The City of Waltham

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

ROADWAY AND TRAFFIC SIGNAL IMPROVEMENT PROJECT, TRAPELO ROAD AND FOREST STREET, WALTHAM, MASSACHUSETTS

Bid Opening for General Contractors:

- **Wednesday, December 19, 2012 At 10:00 AM**

Pre Bid Meeting and Inspection Date:

- **Thursday, December 13, 2012 At 10 AM**

  (Meet at the intersection of Trapelo Rd and Forest St.)

Last Day for Written Questions:

- **Friday December 14, 2012 at 4 pm**

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SECTION 00050
CITY OF WALTHAM
MASSACHUSETTS

INVITATION TO BID

ROADWAY AND TRAFFIC SIGNAL IMPROVEMENT PROJECT, TRAPELO ROAD AND FOREST STREET, WALTHAM, MASSACHUSETTS

The City of Waltham, Massachusetts invites sealed bids from Contractors for the project described herewith. The intersection of Trapelo Road at Forest Street and Metropolitan Parkway currently operates with Forest Street and Metropolitan Parkway under STOP control. The crash rate for the intersection (0.68 crashes per million entering vehicles) is higher than both the statewide and district-wide averages for unsignalized intersections. This project involves signalization of the Trapelo Road/Forest Street intersection, repaving of Trapelo Road between Hobbs Road and Alderwood Road, new sidewalk construction along Trapelo Road in this section, repaving of Forest Street between Trapelo Road and Alderwood Road, new sidewalk along Forest Street in this section, and widening of Trapelo Road to allow for an exclusive right turn lane in the eastbound direction and an exclusive left turn lane in the westbound direction

PLANS, SPECIFICATIONS and other Contract Documents may be obtained by visiting the city's web site at www.city.waltham.ma.us/open-bids or by e-mail request to Jpedulla@city.waltham.am.us Beginning **November 28, 2012 after 4 pm**. Documents will **not** be mailed.

Sealed **GENERAL BIDS** for this project will be accepted from eligible bidders at the Purchasing Department, Waltham City Hall, 610 Main Street, Waltham, MA 02452 until **10:00 AM on December 19, 2012**, at which place and time they shall be publicly opened, read aloud and recorded for presentation to the Awarding Authority.

A **PRE-BID CONFERENCE** will be held for all interested parties at **10:00 AM on December 13, 2012 meet at the intersection of Trapelo Road and Forest Street**. Attendance at this pre-bid conference is strongly recommended but not mandatory for parties submitting a bid. It will be the only opportunity to visit the site prior to the bid opening.

LAST DAY FOR QUESTIONS. Friday December 14, 2012 at 4 pm

Each general bid shall be accompanied by a bid deposit in the form of a bid bond, certified check, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the City of Waltham in the amount of five percent (5%) of the value of the bid. Bid deposits will be dealt with as provided in Massachusetts General Laws, Chapter 149, Section 44B.

To be given consideration, all general bids must be accompanied by the completed documents in the COMPLIANCE Section.

Bids shall be made on the basis of the Minimum Wage Rates as determined by the Commissioner of Labor and Industries, Pursuant to the Provisions of Chapter 149, Sections 26 to 27D inclusive of Massachusetts General Laws, a copy of which can be obtained from the City web site at www.city.walthm.ma.us/open-bids or via e mail request at jpedulla@city.waltham.ma.us. The prevailing Wage Schedule is made part, as reference, of the Contract. Bidders' selection procedures and contract award shall be in conformity with applicable statues of the Commonwealth of Massachusetts.

Performance and Labor and Materials payment bonds in the full amount of the contract price will be required from the successful bidder.

The Awarding Authority reserves the right to reject any or all general bids, if it be in the public interest to do so, and to reject any sub-bid on any sub-trade if it determines that such sub-bid does not represent the sub-bid of a person competent to perform the work as specified or that less than three such sub-bids were received and that the prices are not reasonable for acceptance without further competition.

The successful bidder will be required to furnish a Certificate of Insurance, naming the City of Waltham as a NAMED Additional Insured with a waiver of subrogation, for General Liability and Vehicle Liability in the amount of $500,000 per occurrence and $1,000,000 in the aggregate and Worker's Compensation Insurance as prescribed by law.

In accordance with M.G.L., the undersigned certifies that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by OSHA that is at least 10 hours in duration at the time the employee begins work and shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

CITY OF WALTHAM

Joseph Pedulla, Chief Procurement Officer
Purchasing Department
City Hall, 610 Main Street
Waltham, MA 02452

END OF SECTION

PART 1 - GENERAL

SECTION 00100 - INSTRUCTION TO BIDDERS

1.01 SCHEDULE OF DATES

A. Deadline for Advertisement for Bids: Central Register – Nov. 14, 2012, 4:00 P.M.

B. Advertisement appears in Central Register, Plans and Specifications ready for Bidders **after 4:30 P.M. on November 28, 2012.**

C. Pre-bid walkthrough on **December 13, 2012 at 10:00 A.M.** at the intersection of Trapelo Road and Forest Street.

D. Questions and requests for interpretations may be submitted in writing by the Bidders to Jpedulla@city.waltham.ma.us up to and including: **4:00 P.M. on Friday December 14, 2012**

E. Addenda will be issued with answers to posed questions and interpretations as determined by the City.

F. General Bids Deadline: **10:00 A.M. on Thursday December 19, 2012**, in the Purchasing Department, City Hall, 610 Main Street, Waltham, MA 02452, Attn: Joseph Pedulla, Chief Procurement Officer, where the bids will be publicly open and read.

1.012 BUDGET

A. The budget for this project is not to exceed **$1,600,000.** In the event that the low qualified General Contractor's bid exceeds this amount, the City may withdraw the project until additional funds are secured.

1.02 BIDDING PROCEDURE

A. Bids for the work are subject to the provisions of General Laws, Chapter 30,39M as amended. Regulations governing the bidding procedures as set forth in the above mentioned amended General Laws must be followed.

B. In the event of any inconsistencies between any of the provisions of these Contract Documents and of the cited statute, anything herein to the contrary notwithstanding, the provisions of the said statute shall control.

C. No General Bid received by the Awarding Authority after the time respectively established herein for the opening of General Bids will be considered, regardless of the cause for the delay in the receipt of any such bid.

1.03 WITHDRAWAL OF BIDS

A. Bids may be withdrawn prior to the time respectively established for the opening of General Bids only on written request to the Awarding Authority.

1.04 INTERPRETATION OF CONTRACT DOCUMENTS

A. No oral interpretation will be made to any bidder. All questions or requests for interpretations must be made in writing to the Architect.

B. Every interpretation made to a bidder will be in the form of an Addendum to the drawings and/or specifications, which will be made available to all persons to whom Contract Documents have been issued.

C. Failure of the Awarding Authority to send or of any bidder to receive any such Addendum shall not relieve any bidder form obligation under his bid as submitted.

D. All such Addenda shall become a part of the Contract Documents.

1.05 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

A. Each bidder shall visit the site of the proposed work and fully acquaint himself with conditions as they exist, and shall also thoroughly examine the Contract Documents. Failure of any bidder to visit the site and acquaint himself with the Contract Documents shall not relieve any bidder from any obligation with respect to his bid.

B. By submitting a bid, the bidder agrees that the Contract Documents are adequate and that the required result for a full and complete installation can be produced. The successful bidder shall furnish any and all labor, materials, insurance, permits and all other items needed to produce the required result to the satisfaction of the Awarding Authority.

1.06 BID SECURITY

A. The General Contractor's bid must be accompanied by bid security in the amount of five percent (5%) of the bid.

B. At the option of the bidder, the security may be bid bond, certified, treasurer's or cashier's check issued by a responsible bank or trust company. No other type of bid security is acceptable.

Bid Bonds shall be issued by a Surety Company qualified to do business under the laws of the Commonwealth of Massachusetts.

C. Certified, Treasurer's or Cashier's check shall be made payable to the City of Waltham, Massachusetts.

D. The bid security shall secure the execution of the Contract and the furnishing of a Performance and Payment Bond by the successful General Bidder.

E. Should any General Bidder to whom an award is made fail to enter into a contract therefore within five (5) days, Saturdays, Sundays and Legal Holidays, excluded, after notice of award has been mailed to him or fail within such time to furnish a Performance Bond and also a Labor and Materials or Payment Bond as required, the amount so received from such General Bidder through his Bid Bond, Certified, Treasurer's or Cashier's check as bid deposit shall become the property of the City of Waltham, Massachusetts as liquidated damages; provided that the amount of the bid deposit, which becomes the property of the City of Waltham, Massachusetts, shall not in any event exceed the difference between his bid price and the bid price of the next lowest responsible and eligible bidder; and provided further that, in case of death, disability, bona fide clerical error or mechanical error of a substantial nature, or other unforeseen circumstances affecting the General Bidder, his deposit shall be returned to him.

1.07 BID FORM

A. General Bids shall be submitted on the "FORM FOR GENERAL BID" enclosed. Erasures or other changes must be explained or noted over the signature of the bidder.

B. All Bid Forms must be completely filled in. Bids which are incomplete, conditional, or obscure, or which contain additions not called for will be rejected.

C. General Bidders shall submit one set of executed bid forms to the Awarding Authority.

1.08 SUBMISSION OF BIDS AND BID SECURITIES

A. Each bid submitted by a General Contractor shall be enclosed in a sealed envelope that shall be placed with the bid security in an outer envelope. The outer envelope shall be sealed and clearly marked as follows:

(Firm Name): _____

General Bid and Bid Security for:
Roadway and Traffic Signal Improvements at Trapelo Road and Forest Street

1.09 AWARD OF CONTRACT

A. The Contract shall be awarded to the lowest responsible and eligible General Bidder on the basis of competitive bids in accordance with the procedure set forth in the provision of Chapter 30, 39M of the General Laws of the Commonwealth of Massachusetts.

B. If the bidder selected as the General Contractor fails to perform his agreement to execute a contract in accordance with the terms of his General Bid, and furnish a Performance Bond and also a Labor and Materials or Payment Bond, as stated in his General Bid in accordance with Section 44F, an award shall be made to the next lowest responsible and eligible bidder.

C. The words "lowest responsible and eligible bidder" shall be the bidder whose name is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work and who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed, or to be employed, on the work. Essential information in regard to such qualifications shall be submitted in such form as the Awarding Authority may require.

D. Action on the award will be taken within Sixty (60) days, Saturdays, Sundays and Legal Holidays excluded after the opening of the bids.

