project site.

2.1 MATERIALS

A. Pipe and Fittings:
   1. The polyvinyl chloride pipe and fittings, including those required for stubs, shall conform to ASTM standard specification for PVC Sewer Pipe and Fittings, Designation D 3034 (SDR 35) (4" to 15"), F679 (18" to 27"), or F1760-01 (for recycled pipe, all diameters).
   2. Straight pipe shall be furnished in lengths of not more than 14 feet.
   3. Saddles will not be allowed.

B. Joints:
   1. Joints for the polyvinyl chloride pipe shall be push-on joints using factory installed elastomeric ring gaskets.
   2. The gaskets shall be securely fixed into place by the manufacturer so that they cannot be dislodged during joint assembly.
   3. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oils and ground water, and which will endure permanently under the conditions of the proposed use.
   4. The joints shall conform to ASTM Specifications for Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals, Designation D3212-76.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspection:
   1. Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight.
   2. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16 inch per foot of length.
   3. If a piece of pipe fails to meet this requirement for straightness it shall be rejected and removed from the site.
   4. Any pipe unit or fitting discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

B. Jointing:
   1. All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.
   2. Pipe and fittings shall be installed to the lines and grades indicated on the drawings or as required by the Engineer. Care shall be taken to insure true alignments and gradients.
   3. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation.
   4. Each pipe unit shall than be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.
   5. Joints shall not be "pulled" or "cramped" unless permitted by the Engineer.

C. Service Connections:
   1. All service connections to new pipe shall utilize a wye fitting.
   2. All service connections must enter the top half of the mainline pipe.

D. Pipe Deflection:
   1. Pipe provided under this specification shall be installed so there is no more than a maximum deflection of 5.0 percent. Such deflection shall be computed by multiplying the amount of deflection (normal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
   2. The Contractor shall wait a minimum of 30 days after completion of a section of sewer, including placement and compaction of backfill, before measuring the amount of deflection by pulling a specially designed gage assembly through the completed section. The gage assembly shall be in accordance with the recommendations of the pipe manufacturer and be acceptable to the Engineer.
   3. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem as the Engineer may require without additional compensation.

E. Testing:
   1. Clean and test pipe in accordance with appropriate sections of this division.

END OF SECTION

SECTION 02644

HYDRANT ASSEMBLIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Removal and reinstallation of hydrant assemblies of the type(s) and size (s) and in the locations (s) shown on the Drawings and as specified herein.

B. Hydrant Assemblies consist of:
   1. Hydrant tee.
   2. 6 inch gate valve and valve box.
   3. 6 inch hydrant branch piping.
   4. Hydrant.
   5. Drainage material.
   6. Solid sleeves
   7. Thrust blocking and joint bracing.

1.2 QUALITY ASSURANCE

A. Hydrants shall conform to AWWA C502 and all hydrants shall be from one manufacturer.

B. Gate valves shall conform to AWWA C509 (Resilient-Seated Gate Valves for Water Supply).

C. The City has standardized on the following hydrant only:
   1. American Flow Control B62B

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fire Hydrants:
   1. Dry barrel type with a 5-1/4 inch minimum valve opening.
   2. Two (2) 2-1/2 inch hose connections and one (1) 4-1/2 inch pumper connection.
      a. 2-1/2 inch outlets: 60^{o} V threads, 7-1/2 threads to the inch, external threads 3-1/16 inches, O.D. National Standard threads.
      b. 4-1/2 inch outlet: 4 threads to the inch, external threads 5-3/4 inches, O.D. National Standard threads.
      c. Supply adapters if existing fire fighting equipment does not match the threads specified above.
   3. 200 pounds working pressure and 300 pounds hydrostatic test pressure.
   4. Working parts shall be bronze
   5. Direction of open – right (clockwise)
   6. Designed with standpipe breaking ring or breakable sections.
   7. Caps shall be attached to hydrant body by chains.
   8. Hydrant shall include positive automatic drain to prevent freezing.
   9. Supply one (1) collision repair kit for every twenty-five (25) hydrants installed.

B. Gate Valves: Waterworks type non-rising stem AWWA valve as specified in the appropriate section of this Division.

C. Valve Boxes: As specified in Division 2.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install hydrants as shown in the details and using manufacturer's written instructions.
B. No hydrant assembly shall be backfilled until approved by the Engineer.
C. Provide drainage material and thrust blocks as shown.
D. Provide barrel extensions as required for hydrant to be installed at proper grade.
E. Hydrants to be ordered and delivered to the site painted in Waltham standard colors prior to installation. Colors are as follows:
    a. Hydrant top and caps – Black
    b. Hydrant body - Yellow

3.2 CLEANING

A. Clean all hydrants of concrete, etc. and repaint as necessary to the satisfaction of the Engineer.

END OF SECTION

SECTION 02650

BURIED UTILITY MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

B. This work shall consist of providing and installing utility line markings above all buried lines installed as part of this contract as indicated on the Drawings and replacing existing markings disturbed as part of this contract. Related Work Specified Elsewhere:

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and color shall be in accordance with latest AASHTO specifications for pipe and utility marking.

B. Marking tape color shall be in accordance with latest American Public Works Association (APWA) Uniform Color Code and American National Standards Institute ANSI Standard Z535.1, Safety Color Code specifications for buried utility marking as noted in the Schedule below.

1. Schedule

Marker Color	Buried Utility
Blue	Potable Water &Associated lines
Green	Sanitary Sewers, Storm Drain and other Drain lines
Orange	Telecommunication, signal, alarm
Purple	Reclaimed, Recycled, Irrigation Water and Slurry Lines
Red	Electric Power lines cables conduits and lighting cables
Yellow	Gas, Oil, Steam, Petroleum or Gaseous Material Lines

2. Warning Information shall be in Black Letters with typical wording of:

a. "CAUTION: BURIED (NAME OF UTILITY LINE) BELOW"

C. For ferrous pipe material use 0.004" minimum polyethylene film; 6" wide clearly marking type of buried utility.

D. For non-ferrous pipe material (e.g. Concrete, PVC, PE, etc.) use detection tape composite of polyethylene and metallic core 6" wide clearly marking type of buried utility.

E. Seton Identification Products, New Haven, CT, Utility Safeguard LLC or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Marking tape shall be installed over utility lines centerline and buried 24" below grade.

B. Markings damaged during opening of trench shall be reinstalled with 2' overlap at broken sections.

END OF SECTION

SECTION 02675

CLEANING, TESTING AND DISINFECTION OF WATER MAINS

PART 1 GENERAL

1.1 DESCRIPTION

A. The work of this section includes the furnishing of all labor, tools, equipment and materials and performing all operations necessary for the flushing, pressure testing, leakage testing and chlorination of water mains as specified herein and as required to complete the work.

1.2 QUALITY ASSURANCE

A. Standards (as applicable):
   1. All work shall be in accordance with this specification and AWWA C651. Where conflicts appear between these specifications and AWWA C651 the more stringent requirement shall apply.
   2. Chlorine solution for disinfecting water mains and appurtenances shall be made from either liquid sodium hypochlorite, or solid calcium hypochlorite, which shall conform to the latest AWWA B300 Standard for Hypochlorite.
   3. Chlorine test kits shall be as described in the current edition of AWWA M12 - Simplified Procedures for Water Examination.
   4. Disposal of chlorinated water as per AWWA C651, Appendix B.

1.3 COORDINATION

A. Use of water will only be as approved and coordinated by the Owner.
B. The Contractor shall employ an independent third party testing agency to conduct all flushing, pressure and leakage testing and chlorinating.
C. All flushing, pressure and leakage testing and chlorinating shall be done by a third party testing agency in the presence of the Engineer and in the presence of the Owner or Owner's Representative in accordance with the requirements of the local and state plumbing codes and the appropriate Sections of these Specifications, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Each temporary blow-off shall consist of a corporation cock, type K copper tubing and a curb stop, each of not less than 1-inch diameter.
B. A pumping unit or proportionate feeder suitable for delivering a hypochlorite solution to the isolated main shall be provided. The unit used shall prevent chlorine solution from flowing back into the existing system.

PART 3 - EXECUTION

3.1 GENERAL

A. Thoroughly clean all piping prior to testing. Remove all dirt, dust, oil, grease and other foreign material. Exercise care while cleaning to avoid damage to linings and coatings.

B. Supply all labor, equipment, materials, gages, and pumps required to conduct the tests. The drawings do not detail taps, gages, plugs and other related materials required to perform testing. These materials are the responsibility of the Contractor.

C. Flushing, testing and chlorinating of the mainline shall closely follow main laying work. As the mainline is installed, it shall be tested approximately every 1,000 feet, or between line valves, whichever is less. Should the mainlines fail to be flushed, tested, and chlorinated as specified, the main laying work shall be suspended until the flushing, testing and chlorinating is done.

D. Final acceptance of the water main shall be based on successful (negative) results of bacteriological tests, which shall be done on samples taken from the main following chlorination and final flushing. Locations of samples shall be determined by the Engineer.

E. The testing and related procedures described herein, shall be performed in the order listed.

F. The Contractor, with the assistance of the Owner, shall fill mains as slowly as practicable so as not to cause dirty water and serious pressure drops within the existing system.

3.2 FLUSHING

A. All new water mains, and existing water mains that have been drained and cut-into for making connections, shall be thoroughly flushed prior to pressure or leakage testing or final chlorination. Flushing shall be accomplished by partially opening and closing valves, hydrants, and blowoffs, several times, under expected line pressure, with flow velocities of not less than 2.5 feet per second, in the main. The size and number of hydrant outlets and/or main taps to provide the required flow (at 40 psi residual pressure) is as follows:

Minimum Required Flow and Openings Required to Flush Water Mains
(Assuming 40 psi Residual Pressure in Water Mains)

Main Diameter (in.)	Flow Required to Produce 2.5 fps in Main (gpm)	Minimum Size of Taps (in.)	Hydrant Outlets	
			Number	Size (in.)
4	100	15/16	1	2-1/2
6	220	1-3/8	1	2-1/2
8	390	1-7/8	1	2-1/2
10	610	2-5/16	1	2-1/2
12	880	2-13/16	1	2-1/2
16	1565	3-5/8	2	2-1/2

1. If less than a 40 psi residual is available in the main, with the size tap shown above then a larger, or more tap(s) or hydrant outlets will be required, as determined by the Engineer.
2. The length of time for flushing, at or above the minimum allowable velocity, shall be computed to allow a minimum of 3 times the total volume of water in the main to be flushed to waste. Flushing shall be done in the presence of the Engineer.

3.3 AIR REMOVAL

A. Following flushing, and before applying the specified test pressure, air shall be completely expelled from the mains, valves, and hydrants. After all air has been expelled, the air blowoffs can be closed, and the test pressure applied.

3.4 PRESSURE TEST

A. All new water mains, or any sections thereof, shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure that will exist at the point of testing, or 150 psi, whichever is greater. Test pressures shall meet the following requirements:
   1. Be of at least 2-hour duration.
   2. Be not less than 1.25 times the expected system working pressure at the highest point along the test section.
   3. Not exceed main or thrust-restraint design pressures.
   4. Not vary by more than + 5 psi for the duration of the test.
   5. Not exceed 2-times the rated pressure of the valves or hydrants when the pressure boundary includes closed valves or hydrants. Valves shall not be operated in either direction at differential pressure greater than the rated pressure.
   6. Not exceed 1.5-times the rated pressure of the valves when the pressure boundary of the test section includes closed butterfly valves or resilient seated gate valves.

B. Each section of main shall be slowly raised to the specified test pressure for two separate periods. The first period shall be for 15-minutes, after which the pressure shall be allowed to drop slowly back to system pressure. The pressure shall then be slowly raised again to the specified test pressure and maintained for 2-hours. The test pressure shall be based on the elevation of the lowest point of the main, in the test section and shall be corrected to the elevation of the test gauge, as directed by the Engineer. The test pressure shall be applied by means of a pump connected to the main, in an approved manner, and which will prevent any backflow into the existing system. Valves shall not be operated in either the closing or opening direction, at differential pressure greater than the rated pressure.

C. Any exposed main, fittings, valves, hydrants and joints shall be carefully examined during the test. Any damaged or defective main, fittings, hydrants, or valves discovered following, or as a result of the pressure test shall be repaired or replaced with sound material. If faulty materials are removed and replaced, the pressure testing procedure shall be repeated.

3.5 LEAKAGE TEST

A. Leakage testing shall be conducted concurrently with the pressure test.

B. Leakage is defined as the quantity of water that must be pumped into the new main during the test, or any section thereof, required to maintain pressure within 5 psi of the starting test pressure. Leakage shall be recorded to the nearest one-tenth of a gallon. The Contractor shall employ qualified personnel throughout the testing. Leakage shall not be measured by a drop in pressure over a period of time.

C. Leakage in the test section must be less than an amount determined as follows:

$$L = \frac{SD(P^{0.5})}{148{,}000}, \text{ where}$$

L = allowable gallons of leakage per hour
S = the length of main tested, in feet
D = the nominal main diameter in inches

P = the average test pressure during the test, in psi

D. The leakage formula is based allowable leakage of 11.65 gallons per day, per mile of main, per inch (nominal) of main diameter, at a pressure of 150 psi. Allowable leakage under various conditions is shown below.

Allowable Leakage (gph) per 1,000 Feet of Mainline

Average Test Pressure(psi)	Nominal Diameter (inches)						
	6	8	10	12	16	20	24
250	0.64	0.85	1.07	1.28	1.71	2.14	2.56
225	0.61	0.81	1.01	1.22	1.62	2.03	2.43
200	0.57	0.76	0.96	1.15	1.53	1.91	2.29
175	0.54	0.72	0.89	1.07	1.43	1.79	2.15
150	0.50	0.66	0.83	0.99	1.32	1.66	1.99
125	0.45	0.60	0.76	0.91	1.21	1.51	1.81
100	0.41	0.54	0.68	0.81	1.08	1.35	1.62

1. If the mainline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
2. When testing against closed metal seated valves, an additional leakage shall be allowed per closed valve of 0.0078 gallons per hour, per inch of nominal valve diameter.
3. When hydrants are in the test section, the test shall be made against the closed hydrant(s).

E. Acceptance shall be determined on the basis of allowable leakage. If leakage in any test is greater than that specified, the Contractor shall locate and make repairs as necessary until the leakage is within the specified allowance.
1. All visible leaks are to be repaired regardless of the amount of leakage.
2. All water mains shall be pressure and leakage tested in the presence of the Engineer, in order to qualify for acceptance.

3.6 CHLORINATION

A. The method of chlorination shall be the *Continuous Feed Method* as described hereinafter. Chlorination procedures will not be allowed until acceptable flushing and pressure testing has been performed and accepted. The continuous feed method consists of the following steps:
1. Prior to the application of chlorine, confirm that valves are closed to prevent back-feeding chlorine solution into the existing system.
2. At a point not more than 10 feet downstream from the beginning of the new main, fill the main with chlorinated potable water, having an initial concentration of 25 mg/l free chlorine residual.
   a. Water from the existing distribution system or other approved source of supply shall flow at a constant measured rate, into the new main. In the absence of a meter, the rate may be approximated by measuring the

discharge rate at the end of the test section with a pito-gauge or by measuring the time to fill a container of known volume.

3. The application of chlorine solution shall continue until the entire main is filled with water having 25 mg/l of free available chlorine. To assure that 10 mg/l free chlorine residual concentration is achieved throughout the test section, the Contractor shall measure chlorine concentration at regular intervals.

B. The amount of chlorine required to obtain a concentration of 25 mg/l per 100 feet of various diameter mains is as follows.

Chlorine Required to Obtain 25 mg/l per 100 feet of Various Diameters

Main Diameter (inches)	Sodium Hypochlorite (gallons)				Calcium Hypochlorite (ounces)
	5% Available Chlorine	10% Available Chlorine	12.5% Available Chlorine	15% Available Chlorine	65% Available Chlorine
4	0.03	0.02	0.02	0.01	0.02
6	0.08	0.04	0.03	0.03	0.75
8	0.13	0.07	0.06	0.06	1.30
10	0.20	0.10	0.09	0.07	2.10
12	0.28	0.15	0.12	0.10	2.90
16	0.50	0.25	0.22	0.17	5.30
20	0.80	0.40	0.34	0.28	8.40
24	1.30	0.60	0.50	0.40	12.00

1. The above quantities are to be added to a sufficient quantity of water, dissolved, and mixed. The solution shall be injected into the main as specified.
2. The quantities shown are based on concentrations of available chlorine by volume. Extended or improper storage may have caused a loss of available chlorine.

C. The chlorinated water shall be retained in the main for a minimum of 24-hours. At the end of this 24 hour period, retest portions of the main to confirm that a minimum of 10 mg/l free available chlorine residual exists in the main. If the residual chlorine is less than 10 mg/L, acceptable bacteria results may not be obtained.

3.7 FINAL FLUSHING OF CHLORINATED WATER

A. After the initial 24-hour period period, the heavily chlorinated water shall be flushed from the main until chlorine measurements show the concentration in water leaving the main is no higher than that generally prevailing in the system.

B. The Contractor shall obtain approval of location(s) for discharging the heavily chlorinated water, which will result from the chlorination procedures. Great care shall be exercised in the selection of the rate of flow and the discharge points, in order to minimize complaints, and damage to public or private property.

C. The heavily chlorinated water shall be suitably and thoroughly neutralized prior to disposal into the environment. In no case shall chlorinated or neutralized water be discharged directly into a water body. If necessary, state, federal, and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

3.8 BACTERIOLOGICAL TESTS

A. After final flushing and before the water main is placed in service, water samples shall be collected twice (24-hours apart) by the Engineer or Owner and tested for bacteriological quality in accordance with standard methods. Water samples shall show the absence of coliform organisms and background bacteria.

B. If, during construction, trench water has entered the main, or if in the opinion of the Engineer excessive quantities of dirt or debris have entered the main, bacteriological samples shall be taken at intervals of approximately 200 feet and shall be identified as to location. Samples shall be taken of water that has stood in the main for at least 24-hours after final flushing has been completed.

C. Samples shall be obtained through a corporation cock and copper tubing installed by the Contractor.

D. The Engineer or Owner shall deliver samples to a laboratory approved by the Department of Health Services for bacterial analysis. The Owner shall pay for the cost of analysis. Only after each consecutive sample is approved shall the mains be incorporated into the water system. In the event that positive reports of contamination are received, the mains shall be flushed and chlorinated as many times as may be necessary to obtain approved (negative) results.

3.9 RE-CHLORINATION

A. If the initial chlorination fails to produce satisfactory bacteriological samples, the main shall be re-flushed and re-sampled.

3.10 CHLORINATION PROCEDURES WHEN CUTTING INTO OR REPAIRING EXISTING MAINS

A. Trench Treatment. If during excavation the trench is either wet or filled with water, it is recommended that liberal quantities of hypochlorite tablets be applied to open trench areas to lessen the danger from pollution.

B. The interior of all main and fittings used in making a repair shall be swabbed or sprayed with a 1 percent hypochlorite solution before they are installed.

C. If valve and hydrant locations permit thorough flushing toward the work location from both directions, it shall be done. Flushing shall be started as soon as the repairs are completed and shall be continued until discolored water is eliminated.

D. Slug Chlorination. Where practical and in addition to the procedures above, a section of main in which the break is located shall be isolated. All service connections shall be shut off, and the section flushed and chlorinated by the *Slug Chlorination* method. This method allows the chlorine dose to be increased to as much as 300 mg/l, and the contact time reduced to as little as 1-hour. After chlorination, the section shall be properly flushed until discolored water is eliminated and the water is free of noticeable chlorine odor.

E. Bacteriological samples shall be taken after repairs. If the direction of flow is unknown, samples shall be taken on each side of the main break. If positive samples are recorded, daily sampling shall be continued until two consecutive negative samples are recorded.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cast-In-Place Concrete
B. Formwork
C. Concrete reinforcement and accessories
D. Modifications and/or Repairs to concrete
E. Concrete curing
F. Concrete finishing
G. Concrete repairs
H. Concrete testing
I. Non-Shrink Grout

1.2 REFERENCES

A.	ACI 211.1-91	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
B.	ACI 301-05	Standard Specifications for Structural Concrete
C.	ACI 302.1R-04	Guide for Concrete Floor and Slab Construction
D.	ACI 304.2R-96	Placing Concrete by Pumping Methods
E.	ACI 305R-99	Hot Weather Concreting
F.	ACI 306.1-90	Standard Specification for Cold Weather Concreting
G.	ACI 308R-01	Guide to Curing Concrete
H.	ACI 308.1-98	Standard Specification for Curing Concrete
I.	ACI 309R-05	Guide for Consolidation of Concrete
J.	ACI 318-05/318R-05	Building Code Requirements for Structural Concrete and Commentary
K.	ACI 347R-03	Guide to Formwork for Concrete
L.	ASTM A82-02	Specification for Steel Wire, Plain, for Concrete Reinforcement
M.	ASTM A615/	Specification for Deformed and Plain Billet - Steel Bars A615M-03 for Concrete Reinforcement
N.	ASTM C31/C31M-03a	Standard Practice for Making and Curing Concrete Test Specimens in the Field
O.	ASTM C33-03	Specification for Concrete Aggregates
P.	ASTM C39/C39M-04a	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
Q.	ASTM C42/C42M-03	Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
R.	ASTM C94/C94M-04a	Specification for Ready Mixed Concrete
S.	ASTM C150-02a	Specification for Portland Cement
T.	ASTM C172-99	Practice for Sampling Freshly Mixed Concrete
U.	ASTM C231-04	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
V.	ASTM C260-01	Specification for Air Entraining Admixtures for Concrete
W.	ASTM C309R-98a	Guide for Consolidation of Concrete

X.	ASTM C494/ C494M-99a	Specification for Chemical Admixtures for Concrete
Y.	ASTM C1107	Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
Z.	ASTM E 329-02	Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
AA.	ASTM F1554-02	Standard Specifications for Anchor Bolts, Steel, 36, 55 and 105-KSI yield strength

BB. Concrete Reinforcing Steel Institute - Manual of Standard Practice
CC. Concrete Reinforcing Steel Institute - Placing Reinforcing Bars

1.3 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301 and ACI 318 as modified here-in.
B. Maintain copies of ACI 301 and ACI 318 on site.

1.4 QUALIFICATIONS OF INDEPENDENT TESTING LABORATORY

A. Independent Testing Laboratory shall conform to concrete testing requirements of ASTM E329.
B. Key personnel must be qualified and experienced in concrete quality assurance.
C. Perform concrete field quality control testing with personnel certified as an ACI Concrete Field Testing Technician, Grade 1 according to the American Concrete Institute (ACI).

1.5 SUBMITTALS

A. Submit shop drawings for concrete reinforcement prior to fabrication, showing bar bends, details and placement.
B Submit Concrete Mix designs including past field performance test results.
C. Submit sieve analysis and soundness tests for fine and coarse aggregates taken within the last three (3) months.
D. Submit Cement Manufacturer's Certificates of conformance with ASTM C150 taken during the last 3 months.
E. Submit sample concrete mix delivery slip.
F. Submit product data for concrete curing, sealing and hardening compounds.
G. Independent Testing Laboratory will submit one copy each of all test reports to each of the following: Engineer, Resident Project Representative, Contractor and Concrete Supplier.
H. Independent Testing Laboratory will submit reports within 5 days of testing or inspection.
I. Independent Testing Laboratory will telephone the Engineer within 24 hours if tests indicate deficiencies.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Plywood: APA, B-B Plyform Class I exterior.
B. Lumber: Southern pine, No. 2 grade or equal.
C. Steel: Minimum 16 ga. sheet, well matched, tight fitting, stiffened to resist loads without excess deflection.
D. Form Ties: Factory fabricated assembly providing at least 1.5 inch break back dimension with at least a 1 inch diameter conical wood or plastic cones to leave a uniform hole for patching. Single rod ties require a tightly fitted waterstop washer at the mid point. Multi rod ties do not require washers.
E. Form release agent: non-staining colorless, compatible with finishes. CRETE-LEASE 727 Release Agent by Cresset Chemical Co., Super-X Emulsive by A.H. Harris & Sons, Inc. or equivalent.
F. Conform to ACI 301 and ACI 347

2.2 REINFORCING STEEL

A. Bars: ASTM A615 Grade 60; deformed new materials.
B. Tie wire: ASTM A82, annealed.
C. Bolsters, chairs and supports: plastic coated, stainless steel, or epoxy coated.
D. Conform to CRSI Code of Standard Practice-Fabrication.

2.3 CAST-IN-PLACE CONCRETE

A. Concrete Materials
    1. Portland cement: ASTM C150; Type II. Tricalcium Aluminate (C_3A) content in cement less than 8%.
    2. Aggregates:
        a. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM Specification C-33.
        b. Coarse aggregate shall consist of a well graded crushed stone or a washed gravel conforming to the requirements of ASTM Specification C-33.
    3. Water: potable from municipal water supply or equal.
    4. Admixtures: All from one common manufacturer.
B. Admixtures
    1. Low Range Water Reducer: Pozzolith 122-N by Master Builders; WRDA with HYCOL by Grace Construction Products Division; or equivalent meeting ASTM C494 Type A
    2. High Range Water Reducer (superplasticiser): Rheobuild 1000 by Master Builders; Daracem 100 by W.R. Grace; or equivalent meeting ASTM C494 Type F.
    3. Air entraining agent: Micro-Air by Master Builders, DAREX 11 AEA by Grace Construction Products; or equivalent meeting ASTM C260.
    4. Non-corrosive non-chloride accelerator: Pozzutec 20 by Master Builders; or equivalent meeting ASTM C494 type C or E.
    5. Not permitted: Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions.
C. Concrete
    1. Concrete Class
        a. Reinforced concrete sections: Class A

2. Concrete proportioning shall conform to ACI 318, Chapter 5 except as modified below:

Class	Minimum Compressive Strength (f'_c)	Coarse Aggregate Size	Min.- % Air ±(1.5%)	Min.- Max. Slump	Max. Cem.Fac.	Max. W/C	High Range Water Reducer
A	4000 PSI	No. 67 (¾")	6	1-3	564-620	0.42	Yes

3. The maximum slump as indicated in the above table will be as measured at the batch plant.
4. Pumped Concrete: Conform to Chapter 4 - ACI 304.2
5. High range water reducer shall be added on site to obtain 4" - 8" slump.
6. No water shall to be added on site.
7. Concrete shall be furnished from one source during the project.

D. Selection of Concrete Proportions
1. The Concrete producer shall select the concrete mix proportions on the basis of past field performance or the use of trial mixes in accordance with ACI 318 Sections 5.2, 5.3 and 5.4.

2.4 ACCESSORIES

A. Joint filler and slab perimeters: J-Joint polyethylene foam with tear off strip for sealant or approved equal; joint filler to be slab thickness in depth less 0.5 inch for sealant.
B. Expansion joint filler: Self expanding cork by W.R. Meadows or W.R. Grace or equal, size as indicated on the Drawings.
C. Bond Breaker: Thompson's Water Seal or equivalent, or form oil.
D. Concrete Anchorage Fasteners:
1. Expansion Anchors - Stainless steel AISI Type 316. Kwik-Bolt by Hilti Fastening Systems or Tru Bolt by Ramset Fastening System or equivalent.
2. Anchor Rods - ASTM F1554 Grade 55.
3. Adhesive Anchors. Non-expanding chemical type, 6" minimum projection and nut; Parabond Capsule Anchor by Molly Fastener or HVA Adhesive Anchor by Hilti Fastening Systems or equivalent.

2.5 NON-SHRINK GROUT

A. Conform to ASTM C1107.
B. Install in accordance with manufacturer's recommendations, using appropriate grout for intended use.

2.6 LIQUID CURING COMPOUND MATERIALS

A. Curing and Sealing Compound; ASTM C309 Type 1 Class B. Super Kurseal by A.H. Harris & Sons, Inc. Emulsion Kurseal 309 by A.H. Harris & Sons, Inc. or equivalent.
B. Dissipating Resin Curing Compound: ASTM C1315 type 1; Film must break down in two to four weeks. Kurez-DR by Euclid Chemical Company, Emulsion Super KonKure 309 clear by A.H. Harris & Sons, Inc., or equivalent.
C. Curing/Hardening Compound: Sodium Silicate Type. Eucosil by Euclid Chemical Company, Super KurHard 309 by A.H. Harris & Sons, Inc., or equivalent.

2.7 FINISHING MATERIALS

A. Slab Sealer: Siloxane based 96% chloride ion screen, Euco-Guard-100 by Euclid Chemical or equal.
B. Bonding Admixture: Latex, non-rewetable type SBR Latex or Flex-con by Euclid Chemical, Daraweld C by W.R. Grace or equivalent.
C. Patching Mortar: 1 part of a mixture of white and grey portland cement to 2.5 parts of damp loose sand. Cement type to match substrate.

2.8 REPAIR MATERIALS

A. Epoxy Adhesive: Water Based epoxy resin/portland cement building agent Armatec 110 by Sika Corporation or equivalent.
B. Repair Mortar: polymer improved, cementitious, 2 component, trowel grade mortar equal to Concrete Coat by Euclid Chemical; Sikatop 122 by Sika Corp. or equivalent.