1.10 SECURITY FOR FAITHFUL PERFORMANCE

A. The successful bidder must deliver to the Awarding Authority simultaneously with his delivery of the executed contract, an executed Performance Bond, and also a Labor and materials or Payment Bond, each issued by 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 One Hundred Percent (100%) of the Contract Price, as surety for the faithful performance of his contract, and for the payment of all persons performing labor or furnishing materials in connection therewith. Said bonds shall provide that, if the General Contractor fails or refuses to complete the Contract, the Surety Company will be obligated to do so.

B. Premiums are to be paid by the General Contractor, and are to be included in the Contract Price.

1.11 EQUAL OPPORTUNITY

A. The City of Waltham is an Equal Opportunity employer and will require compliance with the minority business enterprise plan (MBE) on file in the Purchasing Department

1.12 PRE-BID WALK-THRU

A. A pre-bid conference will be held at the site on **Dec. 13, 2012, at 10:00 A.M**. at the intersection of Trapelo Road and Forest Street in Waltham, MA. Interested parties are encouraged to attend given that this will be the only time the building is open prior to the submission of bids. Further, prior to the bid opening, potential bidders may not go onto the site any time other than the aforementioned pre-bid conference.

1.13 LEFT BLANK

1.14 CONTRACT DOCUMENTS

A. Contract documents are available on line only at www.city.waltham.ma.us/open-bids .

1.15 EQUALITY

A. Except where otherwise specifically provided to the contrary, the words "or approved equal" are hereby inserted immediately following the name or description of each article, assembly, system, or any component part thereof in the Contract Documents. It is the Contractor's responsibility to provide all the research and documentation that would prove a product or assembly is "equal". Failure to provide research or documentation does not alleviate the Contractor's responsibility to meet the schedule.

1.16 TAX FREE NUMBER

A. The City of Waltham has a tax-free number.

1.17 SCHEDULE

A. The work of the Contract shall be Substantially Complete in **180 calendar days** following the completion of the utility work.

1.18 LATE FEES

A. If the work is not Substantially Complete as specified in 1.17, the Contractor shall be charged a maximum of Five Hundred Dollars ($500.00) per day to pay for consulting and testing fees required to manage and arrange for the completion of the project. Late fees will be deducted from the Contract via Change Order.

1.19 WEEKLY JOB MEETINGS

A. There will be a weekly job meeting at the site on the same agreed-upon day and time. Time will be provided to discuss and view the progress of the work and to answer questions. The Contractor's job Superintendent and Project Manager shall attend each meeting. The City reserves the right to have job meetings conducted on site or at a city location to be named.

1.20 PROJECT SUPERINTENDENT

A. The Contractor shall provide the same person as Superintendent for the entire duration of the project. Failure to maintain the same person in this position shall result in a One Thousand Dollar ($1,000.00) penalty per incident which shall cover the Architect's time to re-orient new personnel.

1.21 AWARD

A. The Awarding Authority reserves the right to reject any or all bids if it be in the public interest to do so, and to act upon the bids and make its award in any lawful manner.

1.22 MINIMUM WAGE SCHEDULE

A. Bids shall be made on the basis of the Minimum Wage Schedule, as determined by the Commissioner of Labor and Industries, pursuant to the provision of Chapter 149, Section 26 to 27D inclusive, of the Massachusetts General Laws. **The prevailing wage schedule can be found in the City web site at** www.city.waltham.ma.us/open-bids

1.23 CONFLICT OF INTEREST

A. A bidder filing a proposal thereby certifies that the proposal is made in good faith, without fraud, collusion, or connection of any kind with any other bidder for the same work, and that the bidder is competing solely on its own behalf without connection with, or obligation to, any undisclosed person or firm.

1.24 NOTICE TO PROCEED ORDERS

A. No bidder is to proceed without a Notice-To-Proceed (NTP) order as set out in the contract.

1.25 STAGING

A. The General Contractor shall provide all the vertical access (which includes staging, vertical lifts, etc.) for the work of the Contract for the General Bidder.

1.26 COMPLIANCE WITH MASSACHUSETTS GENERAL LAWS

A. Before a contract may be executed by the City, the successful Bidder will be required, in accordance with the provisions of M.G.L. Chapter 62C, Section 49A, to execute and file with the City the following certificate:

B. Pursuant to Massachusetts General Laws, Chapter 62C, Section 49A, I certify under the penalty of perjury that I, to the best of my knowledge and belief have filed all state tax returns and paid all the state taxes required under law.

1.27 CONSTRUCTION BARRICADES

A. The General Contractor shall provide all barricades to enclose the work area to prevent unauthorized access to the site.

1. The barricades shall provide enough room for all construction activities to be performed while separated from pedestrians, students, and staff on site.

2. Safety is the sole responsibility of the Contractor and any barricades necessary to protect the work and the public shall be provided.

3. Provide entrance tunnel protection.

1.28 INSURANCE

A. The contractor shall purchase and maintain, at his expense all insurance required by the Contract. Documents and all insurance required by the applicable laws of Massachusetts, including but not limited to, General Laws, Chapter 146, in connection with all hoisting equipment.

B. The Contractor shall purchase and maintain such insurance as will protect him from claims under workmen's compensation acts and from claims for damages because of bodily injury, including death and all property damage including, without limitation, damage to buildings and adjoining the site of construction which might arise from and during operations under this contract, whether such operations be by himself or by any subcontractor or anyone directly or indirectly employed by either of them including:

1. Statutory Worker's Compensation and Employer's Liability

The contractor shall provide insurance for the payment of compensation and the furnishing of other benefits under Chapter 152 of the General Laws (so-called Worker's Compensation Act) to all persons to be employed under this contract and shall continue in force such insurance as aforesaid shall be deemed a material breach of this Contract and shall

operate as an immediate termination thereof. The contractor shall, without limiting the generality of the foregoing, conform to the provisions of Section 34A of Chapter 149 of the General Laws, which Section is incorporated herein by reference and made a part of hereof.

2. Comprehensive General Liability Insurance

Minimum bodily injury limits of $ 500,000 per person and $ 1,000,000 per accident, and property damage limits of $ 500,000 per accident and $ 1,000,000 aggregate during any 12 month period, shall include the following:

a. Public liability (bodily injury and property damage)
b. X.C.U. (explosion, collapse, and underground utilities)
c. Independent contractor's protective liability.
d. Products and completed operations.
e. Save harmless agreement for Owner and Architects set forth in ARTICLE 10.11 of the GENERAL CONDITIONS.

3. Comprehensive All Risk Motor Vehicle Liability Insurance

Minimum bodily injury limits of $ 500,000 per person, $ 1,000,000 per accident, and property damage limit of $ 1,000,000 per accident.

4. All Risk Insurance

Covering all Contractor's equipment with a provision for Waiver of Subrogation against the Owner.

5. Excess Liability Insurance in Umbrella Form with combined Bodily Injury and Property Damage Limit of $ 1,000,000.

6. City of Waltham shall be **a NAMED Additional Insured with a Waiver of Subrogation on the insurance policy for this project**.

1.29 SITE ACCESS

A. The General Contractor shall gain access to the site via routes approved by the Owner.

1. The General Contractor as part of the bid price will restore all roads, curbs, driveways, walks and grassed or landscaped areas damaged during construction.

1.30 CONSTRUCTION TRAILER

A. The General Contractor shall locate the construction trailer at locations approved by the Owner.

B. The General Contractor shall locate all on site stored or staged materials within the enclosed area designated by the Owner.

1.31 BUILDING PERMIT FEES

A. Building permit fees, if any, will be waived for this project. However all permits must be obtained from the appropriate City Department

1.312 UTILITY RELOCATION AND WORKING WITH UTILITY COMPANIES

A. The contractor is responsible for the relocation of all poles interfering with the job. This includes the scheduling coordination with the utility companies. The City Electrical inspector will assist as needed. An allowance of $10,000 has been built into the price sheet for this task. This allowance will be adjusted up or down according to the actual expense.

1.32 COMPLETE BID FORMS

A. Please Note: Each bidder must fill in all the blanks on all the bid forms, even if the information is “zero dollars” or “not applicable”. Also, please acknowledge all Addenda.

2.00 FUNDS APPROPRIATION and LOAN AUTHORIZATION.

A THE CONTRACT OBLIGATION ON BEHALF OF THE CITY IS SUBJECT TO PRIOR APPROPRIATION OF MONIES FROM THE GOVERNMENTAL BODY AND AUTHORIZATION BY THE MAYOR.

3.0 CITY ORDINANCE. APPROVAL OF CONTRACTS BY MAYOR, SEC. 3-12 OF THE CITY ORDINANCES.

A All contract made by any department, board or commission where the amount involved is two thousand dollars ($2,000) or more shall be in writing, and no such contract shall be deemed to have been made or executed until the approval of the Mayor is affixed thereto. Any construction contract shall, and all other contracts may, where the contract exceed five thousand dollars ($5,000) be required to be accompanied by a bond with sureties satisfactory to the Mayor.

3.1 RETAINAGE.

The retainage applied to this project is 7.5% for Materials and 7.5% for Labor

3.2 ALLOWANCES

Two allowances have been built into the price sheet. One allowance is for the relocation of the utility poles for $10,000; the second is for Police Details also $10,000. Both allowances will be adjusted up or down based on the actual expenses incurred.

3.3 FINAL PAVING, FINISH LAYER.

The final finish coat of asphalt shall be done no later than October 31, 2013

Signature of Individual or Corporate Name

By:

_____

(Signature of Corporate Officer if applicable)

Title:_____

Social Security Number or Federal Identification Number: _____

END OF SECTION

SECTION 00300 FORM FOR GENERAL BID

ROADWAY AND TRAFFIC SIGNAL IMPROVEMENT PROJECT, TRAPELO ROAD AND FOREST STREET, WALTHAM, MASSACHUSETTS

General Bid Opening Date: 10:00 am, December 19, 2012

Joseph Pedulla, CPO
City of Waltham
610 Main Street
Waltham, MA 02452

A. Basic Price

The undersigned:

_____

(Please type or print the business name of the bidding firm)

having visited the site of the above project and having familiarized myself with the local conditions affecting the cost of the work and with the contract documents, including Amendments and Addenda No's. ___,___,___,___,___,___,___,___,___,___, hereby proposes to furnish all labor, materials, tools, equipment, insurance, permits and taxes, and to do and lawfully perform all things as provided in the specifications, all in accordance with the contract documents, for the sum of:

Base Bid (in words)_____

(report the number from the Price Sheet found later in this document)

Dollars, $_____

(Report the number from the Price Sheet found later in this document)

B. The undersigned agrees that, if s/he is selected as General Contractor, s/he 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 issued by 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.