PART 3 - EXECUTION

3.1 FORMWORK

A. Conform to ACI 301 and ACI 347
B. Erect plumb and straight. Maintain rigid. Brace sufficiently.
C. Allow no concrete leakage. Provide continuous, straight, smooth exposed surfaces.
D. Treat forms with form release agent. Protect reinforcing from contact with form release agent.
E. Earth forms not permitted.
F. Chamfer all exposed outside corners and edges 0.75 inch unless otherwise noted.
G. Clean out inside of forms of all foreign materials prior to concrete placement.
H. Maintain forms and shores supporting the cast concrete for the time periods indicated:
   1. Walls and Vertical Surfaces *36 Hours
      * These periods represent cumulative number of days or hours during which the temperature of the air surrounding the concrete is above 50°F and the concrete has been damp and no loss of moisture has occurred.
I. Form pressures increase with the use of concrete with High Range Water Reducers. Design forms accordingly.
J. All concrete formwork, including reinforcing steel and embedment items, shall have a temperature greater than or equal to 35°F at the time of concrete placement.

3.2 REINFORCEMENT

A. Conform to the CRSI Code of Standard Practice - Field Erection for surface condition, bending, spacing and placement tolerance.

B. Splicing reinforcement: conform to ACI 318; welded wire fabric to be lapped 1½ courses or 12 inches; tie fabric at 24 inches on center maximum spacing.
C. Provide bar supports: on grade use concrete brick; elsewhere use manufactured wire supports.
D. Do not bend reinforcing partially embedded in the concrete.

3.3 EMBEDDED ITEMS

A. Coordinate installation of embedded items.
B. Pipes or Conduits for embedment within a slab, wall or beam, other than those merely passing through, shall satisfy the following:
   1. Shall not be larger in outside diameter than one-third (1/3) the thickness of the slab, wall or beam.
   2. Shall not be spaced closer than 3 diameters on center.
   3. Shall not impair significantly the strength of the concrete.

3.4 PLACING CONCRETE

A. Notify Engineer and Independent Testing Laboratory 24 hours minimum prior to each placement.
B. Place no concrete on frozen ground.
C. Place concrete within 90 minutes of batching.
D. Freefall: 4 feet maximum.
E. Do not place partially hardened concrete.
F. Consolidate concrete by vibrating. Conform to ACI 309.
G. Conform to ACI 306R for cold weather concreting.
H. Conform to ACI 305R for Hot Weather Concreting. Temperature of concrete placed shall not exceed 90°F.
I. Provide concrete Delivery Slip prepared at batch plant with each truck load of concrete showing ticket number, date, truck number, mix strength, maximum stone size, weight of coarse aggregate, weight of fine aggregate, cement weight, volume of concrete, gallons of water added at plant, time water added at plant, quantities of all admixtures used and gallons of water withheld at the plant.
J. Thoroughly moisten subgrade materials prior to placing slabs on grade.

3.5 TESTING CAST-IN-PLACE CONCRETE

A. An Independent Testing Laboratory, selected and paid for by the Owner, shall test and sample concrete for strength, slump and air content as follows:
B. Obtain 5 standard test cylinder samples (6" x 12") of each 100 cubic yards or less of each class of concrete placed in any one day.
C. Test 2 cylinders at 7 days; 2 cylinders at 28 days. Hold one cylinder for later testing.
D. Perform slump tests and air entrainment tests on each truck and at each sampling. Perform slump and air entrainment tests before addition of High Range Water Reducer and after addition of High Range Water Reducer.
E. Sample concrete for testing of air and slump at the discharge end of the truck. When concrete is pumped, concrete taken for test cylinders shall be at the discharge end of the pump hose.
F. Perform strength, slump and air entrainment tests at other times when directed by the Engineer.

G. Contractor shall provide and maintain an insulated, heated concrete cylinder curing box, 4 foot square minimum, with a min.-max thermometer and maintain the temperature between 60ºF and 80ºF. Contractor to coordinate location with Engineer and Independent Testing Laboratory.

H. Additional testing and sampling required as a result of deficient results or improper curing shall be paid for by Owner. The cost of resampling and retesting will be determined by Engineer, and Owner will invoice Contractor for this cost. If unpaid after 60 days, this invoice amount will be deducted from the Contract Price.

3.6 ADDITIONAL CONCRETE TESTS

A. Independent Testing Laboratory shall provide additional testing of in-place concrete as directed by Engineer due to non-compliance or considered substandard. Additional tests may consist of non-destructive testing, cores drilled from the area in question or load tests. Costs of additional testing will be paid by Contractor.

B. When the concrete strength is substandard as defined in Specification 03300 Section 3.12 paragraph A, concrete core specimens shall be obtained and tested from the affected area.

1. Three (3) cores shall be taken for each sample in which the strength requirements were not met. The drilled cores shall be obtained and tested in conformance with ASTM C 42 "Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete."

C. Field cured cylinders may be cast and tested by the Independent Testing Laboratory at the request of the Contractor. The costs of these tests shall be borne by the Contractor. If the field cured cylinders are cast and tested prior to 28-days to determine the in-place concrete strength in order to facilitate an accelerated schedule for subsequent concrete placements, backfilling or leakage testing, the following criteria must be met:

1. The Contractor shall notify the Engineer and Independent Testing Laboratory 48 hours in advance of the concrete placement. The Engineer will determine at that point if the results of the field cured cylinders may be used to determine the in-place concrete strength. The Contractor shall notify the Engineer as to when the field cured cylinders will be tested and for what purpose.
2. A minimum of 2 cylinders shall be cast for each separate test the Contractor requests. A test consisting of at least two cylinders will be required to be considered valid.
3. The field cured cylinders shall be left in the field and located such that they are exposed to the identical environmental conditions as the concrete structure. The cylinders shall remain at this location a minimum of 14 days prior to testing.
4. The Engineer shall determine if the strengths indicated by the field cured cylinder tests are adequate for their intended purpose.

3.7 FINISHING SLABS AND FLATWORK

A. Screed to bring concrete surface to proper contour and elevation.

B. Highway straightedge, bull float or darby float the concrete surface immediately after screening.

C. Allow bleed water to evaporate or remove.

D. (STF) Steel Troweled Finish: Float the surface with magnesium or cast aluminum float or with a power finishing machine. Steel trowel surface immediately after floating to

produce smooth surface. Steel trowel again after concrete has hardened enough so that mortar does not adhere to trowel edge. Ringing sound should be apparent when performing second toweling due to tilted, compacting motion.

E. (WFF) Wood Float Finish: allow concrete to stiffen; float surface twice or more to a uniform sandy texture.

F. Tolerances for trowel finished floors: ACI 302 class BX. 5/16 inch maximum deviation from 10 foot long straightedge placed anywhere on the surface.

3.8 FINISHING VERTICAL SURFACES

A. (RFF) Rough Form Finish: Repair structural defects only and patch tie holes. Fins exceeding 1/4 in. in height to be removed by grinding and/or rubbing.

B. (SFF) Smooth Form Finish: The concrete surface shall be of uniform color, texture and free of all irregularities. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the minimum. Material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Remove fins flush by grinding and/or rubbing. Repair surface and structural defects as specified in this section.

C. Curbs: Provide monolithic finish to curbs by stripping forms while concrete is still green and steel-toweling surfaces to a hard, dense finish with corners, intersections, and terminations chamfered.

3.9 CURING

A. Curing: Curing shall begin immediately following the initial set of concrete or after slab surface finishing has been completed and shall continue after form removal per Section 03300A, 3.1.H. All concrete shall be cured to attain strength and durability by one of the following methods for a minimum of seven days after placement regardless of the ambient air temperature:

1. Ponding or continuous sprinkling. Intermittent wetting and drying is not an acceptable curing method.
2. Application of concrete curing compounds. If applying slab sealing compounds, use dissipating resin curing compound. Allow dissipating resin curing compound to chemically break-down, and remove residuals and other foreign material, prior to applying slab sealing compound.

B. Moisture loss from surfaces placed against wooden or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal, the concrete shall be cured by one of the methods described above, for the balance of time remaining as specified above.

C. Schedule of Finishes and Curing Requirements:

1. Provide finishes on concrete surfaces according to the following schedule:

Location	Finish	Curing Requirements
Exterior Exposed Walls to 6" below grade	SFF	Moist cure or apply two coats curing and sealing compound.
Exterior unexposed walls	RFF	Moist cure or apply two coats curing and sealing compound.

Exterior slabs-on-grade	LBF	Moist cure and apply two coats of slab sealer
Slabs (not coated)	STF	Apply two coats of curing/ hardening compound.
Equipment Pads	WFF	
Exterior Pads		Moist cure and apply two coats of slab sealer

D. Cold Weather:
   1. Conform to ACI 306R
   2. Maintain concrete temperature between 50^{O}F and 70^{O}F for a minimum of seven days after placement, enclose and heat, insulate as required.
   3. Reapply curing compounds every two days during heating period.
   4. The maximum allowable temperature drop of the concrete surfaces during the first 24 hours after the end of the curing period shall not exceed 5°F in any 1 hour and shall not exceed a total of a 40°F drop in the first 24 hours.

E. Hot Weather: Conform to ACI 305R Concrete temperature shall not be greater than 90°F. Protect from loss of slump, flash set, plastic cracking and rapid evaporation of water.

3.10 CORING OF HOLES

A. Core drill holes where shown.

B. Coring shall be performed with a non-impact rotary tool with diamond core drills, size shall be suitable for pipe conduit, sleeves or mechanical seals to be installed. All equipment shall conform to OSHA standards. Protect all existing equipment, utilities and critical areas against water or other damage caused by the drilling operation.

C. No structural members shall be cut without any exceptions taken by the Engineer.

3.11 TOLERANCES

A. Maximum allowable deviations from dimensions, elevations, slopes and position shall conform to ACI 117. Tolerances apply to concrete dimensions only, not to positioning of vertical reinforcing steel, dowels, or embedded items.

3.12 FAILURE TO MEET STRENGTH REQUIREMENTS

A. The strength of the concrete in place will be considered substandard if any one of the following results occur:
   1. The arithmetic average of 28-day cylinder tests for any three (3) consecutive test results are less than the specified strength (f'c).
   2. More than 10 percent of the 28-day cylinder tests have strengths less than the specified strength (f'c).
   3. An individual compressive strength test result falls below the specified strength (f'c) by more than 500 psi.

B. Concrete which fails to meet the strength requirements as outlined above will be reviewed by the Engineer. The Engineer will determine whether the substandard concrete will be accepted, rejected or additional tests performed.

C. When Substandard concrete as defined in Parts A.1 and A.2 occurs, the Engineer will require corrective measures to be taken immediately in order to increase the average of subsequent strength tests. When substandard concrete as defined in part A.3 occurs, non-destructive testing shall be performed on the substandard concrete. The testing shall be performed by an independent firm elected by the Engineer and paid for by the contractor at no additional cost to the Owner.

3.13 DEFECTIVE CONCRETE

A. Defective concrete is defined as concrete in place which does not conform to strength, shapes, alignments, appearances and/or elevation as shown on the drawings and/or presents faulty surface areas.

B. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the Drawings will be considered defective.

C. Concrete which differs from the required dimensions or locations in such a manner as to reduce the strength will be considered defective.

D. Concrete surfaces not finished or cured in accordance with this Section shall be classified as defective concrete.

E. Formed surfaces larger or smaller than dimensional tolerances specified in this Division may be rejected. If the Engineer permits the Contractor to correct the error, such correction shall be as directed and in such a manner as to maintain the strength, function and appearance of the structure.

F. Concrete members cast in the wrong location may be rejected and shall be removed at no additional cost to the Owner if the strength, appearance or function of the structure is adversely affected.

G. Inaccurately formed surfaces exposed to view may be rejected and shall be repaired or removed and replaced at no additional cost to the Owner.

H. Concrete exposed to view with defects which adversely affect the appearance of the specified finish shall be repaired. If, in the opinion of the Engineer, the defects cannot be repaired, the concrete may be accepted or rejected in accordance with the decision of the Engineer.

3.14 PROTECTION

A. Protect concrete from high and low temperatures for seven days.

B. Protect against vibration until concrete has attained 33% of its 28-day strength.

C. Protect against premature loads until the 28-day strength has been attained.

D. Concrete structures shall be covered, insulated and heated as required to prevent frost penetration beneath the structures until acceptance by the Owner.

END OF SECTION

BID SET No. _____

CITY OF WALTHAM, MASSACHUSETTS

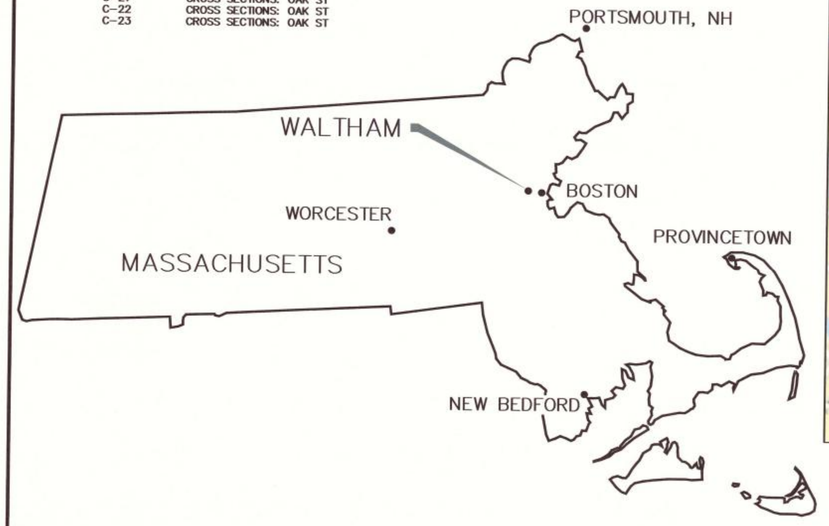
DRAWINGS FOR

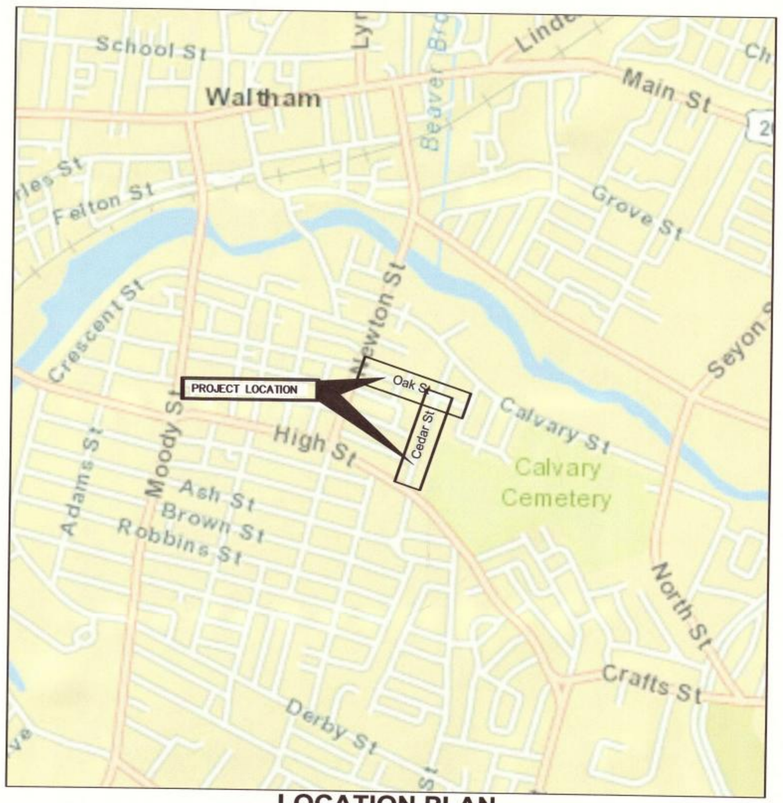
STORM DRAIN AND SURFACE IMPROVEMENTS

CEDAR STREET, OAK STREET

BID SUBMISSION
JULY 2015

DRAWING INDEX





LOCATION PLAN
SCALE: NTS

CITY OF WALTHAM
ENGINEERING DEPARTMENT
119 SCHOOL STREET
WALTHAM, MA 02451

BRIAN J. MONTEJUNAS CIVIL No. 47347 REGISTERED PROFESSIONAL ENGINEER COMMONWEALTH OF MASSACHUSETTS

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FOR REVIEW – _____
FOR BIDDING – _____
WP PROJECT NO. 12858B

EXISTING CONDITIONS NOTES

1. THE LOCATIONS OF UNDERGROUND UTILITIES, STRUCTURES AND POWER LINES AS SHOWN ON THE DRAWINGS, ARE APPROXIMATE AND MAY NOT BE COMPLETE. THE LOCATION OF EXISTING UNDERGROUND UTILITIES ARE BASED ON PREVIOUS CONSTRUCTION PLANS AND RECORDS. NO GUARANTEE IS MADE THAT UTILITIES OR STRUCTURES WILL BE ENCOUNTERED WHERE SHOWN OR THAT ALL UNDERGROUND UTILITIES AND STRUCTURES ARE SHOWN. ALL LOCATIONS AND SIZES OF EXISTING UTILITIES AND STRUCTURES SHALL BE VERIFIED IN THE FIELD WITH TEST PITS AS REQUIRED PRIOR TO BEGINNING CONSTRUCTION OF NEW PIPING THAT MAY BE AFFECTED. THE CONTRACTOR WILL REALIGN NEW PIPE LOCATIONS AS REQUIRED TO CONFORM TO EXISTING LINES AND AS APPROVED BY THE ENGINEER. UTILITY CONTACTS ARE AS FOLLOWS:

POLICE DEPARTMENT: 155 LEXINGTON STREET WALTHAM, MA 02452 TEL: (781) 893–3700	WATER & SEWER DEPT.: 165 LEXINGTON ST. WALTHAM, MA 02452 TEL: (781) 314–3855		
FIRE DEPARTMENT: 175 LEXINGTON STREET WALTHAM, MA 02452 TEL: (781) 314–371	WATER & SEWER DIVISION: 169 LEXINGTON ST WALTHAM, MA 02452 TEL: (781) 314–3820	GAS: NATIONAL GRID NORTHBOROUGH, MA 01532 TEL: 1–800–233–5325	
ELECTRIC: NSTAR ONE NSTAR WAY WESTWOOD, MA 02090 TEL: 1–800–592–2000	CABLE: VERIZON: 1–800–837–4966 RCN: 1–800–746–4726 COMCAST: 1–800–266–2278	TELEPHONE: VERIZON TEL: 1–800–837–4966	

2. SEWER SERVICE LOCATIONS ARE APPROXIMATE AND BASED ON CITY RECORDS. ACTUAL LOCATIONS SHALL BE VERIFIED BY THE CONTRACTOR.
3. PLANS DEVELOPED BASED ON SURVEY PROVIDED BY THE CITY OF WALTHAM, CITY OF WALTHAM GIS DATA, AND EXISTING RECORD DRAWINGS PROVIDED BY THE CITY OF WALTHAM.
4. THE CONTRACTOR SHALL EMPLOY A LICENSED SURVEYOR TO ESTABLISH VERTICAL CONTROL POINTS FOR CONSTRUCTION PURPOSES. THE ELEVATION OF EXISTING STRUCTURES TO BE TIED INTO SHALL BE CONFIRMED OR ESTABLISHED. VERTICAL CONTROL POINTS AND ELEVATIONS ON DRAWINGS ARE FOR DESIGN PURPOSES ONLY.

GENERAL CONSTRUCTION NOTES

1. THE CONTRACTOR SHALL NOTIFY RESIDENTS 48 HOURS IN ADVANCE OF WHEN CONSTRUCTION WILL BE OCCURRING IN PROXIMITY TO THEIR RESIDENCE OR BUSINESS.
2. FLOWS FROM DEWATERING ACTIVITIES SHALL NOT BE DISCHARGED TO SANITARY SEWERS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE APPROPRIATE DISPOSAL OF FLOWS RESULTING FROM PRECIPITATION AND HIS DEWATERING OPERATIONS.
4. CONTRACTOR SHALL NOT TRACK OR SPILL EARTH, DEBRIS OR OTHER CONSTRUCTION MATERIAL ON PUBLIC OR PRIVATE STREETS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE IMMEDIATE ASSOCIATED CLEAN UP.
5. ALL TEST PITS SHALL BE EXCAVATED PRIOR TO CONSTRUCTION LAYOUT AND ACTUAL LOCATIONS OF SUBSURFACE UTILITIES SHALL BE REPORTED TO THE ENGINEER. WHERE APPROPRIATE, MINOR ADJUSTMENTS TO THE ALIGNMENTS OF PROPOSED LINES SHALL BE MADE TO ACCOMMODATE EXISTING UTILITIES AS APPROVED BY ENGINEER. ALL ADJUSTMENTS (NORTHINGS, EASTINGS AND ELEVATIONS) MUST BE DEPICTED IN THE RECORD AS–BUILT DRAWING DATA SUBMITTED TO THE ENGINEER FOR INCLUSION IN THE RECORD AS–BUILT DRAWINGS.
6. ANY EXISTING SEWERS, WATER MAINS, STORM DRAIN OR CULVERTS DAMAGED DURING CONSTRUCTION AND NOT TO BE REPLACED SHALL BE REPAIRED, STRUCTURE TO STRUCTURE BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
7. DO NOT SCALE DRAWINGS UNLESS OTHERWISE NOTED. WRITTEN DIMENSIONS SHALL PREVAIL. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
8. ALL STRUCTURES AND PIPELINES LOCATED ADJACENT TO THE TRENCH EXCAVATION SHALL BE PROTECTED AND FIRMLY SUPPORTED BY THE CONTRACTOR UNTIL THE TRENCH IS BACKFILLED. DAMAGE TO ANY SUCH STRUCTURES CAUSED BY, OR RESULTING FROM, THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. ALL UTILITIES REQUIRING REPAIR, RELOCATION OR ADJUSTMENT AS A RESULT OF THE PROJECT SHALL BE COORDINATED THROUGH THE RESPECTIVE UTILITY.
9. IN THOSE INSTANCES WHERE POWER OR TELEPHONE POLE SUPPORT IS REQUIRED, THE CONTRACTOR SHALL NOTIFY AND COORDINATE WITH UTILITY(S) ACCORDINGLY. NO ADDITIONAL PAYMENT WILL BE PROVIDED FOR TEMPORARY BRACING OF UTILITIES. THE CONTRACTOR SHALL COORDINATE RELOCATION OF TELEPHONE POLES WITH THE RESPECTIVE UTILITY.
10. ALL PIPING, EQUIPMENT AND MATERIALS TO BE DEMOLISHED AND/OR REMOVED FROM SERVICE SHALL BE COORDINATED WITH THE OWNER AND ENGINEER BEFORE COMMENCING THAT WORK. EXISTING PIPES DESIGNATED AS "ABANDONED" MAY BE REMOVED IF THE CONTRACTOR SO CHOOSES. IF ABANDONED PIPE CONFLICTS WITH PROPOSED PIPING, THEN A PORTION OF THE ABANDONED PIPE SHALL BE REMOVED. IN ALL CASES, ABANDONED PIPE TO REMAIN IN–PLACE SHALL BE FILLED AND PLUGGED IN IT'S ENTIRETY WITH CDF (CONTROLLED DENSITY FILL).
11. SEVERING OF EXISTING UTILITIES FOR ABANDONMENT, OR REMOVAL OF A SEGMENT FROM SERVICE, SHALL BE PERFORMED IN SUCH A MANNER AS TO ALLOW THE REMAINING ACTIVE SEGMENT TO CONTINUE IN ITS INTENDED SERVICE. CAP ACTIVE SEGMENTS WITH APPROPRIATE FITTINGS, JOINT RESTRAINT, ETC. TO ENSURE THEIR INTEGRITY.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING OF ALL DEMOLISHED PIPING, EQUIPMENT AND MATERIALS. DISPOSAL SHALL BE IN ACCORDANCE WITH ALL STATE AND LOCAL REGULATIONS. THE OWNER RESERVES THE RIGHT TO RETAIN ANY SUCH PIPING, EQUIPMENT AND MATERIALS DESIGNATED FOR DEMOLITION FOR HIS USE. SUCH MATERIALS TO BE RETAINED SHALL BE PROPERLY STORED IN AN ON–SITE LOCATION. COORDINATE LOCATION AND MATERIALS TO BE SALVAGED WITH THE OWNER/ENGINEER.
13. THE CONTRACTOR SHALL TAKE ALL NECESSARY STEPS TO ENSURE THAT ALL SEWER, WATER & DRAINAGE FLOWS ARE MAINTAINED DURING CONSTRUCTION. PRESSURE, GRAVITY OR PUMPED BYPASSES AND OTHER MEANS OF MAINTAINING FLOW SHALL BE SUBJECT TO THE REVIEW AND ACCEPTANCE OF THE ENGINEER. THE CONTRACTOR SHALL COORDINATE ANY TEMPORARY STOPPAGES OR BYPASSES WITH THE OWNER AND ENGINEER.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESETTING ALL EXISTING PROPERTY MONUMENTATION THAT IS DISTURBED BY HIS OPERATIONS AT NO EXPENSE TO THE OWNER. THIS WORK IS TO BE DONE BY A LAND SURVEYOR LICENSED IN THE COMMONWEALTH OF MASSACHUSETTS. PROPERTY BOUNDS FOUND ARE SHOWN ON LAYOUT PLANS, THIS MAY NOT BE INCLUSIVE OF ALL BOUNDS THAT EXIST IN THE PROJECT AREA. IF ANY ADDITIONAL BOUNDS ARE FOUND, THE CONTRACTOR SHALL DOCUMENT THE LOCATION AND NOTIFY THE ENGINEER.
15. THE CONTRACTOR IS TO TAKE SPECIAL CARE NOT TO DAMAGE TREES WITHIN THE CONSTRUCTION AREA UNLESS THEY ARE NOTED TO BE REMOVED.
16. APPROXIMATE LIMIT OF WORK ON PLANS IS INTENDED TO SHOW GENERAL SCOPE OF THE WORK. ACTUAL LIMITS OF THE WORK ARE TO BE DETERMINED IN THE FIELD TO MEET PROJECT NEEDS AS DETERMINED BY THE OWNER AND THE ENGINEER.
17. EXISTING SIGNS THAT ARE IMPACTED BY THIS PROJECT SHALL BE RESET PER CITY STANDARDS AND IN ACCORDANCE WITH MASS. DOT AND M.U.T.C.D. (MANUAL UNIFORM TRAFFIC CONTROL DEVICES) ADDITIONAL SIGNS MAY BE REQUIRED AS DIRECTED BY THE ENGINEER.
18. COMPACTION TESTS SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS. ANY SETTLEMENT OCCURRING WITHIN ONE YEAR OF SUBSTANTIAL COMPLETION OF THE PROJECT WILL BE CORRECTED BY THE CONTRACTOR IN A MANNER ACCEPTABLE TO THE ENGINEER AT NO ADDITIONAL EXPENSE TO THE OWNER.
19. SUITABLE EXCAVATED MATERIAL MAY BE INCORPORATED IN THE PROJECT. THE CONTRACTOR SHALL DISPOSE OF EXCESS MATERIAL IN ACCORDANCE WITH THE APPLICABLE SECTIONS OF THE CONTRACT DOCUMENTS AND ALL STATE, FEDERAL AND LOCAL REGULATIONS.
20. ALL GRASSED AREA DISTURBED BY CONSTRUCTION ACTIVITIES SHALL BE REGRADED AND SEEDED AS SPECIFIED.
21. THE CONTRACTOR SHALL GPS LOCATE STRUCTURES UPON INSTALLATION. AN ELECTRONIC LIST OF GPS DATA SHALL BE SUBMITTED ON A MONTHLY BASIS TO ENGINEER AND CITY OF WALTHAM – GIS ADMINISTRATOR (781–314–3006).
22. THE CONTRACTOR SHALL COORDINATE HIS WORK WITH OTHERS.
23. SEWER SERVICE SHALL BE MAINTAINED TO ALL CUSTOMERS THROUGHOUT THE CONSTRUCTION PERIOD.
24. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LAYOUT OF ALL NEW SEWER AND DRAINAGE LINES. LAYOUT SHALL BE REVIEWED AND ACCEPTED BY THE OWNER AND THE ENGINEER. THE NEW WATER MAINS MUST BE LOCATED WITHIN THE RIGHT–OF–WAY OR EASEMENTS SHOWN ON THE DRAWINGS.

GENERAL CONSTRUCTION NOTES CONTINUED

25. THE CONTRACTOR SHALL VERIFY TO HIS OWN SATISFACTION THAT ALL PERMITS HAVE BEEN OBTAINED TO COMPLETE SPECIFIED WORK.
26. THE CONTRACTOR SHALL REPAIR ALL PAVEMENT DISTURBED BY THE CONSTRUCTION WORK. THE TRENCH PATCHING SHALL BE PERFORMED AS EACH SECTION OF THE WORK IS COMPLETED.
27. TRENCHES SHALL NOT BE LEFT OPEN DURING NON–WORKING HOURS. ALL OPEN PIPES SHALL BE SECURED WITH A WATER TIGHT PLUG WHEN THE PIPE IS TEMPORARILY BACKFILLED AND WHEN PIPE LAYING IS NOT IN PROCESS.
28. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL BENDS, FITTINGS, AND ANY AND ALL APPURTENANCES NECESSARY FOR THE COMPLETION OF THE WORK AS SHOWN HEREIN. NOT ALL BENDS AND FITTINGS REQUIRED ARE SHOWN OR CALLED OUT ON THE DRAWINGS.
29. 2–INCHES OF RIGID INSULATION SHALL BE PROVIDED BETWEEN STORM DRAINAGE PIPES AND SEWER SERVICE LATERALS WHERE SEPARATION IS LESS THAN 2 FEET.
30. THE CONTRACTOR SHALL NOT OPERATE ANY HYDRANTS, VALVES, CURB STOPS OR CORPORATIONS NOR SHALL THEY DRAW ANY WATER FROM THE SYSTEM, WITHOUT SPECIFIC APPROVAL OF THE OWNER.