C. The undersigned certifies that s/he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work and that s/he will comply fully with all laws and regulations applicable to awards made subject to section forty-four A.

D. The undersigned as Bidder certifies that if this proposal is accepted, s/he will furnish to the City of Waltham with the invoice for the material or equipment supplied two copies of any and all Material Safety Data Sheets applicable to such material or equipment, as required by M.G.L. Chapter 111F, so called "Right to Know Law".

E. The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. The word "person" shall mean any natural person, joint venture, partnership, corporation, or other business or legal entity.

F. **Substantial Completion**. The work of the Contract shall be Substantially Completed in **one hundred and eighty (180)** calendar days following the completion of the Utility Work.

G. In accordance with M.G.L., the undersigned certifies that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by OSHA that is at least 10 hours in duration at the time the employee begins work and shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

Sincerely,

_____
(Bidder)

_____
(Address of Bidder)

By: _____
(Title - Owner*, Partner*)

(Seal, if Corporation)

By: _____
(If Corporation - Name and Office)

* If the business owned by the individual or partnership is conducted under a trade or assumed name, a certified copy of doing business under an assumed name should be annexed.

COMPLIANCE FORMS

(PLEASE COMPLETE AND SUBMIT THESE FORMS WITH YOUR RESPONSE)

NON-COLLUSION FORM AND TAX COMPLIANCE FORM

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity or group of individuals. The undersigned certifies that no representations made by any City officials, employees, entity, or group of individuals other than the Purchasing Agent of the City of Waltham was relied upon in the making of this bid

_____, _____
(Signature of person signing bid or proposal)Date

_____
(Name of business)

TAX COMPLIANCE CERTIFICATION

Pursuant to M.G.L. c. 62C, & 49A,I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

_____, _____
Signature of person submitting bid or proposal Date

_____
Name of business

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.

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

FORM FOR GENERAL BID
00300 - 16

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: _____ ☐ Prime Contractor

Project Name: _____ ☐ Subcontractor
List Prime Contractor: _____

Awarding Auth.: _____

Employer Signature: _____

Work Week Ending: _____

Print Name & Title: _____

☐ Final Report

Employee Name & Address	Work Classification	Hours Worked							(A)	(B)	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	Tot. Hrs.	Hourly Base Wage	(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.

FORM FOR GENERAL BID
00300 - 18

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.

DEBARMENT CERTIFICATION

In connection with this bid and all procurement transactions, by signature thereon, the respondent certifies that neither the company nor its principals are suspended, debarred, proposed for debarment, declared ineligible, or voluntarily excluded from the award of contracts, procurement or non procurement programs from the Commonwealth of Massachusetts, the US Federal Government and /or the City of Waltham. "Principals" means officers, directors, owners, partners and persons having primary interest, management or supervisory responsibilities with the business entity. Vendors shall provide immediate written notification to the Purchasing Agent of the City of Waltham at any time during the period of the contract of prior to the contract award if the vendor learns of any changed condition with regards to the debarment of the company or its officers. This certification is a material representation of fact upon which reliance will be placed when making the business award. If at any time it is determined that the vendor knowingly misrepresented this certification, in addition to other legal remedies available to the City of Waltham, the contract will be cancelled and the award revoked.

Company Name _____

Address _____

City _____, State_____, Zip Code _____

Phone Number (____) _____

E-Mail Address _____

Signed by Authorized Company Representative: _____

_____Print name. Date _____

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.

ROADWAY AND TRAFFIC SIGNAL IMPROVEMENT PROJECT
TRAPELO ROAD AND FOREST STREET
WALTHAM, MASSACHUSETTS

DIVISION I - GENERAL CONDITIONS

SCOPE OF WORK

The work under this Contract consists of the addition of an exclusive northbound left turn lane and southbound right turn lane on Trapelo Road and the installation of a new traffic signal system.

The work under this Contract includes, but is not limited to, excavation; full depth construction; pavement milling; paving; constructing driveways, cement concrete sidewalks and wheelchair ramps; removing and resetting existing granite curb and installing new curbing; installing highway guardrail; drainage; waterworks; providing and spreading loam borrow and seed; installation of traffic control signal system, traffic signing and pavement markings, traffic control management, and other street improvements.

The traffic control signal system shall consist of furnishing and installing traffic equipment, the controller and cabinet, video detection, conduit, pull boxes, signal heads, signal posts, mast arms, anchor bolts and foundations, service connections, wire and cable, the setting of timings for initial operation, pavement markings and all incidental materials necessary for operating and controlling the traffic control signals as shown on the plans and as specified hereinafter.

All work done under this contract shall be in conformance with the Massachusetts Highway Department *Standard Specifications for Highways and Bridges* dated 1988, the *Supplemental Specifications* dated February 25, 2010, and the *Standard Special Provisions* contained in this book; the *2010 Construction Standard Details,* the *1996 Construction and Traffic Standard Details* (as relates to traffic standard details only); the *2003 Manual on Uniform Traffic Control Devices* with *Massachusetts Amendments*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; the latest edition of *American Standard for Nursery Stock*; the Plans and these Special Provisions.

DEFINITIONS

The "MUNICIPALITY" and “City” shall mean the City of Waltham, the municipality in which the Contract work is to be performed.

“Engineer” shall mean a representative appointed by the City.

“Design Engineer” shall mean Greenman–Pedersen, Inc (GPI).

WORK SCHEDULE

No work will be performed on public ways on Saturdays, Sundays or Holidays. Work also will not be allowed on public ways on the day before or the day after a long weekend involving a

Holiday without the approval of the City. No work that will disrupt travel on the existing roadways (lane closures, lane shifts, trenching, etc.) shall be done from 6 to 9 AM and from 3 to 6 PM.

MAINTENANCE OF TRAFFIC

Traffic shall be continuously maintained on the various streets during construction. Work on this contract may require work to be scheduled to one side of streets and intersections at a time, allowing for one lane of continuous traffic movement in each direction. Should it be necessary to close one travel lane, uniformed traffic policemen should be present to alternate traffic flow.

PUBLIC SAFETY AND CONVENIENCE (Supplementing Subsection 7.09)

The Contractor shall be required, without additional compensation, to provide safe and convenient access to all abutters during the prosecution of the work. The Contractor shall provide necessary access for fire apparatus and other emergency vehicles through the work zones and to abutting properties at all times.

Sweeping and cleaning of surfaces beyond the limits of the project to clean up material caused by spillage or vehicular tracking during the various phases of the work shall be considered as incidental to the work being performed under the Contract and there will be no additional compensation.

The Contractor's attention is directed to the fact that the work on this project is to be performed on streets that are used by pedestrians as well as vehicles. The Contractor shall maintain safe conditions for pedestrians and Contractors personnel as well as vehicular traffic. He shall furnish, install, maintain, and move all warning devices, barricades, signs, slow moving vehicle emblems, bridging materials, special apparel, and other safety measures and controls deemed necessary by the Engineer for the protection of motorists, pedestrians, and his own personnel. This responsibility shall be the Contractor’s, regardless of his compliance with these Special Provisions concerning Prosecution of the Work, Maintenance of Traffic and Construction Detouring and Phasing.

The Contractor shall be responsible for the maintenance of flow in all gutters, water pipes, drains and other pipes affected by the work. There shall be no diversion, flooding, or other flow that will cause hindrance to this or other work, or cause nuisance or hazard of any kind.

CONSTRUCTION SAFETY

The Contractor is responsible to ensure that all personnel, including all subcontractors, working on the project are issued and are wearing all necessary personal protective safety equipment while working within the project limits. This equipment shall include, as a minimum, a hardhat and safety vest, regardless of the type of work being performed. Other safety equipment shall be added as required to perform the work in which they are engaged and in accordance with all local, state and federal requirements in effect. Safety equipment shall be provided at no additional cost to the City.

Any automotive equipment not protected by traffic cones, plastic drums or flares, working on a

public way under this project shall have one amber flashing warning light mounted on the cab roof or on the highest practical point of the machinery. This light shall be in operation while the equipment is so working or traveling in the work area at a speed of less than 25 mph, and a slow moving vehicle emblem shall also be displayed.

Construction equipment shall not be parked within any traveled way unless said equipment is adequately lighted and protected by safety devices and vehicular traffic is appropriately detoured. Appropriate MUTCD requirements shall apply.

When, in the opinion of the Engineer, construction operations constitute a hazard to traffic in the area, the Contractor may be required to suspend operations and remove equipment from the roadway. The Engineer may also restrict or suspend operations on any roadway when in the Engineer's opinion this is warranted for the safety of the traveling public. The Contractor may also be required to suspend operations during certain hours and to remove the Contractor's equipment from the roadway at the direction of the Engineer.

GUARANTEE AFTER FINAL ACCEPTANCE (Supplementing Section 2.13)
Upon the date of acceptance of the project by the City, the Contractor shall turnover all guarantees and warranties on all electrical and mechanical equipment to the City.

The Contractor shall diagnose (trouble-shoot) the traffic signal system and, at his own expense, replace any part of the traffic signal control equipment found to be defective in workmanship, material or manner of functioning within six months from date of final acceptance of the installations under this Contract. This requirement does not affect the one-year warranty period on equipment specified in Subsection 815.20 of the Standard Specifications.

SUBSECTION 4.03 EXTRA WORK (Also see Subsection 4.05)
The Contractor shall do any work not herein otherwise provided for when and as ordered in writing by the Engineer, such written order to contain particular reference to this Subsection and to designate the work to be done as Extra Work.

Unless specifically noted in the Extra Work Order, Extra Work will not extend the time of completion of the Contract as stipulated in Subsection 8.10.

The determination of the Engineer shall be final upon all questions concerning the amount and value of Extra Work (except as provided in Subsection 7.16).

Payment for Extra Work will be provided in Subsection 9.03.

SUBSECTION 4.04 CHANGED CONDITIONS.
This Subsection is revised by deleting the two sequential paragraphs near the end that begin “The Contractor shall be stopped…” and “Any unit item price determined …” (1/6/2006).

PROTECTION OF UNDERGROUND FACILITIES

The Contractor's attention is directed to the necessity of making his own investigation in order to assure that no damage to existing structures, drainage lines, traffic signal conduits, etcetera, will occur.

The Contractor shall notify Massachusetts DIG SAFE and procure a Dig Safe Number for each location prior to disturbing existing ground in any way. The telephone number of the Dig Safe Call Center is 1-888-344-7233.

AS-BUILT PLANS (Supplementing Subsection 5.02)

Prior to the date of final acceptance, the Contractor shall furnish as-built drawings of the work within the project limits showing location grades and utilities, including rims, and inverts, and all traffic signal equipment and features. The as-built plans shall be prepared and stamped by a Professional Land Surveyor registered in the Commonwealth of Massachusetts. The Contractor shall be required to furnish both Mylar reproducible of the as-built plans and an electronic file of the as-built plan formatted in conformance with MassHighway signal inventory standards (AutoCAD version 2005 or higher). Digital photo (JPG) for each approach to each signal shall accompany the "As Built" drawings.

Full compensation for these plans shall be included in the prices for the various items of work and no additional compensation will be allowed therefore. The Engineer will make the original drawings available in an electronic format to the Contractor for use in preparing the "AS BUILT" plans.

The Contractor shall also provide the Design Engineer the "As Built" plans as stated above with locations of the traffic signal equipment. The Design Engineer shall then prepare the As-Built Signal Layout Plans in accordance with City of Waltham requirements and submit to the City prior to final acceptance.

PROCEDURES FOR SHOP DRAWINGS SUBMITTALS (Supplementing Subsection 5.02)

The following procedure shall be followed when making shop-drawing submittals for this project.

1. The Prime Contractor shall submit two (5) sets of drawings directly to the Design Engineer for preliminary review.

2. The Design Engineer will reply, in writing, returning three (3) sets of marked up drawings to the Prime Contractor within five (5) business days of receipt of the drawings.

3. If the Engineer's reply indicates rejection or advises corrections or additions to the drawings, Steps 1 and 2 are repeated until the Design Engineer indicates that approval will be given.

4. If the Design Engineer's reply indicates that the shop drawings are acceptable as submitted, the Prime Contractor shall submit five (5) final sets of corrected drawings

directly to the Design Engineer to receive his stamp of approval or acceptance. The approval shall be general and shall not relieve the Contractor from his responsibility for adherence to the contract or for any error in the drawing.

5. The Design Engineer will return three (3) sets of stamped/approved shop drawings to the Prime Contractor within five (5) working days of receipt of drawings.

The Contractor shall not receive payment for, nor will he be allowed to install any item or materials which require shop drawing approval unless and until he has received shop drawing approval for that item from the Design Engineer with an approval stamp placed thereon.

The following is a list of item(s) and materials that require shop-drawing approval. Along with each item is listed certain information which shall be clearly marked on the shop drawing or submittal.

1. Mast Arm Assembly – Shop Drawings and Design Calculations

Within 15 days after receipt of an approved shop drawing for any item, the Contractor shall provide the Engineer written proof that he has ordered such approved materials required on the subject contract and a written confirmation of such order and delivery schedule from the manufacturer of the item. This delivery schedule shall be appropriate for timely completion of this project.

Manufacturer's specifications, catalog data, descriptive matter, illustrations, etc. shall be submitted for signal system components not requiring structural drawings (controller cabinets, controllers, signal housings, etc.). The requirements shall be as specified for shop and working drawings insofar as applicable except that the submission shall be in duplicate. One marked-up copy of the catalog cuts will be returned to the Contractor. The Contractor shall furnish additional copies of the catalog cuts for distribution. The above procedure for shop drawing shall also be used for submission.

CONCURRENT WORK BY OTHERS WITHIN PROJECT LIMITS

(Supplementing Section 5.06)

Concurrent work may be in progress in the project area by the City, utility companies, or by other contractors hired by private parties. The Contractor shall be fully responsible for arranging and coordinating his work with that to be performed by others. This coordination and phasing shall be submitted to the Engineer for his approval.

The Contractor is required to initialize contact with and coordinate all work by the local utilities in the relocation of utility poles and overhead wiring, and manholes and subsurface lines, which will be required by this project. No additional compensation or extension of time shall be granted due to any delays that may result from the failure to relocate utilities in a timely fashion.

Relocation and/or resetting of all private utilities to new grades, including utility poles, made necessary by the construction of this project will be accomplished by the respective utility

companies. The Contractor shall coordinate all relocation of private utilities with their respective owners, as well as coordinate his work with that performed by others.

No additional payments will be allowed for any disruption of work schedule caused by or required to coordinate work in this contract with work to be performed by others, as described above, or which may be encountered during the prosecution of the work.

UTILITY POLES
The Contractor shall be solely responsible for coordinating the relocation of the utility poles with the appropriate utility companies. These poles are shown on the Contract Plans. Any additional pole that may require relocation for any work within the Contract shall also be the responsibility of the Contractor. The Contractor shall also coordinate the relocation of these additional poles with the appropriate utility.

CONSTRUCTION STAKING (Supplementing Subsection 5.07)
The Contractor will be furnished information and ties for the survey baseline and benchmarks. The Contractor shall perform all survey required for the work.

LAWS TO BE OBSERVED (Supplementing Subsection 7.01)
The Contractor shall comply with the provisions of the rules and regulations for the control of air pollution adopted under Section 142B and 142D, Chapter 111 of the General Laws pertaining to air pollution control in the applicable Air Pollution Control District.

PERMITS AND LICENSES (Supplementing Subsection 7.03)
The Contractor shall be responsible for obtaining and coordinating all necessary permits and shall pay any and all fees associated with these permits.

The Contractor's attention is directed to the fact that the Scope of Work may be adjusted as a result of these permits and approvals.

INSURANCE (Supplementing Subsection 7.05)
The City of Waltham and Greenman-Pedersen, Inc. shall be named as additionally insured on the Contractor's Public Liability Insurance policy, and a full original copy shall be delivered to the City.

NOTICE TO OWNERS OF UTILITIES (Supplementing Subsection 7.13)
Written notice shall be given by the Contractor to all public service corporations or Municipal and State officials, owning or having charge of publicly or privately owned utilities, of his/her intention to commence operations affecting such utilities at least one week in advance of the commencement of such operations. The Contractor shall, at the same time, file a copy of such notice with the Engineer.

Before the Contractor begins any work or operations, he/she shall locate all utilities in the vicinity of proposed construction by test pits, probing or other methods, in order to determine the

exact location of these utilities. If during the investigation, the location of a utility line is found to be different from that shown on the Plans and it will interfere with the construction, he/she shall notify the Engineer immediately.

The following are the names of owners and representatives of the principal utilities affected as well as other major contacts for the City, but completeness of this list is not guaranteed:

Greenman-Pedersen, Inc.
181 Ballardvale Street, Suite 202
Wilmington, MA 01887
Contact: John W. Diaz, P.E., PTOE (978) 570-2953

Waltham Traffic Engineering Department
119 School Street
Waltham, Ma 02451
Contact: Michael Garvin (781) 314-3406

Electric
NStar Electric
One NStar Way – SUM SE 310
Westwood, Ma 02090
Contact: Steven Owens (781) 441-8709

Gas
National Grid Gas
40 Sylvan Road, 3rd Floor-W3.244
Waltham, MA 02451
Contact: Melissa Owens (781) 907-2845

Spectra Energy Transmission, LLC
8 Wilson Way
Westwood, MA 02090
Contact: Frank B. Bailey (508) 938-7713

Telephone
Verizon
1166 Shawmut Avenue
New Bedford, MA 02746
Contact: Karen Nunes (508) 991-3522

Consolidated Public Works
165 Lexington Street
Waltham, Ma 02452
Contact: Michael Chiasson (781) 314-3800
Water & Sewer Contact: Wade Putnam (781) 314-3800

Massachusetts Water Resources Authority
2 Griffin Way
Chelsea, MA 02150

Sewer Contact:	Kevin McKenna	(617) 305-5956
Water Contact:	Ralph Francesconi	(617) 305-5827

Railroad
MBTA
500 Arborway
Boston, Ma 02130

Contact:	Christine Bresnahan	(617) 222-3361

PanAm Railways
1700 Iron Horse Park
North Billerica, MA 01862

Contact:	John Steiniger	(978) 663-6961

Cable
Comcast
676 Island Pond Road
Manchester, NH 03109

Contact:	Jean MacLaren	(603) 695-1461

RCN
173 Bedford Street
Lexington, MA 02040

Contact:	Margot Jones	(781) 652-8951

AT&T/TCG, c/o Siena Engineering
50 Mall Road – Suite 203
Burlington, Ma 01803

Contact:	David Edgar	(781) 221-8400 Ext. 7005

MassDOT Fiber Telcom
10 Park Plaza – Rm 4470 Office of Real Estate & Asset Development
Boston, MA 02116

Contact:	Martin Polera	(617) 248-2974

Fire Alarm/Traffic Signal/Electrical Inspection
Waltham Wires Department
14 Church Street
Waltham, Ma 02452

Contact:	Tim Kelley	(781) 314-4185

Other

MCI Metro Access
P.O. Box 600
Charlton, MA 01507
Contact: Stephen Parretti (508) 248-1305

Above Net Communications
4 Powderhouse Road
Medfield, MA 02052
Contact: Neil Bresnahan (781) 760-3034

Raytheon Company
600 Technology Park Drive, MS-2C-260
Billerica, MA 01821
Contact: Douglas Flynn (781) 603-5812

NStar Communications
One NStar Way, NE 220
Westwood, MA 02090
Contact: Andrew Balta (781) 441-3492

Veroxity Technology Partners, LLC
80 Central Street
Boxborough, MA 01719
Contact: Evin Spitzer (978) 264-6022

PROTECTION AND RESTORATION PROPERTY (Supplementing Subsection 7.13)

The Contractor shall make all arrangements for the alteration, adjustment or relocation of gas, electric, telephone and any other private utilities by the utility companies. If the Contractor wishes to have any utility temporarily relocated for his/her convenience, other than as contemplated by the City, he/she shall make the necessary arrangements with the owners and make reimbursement for the cost thereof at his/her own expense.