TRAFFIC CONTROL NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING TRAFFIC FLOW AT ALL TIMES UNLESS OTHERWISE APPROVED. THE CONTRACTOR IS REQUIRED TO SUBMIT A TRAFFIC CONTROL PLAN TO THE OWNER AND ENGINEER PRIOR TO COMMENCING CONSTRUCTION. THE POLICE DEPARTMENT AND FIRE DEPARTMENT ARE TO BE CONSULTED AT LEAST 48 HOURS IN ADVANCE OF ANY PROPOSED STREET CLOSING OR DETOUR.
2. CONTRACTOR SHALL INSTALL AND MAINTAIN PERMANENT AND TEMPORARY TRAFFIC CONTROL DEVICES AS NECESSARY AND IN A MANNER CONSISTENT WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (M.U.T.C.D.).

CONSTRUCTION SEQUENCING NOTES - CEDAR AND OAK ST

CONTRACTOR IS REQUIRED TO SUBMIT A DETAILED SEQUENCE OF CONSTRUCTION PLAN FOR APPROVAL PRIOR TO WORK COMMENCING:

CIVIL ABBREVIATIONS

&	AND
ø, DIA	DIAMETER
#, NO	NUMBER
AC	ASBESTOS CEMENT
APP'D	APPROVED
BLDG	BUILDING
CB	CATCH BASIN
CDF	CONTROLLED DENSITY FILL
CEN	CENTER
CFS	CUBIC FEET PER SECOND
CI	CAST IRON
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
CONC	CONCRETE
COR	CORNER
CY	CUBIC YARD
DEMO	DEMOLITION
DMH	DRAIN MANHOLE
DI	DUCTILE IRON
DR	DRAIN
DWG	DRAWING
EL	ELEVATION
EMH	ELECTRIC MANHOLE
FM	FORCE MAIN
FT	FEET
G	GAS
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
HYD	HYDRANT
ID	INSIDE DIAMETER
IN	INCH
INF	INFLUENT
INV	INVERT
LBS	POUNDS
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MJ	MECHANICAL JOINT
N	NORTH
NGVD	NATIONAL GEODETIC VERTICAL DATUM
N/A	NOT AVAILABLE/APPLICABLE
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
REQ'D	REQUIRED
S	SLOPE OR SEWER
SD	STORM DRAIN
SF	SQUARE FEET
SMH	SANITARY SEWER MANHOLE
SQ	SQUARE
STA	STATION
T, XFMR	TRANSFORMER
TBM	TEMPORARY BENCH MARK
THK	THICKNESS
TOS	TOP OF STRUCTURE
TYP	TYPICAL
UD	UNDERDRAIN
UG	UNDERGROUND
UGE	UNDERGROUND ELECTRIC
W/	WITH
W	POTABLE WATER
WG	WATER GATE VALVE

LEGEND

EXISTING		PROPOSED
	PROPERTY/ROW LINE	
	SETBACK LINE	
	EASEMENT LINE	
	CENTERLINE	
	EDGE OF PAVEMENT	
	CURBING	
	EDGE OF GRAVEL	
	EDGE OF CONCRETE	
122	CONTOUR	123
	BUILDING	
	STONEWALL	
	TREELINE	
	CHAIN LINK FENCE	
	STOCKADE FENCE	
	BARB WIRE FENCE	
	RETAINING WALL	
	GUARDRAIL	
8" S	SEWER	8"S
4" FM	SEWER FORCE MAIN	4"FM
4" G	GAS	4"G
4" W	WATER	8"W
15" SD	STORM DRAIN	15"SD
6" UD	UNDERDRAIN	6"UD
12" CMP	CULVERT	12" CMP
UGE	UNDERGROUND ELECTRIC	UGE
	OVERHEAD ELECTRIC	OHE
	IRON PIPE/REBAR	
	DRILLHOLE	
	MONUMENT	
	SURVEY CONTROL POINT	
124.6	SPOT ELEVATION	x 134.5
SMH	SEWER MANHOLE	SMH
DMH	DRAINAGE MANHOLE	DMH
CB CB	CATCH BASIN	CB CB
EMH	ELECTRIC MANHOLE	EMH
TMH	TELEPHONE MANHOLE	TMH
	GATE VALVE	
	CURB STOP	
	YARD HYDRANT	
	HYDRANT	
	UTILITY POLE	
	UTILITY POLE W/ GUY	
	UTILITY POLE W/ LIGHT	
	LIGHT POLE	
	BOLLARD	
	FLAGPOLE	
	CONIFEROUS TREE	
	DECIDUOUS TREE	
	SHRUB	
	EDGE OF WATER	
	STREAM	
	EDGE OF WETLANDS	
	FLOODPLAIN	
	WETLANDS	
	DRAINAGE FLOW	
	DRAINAGE SWALE	
	PAVEMENT MARKINGS	
	SIGN	
MB	MAILBOX	
	TEMPORARY BENCH MARK	
TP–2	TEST PIT	
B–3	TEST BORING	
P–4	TEST PROBE	
MW	MONITORING WELL	
	LIMIT OF WORK	
	SILT FENCE	
	RIPRAP	
	RAILROAD	
	MATCHLINE	
	ROCK OUTCROP	

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD CORR: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

COMMONWEALTH OF MASSACHUSETTS
BRIAN J. MONTEIJUNAS
CIVIL
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REGISTERED PROFESSIONAL ENGINEER
6/23/15

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WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

GENERAL NOTES, LEGEND, AND ABBREVIATIONS

DRAWING
C–1

LAST SAVED BY: JJM 6/23/2015 12:47 PM

EROSION AND SEDIMENTATION CONTROL NOTES

THIS PLAN HAS BEEN DEVELOPED AS A STRATEGY TO CONTROL SOIL EROSION AND SEDIMENTATION DURING AND AFTER CONSTRUCTION. THIS PLAN IS BASED ON THE STANDARDS AND SPECIFICATIONS FOR EROSION PREVENTION IN URBAN AND SUBURBAN AREAS AS CONTAINED IN THE "MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS", FRANKLIN, HAMPDEN, HAMPSHIRE CONSERVATION DISTRICTS, DATED MARCH, 1997.

THE PROPOSED LOCATIONS OF SILTATION AND EROSION CONTROL STRUCTURES REQUIRED FOR THE PUMP STATION AND WATER METERING STATION ARE SHOWN ON THE GRADING/EROSION CONTROL PLANS. PROVIDE SILT FENCE, STONE CHECK DAMS AND OTHER EROSION CONTROL MEASURES AS REQUIRED TO ADEQUATELY PREVENT SEDIMENT TRANSPORT AS NOTED IN THE BMP.

1. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE DONE IN ACCORDANCE WITH THE "MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS", FRANKLIN, HAMPDEN, HAMPSHIRE CONSERVATION DISTRICTS, DATED MARCH, 1997.
2. THOSE AREAS UNDERGOING ACTUAL CONSTRUCTION WILL BE MAINTAINED IN AN UNTREATED OR UNVEGETATED CONDITION FOR THE MINIMUM TIME REQUIRED. IN GENERAL, AREAS TO BE VEGETATED SHALL BE PERMANENTLY STABILIZED WITHIN 15 DAYS OF FINAL GRADING AND TEMPORARILY STABILIZED WITHIN 30 DAYS OF INITIAL DISTURBANCE OF THE SOIL.
3. SEDIMENT BARRIERS (SILT FENCE, STONE CHECK DAMS, ETC.) SHOULD BE INSTALLED PRIOR TO ANY SOIL DISTURBANCE OF UPGRADIENT DRAINAGE AREAS.
4. INSTALL SILT FENCE AT TOE OF SLOPES TO FILTER SILT FROM RUNOFF. SEE SILT FENCE DETAIL FOR PROPER INSTALLATION. SILT FENCE WILL REMAIN IN PLACE PER NOTE #5.
5. ALL EROSION CONTROL STRUCTURES WILL BE INSPECTED, REPLACED AND/OR REPAIRED EVERY 7 DAYS AND IMMEDIATELY FOLLOWING ANY SIGNIFICANT RAINFALL OR SNOW MELT OR WHEN NO LONGER SERVICEABLE DUE TO SEDIMENT ACCUMULATION OR DECOMPOSURE. SEDIMENT DEPOSITS MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE HALF THE HEIGHT OF THE BARRIER. SEDIMENT CONTROL DEVICES SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL AREAS UPSLOPE ARE PERMANENTLY STABILIZED.
6. NO SLOPES, EITHER PERMANENT OR TEMPORARY, SHALL BE STEEPER THAN TWO HORIZONTAL TO ONE VERTICAL (2 TO 1) UNLESS STABILIZED WITH PERMANENT EROSION CONTROL MEASURES.
7. IF FINAL SEEDING OF THE DISTURBED AREAS IS NOT TO BE COMPLETED 30 DAYS PRIOR TO THE ANTICIPATED DATE OF THE FIRST KILLING FROST, USE TEMPORARY MULCHING (DORMANT SEEDING MAY BE ATTEMPTED AS WELL) TO PROTECT THE SITE AND DELAY PERMANENT SEEDING, UNTIL UPGRADIENT AREAS ARE STABILIZED.
8. WHEN FEASIBLE, TEMPORARY SEEDING OF DISTURBED AREAS THAT HAVE NOT BEEN FINISH GRADED SHALL BE COMPLETED 30 DAYS PRIOR TO THE FIRST KILLING FROST.
9. DURING THE CONSTRUCTION PHASE, INTERCEPTED SEDIMENT WILL BE RETURNED TO THE SITE AND REGRADED ONTO OPEN AREAS. POST SEEDING SEDIMENT, IF ANY, WILL BE DISPOSED OF IN AN ACCEPTABLE MANNER.
10. REVEGETATION MEASURES WILL COMMENCE UPON COMPLETION OF CONSTRUCTION EXCEPT AS NOTED ABOVE. ALL DISTURBED AREAS NOT OTHERWISE STABILIZED WILL BE GRADED, SMOOTHED, AND REVEGETATED AS FOLLOWS:
    A. A MINIMUM OF FOUR (4) INCHES OF LOAM WILL BE SPREAD OVER DISTURBED AREAS AND SMOOTHED TO A UNIFORM SURFACE.
    B. APPLY LIMESTONE AND FERTILIZER ACCORDING TO SOIL TEST. IF SOIL TESTING IS NOT DEEMED FEASIBLE ON SMALL OR VARIABLE SITES, OR WHERE TIMING IS CRITICAL, FERTILIZER MAY BE APPLIED AT THE RATE OF 800 POUNDS PER ACRE OR 18.4 POUNDS PER 1,000 SQUARE FEET USING 10-20-20 (N-P205-K20) OR EQUIVALENT. APPLY GROUND LIMESTONE (EQUIVALENT TO 50% CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF 3 TONS PER ACRE (138 LB PER 1,000 SQ. FT.).
    C. FOLLOWING SEED BED PREPARATION, DITCHES AND BACK SLOPES WILL BE SEEDED WITH A MIXTURE OF 47% CREEPING RED FESCUE, 5% REDTOP, AND 48% TALL FESCUE. THE LAWN AREAS WILL BE SEEDED WITH A PREMIUM TURF MIXTURE OF 44% KENTUCKY BLUEGRASS, 44% CREEPING RED FESCUE, AND 12% PERENNIAL RYE GRASS: SEEDING RATE IS 3.0 LBS PER 1000 SQ. FT. LAWN QUALITY SOD MAY BE SUBSTITUTED FOR SEED.
    D. HAY MULCH AT THE RATE OF 70-90 LBS PER 1000 SQUARE FEET OR A HYDRO-APPLICATION OF CELLULOSE FIBER SHALL BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER WILL BE USED ON HAY MULCH FOR WIND CONTROL.
11. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE REMOVED ONCE THE WORK AREA IS STABILIZED.
12. WETLANDS (EXCEPTING THOSE WHICH ARE TO BE FILLED IN ACCORDANCE WITH STATE AND FEDERAL REGULATIONS) WILL BE PROTECTED WITH SILT FENCE INSTALLED AT THE EDGE OF THE WETLAND OR THE BOUNDARY OF WETLAND DISTURBANCE.
13. IN GENERAL, AREAS WITHIN 100 FEET OF DELINEATED WETLANDS OR STREAMS SHALL HAVE A MAXIMUM PERIOD OF EXPOSURE OF NOT MORE THAN 15 DAYS.
14. FOLLOW APPROPRIATE EROSION CONTROL MEASURES PRIOR TO EACH STORM IN ALL AREAS WITHIN 100 FEET OF DELINEATED WETLANDS OR STREAMS.

EROSION CONTROL DURING WINTER CONSTRUCTION

1. WINTER CONSTRUCTION PERIOD DEFINED: NOVEMBER 1 THROUGH APRIL 15
2. WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE SITE IS WITHOUT STABILIZATION AT ANY ONE TIME.
3. EXPOSED AREA SHOULD BE LIMITED TO THAT THAT CAN BE MULCHED IN ONE DAY PRIOR TO ANY PRECIPITATION EVENT.
4. AN AREA SHALL BE CONSIDERED TO HAVE BEEN STABILIZED WHEN EXPOSED SURFACES HAVE BEEN EITHER MULCHED WITH STRAW OR HAY AT A RATE OF 100 LB. PER 1,000 SQUARE FEET (WITH OR WITHOUT SEEDING) OR DORMANT SEEDED, MULCHED AND ADEQUATELY ANCHORED BY AN APPROVED ANCHORING TECHNIQUE. IN ALL CASES, MULCH SHALL BE APPLIED SUCH THAT SOIL SURFACE IS NOT VISIBLE THROUGH THE MULCH.
5. BETWEEN THE DATES OF OCTOBER 15 AND APRIL 1ST, LOAM OR SEED WILL NOT BE REQUIRED. DURING PERIODS OF ABOVE-FREEZING TEMPERATURES, THE SLOPES SHALL BE FINE GRADED AND EITHER PROTECTED WITH MULCH OR TEMPORARILY SEEDED AND MULCHED UNTIL SUCH TIME AS THE FINAL TREATMENT CAN BE APPLIED. IF THE DATE IS AFTER NOVEMBER 1ST AND IF THE EXPOSED AREA HAS BEEN LOAMED, FINAL GRADED AND IS SMOOTH, THEN THE AREA MAY BE DORMANT SEEDED AT A RATE 200 - 300% HIGHER THAN SPECIFIED FOR PERMANENT SEED AND THEN MULCHED. IF CONSTRUCTION CONTINUES DURING FREEZING WEATHER, ALL EXPOSED AREAS SHALL BE GRADED BEFORE FREEZING AND THE SURFACE TEMPORARILY PROTECTED FROM EROSION BY THE APPLICATION OF MULCH. SLOPES SHALL NOT BE LEFT EXPOSED OVER THE WINTER OR ANY OTHER EXTENDED TIME OF WORK SUSPENSION UNLESS TREATED IN THE ABOVE MANNER. UNTIL SUCH TIME AS WEATHER CONDITIONS ALLOW DITCHES TO BE FINISHED WITH THE PERMANENT SURFACE TREATMENT, EROSION SHALL BE CONTROLLED BY THE INSTALLATION OF BALES OF HAY OR STONE CHECK DAMS IN ACCORDANCE WITH THE STANDARD DETAILS.
6. A) BETWEEN THE DATES OF NOVEMBER 1ST AND APRIL 15TH ALL MULCH SHALL BE EITHER WOOD CELLULOSE FIBER OR BE ANCHORED WITH MULCH NETTING OR CHEMICAL TACK.
   B) MULCH NETTING SHALL BE USED TO ANCHOR MULCH IN ALL DRAINAGE WAYS WITH A SLOPE GREATER THAN 3%, FOR SLOPES EXPOSED TO DIRECT WINDS AND FOR ALL OTHER SLOPES GREATER THAN 8%.
   C) MULCH NETTING SHALL BE USED TO ANCHOR MULCH IN ALL AREAS WITH SLOPES GREATER THAN 15%. AFTER OCTOBER 1ST, THE SAME APPLIES FOR ALL SLOPES GREATER THAN 8%.
7. AFTER NOVEMBER 1ST THE CONTRACTOR SHALL APPLY DORMANT SEEDING OR MULCH AND ANCHORING ON ALL BARE EARTH AT THE END OF EACH WORKING DAY.
8. DURING WINTER CONSTRUCTION PERIODS ALL SNOW SHALL BE REMOVED FROM AREAS OF SEEDING AND MULCHING PRIOR TO PLACEMENT.

MULCH ANCHORING

ANCHOR MULCH WITH: MULCH NETTING (AS PER MANUFACTURER); ASPHALT EMULSION (0.05 GALLONS PER SQ. YD.); CHEMICAL TACK (AS PER MANUFACTURER'S SPECIFICATIONS); OR BE WOOD CELLULOSE FIBER (2000 LBS/ACRE). WETTING FOR SMALL AREAS AND ROAD DITCHES MAY BE PERMITTED.

ADDITIONAL TEMPORARY SEED MIXTURE (OR PERIODS LESS THAN 12 MONTHS)

DATES	SEED	RATE
4/1/02 - 7/1/02 8/15/02 - 9/15/02	OATS	80 LBS/ACRE
4/1/02 - 6/1/02 (8/15/02 - 9/15/02)	ANNUAL RYE GRASS	40 LBS/ACRE
(8/15/02 - 10/15/02)	WINTER RYE	120 LBS/ACRE
(11/1/02 - 4/1/03)	MULCH W/ DORMANT SEED	80 LBS/ACRE*
(5/1/02 - 6/30/01)	FOXTAIL MILLET	30 LBS/ACRE

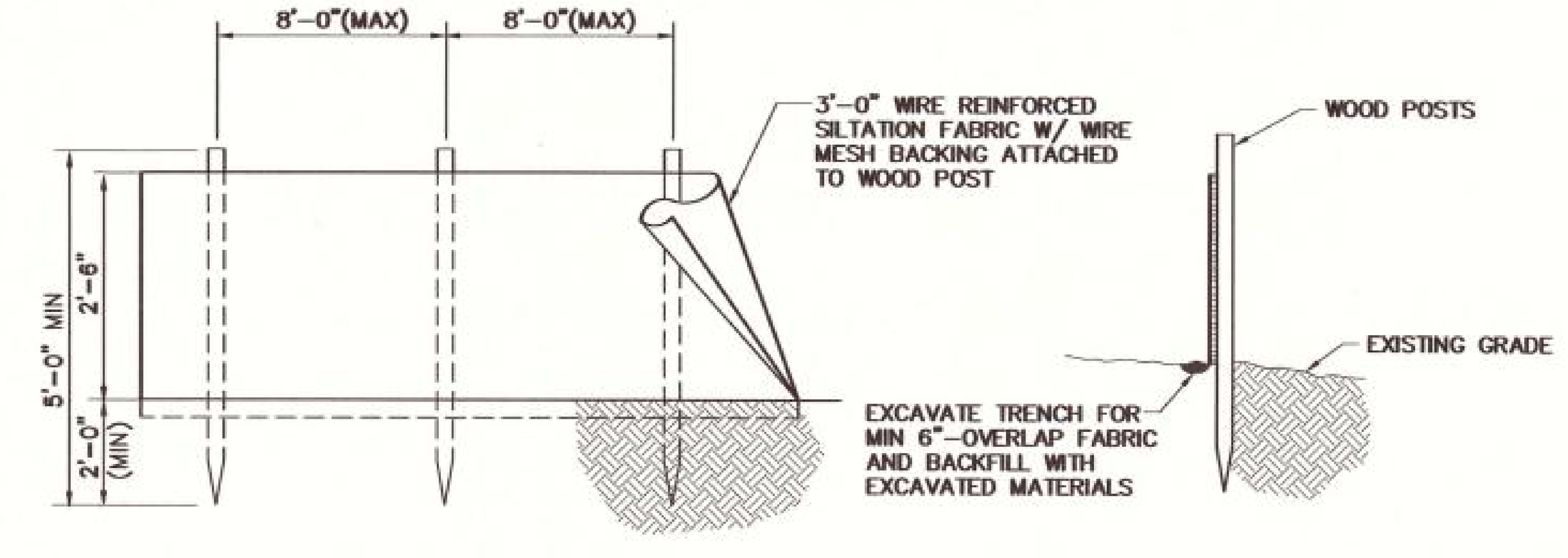
*SEED RATE ONLY

MULCH AND MULCH ANCHORING

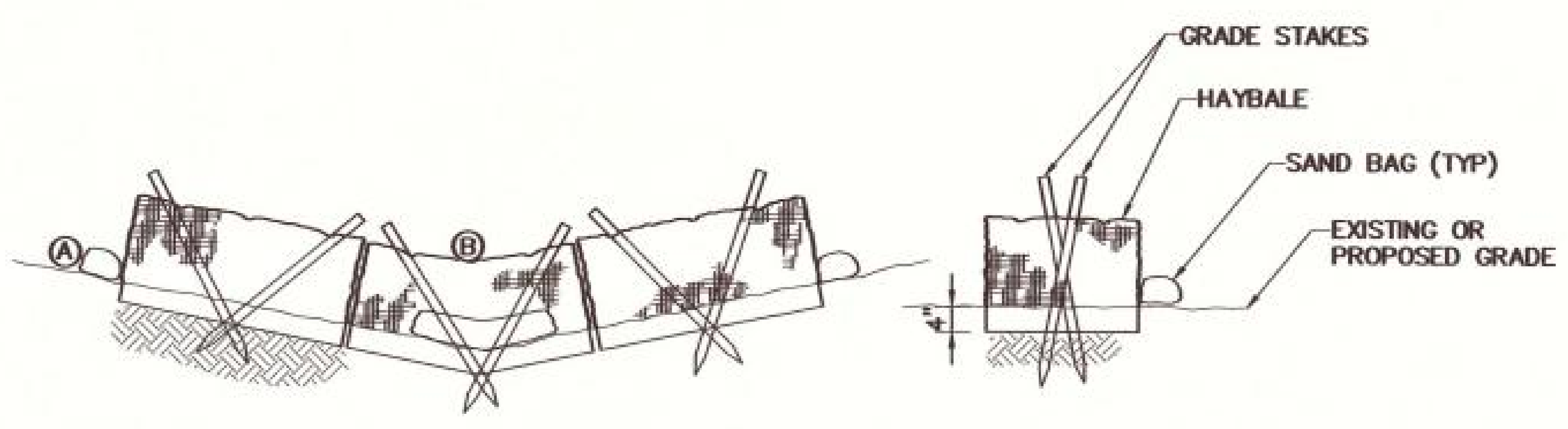
MULCH

LOCATION	MULCH	RATE (1000 S.F.)
PROTECTED AREA	STRAW OR HAY *	100 POUNDS
WINDY AREAS	STRAW OR HAY (ANCHORED) *	100 POUNDS
MODERATE TO HIGH VELOCITY AREAS OR STEEP SLOPES (GREATER THAN 3:1)	JUTE MESH, EXCELSIOR MAT OR EQUIV.	AS REQUIRED AS REQUIRED

* A HYDRO-APPLICATION OF CELLULOSE FIBER MAY BE APPLIED FOLLOWING SEEDING. A SUITABLE BINDER SHALL BE USED ON HAY MULCH FOR WIND CONTROL.

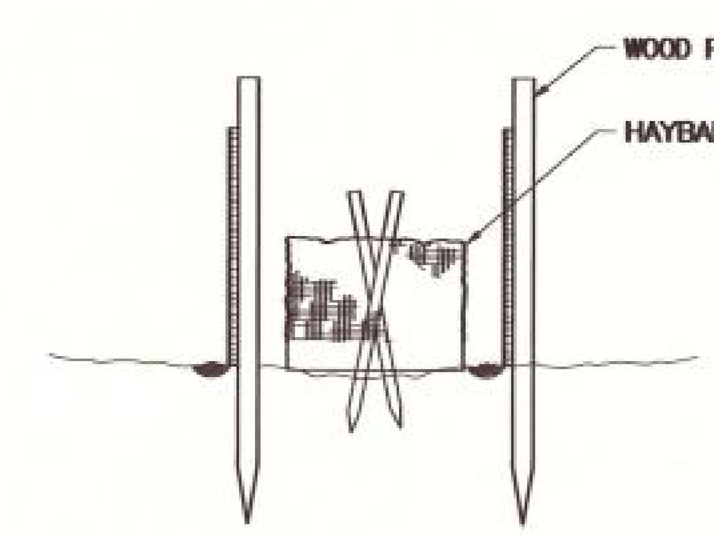


SILT FENCE INSTALLATION DETAIL
SCALE: "NTS"

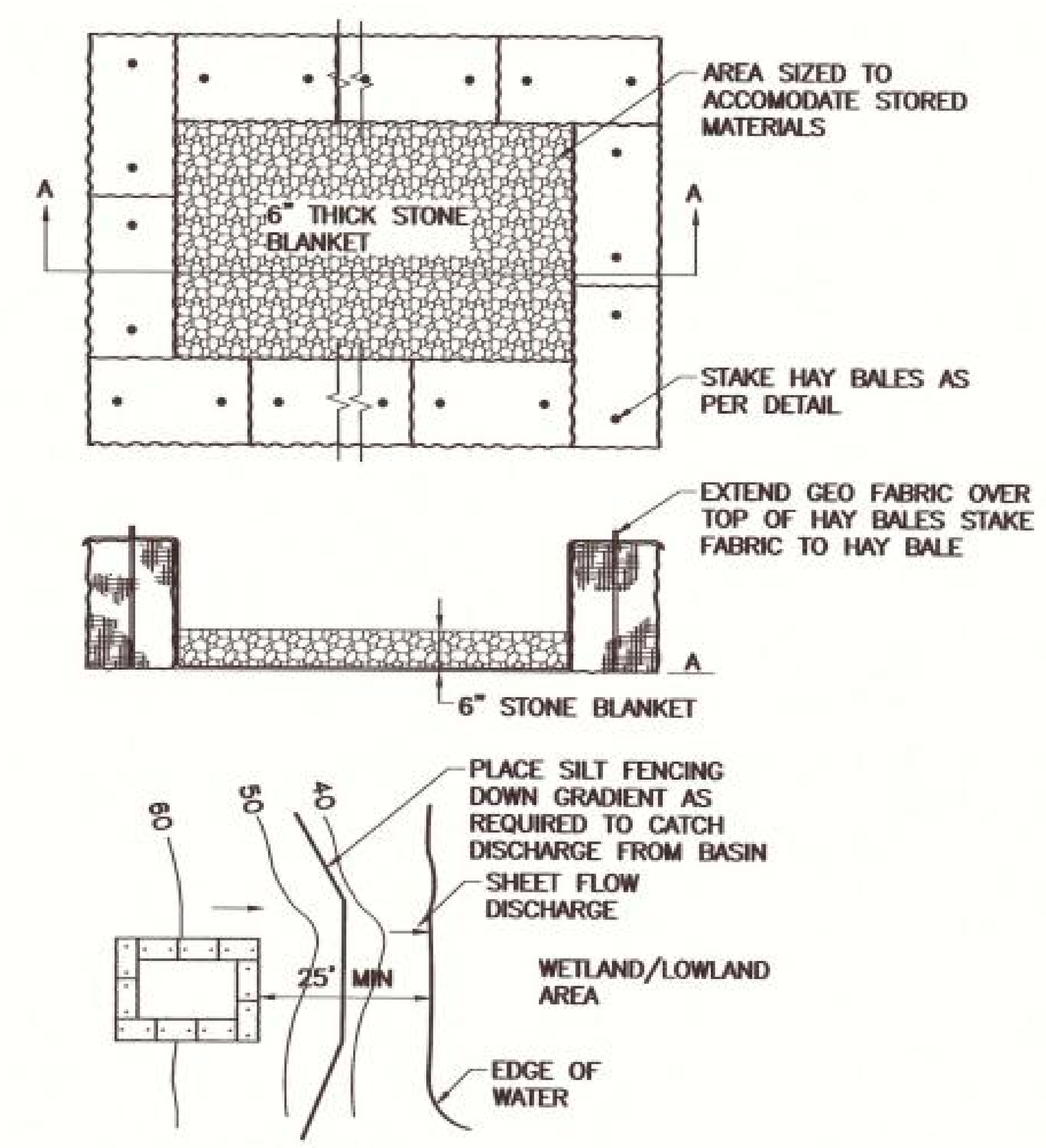


EROSION CHECK TO BE BALES OF HAY SECURED TO THE GROUND WITH TWO 4' LONG GRADE STAKES FOR EACH BALE. SAND BAG AS REQUIRED, PLACE SUFFICIENT BALES TO ESTABLISH ELEVATIONS AT (A) AT LEAST 6 INCHES ABOVE OVERFLOW AT (B)