The Contractor, in constructing or installing facilities alongside or near sanitary sewers, storm drains, water or gas pipes, electric or telephone conduits, poles, sidewalks, walls, vaults or other structures shall, at his expense, sustain them securely in place, cooperating with the officers and agents of the various utility companies and municipal departments which control them, so that the services of these structures shall be maintained. The Contractor shall also be responsible for the repair or replacement, at the Contractor's own expense, of any damage to such structures caused by the excavation, backfilling or settlement of the backfill, injury to persons or damage to property occurring as a result of such damage or neglect and shall leave them in the same condition as they existed prior to commencement of the work. In case of damage to utilities, the Contractor shall promptly notify the utility owner and shall, if requested by the Engineer, furnish labor and equipment to work temporarily under the utility Owner's direction in providing access to the utility. Pipes or other structures damaged by the operation of the Contractor may be

repaired by the Department or by the utility owner that suffers the loss. The cost of such repairs shall be borne by the Contractor, without compensation therefore. It shall be the sole responsibility of the Contractor to repair the damage to municipally owned utilities and not the City.

If, in the judgment of the Engineer, it is found that any utility or structure is so placed as to render it impracticable to do the work under this Contract, the Contractor shall protect and maintain the services in such utilities and structures. The location, elevation and size of the utility shall be accurately determined without delay by the Contractor and the information furnished to the Engineer. The Engineer will, as soon thereafter as reasonable, cause the position of the utilities to be changed or take such other actions deemed suitable and proper.

If live service connections are to be interrupted by excavations of any kind, the Contractor shall not break the service until new services are provided. Abandoned services shall be plugged off or otherwise made secure.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all the work involved in protecting or repairing property as specified in this section, shall be included in the various contract items and no additional compensation will be allowed therefore.

WORK IN THE IMMEDIATE VICINITY OF UNDERGROUND STRUCTURES AND UTILITY POLES

Before starting any work at existing manholes, the contractor shall test for gas and blow out the manholes.

For overhead connections, the electric company will make the connection from the top of the riser on the utility pole to the power source. The Contractor shall supply all labor, materials and equipment to install the service connection, complete in place and in accordance with the electric company, from the controller to and including the riser with enough wire coiled above the riser to permit the electric company to make the final connection.

For underground connections, the electric company will perform the actual wiring of the service connections from its power source to the sweep at the local controllers, but all sweeps, ducts, entrance holes into manholes, patching and all other necessary labor, materials and equipment required to install the electric service, complete in place, shall be furnished by the Contractor.

The Contractor shall pay the electric company for their services rendered for the connection of overhead and underground service connections.

No work is to be performed in the immediate vicinity of electric manholes or utility poles, or telephone manholes or utility poles or conduit system without prior notice (at least 48 hours) to the affected company.

SCHEDULE OF OPERATIONS (Supplementing Subsection 8.02)
The first paragraph is revised to read:
The Low Bidder shall, for the convenience of the City, submit to the Engineer, three copies of a schedule of operations (with values) within seven day after the opening of bids. This seven-day period may be changed or waived with the approval of the Engineer. The schedule shall show the proposed methods of construction and sequence of work and the time the Contractor proposes to complete the various items of work within the time specified in the Contract.

The Contractor shall note the following restriction: **With the exception of traffic controllers, mast arms and signal housing, all work, including installation of underground traffic conduits and foundations, shall be completed within 30 days from issuing Notice to Proceed.**

PROSECUTION OF THE WORK (Supplementing Subsection 8.03)
Before starting work under this Contract, the Contractor shall prepare and submit to the Engineer for approval, a plan (based on the Contract Traffic Management Plan) that indicates the traffic and pedestrian routing proposed by the Contractor during the various stages and time periods of the work and the temporary barricades, signs, drums and other traffic control devices to be employed during each stage and time period of the work to maintain traffic and access to abutting properties.

Particular care shall be taken to establish and maintain methods and procedures that will not create unnecessary or unusual hazards to public safety. Traffic control devices required only during working hour operations shall be removed at the end of each working day.

Warning and Regulatory signs having messages that are irrelevant to the proposed traffic conditions during each phase of operations shall be removed or properly covered at the end of each work period. Signs shall be kept clean at all times and legends shall be distinctive and unmarred.

The Contractor in constructing or installing facilities adjacent to abutting properties shall protect all existing landscaping, structures and other facilities. Payment for any work required shall be included in respective bid items with no additional compensation. The Contractor shall be responsible for any damages caused by the failure of any signs, barricades or other safety devices intended to protect the public or his/her own personnel. The Contractor shall also be responsible for the repair or replacement of all facilities damaged by the Contractor's operations and shall leave them in the same or equivalent condition as they existed prior to commencement of work. Damage occurring from the Contractor's negligence will not be compensated for.

The Contractor shall coordinate Contract work with the work to be done by other Contractors for the City, the public and private utilities or other agencies, and shall so schedule operations as to cause the least interruption to the normal flow of traffic at all times during the period of time required for the completion of the work.

Temporary traffic devices and barricades shall be placed and utilized in conformance with Section 850 of the Standard Specifications and the 2003 Manual on Uniform Traffic Control Devices with the latest revisions.

The above provisions represent minimum requirements for maintenance of traffic and may be modified at the discretion of the Engineer.

When, in the opinion of the Engineer, construction operations constitute a hazard to traffic in the area, the Contractor may be required to suspend operations and remove equipment from the roadway. The Engineer may also restrict or suspend operations on any roadway when in the Engineer's opinion this is warranted for the safety of the traveling public. The Contractor may also be required to suspend operations during certain hours and to remove the Contractor's equipment from the roadway at the direction of the Engineer.

Storage areas within the project are limited. The Contractor may be required to obtain storage outside of the project limits at the Contractor's own expense. No areas shall be used for storage outside the project limits without permission of the Engineer.

WORK DONE IN THE VICINITY OF PRIVATE PROPERTY

There are many structures located in the very near vicinity to the proposed construction. The Contractor shall use extreme care not to cause any damage to existing property in the execution of this Contract. Any private property damaged by the Contractor shall be restored to its original condition at no additional compensation.

TEMPORARY ACCESS TO AREA RESIDENTS AND BUSINESSES

(Supplementing Subsections 8.06)

The Contractor shall provide safe and ready means of ingress and egress to all abutting properties, all public and private buildings and any other business or residence in the project area, both day and night, for the duration of the project.

DISPOSAL OF SURPLUS MATERIALS

All existing and other materials not required or needed for use on the project, and not required to be removed and stacked, shall become the property of the Contractor and shall be removed from the site during the construction period and legally disposed of. No separate payment will be made for this work, but all costs in connection therewith shall be included in the prices bid for various Contract items.

DISPOSAL OF EXCAVATION MATERIAL

Surplus materials obtained from any type of excavation, and not needed for further use as determined by the Engineer shall become the property of the Contractor and shall be disposed of by him/her outside the location subject to the regulations and requirements of local authorities governing the disposal of such materials, at no additional compensation.

STONE WALLS AND FENCES

The Contractor shall exercise due care when working around all stone walls and fences that are to remain. Should any damage to a stone wall or fence result from the actions of the Contractor, the damaged portion shall be replaced and/or realigned by the Contractor as directed at no cost to the owner.

DRAINAGE

It shall be the Contractor's responsibility to maintain the drainage system in the project areas to provide continual drainage of the travel ways and construction area and in conformance with permits and approvals in the area under construction prior to the time the final system is put into use.

All pipes and structures within the limits of this Contract shall be left in a clean and operable condition at the completion of the work. It shall be the responsibility of the Contractor to make certain that all drainage systems, either new or existing, that carry drainage runoff from the limits of project, operate efficiently to a point of discharge.

No separate payment will be made for the maintenance of the existing drainage system, but all costs in connection therewith shall be included in the unit prices bid for the various Contract items.

Pipes and structures requiring cleaning as a result of accumulations from construction operations shall be cleaned without additional compensation.

Compensation for breaking into existing structures, and sealing abandoned inlets and outlets will be included in the price of the respective drainage items.

Drainage structures abandoned or removed shall be done in accordance with Section 140.63 of the MassHighway Standard Specifications. The structure shall be backfilled with controlled density fill, Type 2E, such cost to be included in the cost of the Items.

Existing drainage pipes to be abandoned shall be plugged in accordance with Section 140.63 of the MassHighway Standard Specifications.

The cost for all saw cuts required to install the new drainage shall be included under the various drainage items. No separate payment shall be made for saw cutting as it relates to the drainage work.

DRAINAGE STRUCTURES

Where indicated on the plans or as directed by the Engineer, existing pipe inverts shall be utilized as reference to establish proposed catch basin and manhole inverts and to establish proper slope for the proposed pipe. The Contractor shall verify existing elevations.

Where new pipe is shown on the drawings to be connected into an existing drainage structure to remain, the existing structure shall be first cleaned to remove all mud, debris and other material.

The existing structure wall shall be carefully and neatly cut to provide the minimum size opening required for the insertion of the new pipe. The proposed pipe end shall be set or cut off flush with the inside face of the existing structure wall and the remaining space around the pipe completely filled with cement grout for the full thickness of the structure wall.

Existing shaped inverts shall be reconstructed as necessary to provide a smooth and uniform flow channel from the new pipe through the existing structure. All reinforced concrete and clay pipes to be abandoned in existing drainage structures shall be plugged at the inlet and outlet. All metal pipes shall be filled with controlled density fill.

All drainage structures to be abandoned or removed shall have the pipe openings plugged.

Where new structures shown on the plans are to connect to existing pipes to remain, the remaining pipe shall be cleaned from the new structure to the next structure up or downstream. **Test pits to locate and survey the existing pipe shall be performed prior to ordering structures.** The existing pipe shall be carefully cut to allow the insertion of the drainage structure. The existing pipe end shall be cut off flush with the inside face of the proposed structure wall and the remaining space around the pipe completely filled with cement grout for the full thickness of the structure wall. No separate payment will be made for the cost of connecting existing pipes to new structures, nor for the cost of cleaning the existing pipe, but all costs in connection therewith shall be included in the unit price bid for the various structure items.

No separate payment will be made for the cost of connecting existing pipes to new structures, but all costs in connection therewith shall be included in the unit price bid for the various structure items. If new pipe or pipe section are required to extend the existing line to and through the new structure wall, the new pipe will be paid for under the unit price per foot established under that item.

No separate payment will be made for the cost of connecting new pipes into existing structures and necessary alterations of existing structures, but all costs in connection therewith shall be included in the unit prices bid for the various pipe items.

Compensation for cleaning and disposal of pre-existing sediments in existing drainage structures and drainage pipe shall be made under Item 187.3 Removal and Disposal of Drainage Structure Sediments and Item 187.31 Removal and Disposal of Drainage Pipe Sediments respectively.

ARCHITECTURAL ACCESS BOARD TOLERANCES

The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations and standards.

All construction elements in this project associated with sidewalks, walkways, wheelchair ramps and curb cuts are controlled by 521CMR-Rules and Regulations of the Architectural Access Board (AAB).

The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions.

Contractors shall establish grade elevations at all wheel chair ramp locations, and shall set transition lengths according to the appropriate table in the Construction Standards (or to the details shown on the plans).

All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

SAW CUTS

Existing pavements to remain shall be saw cut at all openings for utility work, for new or reset curbing and at all joints with proposed full-depth bituminous concrete pavement, as shown on the plans and as directed by the Engineer.
Saw cutting required for the installation of traffic signal equipment and conduit, street lighting conduit, water pipes, drainage pipes and structures will be paid for separately under the respective items and shall not be included for payment under Item 482.5.

Sawcuts shall be made at limits of full depth pavement construction and limits of cold planing. Payment for this work shall be included under Item 482.3, Sawing Asphalt Pavement.

JOINTS

All joints between proposed pavement and existing pavement to remain shall be coated with a hot poured rubberized asphalt sealant meeting the requirements of Federal Specification Number SS-S-1401.

PAVEMENT MARKINGS

All permanent pavement markings shall be thermoplastic.

The Contractor shall provide all temporary pavement markings as may be necessary or as directed by the Engineer.

All permanent pavement markings must be applied within two weeks of paving the top course. Upon completing the paving of the top course within any section of roadway, the permanent pavement markings must be applied. The Contactor shall not wait until all paving has been completed prior to applying the permanent pavement markings.

PROPERTY BOUNDS

The Contractor shall exercise due care when working around all layout bounds that are to remain. Should any damage to a bound result from the actions of the Contractor, it shall be replaced and/or realigned by the Contractor as directed by the Engineer. No further compensation will be due the Contractor for the materials and labor required for re-establishing the bound in its proper orientation.

MAINTENANCE OF TRAFFIC SIGNALS

The Contractor shall provide all labor, equipment and materials required for total maintenance and emergency repairs of all existing and proposed temporary and permanent traffic signal control equipment, within the project limits, including damage by automobile accidents, unless otherwise specified under Subsection 7.17 "Traffic Accommodation" of the MHD Standard Specifications, as amended, in which case Subsection 7.17 will govern. These provisions will apply to all signalized locations included as part of the Contract on the day that the Contractor will commence work on the project, until the date of acceptance of the completed project from the City. This written notice must be given before the Contractor may proceed with any work on a specified traffic signal system. For the purpose of these paragraphs, the phrase "Traffic Signal Control Equipment" is intended to include, but not limited to, controllers, video cameras, signal housing, support structures, cabinets, wires, conduit and all other auxiliary electrical equipment used for traffic control. In the event of damage caused by automobile accidents, the Contractor shall replace all damaged material with new material. The Contractor installing the traffic signal equipment will be required to service and maintain the traffic signal controllers and associated equipment, on a 24-hour basis, including Sundays and Holidays.

All costs incurred in maintaining existing traffic signal equipment during construction and until the new signal equipment is operating shall be included in the various contract items. Furthermore, all costs incurred in maintaining and operating the new signal equipment during the time of construction and until final acceptance is also to be included in the various contract items.

No other Contractor will be allowed to service the traffic signal equipment other than the Contractor who installed the traffic signal equipment, until the final acceptance by the City. If the Contractor fails to provide maintenance to the traffic signal equipment during the duration of the project, the City has the right to dispatch their traffic signal contractor and bill the contracting contractor for payment of parts and labor. A reasonable time frame for repairs shall not exceed 24 hours.

The cost of maintenance of signals shall be deemed to be included in the various traffic signal Contract items and no additional payments will be made, except as provided under Subsection 7.17.

PRECAUTIONS UNDER ELECTRIC LINES

The Contractor's attention is directed to the AASHTO Guide on Occupational Safety on Highway Construction Projects, Subpart N, 1926.550, relating to construction equipment clearances at overhead electric lines, which states in part "…the minimum clearance between the lines and any part of the crane or load must be at least ten feet from lines rated 50 KV or below, and greater distances for higher voltage…".

For the protection of personnel and equipment, the Contractor shall be aware of this regulation especially during paving operations using large semi-trailer vehicles.

QUALIFIED ELECTRICIANS

Within 10 days after opening of bids, the low bidder shall submit a list of the Journeyman Electricians (Massachusetts License) who will perform the electrical work in this contract.

Journeymen performing electrical work on traffic signals must be certified by I.M.S.A. with a LEVEL II or higher certification in Traffic Signal Technicians. A copy of the certification and each Journeyman Electrician's current Massachusetts License shall be submitted to the City.

SERVICE CONNECTIONS

Before commencing work on service connections, the Contractor shall be responsible for contacting the Electric Company servicing the area to obtain construction requirements, standards, and to give notice of commencement of work.

The Contractor shall be responsible for the payment of all fees for services rendered in conjunction with service connections by utility companies under this project. The cost thereof shall be included in the various contract items. All electrical services shall be metered.

No work is to be performed in the immediate vicinity of any electric or telephone company utility poles, structures or wires without prior notice (at least 48 hours) to the affected company.

TRAFFIC SIGNAL EQUIPMENT FINE TUNING, ADJUSTMENT AND TESTING PERIOD

After the Contractor has finished installing the controller and all other associated signal equipment and after the Contractor has set the signal equipment to operate as specified in the contract documents, the fine tuning, adjusting and testing period shall begin. The Contractor shall advise the Engineer, in writing, of the date of the beginning of the fine-tuning and testing period prior to the starting date. This testing period shall not start until the work at the intersection is complete. During this period, the Contractor, under the direction of the Engineer, shall make necessary adjustments and tests to insure the safe and efficient operation of the equipment. This period shall not last for more than 30 days and the Contract completion date shall take this testing period into consideration. No request for final acceptance will be considered until successful completion of the testing period.

The cost of electrical energy consumed by the operation of traffic signals during the construction, fine tuning and testing of the traffic signals will be borne by the Contractor.

MAINTENANCE AND CLEANING OF ROADS

Existing roadways intended to be used for hauling earth and rock excavated materials shall be cleaned and maintained by the Contractor for the duration of the project. The Contractor shall be responsible for providing street sweepers and operators for sweeping of haul road paved surfaces. Sweeping services shall be provided on an hourly basis at the discretion of the Engineer. Street sweepers shall be self-propelled, diesel powered units with brushed and a water spray, less than three years old. The Contractor shall remove debris from the work area and deposit sweepings at locations as directed. The Contractor shall also be responsible for repairing roadways and bridges damaged by construction vehicles. Payments for maintenance and cleaning of roads will

not be paid for separately but shall be considered incidental to the work of Item 120., Earth Excavation.

PROMPT PAYMENT AND RELEASE OF RETAINAGE TO SUBCONTRACTORS

The Contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of subcontract work not later than 10 business days from the receipt of each payment the prime contractor receives from the City. Failure to comply with this requirement may result in the withholding of payment to the prime contractor until such time as all payment due under this provision has been received by the subcontractor(s) and/or referral to the Prequalification Committee for action which may affect the contractor's prequalification status.

The Contractor further agrees to make payment in full, including retainage, to each subcontractor not later than 10 business days after the subcontractor has completed all of the work required under its subcontract.

END OF SECTION

DIVISION II - TECHNICAL SPECIFICATIONS

ITEM 102.51 INDIVIDUAL TREE PROTECTION EACH

The work under these items shall conform to the relevant provisions of Sections 101, 644 and 771 and the following:

The purpose of these items is to prevent damage to branches, stems and root systems of existing individual trees as well as shrubs and other quality vegetation to remain, and to ensure their survival. To the extent possible, to avoid soil compaction within the root zone, construction activities including, but not limited to, vehicle movement, excavation, embankment, staging and storage of materials or equipment shall not occur underneath the canopy (drip line) of trees to remain. Where these activities will occur within 10 feet (3 meters) of the canopy of trees or where directed, the Contractor shall take the appropriate protective measures specified herein.

Individual Tree Protection, Item 102.51, shall be used when construction activities are likely to occur within the canopy of individual trees or where there may be any risk of damage to trees.

Temporary Tree Protection Fence, Item 102.52, shall be used to protect areas of existing trees or other areas of quality vegetation that is to remain.

The Contractor shall be solely responsible for judging the full extent of the work requirements, including, but not necessarily limited to any equipment and materials necessary for providing tree protection.

Incidental to the cost of these items, the Contractor shall retain the services of a certified arborist, who shall make recommendations as to the specific appropriate treatment of trees within or near the work zone.

Prior to any construction activities, the Contractor and Arborist shall walk the site with the Engineer and City Tree Warden to identify which trees will require protection and to determine approved measures. The Arborist shall make recommendations as to appropriate methods to protect the trees. The Engineer will have final decision as to trees and methods.

The Contractor is responsible for the protection of all existing trees and plants within and immediately adjacent to the construction area that are not designated to be removed for the length of the construction period.

SUBMITTALS

Incidental to this item, the Contractor shall provide to the Engineer one (1) copy American National Standards Institute (ANSI) Standard Z-133.1 and A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance, Part 1: Pruning. These references shall be kept by the Engineer at his office for the length of the Contract.

Prior to start of work, the Contractor shall submit to the Engineer the name and certification number of the Massachusetts Certified Arborist referenced herein. Cost for Certified Arborist for all activities pertaining to this Item shall be incidental to this item.

MATERIALS

Fence and temporary fence posts shall be subject to the approval of the Engineer.

Fencing for individual plants shall be polyethylene fencing or chain link fence (new or used).

Staking for individual tree protection fencing shall be steel posts or 2x4 lumber as directed and approved by the Engineer.

Wood chips shall conform to provisions of Wood Chip Mulch under Materials Section M6.04.3.

Trunk protection shall be 2x4 cladding, at least 8 feet (2.4 meters) in length, clad together with wire. Alternative materials shall be at the approval of the Engineer. Alternative materials shall provide adequate protection from anticipated construction activities and shall not injure or scar trunk. Trunk protection shall include burlap to separate trunk cladding from bark.

Temporary Tree Protection Fence shall be brightly colored polypropylene barricade or wooden snow fencing for tree protection or safety fencing as shown on the Contract drawings or as directed by the Engineer. Fencing shall be a minimum of 4 feet high (1.2 meters) and supported by steel or hardwood stakes spaced at a maximum of 8 feet (2.4 meters) on center or by other means acceptable to the Engineer. Fencing shall be materials and fastenings sufficient to provide sturdy and highly visible separation of the construction activates from the trees and existing plantings to be preserved

Incidental to these items, the Contractor shall provide water for maintaining plants in the construction area that will have exposed root systems for any period during construction.