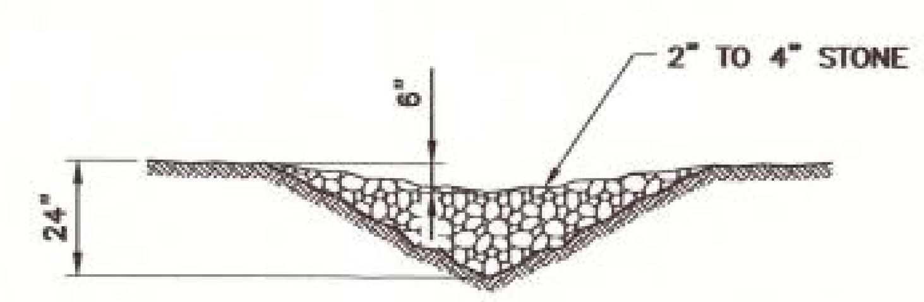
HAY BALE CHECK DAM
SCALE: "NTS"



COMBINATION SILT FENCE AND HAY BALE BARRIER
SCALE: "NTS"

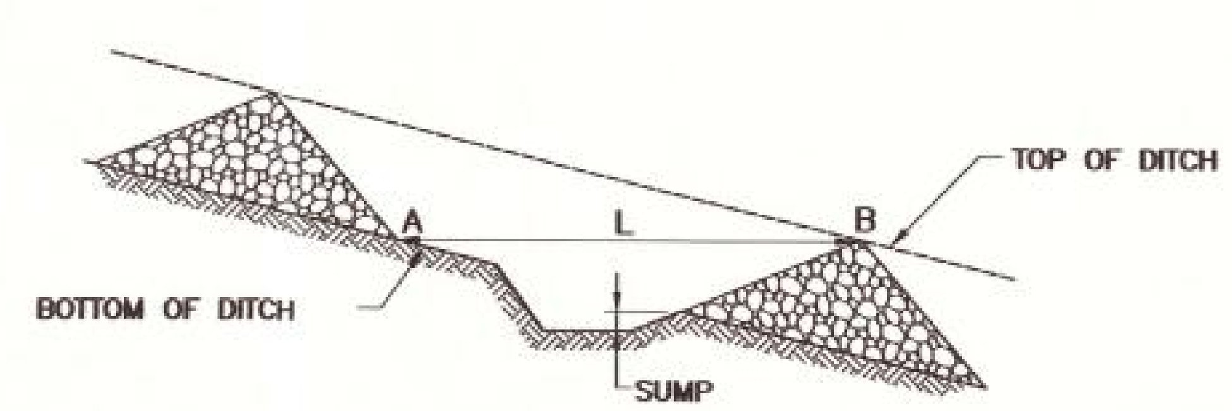


TEMPORARY HAY BALE SEDIMENT BASIN
SCALE: "NTS"



CROSS SECTION

DITCH SLOPE (FT/FT)	L (FT)
0.020	100
0.030	66
0.040	50
0.050	40
0.080	25
0.100	20
0.120	17
0.150	13



PROFILE

STONE CHECK DAM DETAIL
SCALE: "NTS"

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD COORD: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

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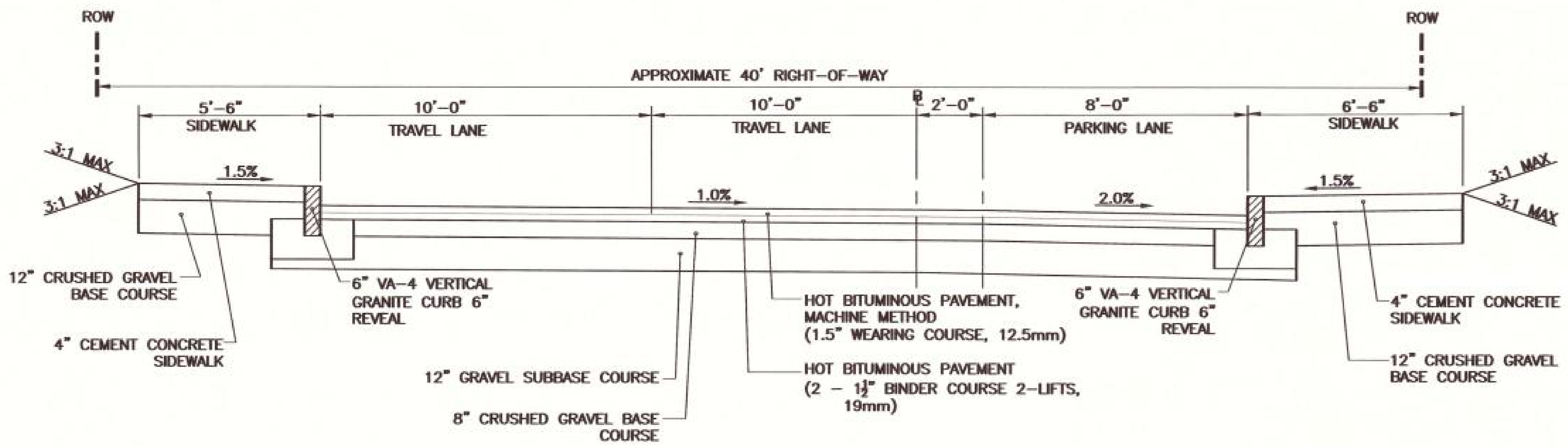
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

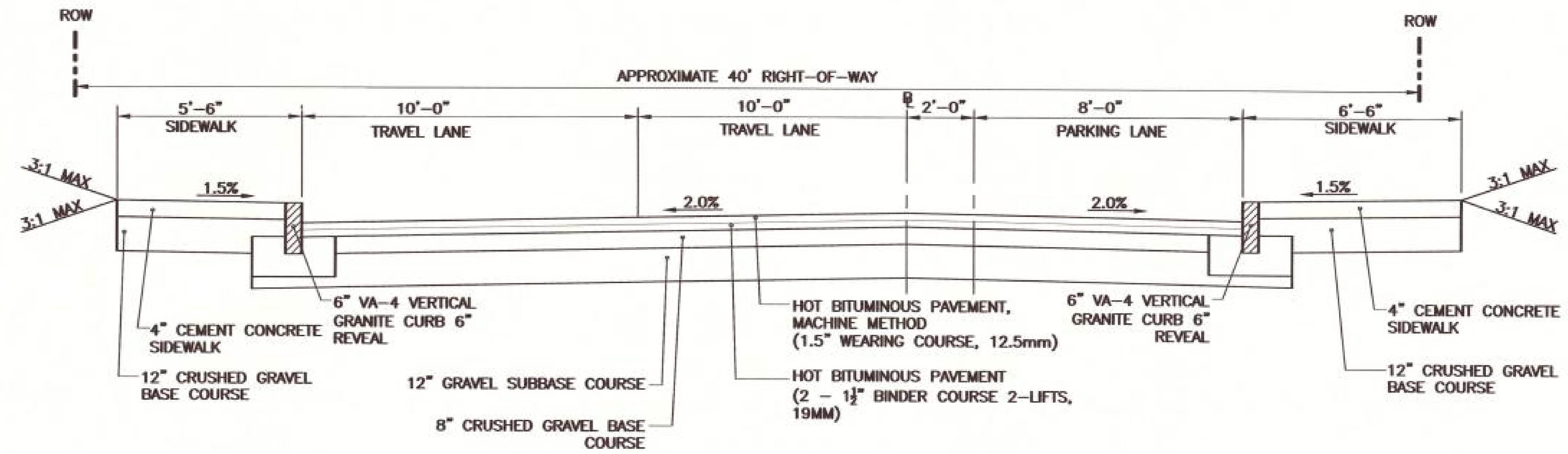
EROSION CONTROL NOTES AND DETAILS

DRAWING
C-2

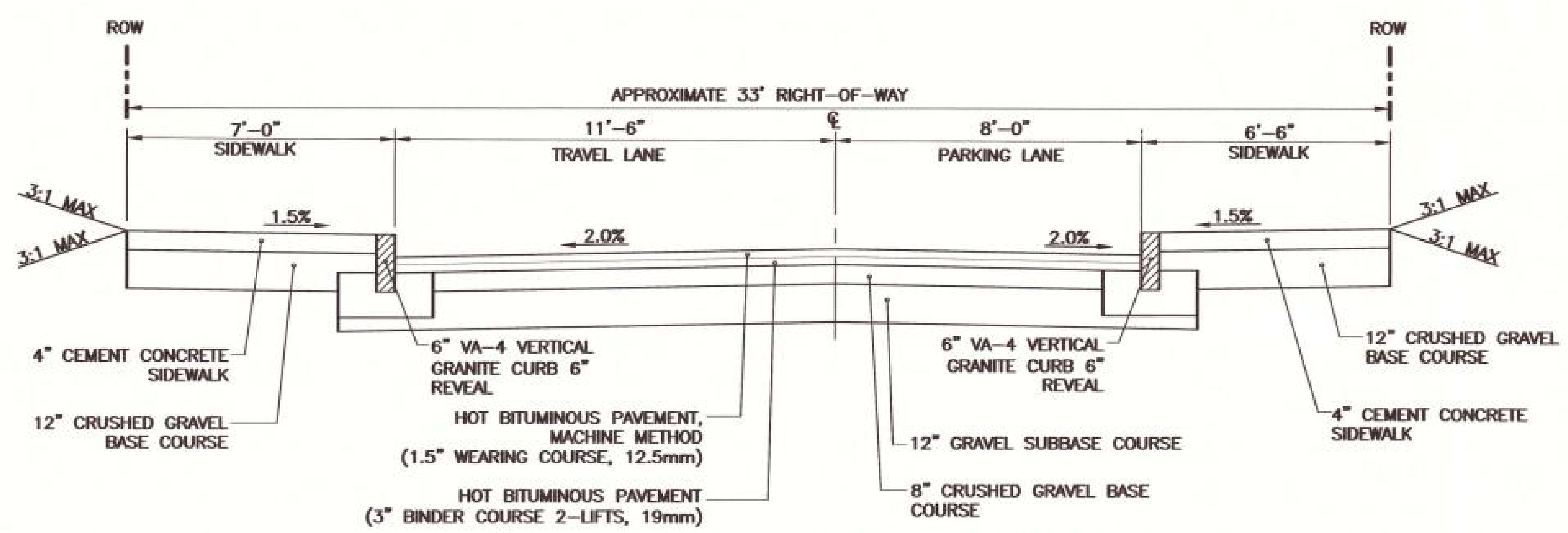
G:\DWGS\MA\WALTHAM\12858B-FD\CIVIL\12858BC02.DWG | 12858C02 | 1:4.56 | ----- | 6/29/2015 8:34:09 AM | BRIAN.MONTEJUNAS



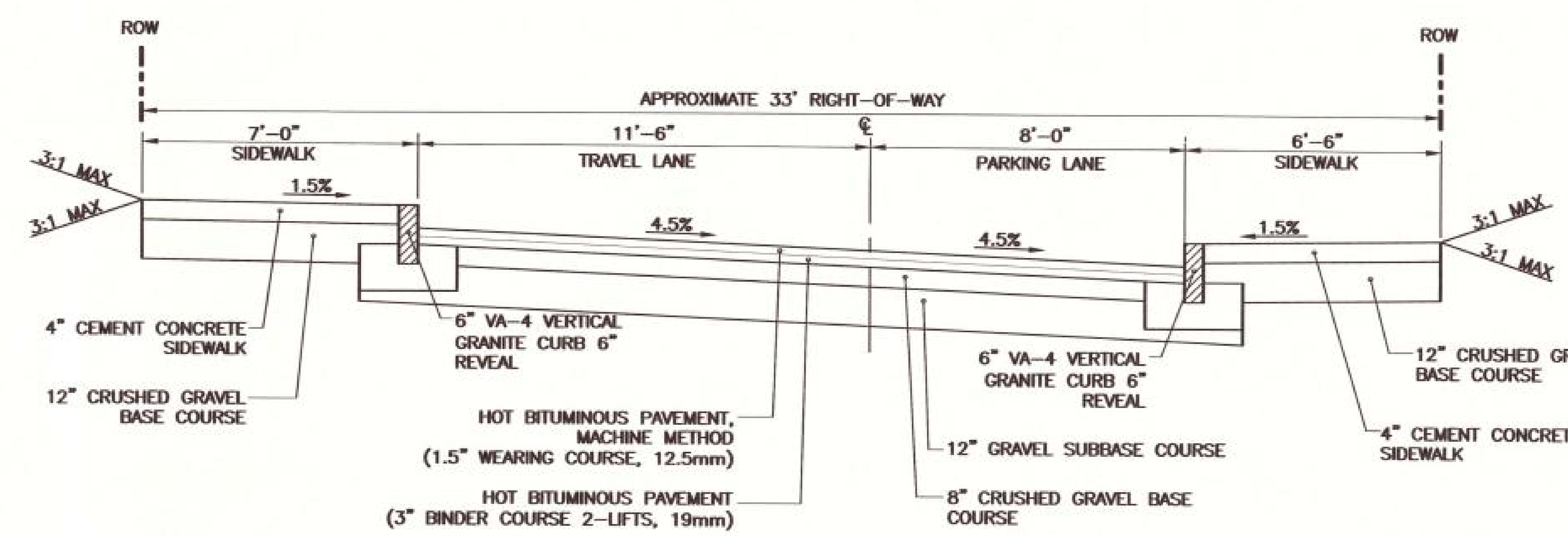
CEDAR ST: STA 1+20 TO STA 1+65
NTS



CEDAR ST: STA 1+65 TO STA 11+65
NTS



OAK ST: STA 20+00 TO STA 28+23
NTS



OAK ST: 28+23 TO STA 29+20
NTS

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD COORD: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

COMMONWEALTH OF MASSACHUSETTS — BRIAN J. MONTEJUNAS — CIVIL — No. 47347 — REGISTERED PROFESSIONAL ENGINEER

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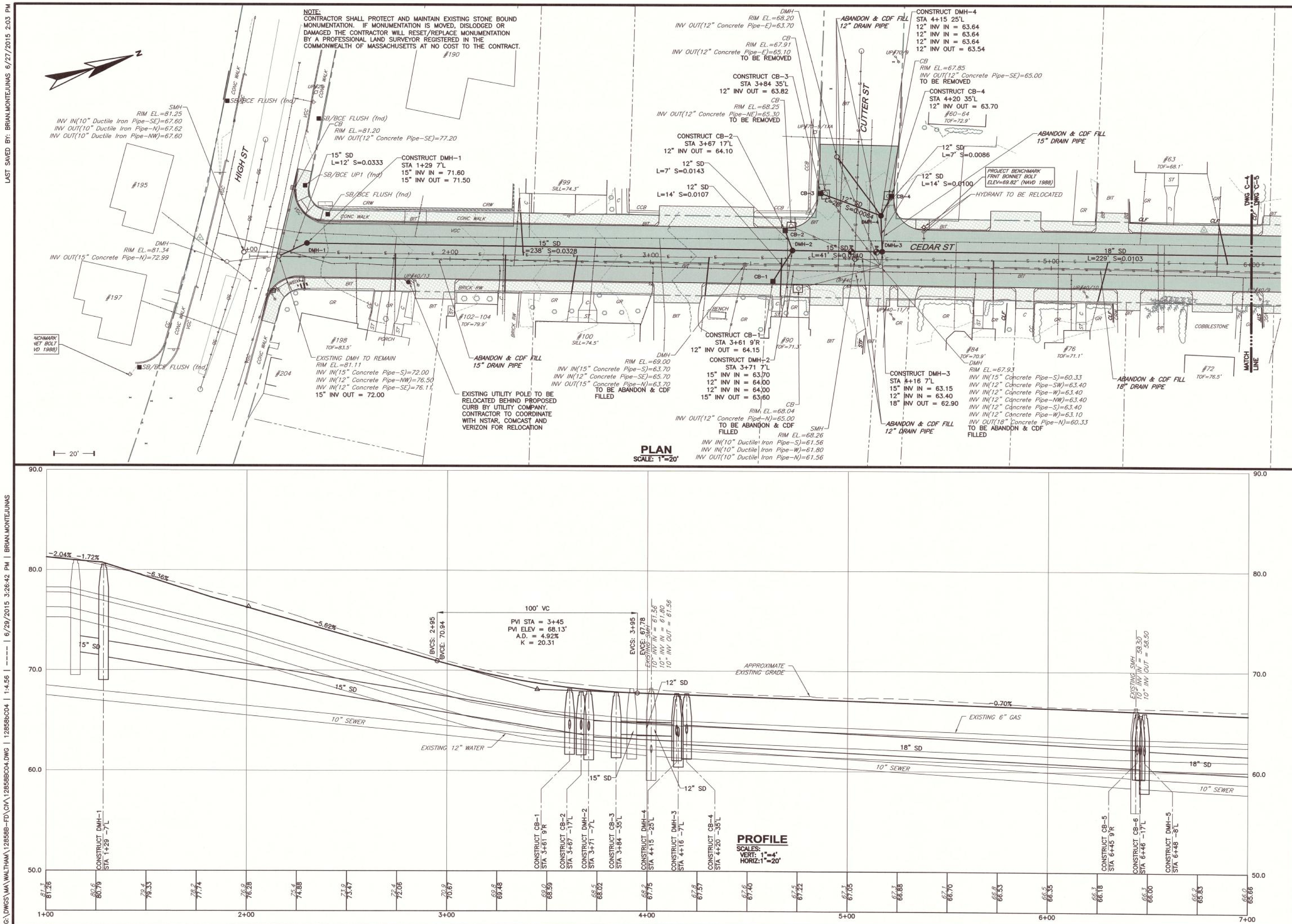
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

TYPICAL ROADWAY SECTIONS

DRAWING
C-3

LAST SAVED BY: BRIAN.MONTEJUNAS 6/27/2015 2:03 PM



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NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD COORD: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

COMMONWEALTH OF MASSACHUSETTS — BRIAN J. MONTEJUNAS, CIVIL, No. 47347, REGISTERED PROFESSIONAL ENGINEER

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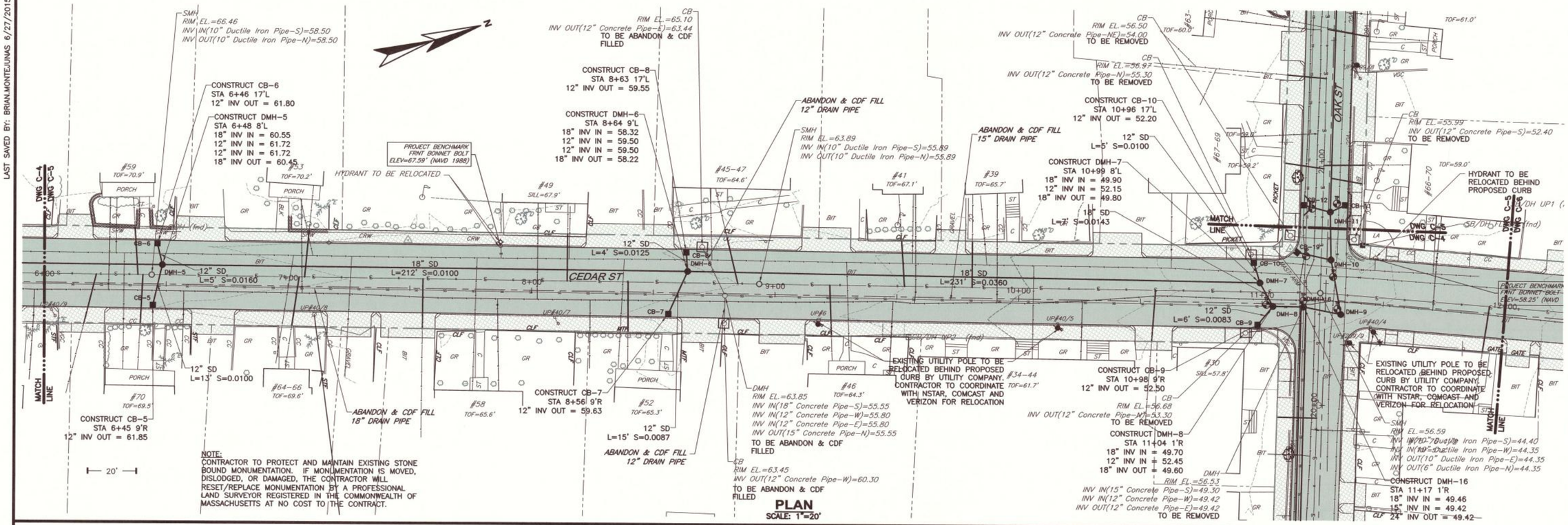
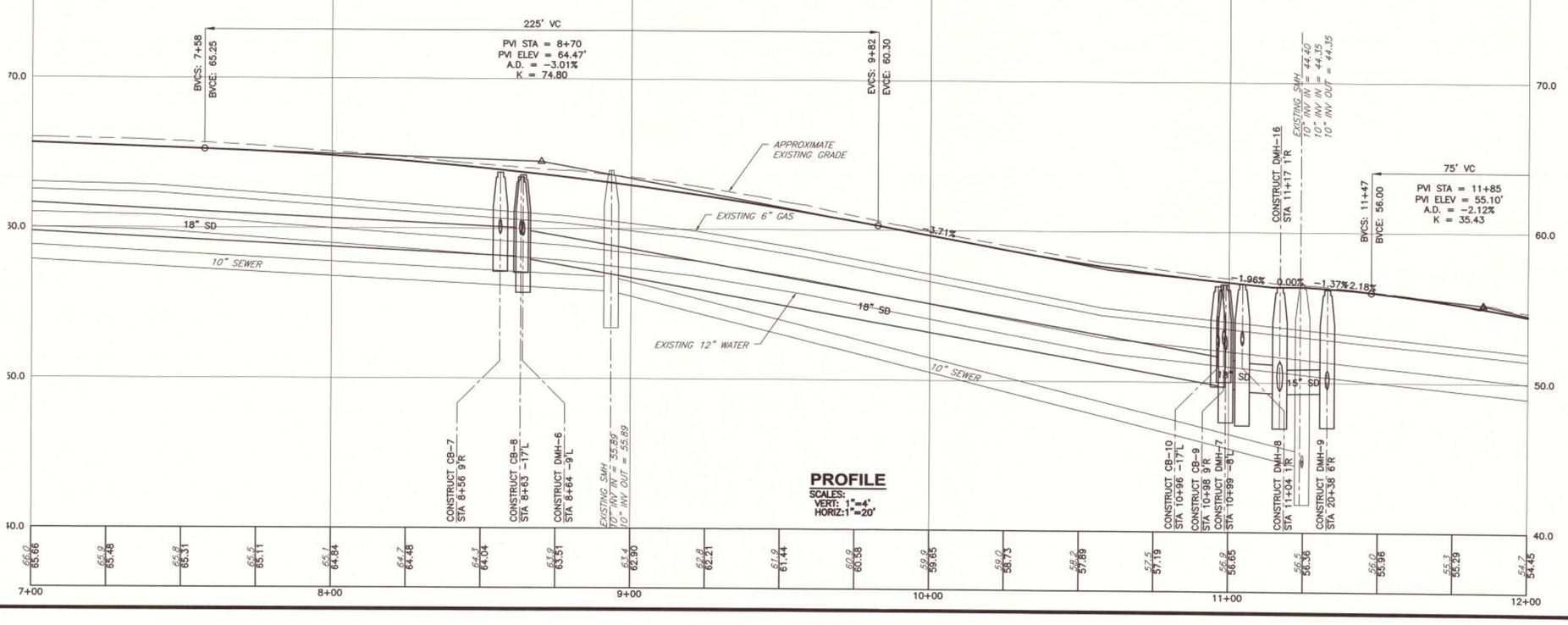
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

PLAN AND PROFILE: CEDAR STREET
STA 1+00 TO STA 6+00

DRAWING
C-4





NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD COORD.: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

COMMONWEALTH OF MASSACHUSETTS
BRIAN J. MONTEJUNAS
CIVIL
No. 49417
REGISTERED PROFESSIONAL ENGINEER
6/30/15

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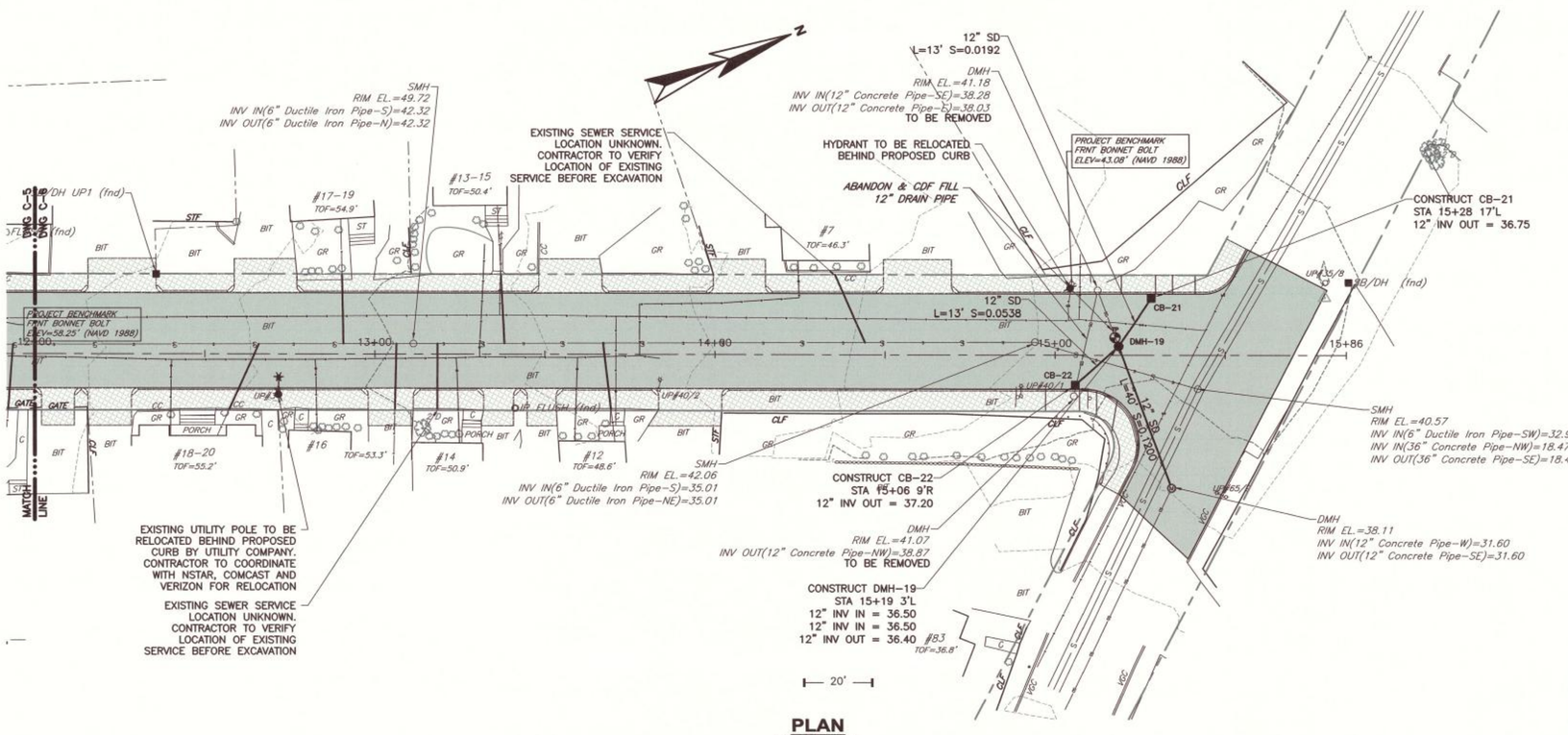
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

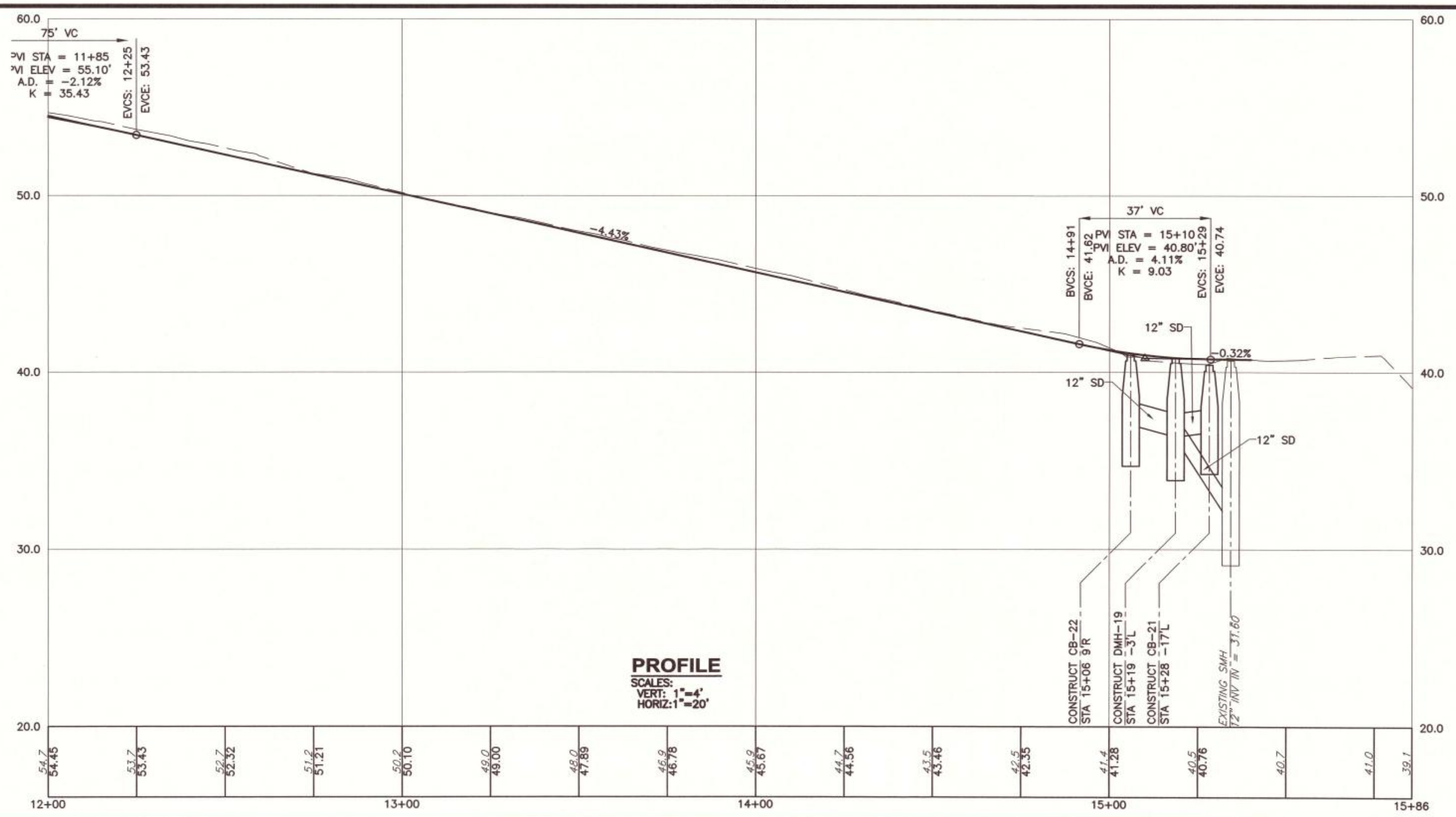
PLAN AND PROFILE: CEDAR STREET
STA 6+00 TO STA 12+00

DRAWING
C-5



PLAN
SCALE: 1"=20'

NOTE:
CONTRACTOR TO PROTECT AND MAINTAIN EXISTING STONE BOUND MONUMENTATION. IF MONUMENTATION IS MOVED, DISLODGED, OR DAMAGED, THE CONTRACTOR WILL RESET/REPLACE MONUMENTATION BY A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AT NO COST TO THE CONTRACT.



PROFILE
SCALES:
VERT: 1"=4'
HORIZ:1"=20'

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
DRAWN BY: JJM
CAD CODED: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

COMMONWEALTH OF MASSACHUSETTS BRIAN J. MONTEJUNAS CIVIL No. 47340 REGISTERED PROFESSIONAL ENGINEER 6/29/15

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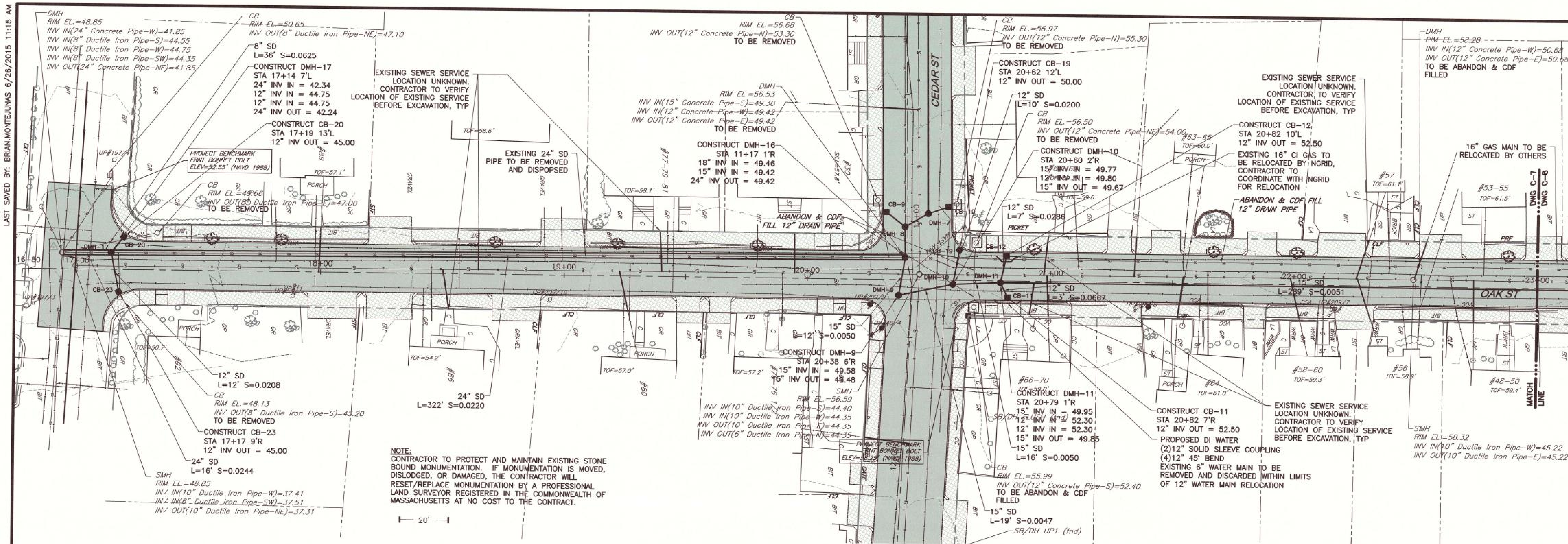
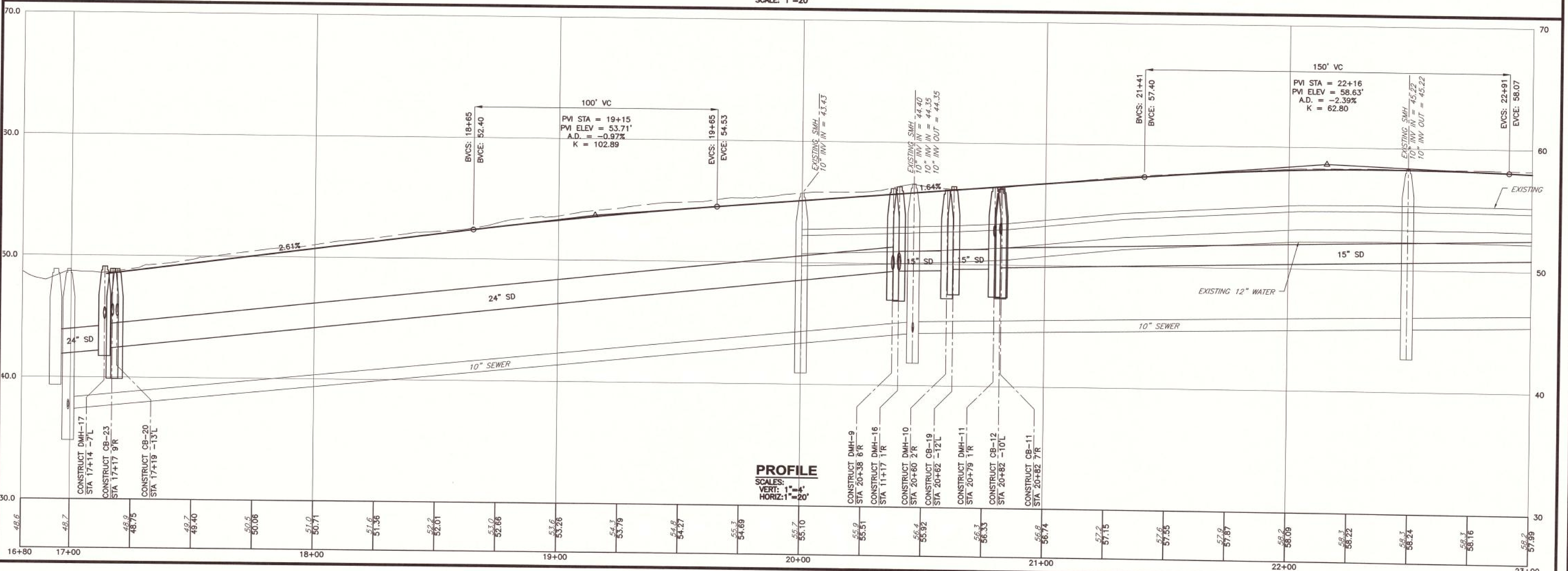
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

PLAN AND PROFILE: CEDAR STREET
STA 12+00 TO STA 15+86

DRAWING
C–6


DMH
RIM EL.=48.85
INV IN(24" Concrete Pipe-W)=41.85
INV IN(8" Ductile Iron Pipe-S)=44.55
INV IN(8" Ductile Iron Pipe-W)=44.75
INV IN(8" Ductile Iron Pipe-SW)=44.35
INV OUT(24" Concrete Pipe-NE)=41.85
CB
RIM EL.=50.65
INV OUT(8" Ductile Iron Pipe-NE)=47.10
8" SD
L=36' S=0.0625
CONSTRUCT DMH-17
STA 17+14 7'L
24" INV IN = 42.34
12" INV IN = 44.75
12" INV IN = 44.75
24" INV OUT = 42.24
CONSTRUCT CB-20
STA 17+19 13'L
12" INV OUT = 45.00
PROJECT BENCHMARK
FRNT BONNET BOLT
ELEV=52.55' (NAVD 1988)
CB
RIM EL.=49.66
INV OUT(8" Ductile Iron Pipe-E)=47.00
TO BE REMOVED
EXISTING SEWER SERVICE LOCATION UNKNOWN. CONTRACTOR TO VERIFY LOCATION OF EXISTING SERVICE BEFORE EXCAVATION, TYP
EXISTING 24" SD PIPE TO BE REMOVED AND DISPOSED
CB
RIM EL.=56.68
INV OUT(12" Concrete Pipe-N)=53.30
TO BE REMOVED
DMH
RIM EL.=56.53
INV IN(15" Concrete Pipe-S)=49.30
INV IN(12" Concrete Pipe-W)=49.42
INV OUT(12" Concrete Pipe-E)=49.42
TO BE REMOVED
CONSTRUCT DMH-16
STA 11+17 1'R
18" INV IN = 49.46
15" INV IN = 49.42
24" INV OUT = 49.42
ABANDON & CDF FILL 12" DRAIN PIPE
CEDAR ST
CB
RIM EL.=56.97
INV OUT(12" Concrete Pipe-N)=55.30
TO BE REMOVED
CONSTRUCT CB-19
STA 20+62 12'L
12" INV OUT = 50.00
12" SD
L=10' S=0.0200
CB
RIM EL.=56.50
INV OUT(12" Concrete Pipe-NE)=54.00
TO BE REMOVED
CONSTRUCT DMH-10
STA 20+60 2'R
15" INV IN = 49.77
12" INV IN = 49.80
15" INV OUT = 49.67
12" SD
L=7' S=0.0286
EXISTING SEWER SERVICE LOCATION UNKNOWN. CONTRACTOR TO VERIFY LOCATION OF EXISTING SERVICE BEFORE EXCAVATION, TYP
CONSTRUCT CB-12
STA 20+82 10'L
12" INV OUT = 52.50
EXISTING 16" CI GAS TO BE RELOCATED BY NGRID, CONTRACTOR TO COORDINATE WITH NGRID FOR RELOCATION
ABANDON & CDF FILL 12" DRAIN PIPE
DMH
RIM EL.=58.28
INV IN(12" Concrete Pipe-W)=50.68
INV OUT(12" Concrete Pipe-E)=50.68
TO BE ABANDON & CDF FILLED
16" GAS MAIN TO BE RELOCATED BY OTHERS
DWG C-7
DWG C-8
MATCH LINE
OAK ST
12" SD
L=3' S=0.0667
15" SD
L=289' S=0.0051
15" SD
L=12' S=0.0050
CONSTRUCT DMH-9
STA 20+38 6'R
15" INV IN = 49.58
15" INV OUT = 49.48
SMH
RIM EL.=56.59
INV IN(10" Ductile Iron Pipe-S)=44.40
INV IN(10" Ductile Iron Pipe-W)=44.35
INV OUT(10" Ductile Iron Pipe-E)=44.35
INV OUT(6" Ductile Iron Pipe-N)=44.35
PROJECT BENCHMARK
FRNT BONNET BOLT
ELEV=52.25' (NAVD 1988)
CONSTRUCT DMH-11
STA 20+79 1'R
15" INV IN = 49.95
12" INV IN = 52.30
12" INV IN = 52.30
15" INV OUT = 49.85
15" SD
L=16' S=0.0050
CB
RIM EL.=55.99
INV OUT(12" Concrete Pipe-S)=52.40
TO BE ABANDON & CDF FILLED
15" SD
L=19' S=0.0047
SB/DH UP1 (fnd)
CONSTRUCT CB-11
STA 20+82 7'R
12" INV OUT = 52.50
PROPOSED DI WATER
(2)12" SOLID SLEEVE COUPLING
(4)12" 45° BEND
EXISTING 6" WATER MAIN TO BE REMOVED AND DISCARDED WITHIN LIMITS OF 12" WATER MAIN RELOCATION
EXISTING SEWER SERVICE LOCATION UNKNOWN. CONTRACTOR TO VERIFY LOCATION OF EXISTING SERVICE BEFORE EXCAVATION, TYP
SMH
RIM EL.=58.32
INV IN(10" Ductile Iron Pipe-W)=45.22
INV OUT(10" Ductile Iron Pipe-E)=45.22
12" SD
L=12' S=0.0208
CB
RIM EL.=48.13
INV OUT(8" Ductile Iron Pipe-S)=45.20
TO BE REMOVED
CONSTRUCT CB-23
STA 17+17 9'R
12" INV OUT = 45.00
24" SD
L=16' S=0.0244
SMH
RIM EL.=48.85
INV IN(10" Ductile Iron Pipe-W)=37.41
INV IN(6" Ductile Iron Pipe-SW)=37.51
INV OUT(10" Ductile Iron Pipe-NE)=37.31
24" SD
L=322' S=0.0220
NOTE:
CONTRACTOR TO PROTECT AND MAINTAIN EXISTING STONE BOUND MONUMENTATION. IF MONUMENTATION IS MOVED, DISLODGED, OR DAMAGED, THE CONTRACTOR WILL RESET/REPLACE MONUMENTATION BY A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AT NO COST TO THE CONTRACT.
20'
16+80
17+00
18+00
19+00
20+00
21+00
22+00
23+00

PLAN
SCALE: 1"=20'


100' VC
PVI STA = 19+15
PVI ELEV = 53.71'
A.D. = -0.97%
K = 102.89
BVCS: 18+65
BVCE: 52.40
EVCS: 19+65
EVCE: 54.53
150' VC
PVI STA = 22+16
PVI ELEV = 58.63'
A.D. = -2.39%
K = 62.80
BVCS: 21+41
BVCE: 57.40
EVCS: 22+91
EVCE: 58.07
2.61%
1.64%
24" SD
15" SD
EXISTING
EXISTING 12" WATER
10" SEWER
CONSTRUCT DMH-17 STA 17+14 7'L
CONSTRUCT CB-23 STA 17+17 9'R
CONSTRUCT CB-20 STA 17+19 13'L
CONSTRUCT DMH-9 STA 20+38 6'R
CONSTRUCT DMH-16 STA 11+17 1'R
CONSTRUCT DMH-10 STA 20+60 2'R
CONSTRUCT CB-19 STA 20+62 12'L
CONSTRUCT DMH-11 STA 20+79 1'R
CONSTRUCT CB-12 STA 20+82 10'L
CONSTRUCT CB-11 STA 20+82 7'R
70.0
60.0
50.0
40.0
30.0
16+80
17+00
18+00
19+00
20+00
21+00
22+00
23+00

PROFILE
SCALES:
VERT: 1"=4'
HORIZ: 1"=20'

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD COORD: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

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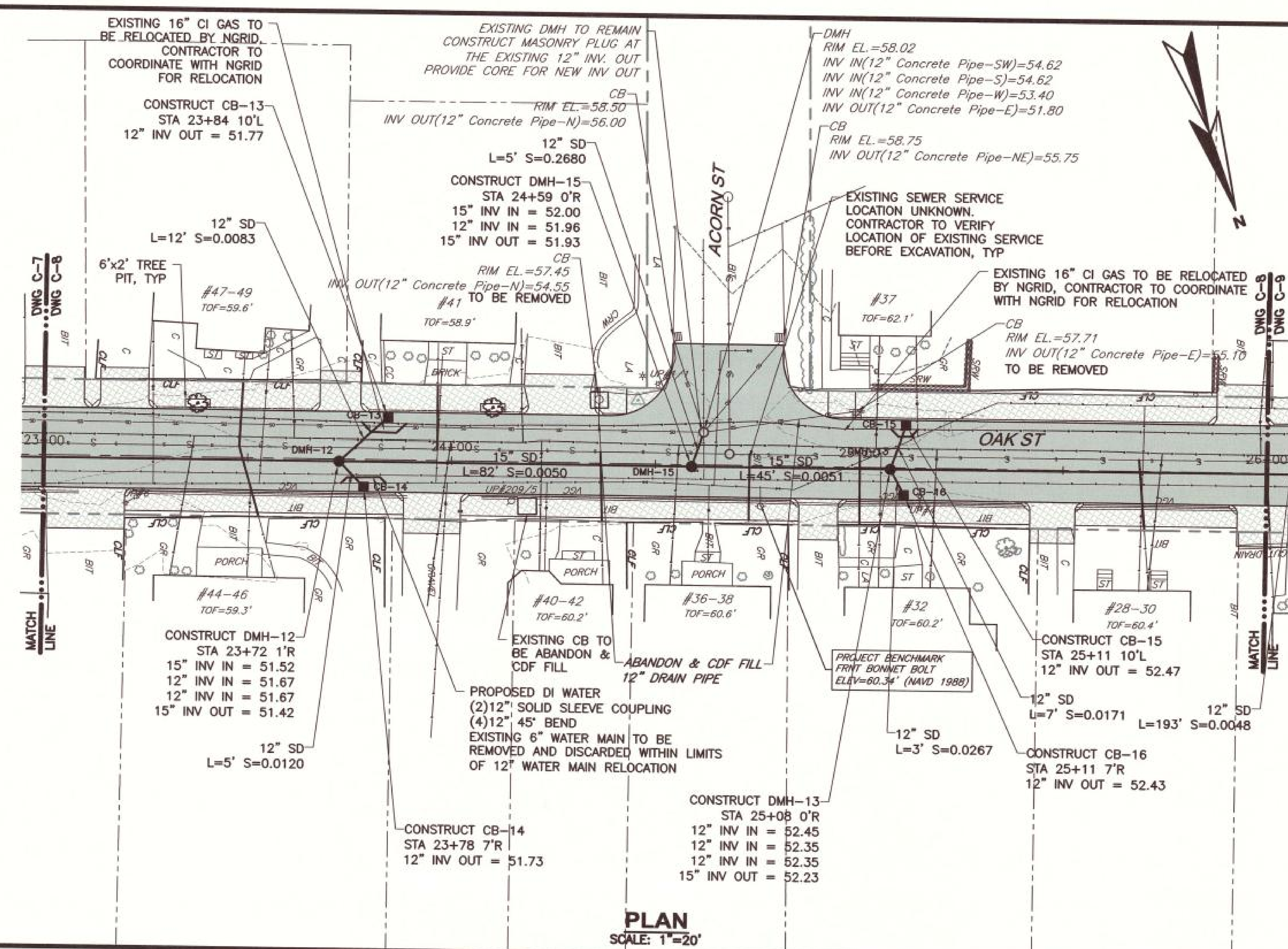
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

PLAN AND PROFILE: OAK STREET
STA 16+80 TO STA 23+00

DRAWING
C-7

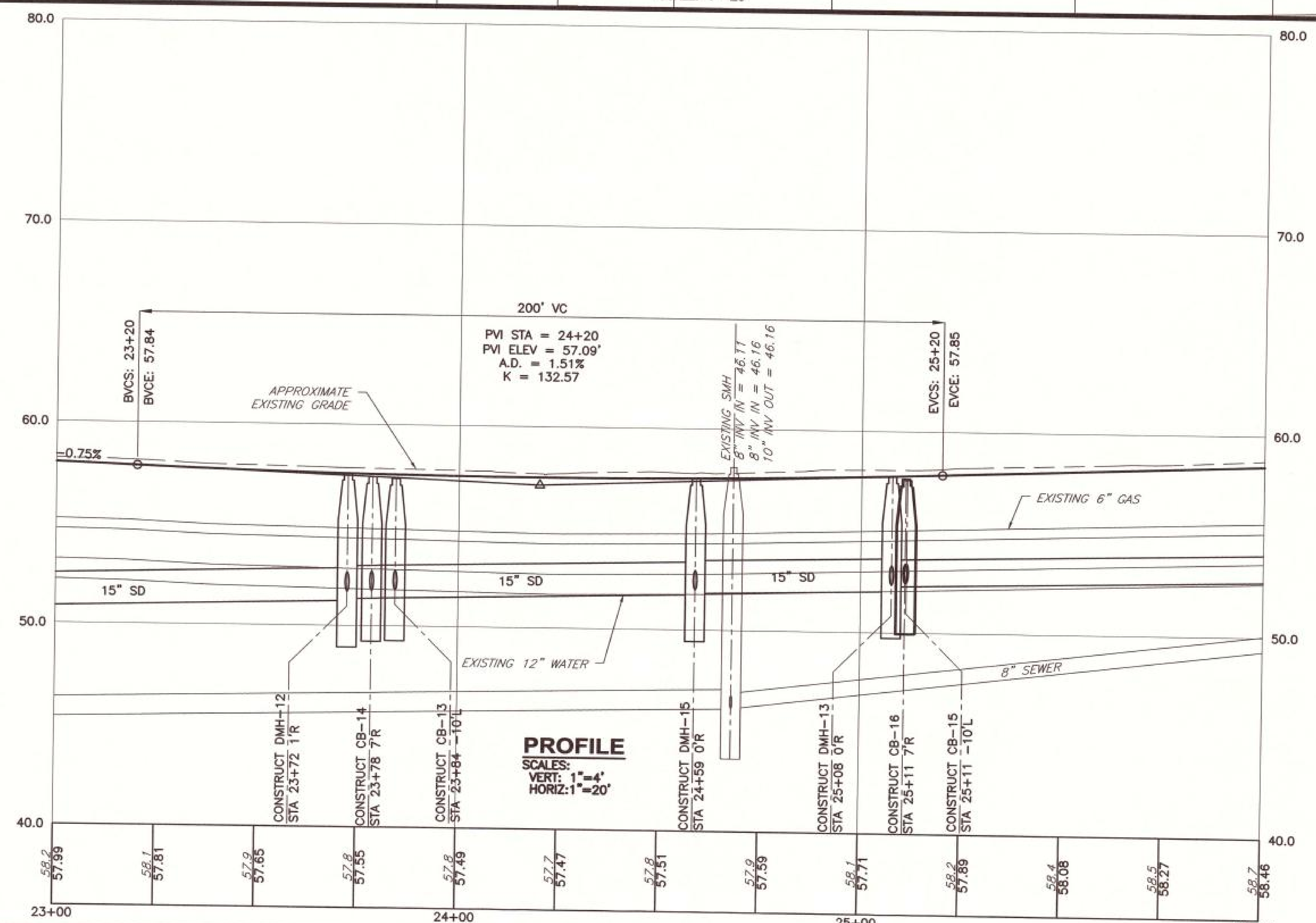
LAST SAVED BY: BRIAN.MONTEJUNAS 6/26/2015 11:32 AM

G:\DWGS\MA\WALTHAM\12858B-FD\CIV\12858BC08.DWG | 12858bC08 | 1:4.56 | ---- | 6/29/2015 3:34:43 PM | BRIAN.MONTEJUNAS



PLAN
SCALE: 1"=20'

NOTE:
CONTRACTOR TO PROTECT AND MAINTAIN EXISTING STONE BOUND MONUMENTATION. IF MONUMENTATION IS MOVED, DISLODGED, OR DAMAGED, THE CONTRACTOR WILL RESET/REPLACE MONUMENTATION BY A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AT NO COST TO THE CONTRACT.



PROFILE
SCALES:
VERT: 1"=4'
HORIZ: 1"=20'

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15
1			
2			
3			
4			

DESIGNED BY: BJM
CAD COORD: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

COMMONWEALTH OF MASSACHUSETTS BRIAN J. MONTEJUNAS CIVIL No. 47347 REGISTERED PROFESSIONAL ENGINEER
[illegible] 6/30/15

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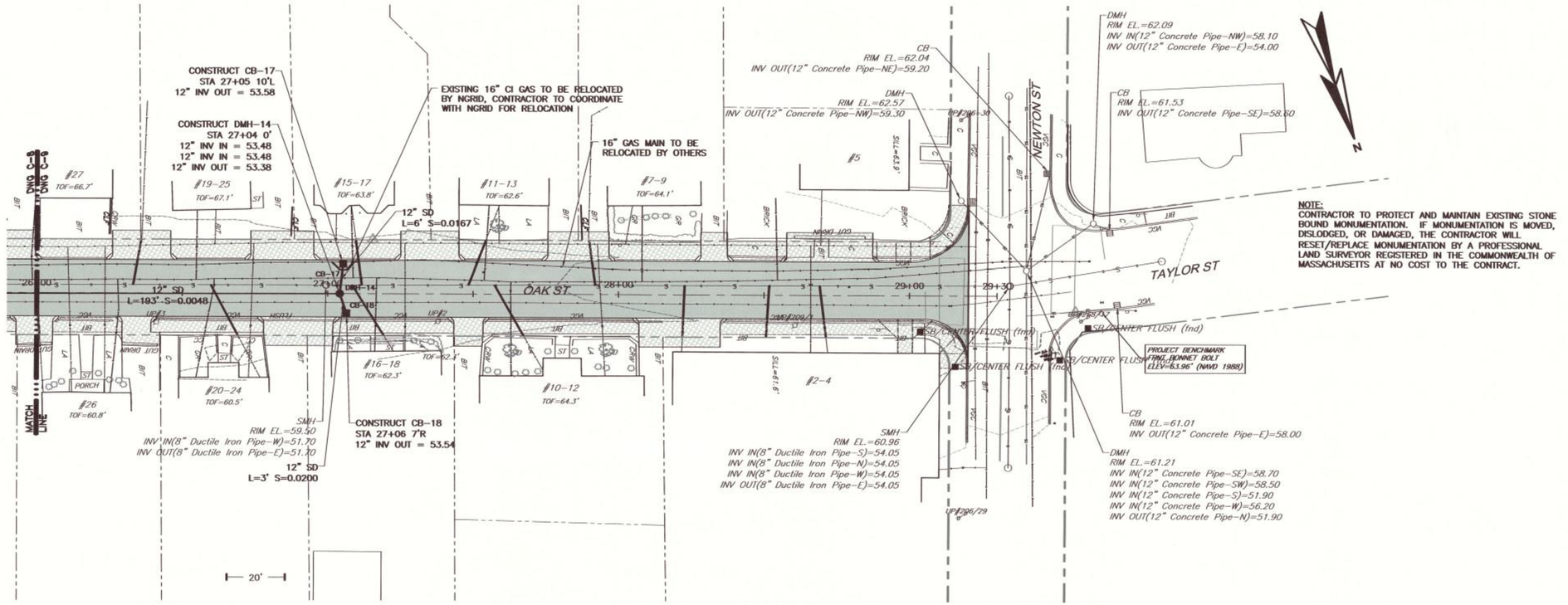
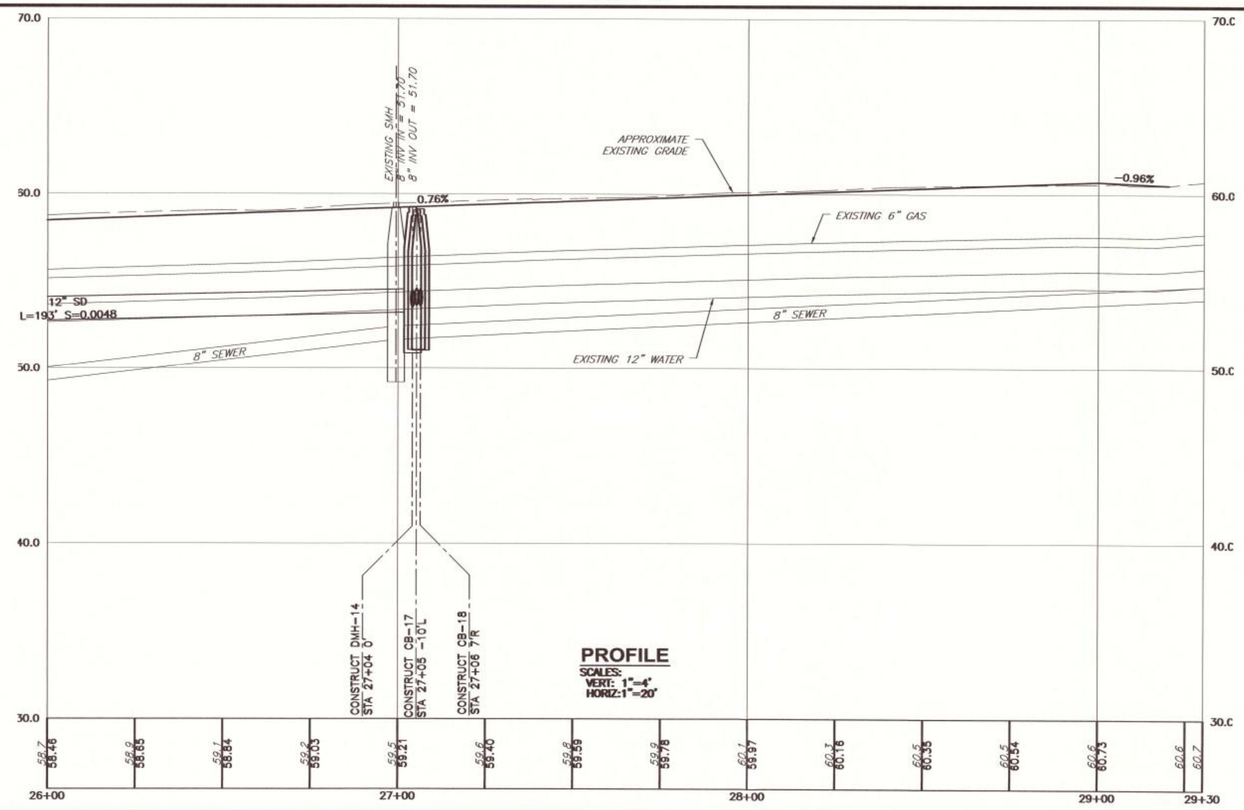
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

PLAN AND PROFILE: OAK STREET
STA 23+00 TO STA 26+00

DRAWING
C-8



PLAN
SCALE: 1"=20'



PROFILE
SCALES:
VERT: 1"=4'
HORIZ:1"=20'

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD COORD.: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO.: 12858B

COMMONWEALTH OF MASSACHUSETTS
BRIAN J. MONTEJUNAS
CIVIL
No. 47347
REGISTERED PROFESSIONAL ENGINEER

NOTE:
CONTRACTOR TO PROTECT AND MAINTAIN EXISTING STONE BOUND MONUMENTATION. IF MONUMENTATION IS MOVED, DISLODGED, OR DAMAGED, THE CONTRACTOR WILL RESET/REPLACE MONUMENTATION BY A PROFESSIONAL LAND SURVEYOR REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS AT NO COST TO THE CONTRACT.