CONSTRUCTION METHODS

To the extent possible, to avoid soil compaction within the root zone, construction activities including, but not limited to, vehicle movement, excavation, embankment, staging and storage of materials or equipment shall not occur underneath the canopy (drip line) of trees to remain. Where these activities will occur within 10 feet (3 meters) of the canopy of trees, the Contractor shall provide Individual Tree Protection as specified herein.

For individual tree protection, the Contractor shall set posts and fencing at the limits of the tree canopy. Where construction activities closer to the trees is unavoidable, the contractor shall tie branches out of the way and place wood chips to a depth of 6 inches (150 mm) on the ground to protect the root systems. The Contractor shall wrap the area of the trunk of the tree with burlap prior to armoring with 2x4 cladding. Cladding for tree trunks shall extend from the base of the tree to at least 8 feet (2.4 meters) from the base.

To the extent possible, temporary landscaped fencing shall be installed at the limit of tree canopy and shall be staked and maintained vertical for the length of the contract.

Where excavation within canopy is unavoidable, the Contractor shall use equipment and methods that shall minimize damage to the tree roots, per recommendations of the Certified Arborist. Such methods may require root pruning prior to, as well as during, any excavation activities.

All fencing, trunk protection, branch protection, and woodchips shall be maintained throughout the duration of the contract. Protective fencing shall be repaired and woodchip mulch replaced as necessary during the duration of the contract at no additional cost.

Cutting and Pruning

Some pruning of roots and branches may be a necessary part of construction. Pruning will be performed on the same side of the tree that roots have been severed.

The Contractor shall retain the services of a Massachusetts State Certified Arborist to oversee any cutting of limbs, stem or roots of existing trees. All cuts shall be clean and executed with an approved tool. Under no circumstances shall excavation in the tree protection area be made with mechanical equipment that might damage the existing root systems.

Any tree root area exposed by construction shall be covered and watered immediately. Exposed tree roots shall be protected by dampened burlap at all times until they can be covered with soil.

Watering

Water each tree within the construction area where work is in progress twice per week until the surrounding soil of each tree is saturated for the duration of construction activities.

Removal of Protection

After all other construction activities are complete, but prior to final seeding, wood chips, temporary fencing, branch protection, and trunk protection materials shall be removed and disposed off site by the Contractor at no additional cost.

Tree Damage

The Contractor shall be held responsible for the health and survival of the existing trees in the immediate vicinity of the of the construction area. Damage that, in the Engineer's opinion, can be remedied by corrective measures shall be repaired immediately. Broken limbs shall be pruned according to industry standards. Wounds shall not be painted. Trees or shrubs that are damaged irreparably shall, at the Engineer's discretion, be replaced per the requirements of Division I of these Special Provisions. Cost of replacement trees shall be borne by the Contractor.

COMPENSATION

Where the plans show specific, individual trees to remain and where grading or other disturbance is shown within the drip line of these trees or where the Engineer determines that an individual tree must be protected, these trees shall be protected and paid for under Item 102.51 Individual Tree Protection per each tree protected.

Temporary landscape fence will be measured for payment by the foot of fence installed, complete in place.

Where the plans show specific, individual trees to remain and where grading or other disturbance is shown within the drip line of these trees or where the Engineer determines that an individual tree must be protected, these trees shall be protected and paid for under Item 102.51, Individual Tree Protection.

Payment under these items shall be scheduled throughout the length of contract: 30 percent of value shall be paid upon installation, 30 percent approximately halfway through the contract, and the remainder to be paid at the end of the contract after completion of construction operations that would disturb plants and after the protection materials have been removed and properly disposed of off-site by the Contractor.

Compensation for Individual Tree Protection will be paid for at the contract unit price per each under Item 102.51. This item shall include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work, including the services of a certified arborist, water and fertilizer, and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

Where construction disturbance, such as grading activities, will occur within the limits of the canopy of groups of trees, these trees shall be protected and paid for under ¬Item 102.52, Temporary Tree Protection Fence.

Temporary Tree Protection Fence will be paid for at the Contract unit price per foot. This item shall include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work, including the services of a certified arborist, water and fertilizer, and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

Cost of wood chips, as required, shall be incidental to these items.

ITEM 180.1 HEALTH AND SAFETY PLAN LUMP SUM

It is the contractor's ultimate responsibility to ensure the health and safety of all the Contractor's employees and subcontracting personnel, the Engineer and his representatives, and the public from any on-site chemical contamination.

A Health & Safety Plan (HASP) shall be prepared by a Certified Industrial Hygienist or other experienced individual with the appropriate training required by OSHA to prepare such a plan, and it shall include the components detailed in OSHA 29 CFR 1910.120(b). The preparer's name and work experience shall be included as part of the Health and Safety Plan submittal. The HASP must be stamped by a Certified Industrial Hygienist certifying that it meets the standards in 29 CFR 1910.120(b); complies with all applicable laws, regulations, standards and guidelines; and that it provides a degree of protection and training appropriate for implementation on the project during the execution of this contract.

The HASP shall be designed to identify, evaluate, and control health and safety hazards associated with the work on this project and provide for emergency response if needed. The HASP shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions (e.g. OSHA, RCRA, CERCLA). In addition, guidelines of NIOSH, OSHA, USCG, EPA, etc., shall be followed. Equipment used for the purpose of health and safety shall be approved and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the Health and Safety Plan shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the Department, Contractor and subcontractors. The employee's signature on the Health and Safety Plan shall be deemed prima facie evidence that the employee has been briefed on and/or has read and therefore understands the plan. A copy of the plan with signatures shall be submitted to the Engineer at the conclusion of the Contract, or at the Engineer's request. Signature sheets shall be submitted monthly, or at the request of the Engineer.

BASIS OF PAYMENT

The work to be done under this Item shall be paid at the Contract Lump Sum Price under Item 180.1 for the development and preparation of the HASP by a qualified individual.

ITEM 180.2 IMPLEMENTATION OF HEALTH AND SAFETY PLAN HOUR

For all construction activities which require handling or exposure to potentially hazardous materials, the Health and Safety Plan shall specify an on-site Site Health and Safety Officer (HSO). The HSO duties shall include, but are not limited to: implementation of the site Health and Safety Plan, field briefing on the HASP, training, evaluating risks, safety oversight, determining levels of personal protection required, and performing any required monitoring at the site. A Daily Log shall be kept by the on-site HSO and provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personal protection being employed, monitoring data and any other information relevant to on-site safety conditions. The HSO shall sign and date the Daily Log.

In the event that subsurface contamination is discovered during construction, the HSO shall be present to oversee all handling, storage, sampling, and transport of such contaminated materials.

The level of protection, relative to respiratory and dermal hazards, required to ensure the health and safety of on-site personnel will be stipulated in the Health and Safety Plan and will be subject to modification by the on-site HSO based on changing site and weather conditions and the following factors: type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and equipment, and type of equipment to be utilized.

The Contractor shall be required to provide appropriate personal protective equipment for anyone who is working in an area either containing or suspected of containing a hazardous environment. This work will include both individuals physically working in these areas and those directing the work of same. Contingencies for upgrading the level of protection for on-site workers will be identified in the Health and Safety Plan and the contractor shall have the necessary materials/equipment on hand to implement the level of protection upgrade in a timely manner. Payment for this level of upgraded protection shall be paid for under Item 180.3.

BASIS OF PAYMENT

Implementation of the Health and Safety Plan will be paid at the contract bid price per hour of implementing the plan and shall include the cost of enforcement by an on-site Safety Officer. Personnel protective clothing and equipment below Level "C" shall be considered incidental to the project and shall be a cost borne by the contractor.

ITEM 180.3 PERSONNEL PROTECTION LEVEL C UPGRADE HOUR

The Contractor shall provide to all workers disposable, protective clothing appropriate to the hazard level of the work. The protective equipment and its use shall be in strict compliance with the Health and Safety Plan (Item 180.1), and all appropriate regulations that address employee working conditions.

BASIS OF PAYMENT

Payment for Item 180.3 will be at the Contract unit price, per hour, per man, required in level 'C' personal protection.

ITEM 187.3 **REMOVAL AND DISPOSAL OF DRAINAGE STRUCTURE SEDIMENTS** **CUBIC YARD**

ITEM 187.31 **REMOVAL AND DISPOSAL OF DRAINAGE PIPE SEDIMENTS** **FOOT**

The work to be done under item 187.3 shall include removing the accumulated dirt, refuse, and other debris, as directed by the Engineer, as necessary for the Contractor to perform relevant items of work under this Contract, from designated drainage structures, including the gutter mouth of curb inlets, and disposing of materials removed. The cast iron hood shall be removed from all catch basins so equipped, prior to cleaning.

The work to be done under item 187.31 shall consist of removing the accumulated dirt, refuse, and other debris from drainage pipes. Drainage pipes shall be cleaned as directed by the Resident Engineer. No casting shall be removed until immediately preceding the work and shall be replaced immediately after the cleaning of the drainage pipes is completed. The uncovered catch basin leading to the designated drainage pipes shall not be left unattended at any time. The provisions of this item are not to be construed that all work be accomplished with equipment. Special conditions such as location, extraordinary shape due to conduits or public utility pipes, or off pavement work, etc., may require hand work.

Hydraulic lift trucks should be used during drainage structure and pipe cleaning operations so that the material can be decanted at the site. After material from several drainage structures along the same system is loaded onto the truck, the truck should be elevated so any free flowing liquid may drain back into the drainage structure. Material must arrive at the disposal facility sufficiently dry to pass the Paint Filter Liquids Test (or no liquid drips from it when a handful is taken and squeezed).

All material removed from the drainage structures and pipes shall be properly handled and disposed of by the Contractor, and this must be done in accordance with all DEP regulations, policies, and guidance. The responsibility for the proper handling and disposal of this material shall be solely the Contractor's.

Material removed from drainage structures and pipes shall be transported immediately to the place of disposal in machines or trucks that will not spill the material along the roadway. Any material falling on the roadway shall be removed at the Contractor's own expense.

Drainage structure and pipe cleanings are classified as a solid waste by the Massachusetts Department of Environmental Protection (DEP) and may be disposed of at any landfill that is permitted by DEP to accept solid waste. Materials containing free-flowing liquids are prohibited from being accepted at landfills. The DEP encourages the beneficial reuse of this material whenever possible; however, use not in accordance with DEP determination, or disposal or use as fill in an unapproved location is not acceptable.