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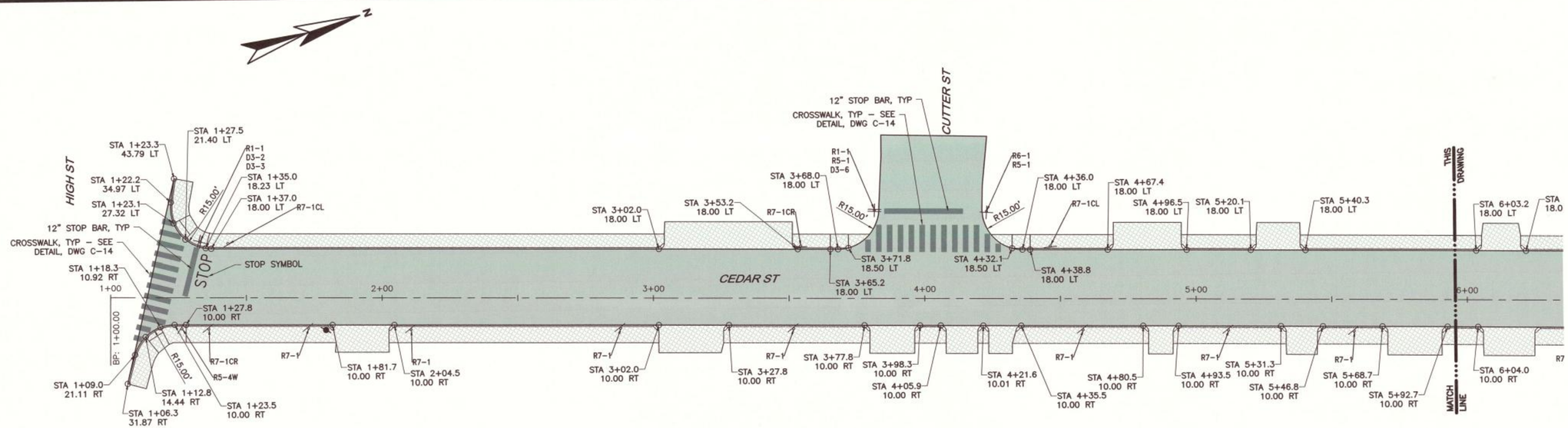
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

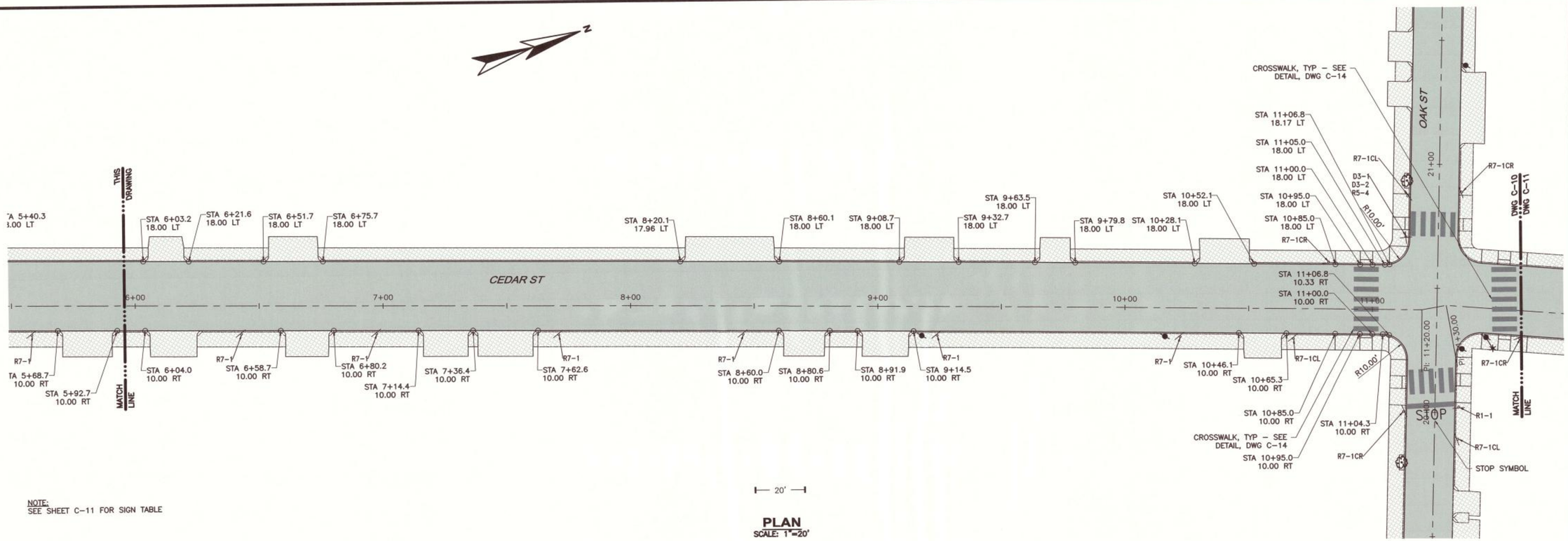
PLAN AND PROFILE: OAK STREET
STA 26+00 TO STA 29+30

DRAWING
C-9



20'

PLAN
SCALE: 1"=20'



20'

PLAN
SCALE: 1"=20'

NOTE:
SEE SHEET C-11 FOR SIGN TABLE

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD CODE: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO. 12858B

COMMONWEALTH OF MASSACHUSETTS — BRIAN J. MONTEJUNAS — CIVIL — No. 47343 — REGISTERED PROFESSIONAL ENGINEER

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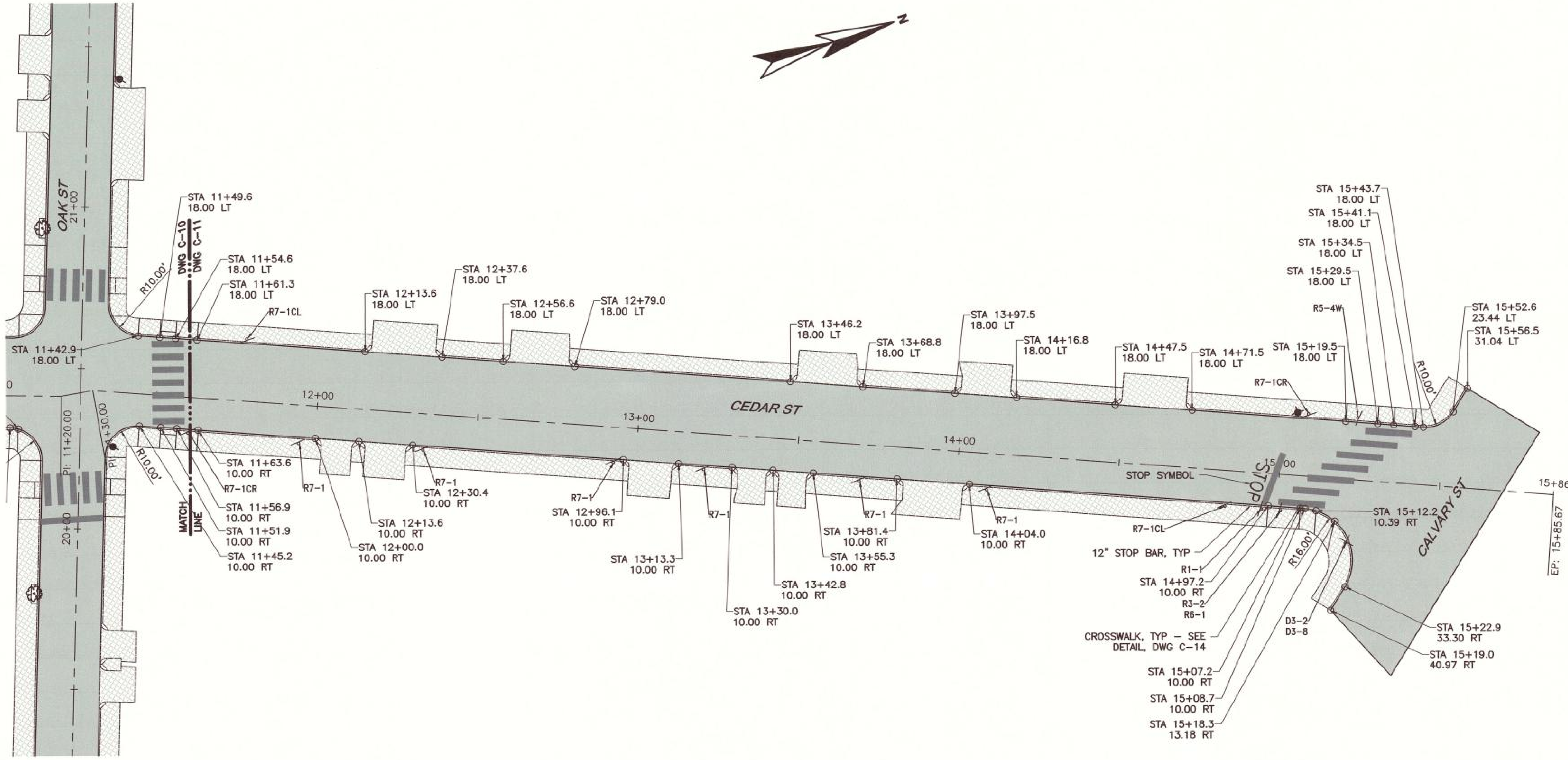
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

LAYOUT PLAN: CEDAR ST

DRAWING
C-10

LAST SAVED BY: BRIAN.MONTEJUNAS 6/29/2015 11:40 AM



PLAN
SCALE: 1"=20'

ID #	SIZE OF SIGN (IN) WIDTH	HEIGHT	SIGN	TEXT DIMENSIONS LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.	NUMBERS OF SIGNS REQUIRED	COLOR BACK-GROUND	LEGEND	BORDER	POST SIZE
D3-1	24	9	OAK ST	SEE CURRENT MUTCD			3	SEE CURRENT MUTCD			P5-1
D3-2	24	9	CEDAR ST				3				P5-1
D3-3	24	9	HIGH ST				1				P5-1
D3-4	24	9	NEWTON ST				1				P5-1
D3-5	24	9	MOORE ST				1				P5-1
D3-6	24	9	CUTTER ST				1				P5-1
D3-7	24	9	ACORN ST				1				P5-1
D3-8	30	9	CALVARY ST				1				P5-1

ID #	SIZE OF SIGN (IN) WIDTH	HEIGHT	SIGN	TEXT DIMENSIONS LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.	NUMBERS OF SIGNS REQUIRED	COLOR BACK-GROUND	LEGEND	BORDER	POST SIZE
R1-1	30	30	STOP	SEE CURRENT MUTCD			6	SEE CURRENT MUTCD			P5-1
R3-1	24	24	(no right turn symbol)				1				P5-1
R3-2	24	24	(no left turn symbol)				1				P5-1
R5-1	30	30	DO NOT ENTER				4				P5-1
R6-1	36	12	ONE WAY				4				P5-1
R7-1	12	18	PBS NO PARKING ANY TIME				33				P5-1
R7-1CL	12	18	NO PARKING HERE TO CORNER				10				P5-1
R7-1CR	12	18	NO PARKING HERE TO CORNER				10				P5-1
R5-4W	24	24	COMMERCIAL VEHICLES OVER 2 ½ TONS EXCLUDED				4				P5-1

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD COORD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

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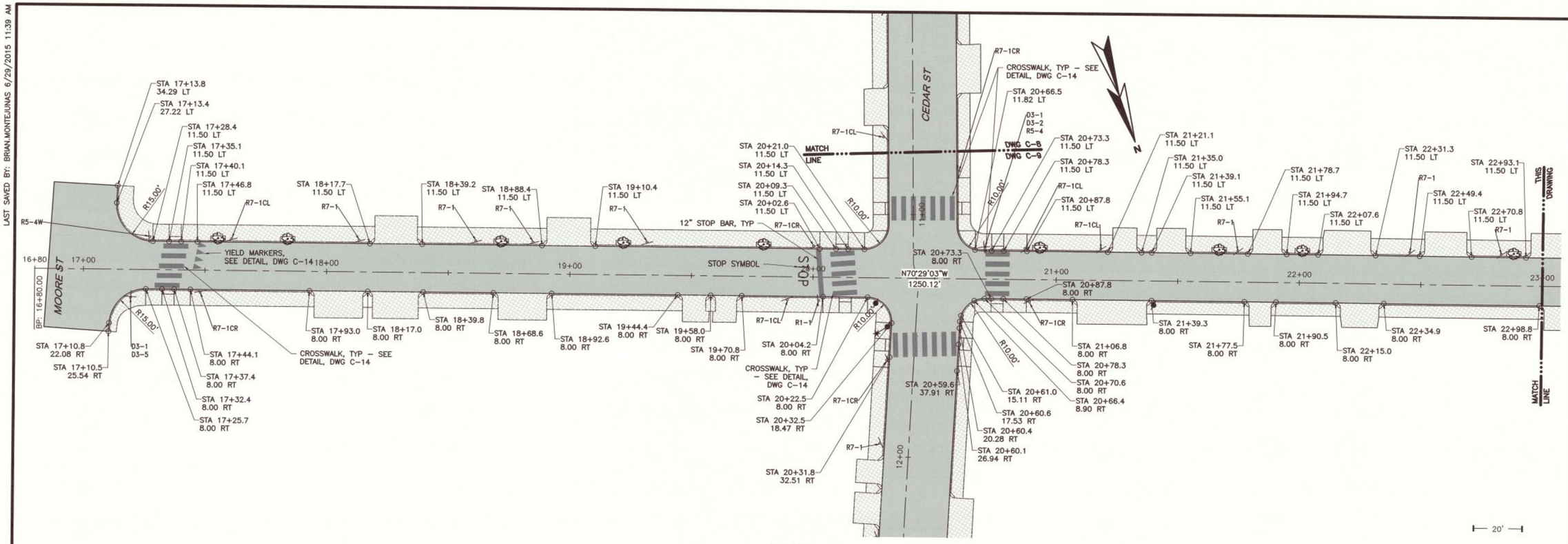
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

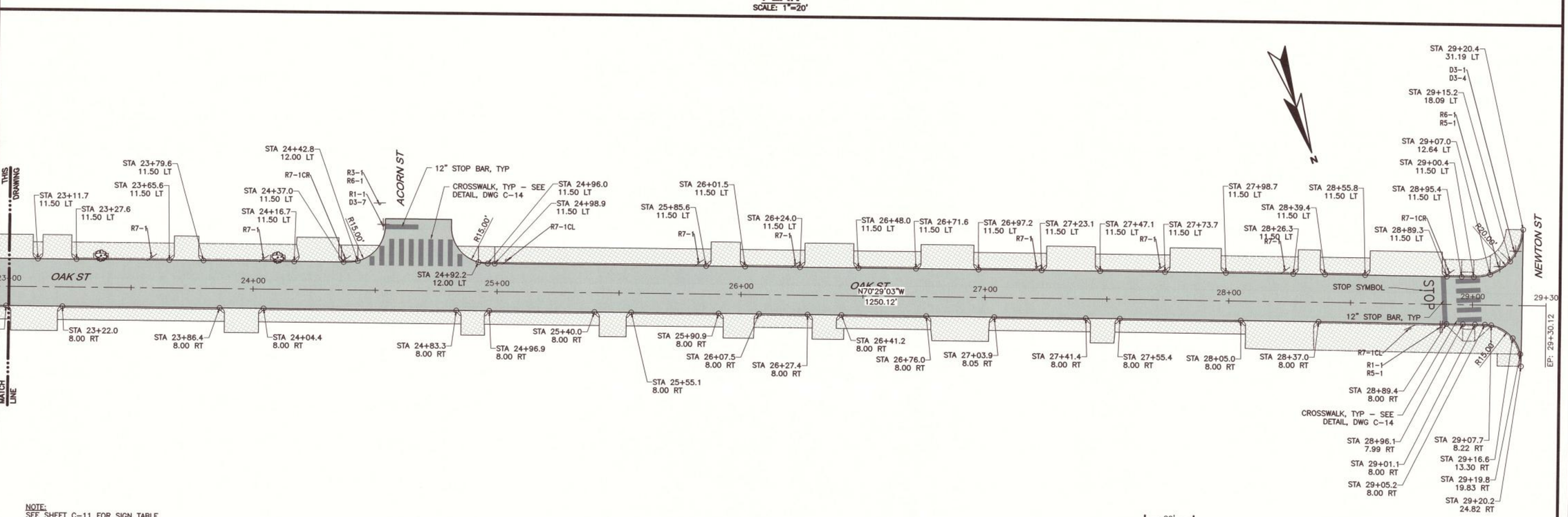
LAYOUT PLAN: CEDAR ST

DRAWING
C-11

G:\DWGS\MA\WALTHAM\12858B-FD\CIV\12858BC11.DWG | 1:4.56 | ---- | 6/29/2015 3:38:31 PM | BRIAN.MONTEJUNAS



PLAN
SCALE: 1"=20'



PLAN
SCALE: 1"=20'

NOTE:
SEE SHEET C-11 FOR SIGN TABLE

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	BID DOCUMENTS	BJM	6/15

DESIGNED BY: BJM
CAD CORP: JJM
CAD: JJM
CHECKED BY: ACE
DATE: 6/25/15
APPROVED BY: BJM
DATE: 6/25/15
PROJECT NO: 12858B

COMMONWEALTH OF MASSACHUSETTS — BRIAN J. MONTEJUNAS — No. 47547 — REGISTERED PROFESSIONAL ENGINEER — 6/29/15

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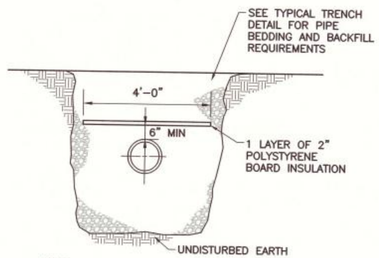
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

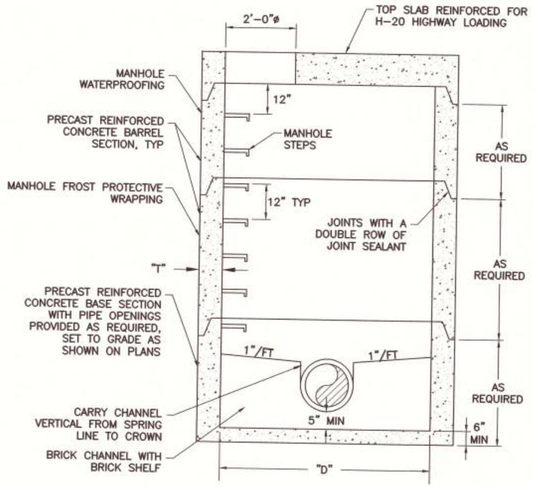
LAYOUT PLAN: OAK ST

DRAWING
C-12



NOTE:
TRENCH PIPE INSULATION TO BE USED WHERE DEPTH OF COVER IS LESS THAN ** FEET OR AS DIRECTED BY THE ENGINEER

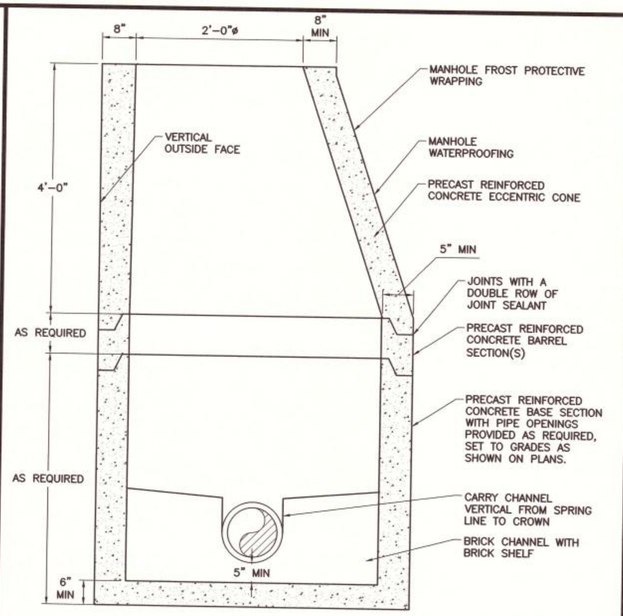
TRENCH PIPE INSULATION
SCALE: NTS



NOTE: MANHOLE CHANNELS REQUIRING CHANGE IN ALIGNMENT ARE TO BE BUILT ON A SMOOTH RADIUS. IF SIDE PIPES ENTER CHANNEL, SHAPE TO RECEIVE ADDED SIDE FLOW.

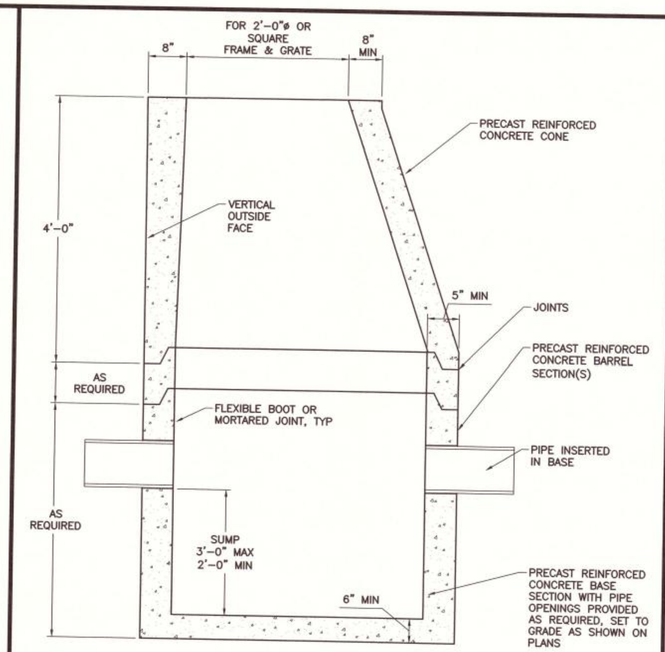
DIAMETER ("D")	MAX PIPE DIAMETER STRAIGHT THRU TO 45° DEFLECTION	MINIMUM WALL THICKNESS ("T")
48"	UP TO 30" O.D.	5"
60"	UP TO 44" O.D.	6"
72"	UP TO 51" O.D.	7"
96"	UP TO 72" O.D.	9"

FLAT SLAB TOP MANHOLE
SCALE: NTS



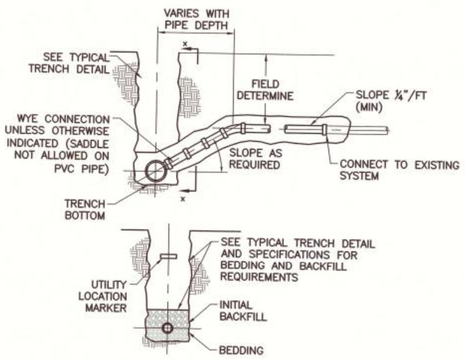
NOTES:
1. MANHOLE CHANNELS REQUIRING A CHANGE IN DIRECTION ARE TO BE BUILT ON A SMOOTH CURVE OF THE LONGEST POSSIBLE RADIUS. IF SIDE PIPES ENTER CHANNEL, SHAPE TO RECEIVE ADDED SIDE FLOW.
2. USE A FLAT SLAB TOP MANHOLE WHEN THE HEIGHT DIFFERENCE BETWEEN THE HIGHEST INVERT AND RIM IS LESS THAN 6'-0" AND WHEN MANHOLE DIAMETER IS GREATER THAN 4'-0".

TYPICAL 4-FT MANHOLE
SCALE: NTS



NOTE: USE FLAT SLAB TOP CATCH BASIN WHERE REQUIRED TO MATCH GRADE

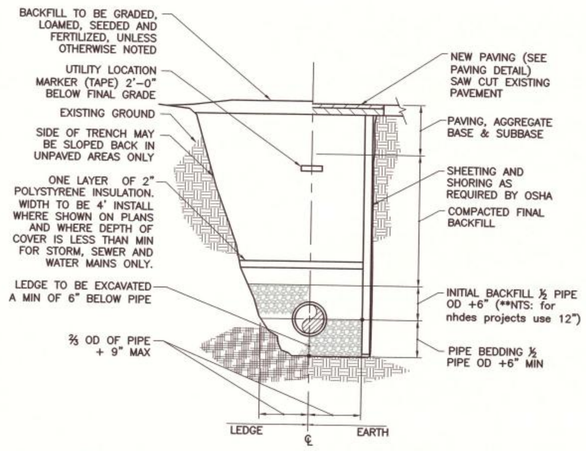
4-FT CATCH BASIN
SCALE: NTS



SECTION X-X

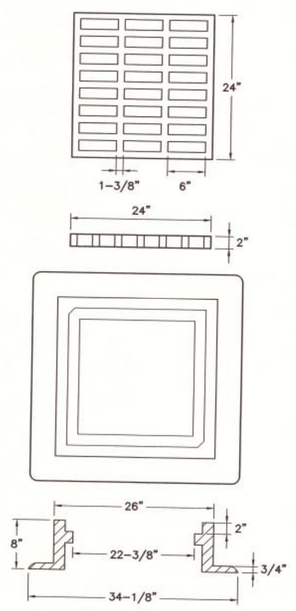
NOTES:
1. ALL SERVICE CONNECTIONS TO BE 6"ø UNLESS OTHERWISE SHOWN ON THE PLANS.
2. USE CHIMNEY DETAIL WHERE SERVICE CONNECTION ENTERS SEWER AT GREATER THAN 60° TO THE HORIZONTAL.
3. EXTEND SERVICE TO REAR OF SIDEWALK, TYPICAL.

SEWER SERVICE CONNECTION
SCALE: "NTS"

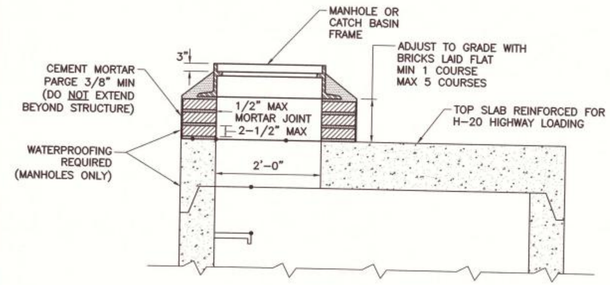


NOTES:
1. ALL EXCAVATION MUST MEET OSHA STANDARDS.
2. INSTALL 3 FOOT LONG IMPERVIOUS MATERIAL DAM IN BEDDING/INITIAL BACKFILL MATERIAL EVERY 100' AND WHERE SHOWN ON PLANS TO PREVENT TRENCH GROUNDWATER FROM BEING CHANNELED ALONG BEDDING/INITIAL BACKFILL.
3. SEE SPECIFICATIONS FOR BEDDING AND BACKFILL REQUIREMENTS.

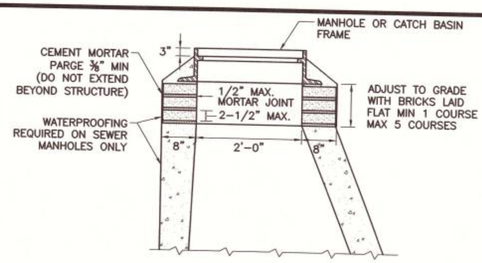
PIPE TRENCH
SCALE: "NTS"



FRAME AND COVER FOR TYPE "A" CATCH BASIN
SCALE: NTS



FLAT SLAB TOP MANHOLE AND CATCH BASIN FRAME INSTALLATION
SCALE: NTS



MANHOLE AND CATCH BASIN FRAME INSTALLATION
SCALE: NTS

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
0	BID DOCUMENTS	BJM	6/15

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CAD DOCR: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 128588

COMMONWEALTH OF MASSACHUSETTS BRIAN J. MONTEJUNAS No. 47367 CIVIL REGISTERED PROFESSIONAL ENGINEER

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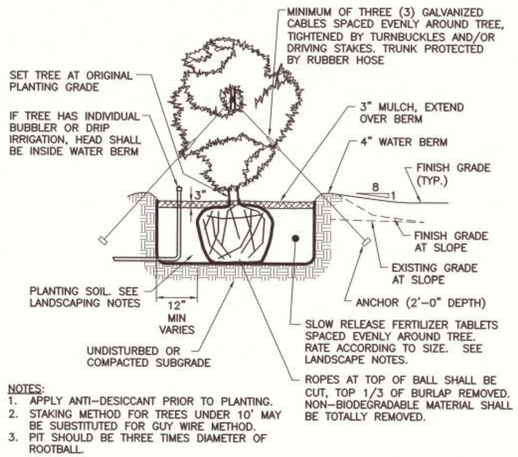
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

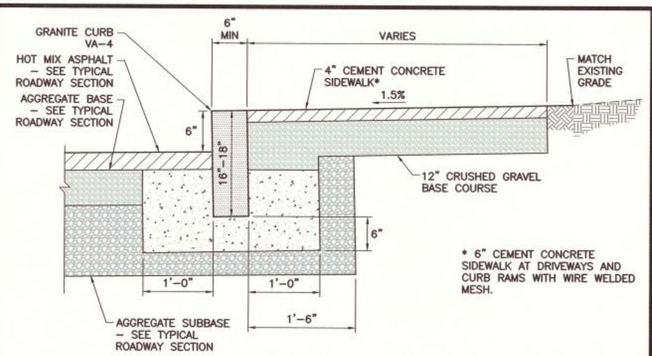
DETAILS I

DRAWING
C-13

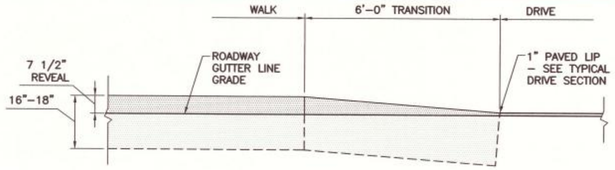


NOTES:
1. APPLY ANTI-DESICCANT PRIOR TO PLANTING.
2. STAKING METHOD FOR TREES UNDER 10' MAY BE SUBSTITUTED FOR GUY WIRE METHOD.
3. PIT SHOULD BE THREE TIMES DIAMETER OF ROOTBALL.

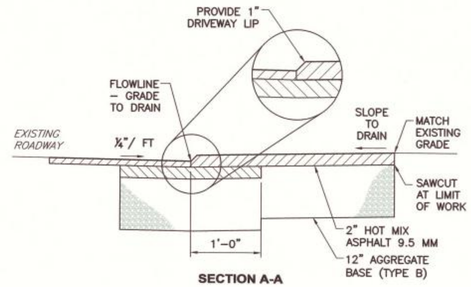
TREE INSTALLATION: CONIFER
SCALE: NTS



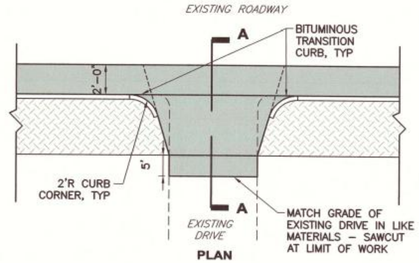
GRANITE CURB WITH CONCRETE
SCALE: NTS



GRANITE CURB TRANSITION
SCALE: NTS

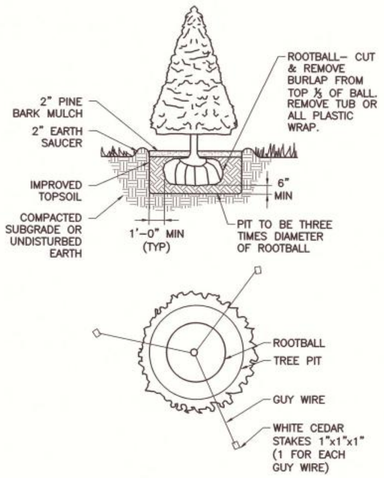


SECTION A-A

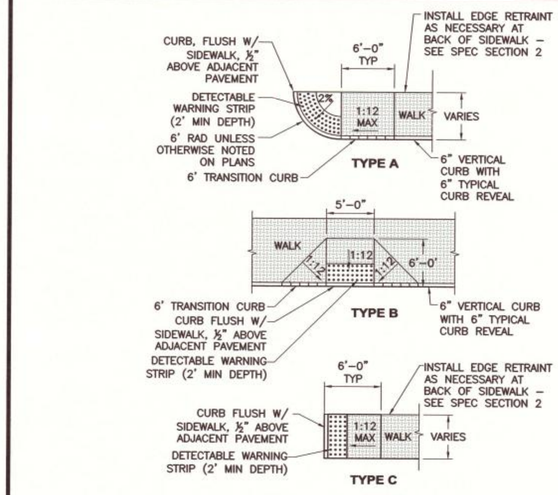


PLAN

PAVED DRIVE APRON
SCALE: NTS

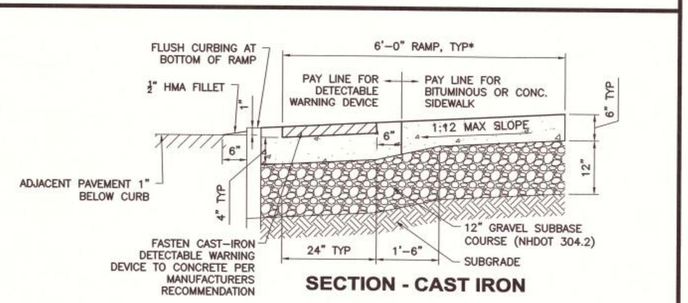


EVERGREEN TREE PLANTING
SCALE: NTS

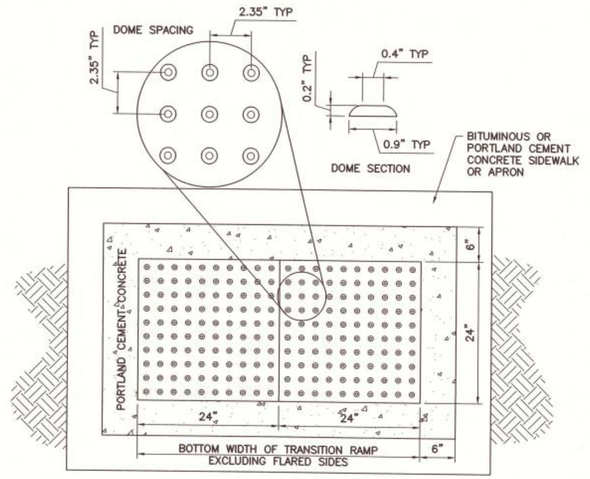


HANDICAP RAMP
SCALE: NTS

NOTES:
1. RAMPS SHALL CONFORM TO THE REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT (ADA).
2. DETECTABLE WARNING STRIPS REQUIRED ON ALL RAMPS INDICATED ON THE DRAWINGS AND AS DIRECTED BY THE ENGINEER.

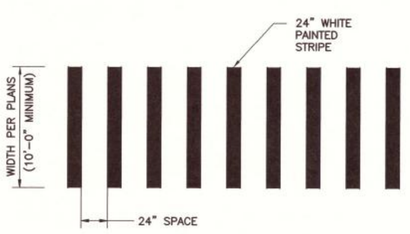


SECTION - CAST IRON



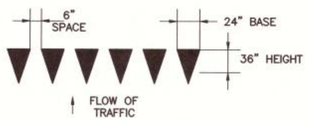
NOTE:
1. ALL DETECTABLE WARNING DEVICES SHALL CONFORM TO THE REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG). 2'x2', 2'x4' AND RADIUS DEVICES ARE ACCEPTABLE.
2. INSTALL DETECTABLE WARNING DEVICES AT ALL ROADWAYS, HIGH USE ACCESS WAYS, OR AT THE DIRECTION OF THE ENGINEER.
3. ALL DEVICES SHALL HAVE A MIN. 6" WIDTH PORTLAND CEMENT CONCRETE SURROUND REGARDLESS OF THE SURROUNDING WALK OR APRON MATERIAL.

RECTANGULAR CAST IRON HANDICAP DETECTABLE WARNING DEVICE DETAIL
SCALE: NTS

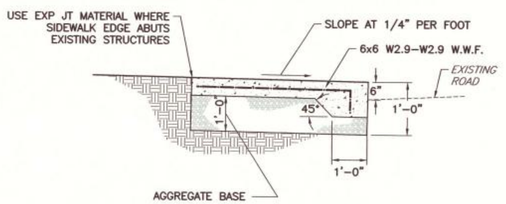


CROSSWALK LAYOUT
SCALE: NTS

NOTE:
1. ALL PAVEMENT MARKINGS SHALL BE THERMOPLASTIC.
2. YIELD MARKERS SHALL BE PLACED 4' IN ADVANCE OF CROSSWALKS.
3. ALL PAVEMENT MARKINGS SHALL BE PER M.U.T.C.D.



YIELD MARKERS
SCALE: NTS



SECTION WITH CURB

NOTE: SAWCUT CONTROL JOINTS AT 5'-0" CENTERS (2" DEEP)

CONCRETE SIDEWALK
SCALE: NTS

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
1	BID DOCUMENTS	BJM	6/15
2			
3			
4			
5			

DESIGNED BY: BJM
CAD COORD.: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

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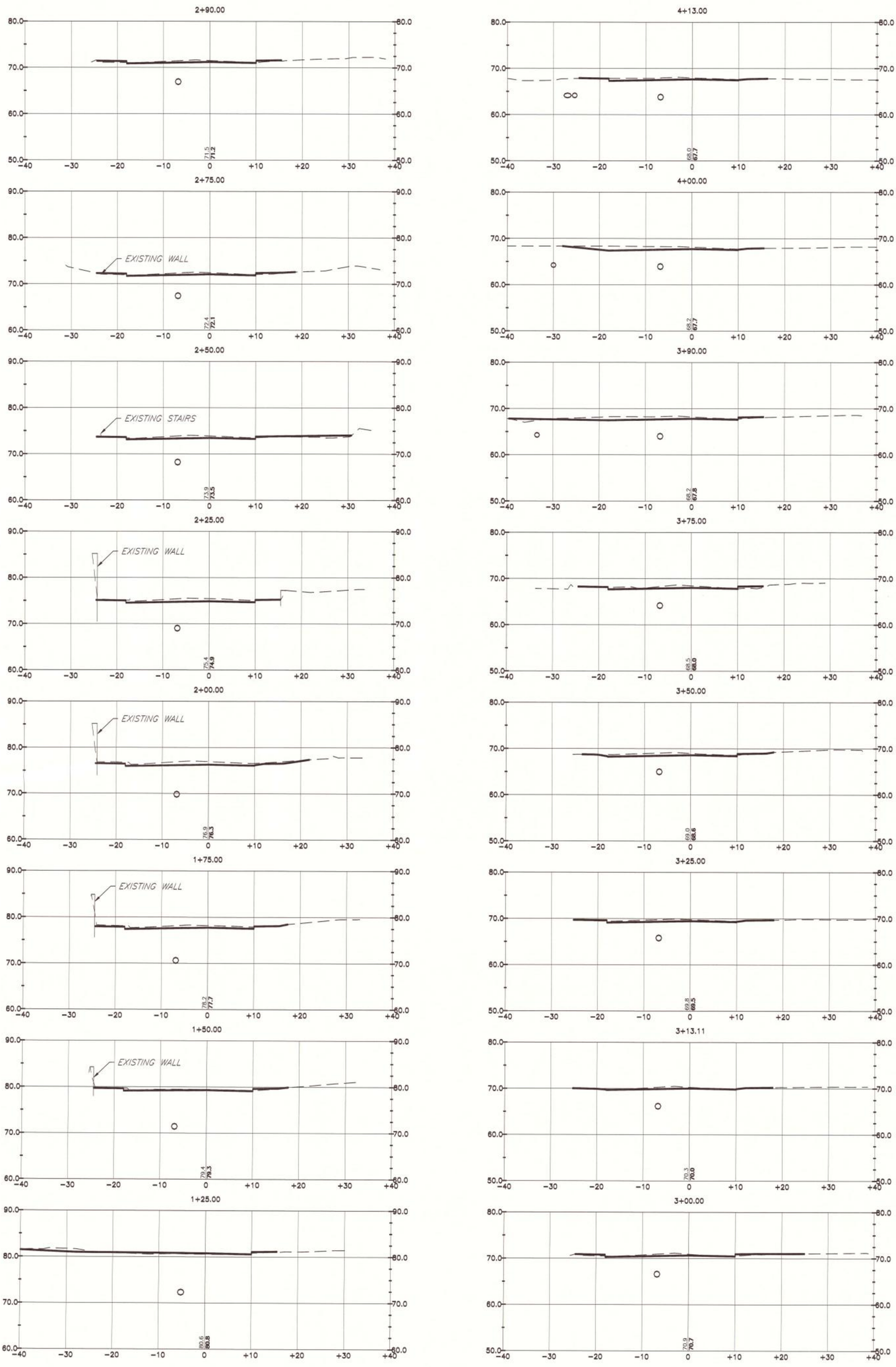
WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

DETAILS II

DRAWING
C-14

SECTIONS
SCALE: 1"=10'



DRAWING C-15

WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

CROSS SECTIONS: CEDAR ST

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BRIAN J. MONTEJUNAS CIVIL No. 47347 REGISTERED PROFESSIONAL ENGINEER 6/23/15

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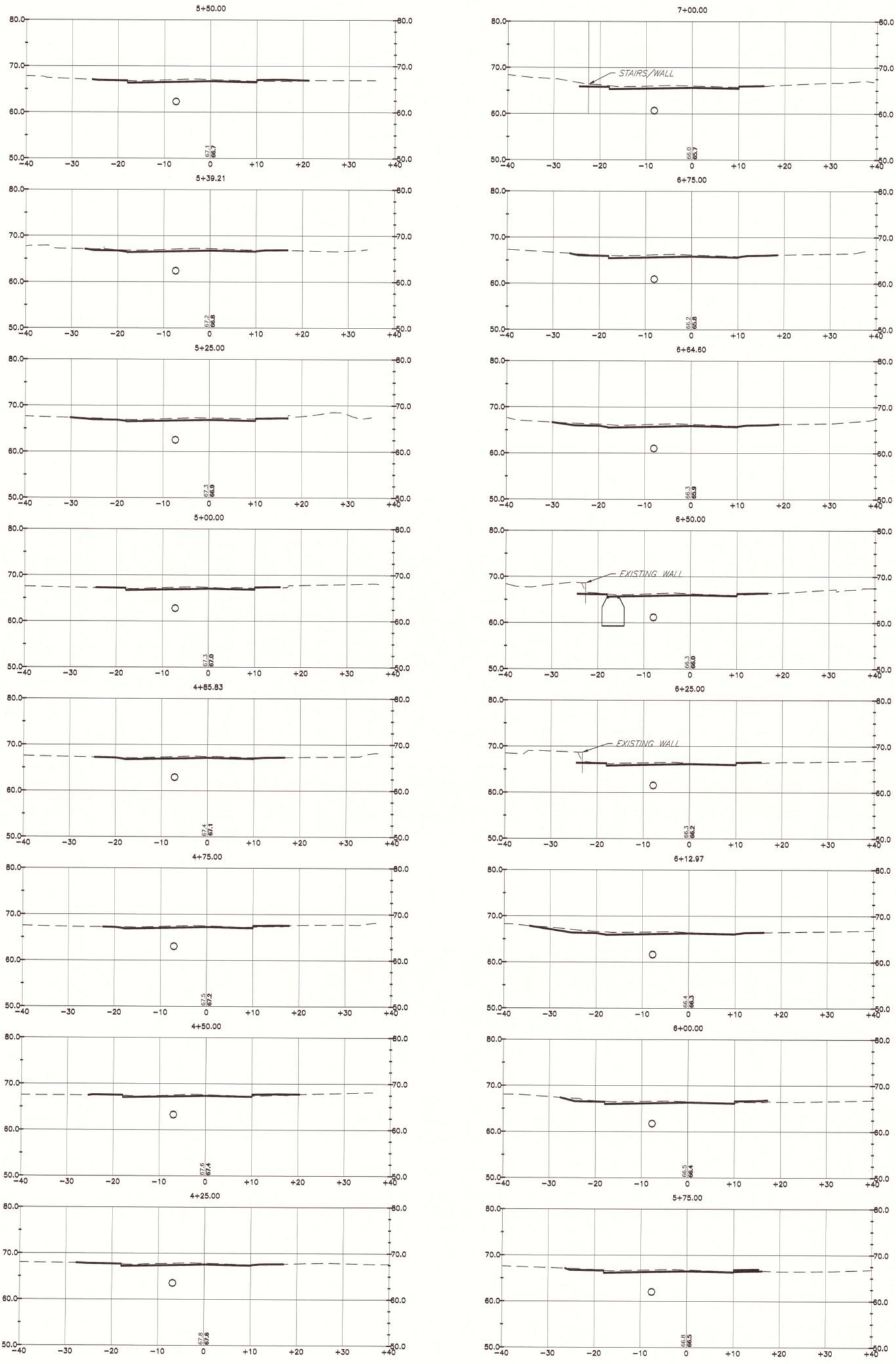
CAD COORD.: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

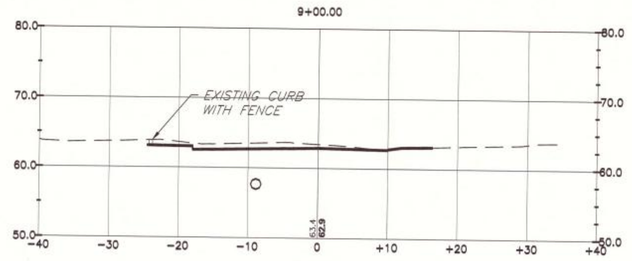
NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15
1			
2			
3			
4			

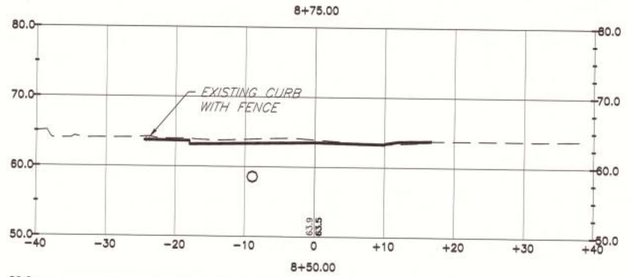
SECTIONS
SCALE: 1"=10'

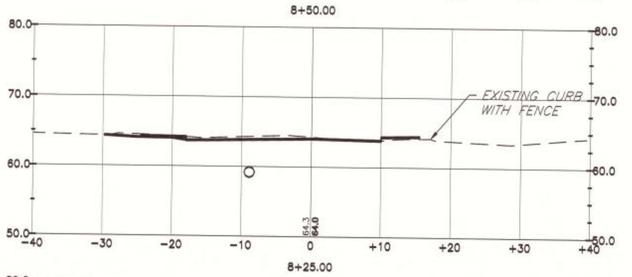


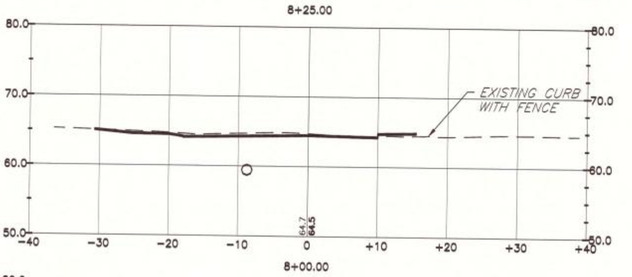
DRAWING C-16	WALTHAM, MASSACHUSETTS STORM DRAIN & SURFACE IMPROVEMENTS CEDAR ST AND OAK ST	WRIGHT-PIERCE Engineering a Better Environment Offices Throughout New England 888.621.8156 | www.wright-pierce.com	DESIGNED BY: BJM CAD COORD: JJM CAD: JJM CHECKED BY: JCE DATE: 6/23/15 APPROVED BY: BJM DATE: 6/23/15 PROJECT NO: 12858B
	CROSS SECTIONS: CEDAR ST		NO. SUBMISSIONS/REVISIONS APP'D DATE BID DOCUMENTS BJM 6/15

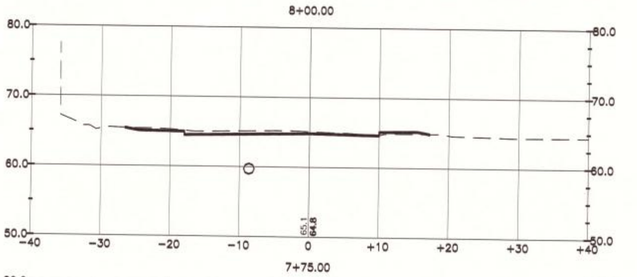
SECTIONS
SCALE: 1"=10'

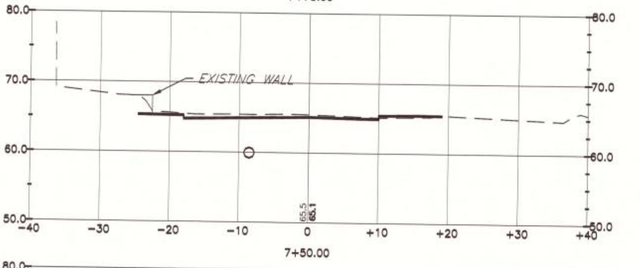


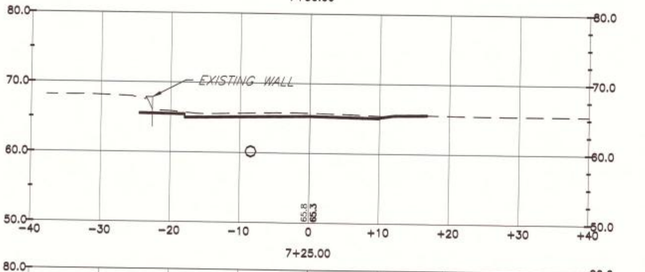


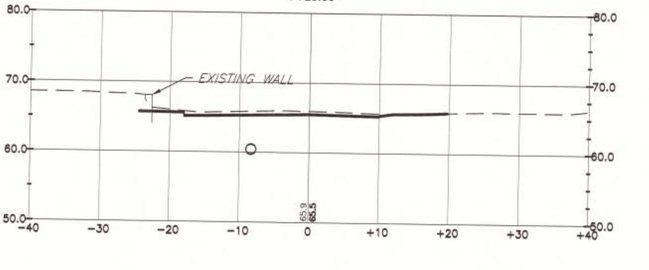


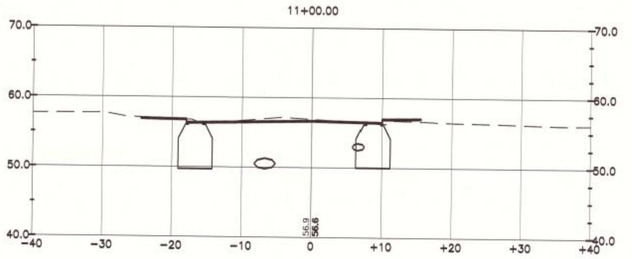


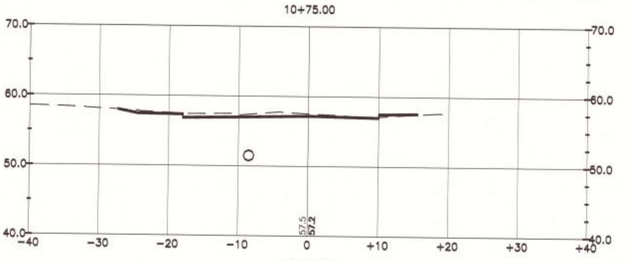


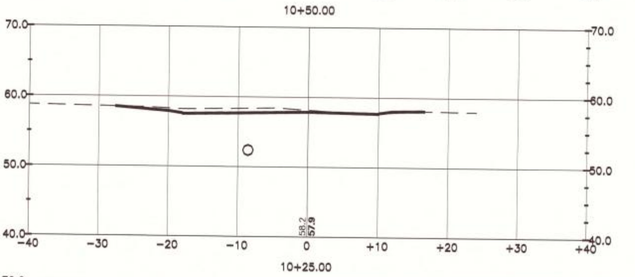


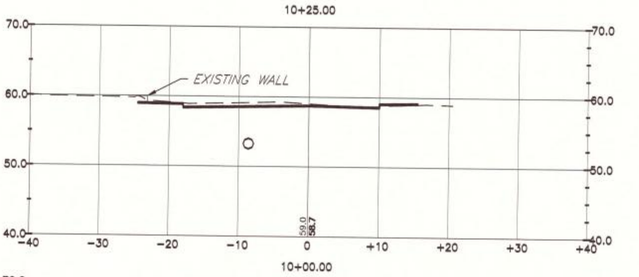


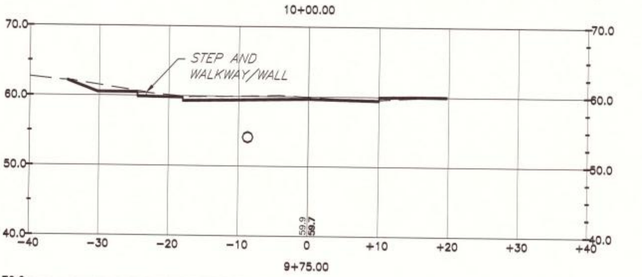


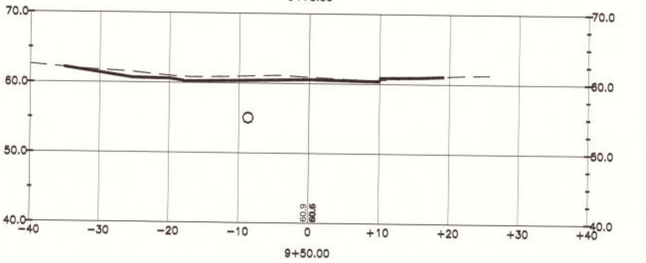


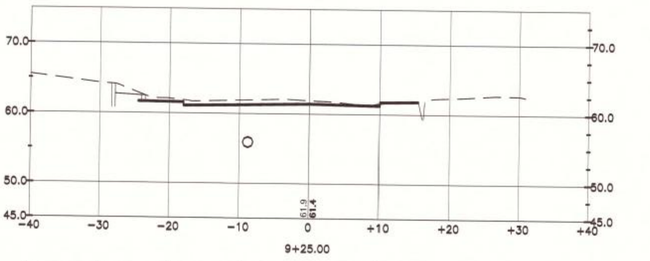


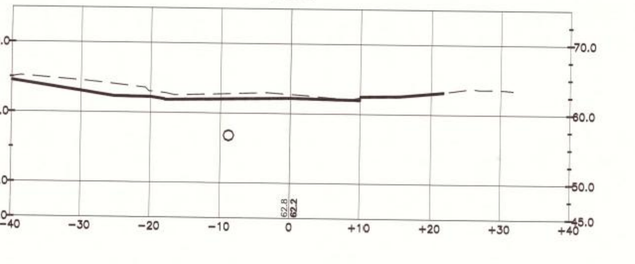












DRAWING C-17

WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

CROSS SECTIONS: CEDAR ST

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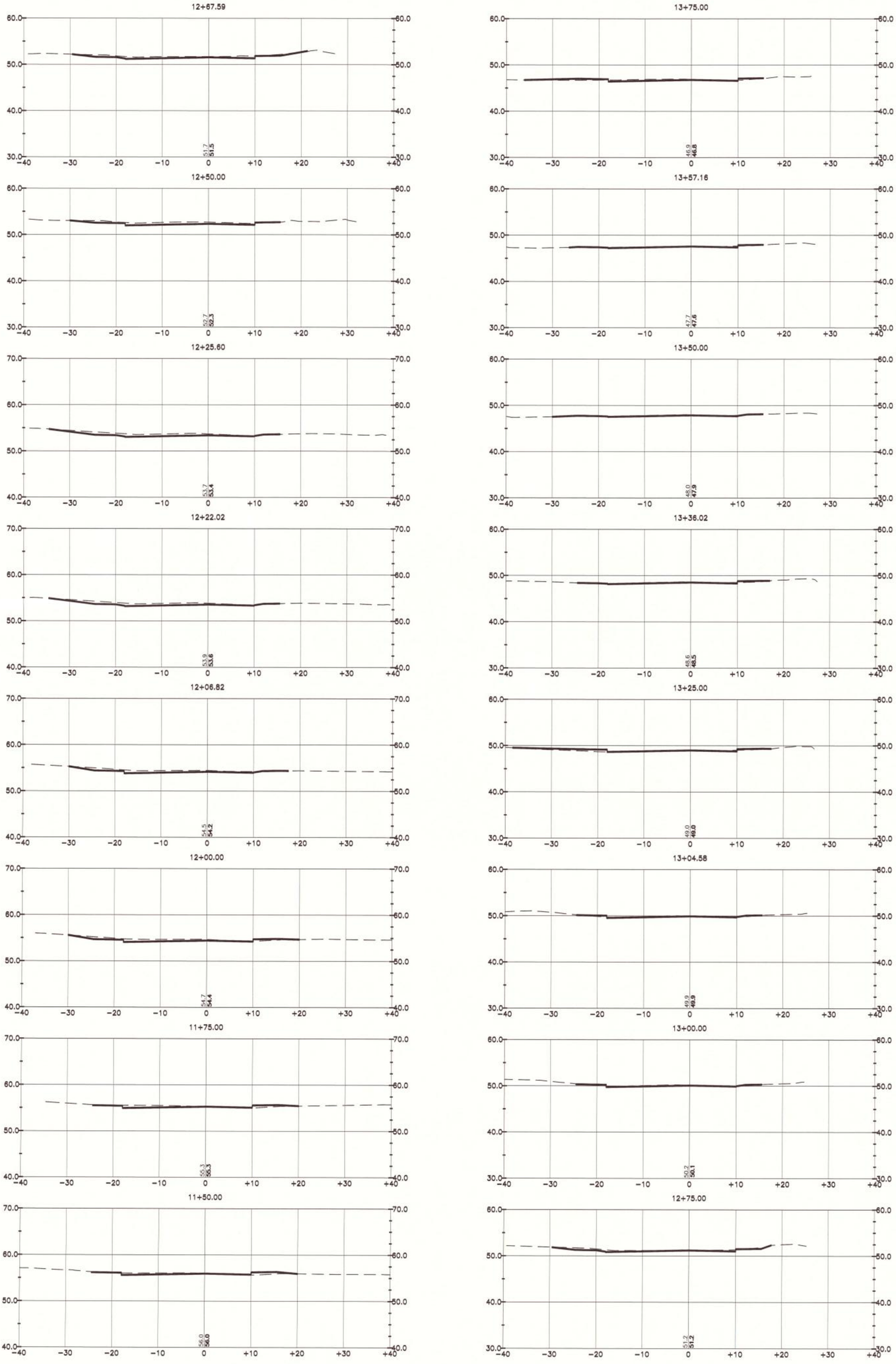
BRIAN J. MONTEJUNAS CIVIL No. 47347 COMMONWEALTH OF MASSACHUSETTS

DESIGNED BY: BJM
CAD COORD: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15
1			
2			
3			
4			

SECTIONS

SCALE: 1"=10'



DRAWING C-18

WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

CROSS SECTIONS: CEDAR ST

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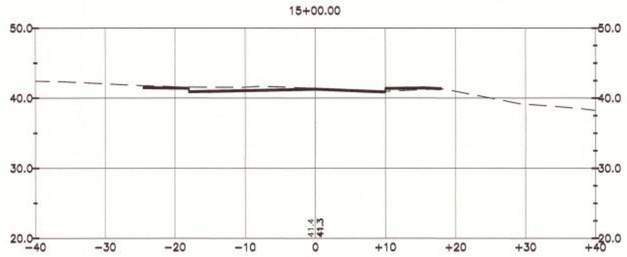
COMMONWEALTH OF MASSACHUSETTS
BRIAN J. MONTEJUNAS
CIVIL
No. 47347
REGISTERED PROFESSIONAL ENGINEER

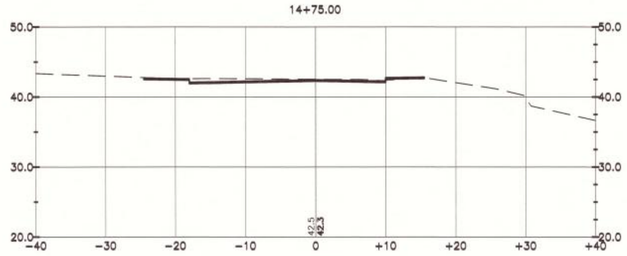
DESIGNED BY: BJM
CAD COORD.: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

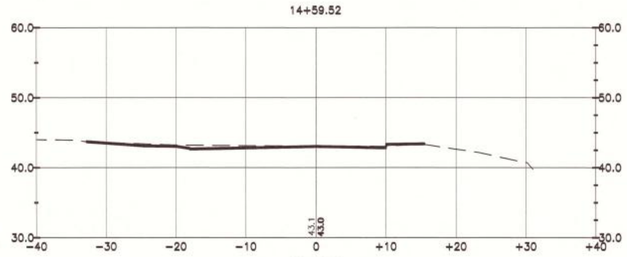
NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15
1			
2			
3			
4			

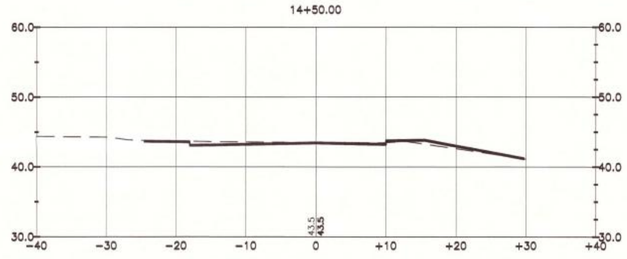
SECTIONS

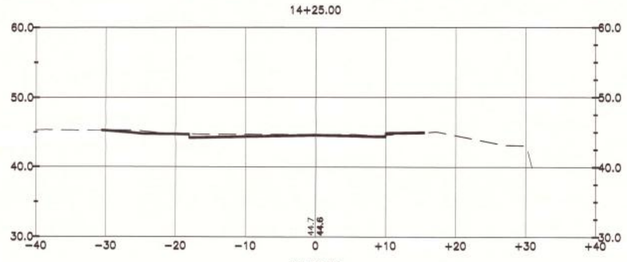
SCALE: 1"=10'

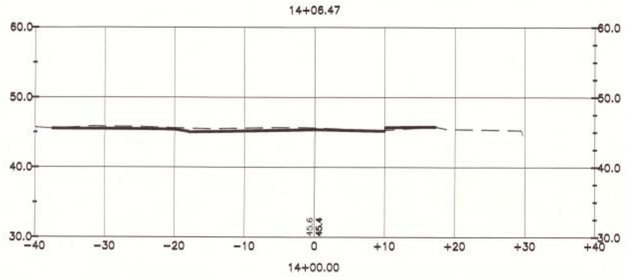


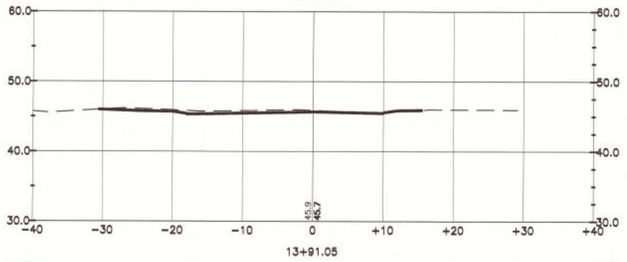


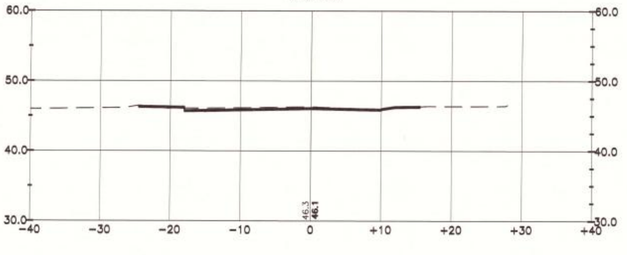


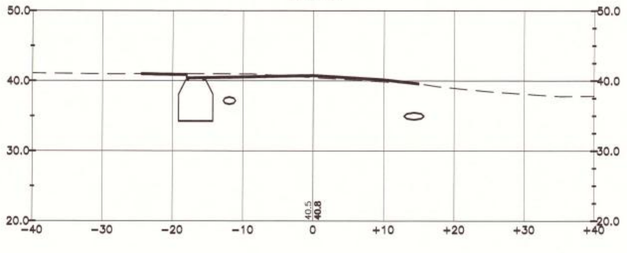












DRAWING C−19

WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

CROSS SECTIONS: CEDAR ST

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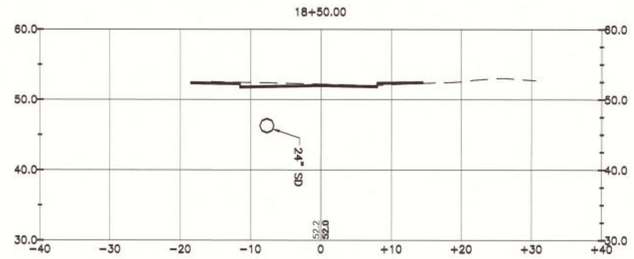
COMMONWEALTH OF MASSACHUSETTS
BRIAN J. MONTEJUNAS
CIVIL
No. 47347
REGISTERED PROFESSIONAL ENGINEER

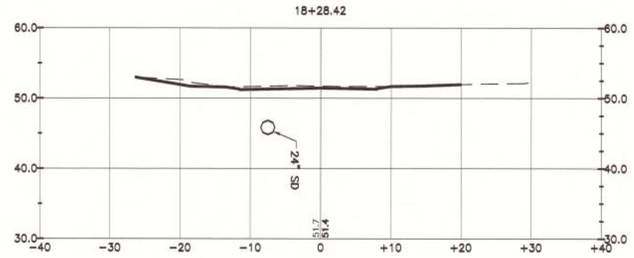
DESIGNED BY: BJM
CAD COORD: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

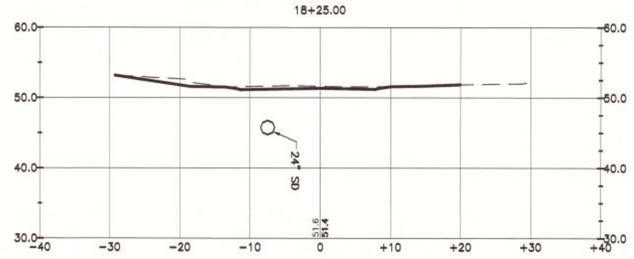
NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15
1			
2			
3			
4			

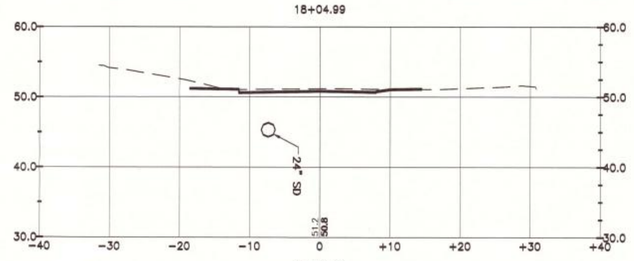
SECTIONS

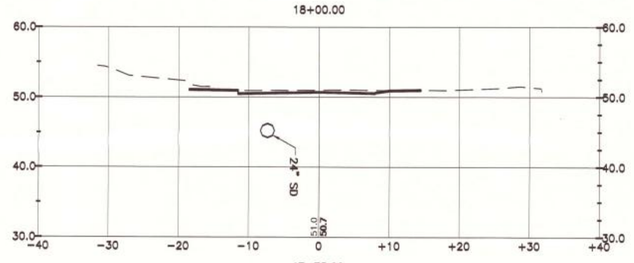
SCALE: 1"=10'

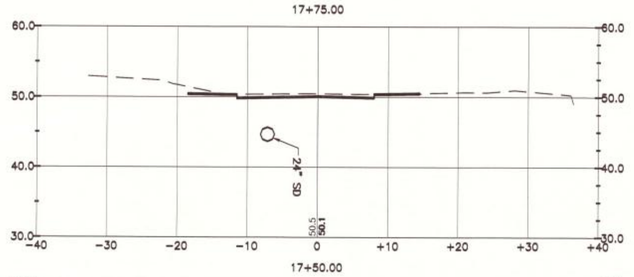


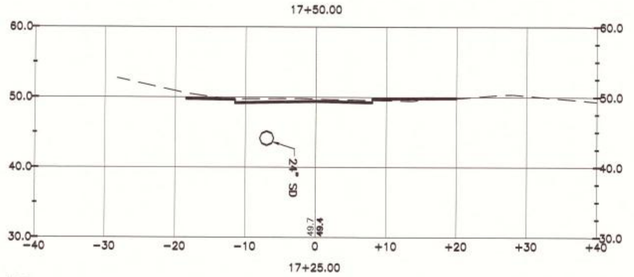


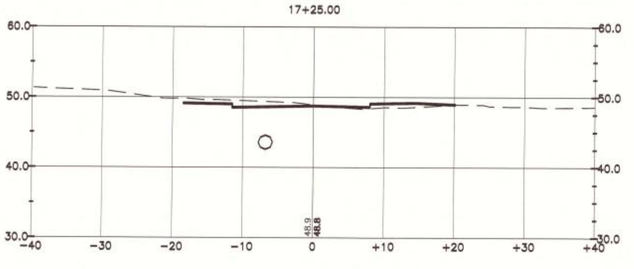


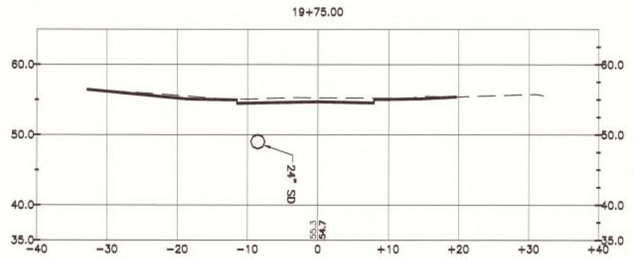


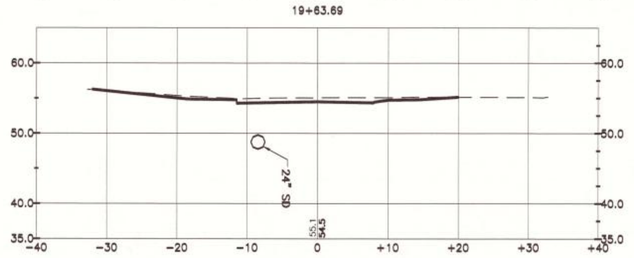


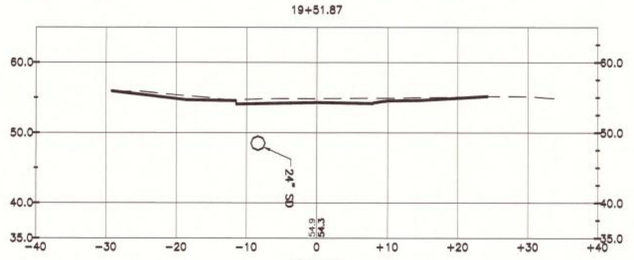


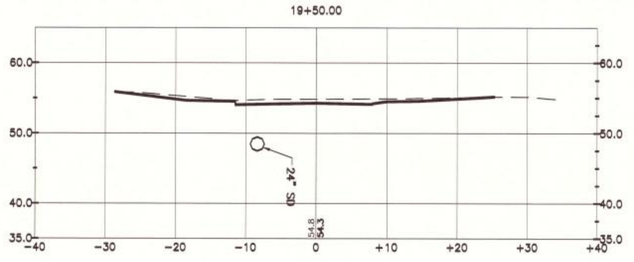


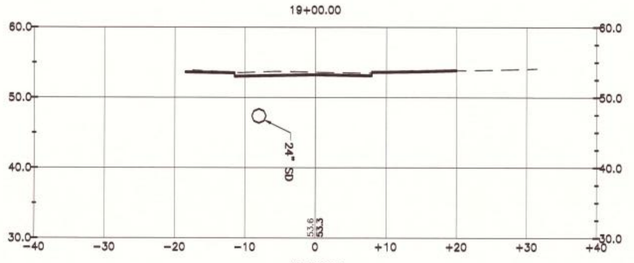


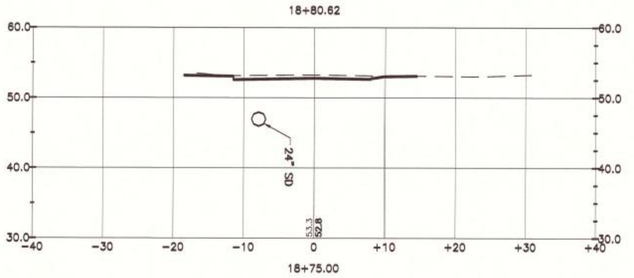


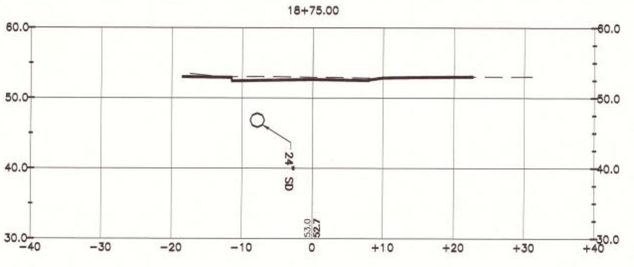












DRAWING C-20

WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

CROSS SECTIONS: OAK ST

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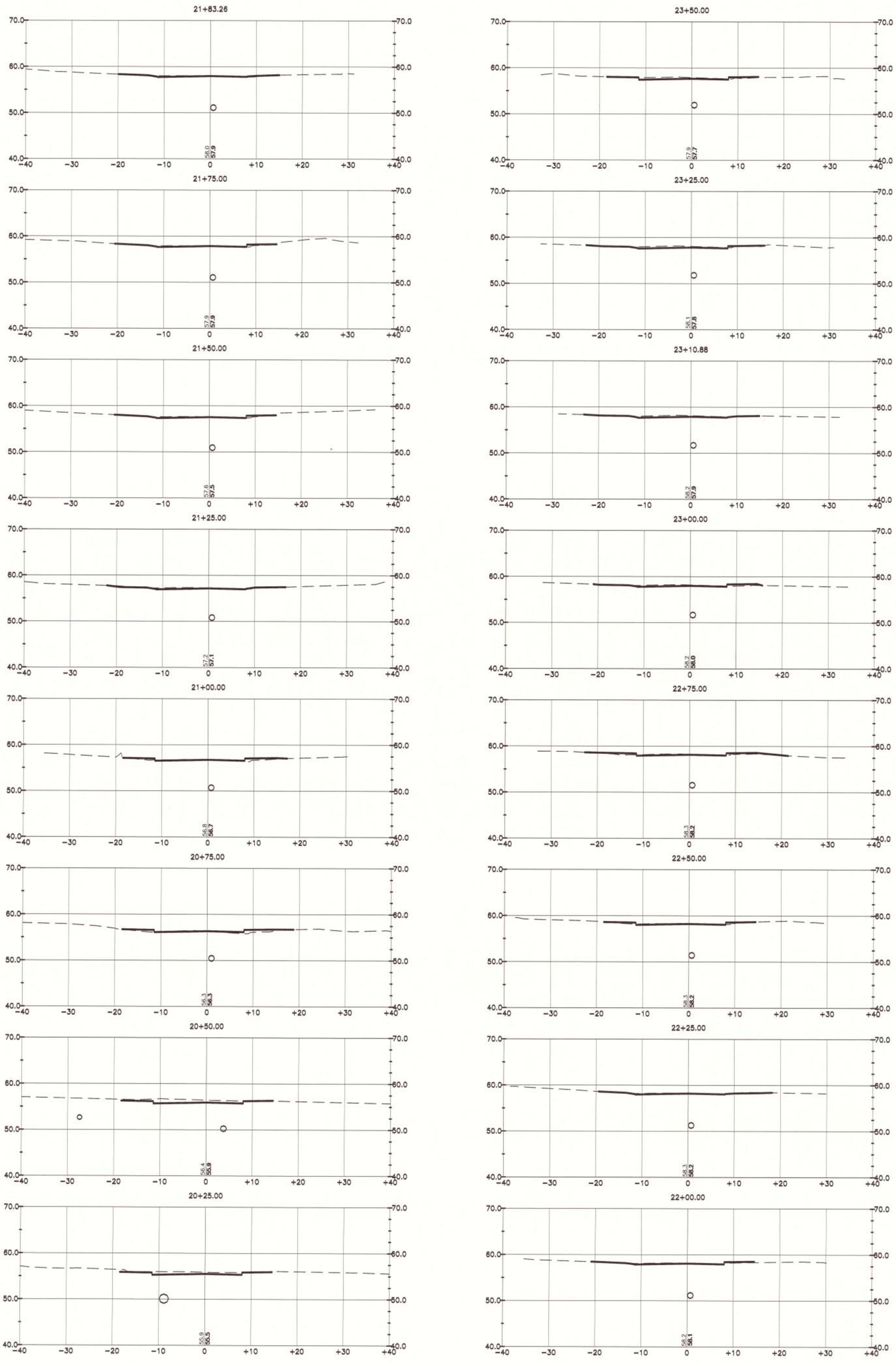
BRIAN J. MONTEJUNAS CIVIL No. 47047 COMMONWEALTH OF MASSACHUSETTS REGISTERED PROFESSIONAL ENGINEER

DESIGNED BY: BJM
CAD COORD.: JJM
CADD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15
1			
2			
3			
4			

SECTIONS

SCALE: 1"=10'



DRAWING C-21

WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

CROSS SECTIONS: OAK ST

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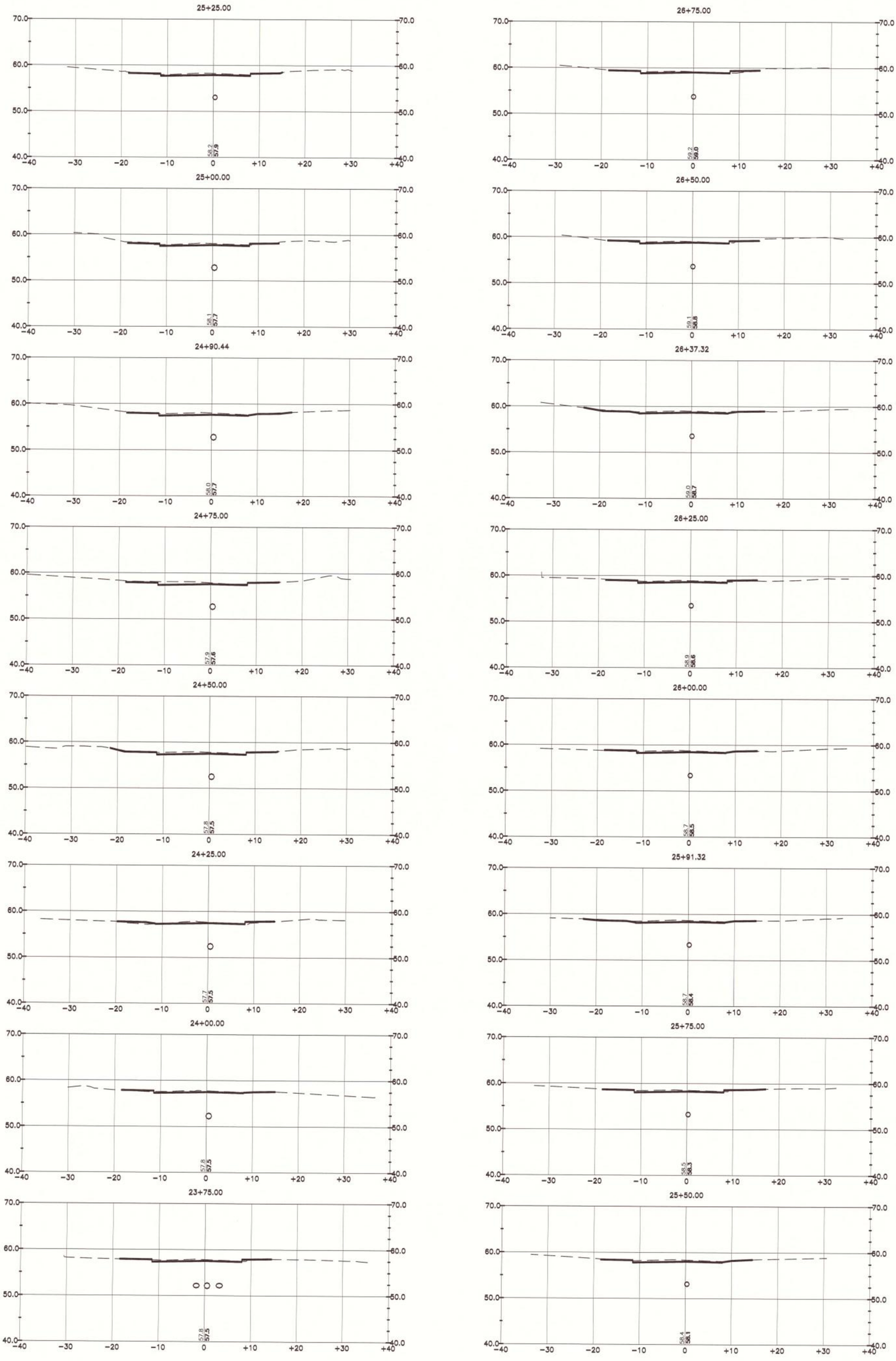
COMMONWEALTH OF MASSACHUSETTS
BRIAN J. MONTEJUNAS
CIVIL
No. 47347
REGISTERED PROFESSIONAL ENGINEER

DESIGNED BY: BJM
CAD COORD: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15
1			
2			
3			
4			

SECTIONS
SCALE: 1"=10'



DRAWING C-22

WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

CROSS SECTIONS: OAK ST

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COMMONWEALTH OF MASSACHUSETTS
BRIAN J. MONTEJUNAS
CIVIL
No. 47347
REGISTERED PROFESSIONAL ENGINEER
6/23/15

DESIGNED BY: BJM
CAD COORD: JJM
CAD: JJM
CHECKED BY: JCE
DATE: 6/23/15
APPROVED BY: BJM
DATE: 6/23/15
PROJECT NO: 12858B

NO	SUBMISSIONS/REVISIONS	APP'D	DATE
	BID DOCUMENTS	BJM	6/15
1			
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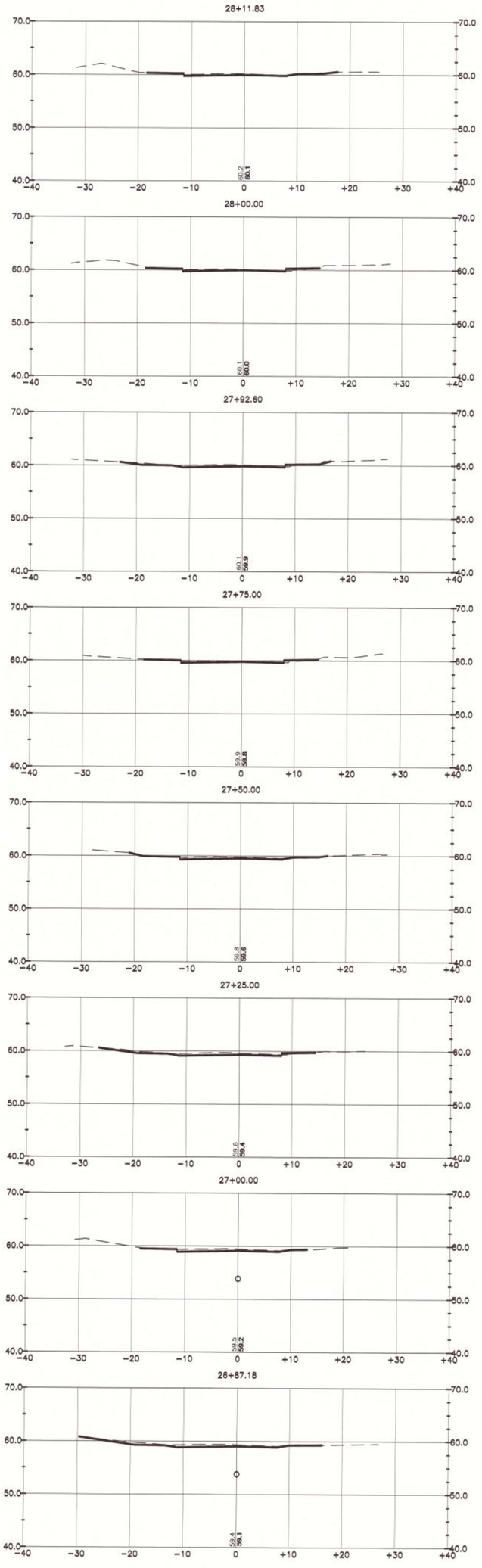
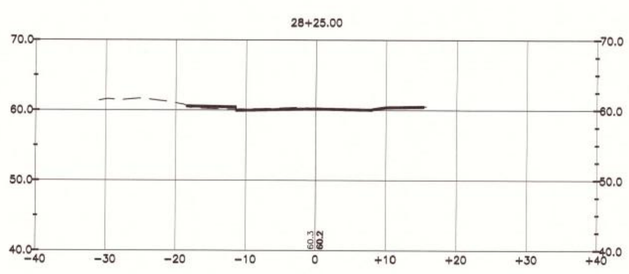
3			
4			

SECTIONS

SCALE: 1"=10'





DRAWING C-23

WALTHAM, MASSACHUSETTS
STORM DRAIN & SURFACE IMPROVEMENTS
CEDAR ST AND OAK ST

CROSS SECTIONS: OAK ST

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COMMONWEALTH OF MASSACHUSETTS
BRIAN J. MONTEJUNAS
CIVIL
No. 47347
REGISTERED PROFESSIONAL ENGINEER

DESIGNED BY: BJM
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NO	SUBMISSIONS/REVISIONS	APP'D	DATE
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