It is anticipated that most, if not all, of the material will be landfilled, therefore the Contractor should be aware that many landfills may require testing and analysis of the material prior to accepting it for disposal at the facility.

The Contractor should be aware that in the event that the test results indicate a hazardous waste that can not be landfilled, the Contractor shall be responsible for all costs associated with adhering to special regulations regarding disposal of hazardous waste. The Contractor should take this into consideration in preparing the bid.

Material removed and that is to be transported to an approved facility, will be measured in the hydraulic lift truck, after DECANTING.

Measurement for Item 187.31 shall be made by the foot of drainage pipe, regardless of pipe size, from which material is removed.

Excavated material will be paid for at the contract unit price per cubic yard for ITEM 187.3 and per foot for ITEM 187.31 which price shall include the cost of removal, delivery and disposal at an approved landfill, disposal facility or recycling facility, the costs for approvals, permits, testing, transportation, and other incidental expenses, by a qualified individual as described above.

ITEM 201.	**CATCH BASIN**	**EACH**
ITEM 204.	**GUTTER INLET**	**EACH**

The work under these items shall conform to the relevant provisions of Section 201 of the Standard Specifications and the following:

All catch basins shall be precast unit and constructed as shown in MassDOT Precast Concrete Catch Basin E201.4.0 except that the sump shall be 4 feet minimum. No additional compensation will be allowed for deep sumps.

All castings located within the pavement area shall not be set to finished grade until after the binder course has been placed.

All catch basins and gutter inlets shall be placed on a bedding of 6 inches crushed stone if necessary to stabilize foundations in accordance with subsection 150.68. Excavation shall be included in the cost of the structure, while the crushed stone shall be paid for under the unit price for Item 156. Crushed Stone.

Where required, cone sections of catch basins shall be replaced by flat top sections or eccentric sections at no additional cost.

All frames shall be set in a concrete collar conforming to Construction Standard Detail E 202.9.0 prior to placement of top course. All frames shall be set on a minimum of two courses of

mortared brick or precast grade rings as specified in the Standard Specifications. Cost of such work shall be included in the cost of the structure or item of which it forms a part.

Where new catch basins are shown on the drawings to be constructed over existing pipes, the work shall also include the connecting of the pipe to the structures and the necessary cutting and removal of the existing pipe within the structures. The existing pipe shall be neatly cut to provide a smooth uniform face flush with the inside wall surface of the structure and totally removed or neatly cut longitudinally and partially removed to retain the lower half of the existing pipe barrel to form the required (manhole) shaped invert.

Catch basins shall be measured as a unit regardless of required depth.

A gutter inlet may be used as necessary as a substitute for, or in addition to, a catch basin and at the direction of the Engineer.

COMPENSATION

Catch basin and gutter inlet will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for excavation regardless of depth, but all costs in connection therewith shall be included in the Contract unit price bid.

No separate payment will be made for sawcutting pavement, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 220.	**DRAINAGE STRUCTURE ADJUSTED**	**EACH**
ITEM 220.3	**DRAINAGE STRUCTURE CHANGE IN TYPE**	**EACH**
ITEM 220.5	**DRAINAGE STRUCTURE REMODELED**	**EACH**
ITEM 220.7	**SANITARY STRUCTURE ADJUSTED**	**EACH**
ITEM 220.8	**SANITARY STRUCTURE REMODELED**	**EACH**

The work under these items shall conform to the relevant provisions of Section 220 of the Standard Specifications and the following:

DESCRIPTION

The work shall include all necessary excavation of the existing pavement, cement concrete collars and earth material to obtain access to the masonry and removal of the casting. It shall also involve necessary backfill and compaction and hot mix asphalt of the excavated area.

Backfilling shall consist of suitable material thoroughly compacted with mechanical devices. Any structure that is in the paved roadway, and is not to the point of being backfilled and the collar installed at the end of any work day, shall be steel-plated or backfilled with compacted gravel, level with the roadway. Cost for the gravel and the re-excavation of the gravel to complete the work shall be included in the cost of the structure or item of which it forms a part.

Excavated holes shall be cut in the pavement in a neat manner with an approximate vertical face.

All frames and other castings shall be set in a concrete collar conforming to Cosntruction Standard Detail E 202.9.0 prior to placement of top course. The concrete collar shall be composed of 4000 PSI, 1 1/2 Inch. 565 High Early Strength Concerte. All frames shall be set on a minimum of two courses of mortared brick. The concrete collar shall be constructed to allow the full depth of the top course of hot mix asphalt to be placed. The collar shall be completely coated with (RS-1) Asphaltic Emulsion before placement of hot mix asphalt. Cost of all such work shall be included in the cost of the structure or item of which it forms a part.

Debris, excess mortar or other materials shall be removed from the structures. All excess excavated materials and construction debris shall be removed and disposed of off the site.

The work to rebuild a structure consists of the removal and replacement of any masonry, which in the judgment of the Engineer, shows signs of deterioration. Masonry shall be replaced in accordance with Subsection 220.60.

The brick for sanitary structures shall be sound, hard and uniformly burned brick, regular and uniform in shape and size, of compact texture and satisfactory to the Engineer. Brick shall comply with ASTM Standard Specifications for sewer brick (made from clay or shale), Designation C-32-63 or Grade SA, hard brick, except that the mean of five tests for absorption shall not exceed 8 percent by weight. Rejected brick shall be immediately removed from the work and substituted with approved brick.

COMPENSATION

Drainage and sanitary structure remodeled will be measured for payment by each, when the adjustment of structures to line or grade or both line and grade is greater than 6 inches but less than 10 inches, complete in place.

Drainage and sanitary structure adjusted will be paid for at the Contact unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removing and resetting frame and covers, but all costs in connection therewith shall be included in the Contract unit price bid.

Drainage and sanitary structure remodeled will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removing and resetting frame and covers, but all costs in connection therewith shall be included in the Contract unit price bid.

Removing and resetting of the frame and cover to the proposed grade for structures designated to be rebuilt shall be separately measured for payment under Item 223.

ITEM 222.3 FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD EACH

Work under this Item shall be in accordance with the relevant provisions of Section 220 of the Standard Specifications and the following:

DESCRIPTION

Municipal frames, grates and covers shall be as required by the City of Waltham Department of Public Works and shall be as manufactured by East Jordan Iron Works or approved equivalent. The following model numbers refer to East Jordan Iron Works products:

Frames and Covers for Drain Manholes – LK110 Type A
Frames and Grates for Catch Basins and Gutter Inlets – LF248-2, Type F

Manhole covers shall have a diamond pattern; pick holes and the appropriate word "DRAIN" or "SEWER" cast in 3-inch letters to match the corresponding utility.

Casting frames shall be set in a full mortar bed with bricks, a maximum of 8 inches thick. All castings shall be set in a full concrete collar, conforming to Construction Standard Detail E 202.9.0.

COMPENSATION

Frame and grate (or cover) municipal standard will be measured for payment by the each, complete in place.

Frame and grate (or cover) municipal standard will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 223.2 FRAME AND GRATE (OR COVER) REMOVED AND DISCARDED EACH

The work under this item shall conform to the relevant provisions of Section 220 of the Standard Specifications and the following:

DESCRIPTION

The work shall consist of removing and discarding existing frames and grates (or covers) not required for reuse on this project. Said items shall become the property of the Contractor and shall be removed from the project and disposed of legally.

COMPENSATION

Frame and grate (or cover) removed and discarded will be measured for payment by the each, complete in place.

Frame and grate (or cover) removed and discarded will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 302.06 — 6 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET) — FOOT

The work under this item shall conform to the relevant provisions of Section 301 of the Standard Specifications and the following:

All pipe shall be supported with 6 inches of crushed stone (M2.01.4) foundation. Excavation shall be included in the cost of the pipe to which it pertains.

The cost of the water line shall include but is not limited to excavation, backfill, fittings, restraining glands, tie rods, concrete for thrust block, couplings and all other labor, equipment and material required to install the water line, complete in place.

Payment for the work under this item will be made at the Contract unit price per foot for Item 302.06 6 Inch Ductile Iron Water Pipe (Rubber Gasket).

ITEM 376.2 — HYDRANT – REMOVED AND RESET — EACH
ITEM 376.5 — HYDRANT – ADJUSTED — EACH

The work under these items shall conform to the relevant provisions of Section 300 of the Standard Specifications and the following:

All hydrants whether designated to be “Removed & Reset” or “Adjusted” shall be done so one hydrant at a time. The contractor shall have all the necessary tools, materials, equipment and workmen needed to do the work on site and ready before any hydrant is removed. The contractor shall give at least 48 hours written notice to the Weymouth Fire Department prior to working on any hydrant. Hydrants which will be out of service for more than twenty-four (24) hours shall be replaced by temporary hydrants.

HYDRANT REMOVED AND RESET
Hydrants shall be set plumb with the steamer nozzle facing the roadway.

Hydrants shall be set with the center of the operating nut 18” back from the face of the curb if in sidewalk, or to the center of the grass strip.

Hydrants shall be set so that manufacturers "bury" mark or ground line is at finish grade. If there is no bury mark on the hydrant, the bottom of the breakaway feature shall be a minimum of 2” and a maximum of 4” above finished grade.

Hydrants shall be restrained by using mechanical joint follower glands, rods and clamps, thrust blocks or any combination thereof as required by the Engineer. Thrust blocks shall be paid for separately under Item 903. 3000 PSI, 1.5 IN., 470 Cement Concrete.

A drainage pit shall be excavated below and around each hydrant and backfilled to a height of at least 12” above hydrant service pipe of 3/4” to 1” crushed stone.

All hydrants to be reset shall be removed in their entirety prior to resetting. Hydrants not reset in accordance with these specifications will not be eligible for payment.

HYDRANT ADJUSTED

Hydrants noted on the plans to be adjusted shall be carefully removed and set on blocks temporarily. The contractor shall install a riser extension of the appropriate length on the existing riser and reset the hydrant. Extension sections used to adjust hydrants shall be ductile iron only and shall adapt readily to the existing hydrant and fittings. Extension sections shall also include extensions for hydrant stem approved by the City and all fittings. Extensions shall be a minimum of 6-inch long. The final height of the reset hydrant shall be between 2'-6" and 2'- 9” as measured from the proposed finished grade to the top of the hydrant.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Hydrant removed and reset and hydrant adjusted will be measured for payment by the Each installed, complete in place.

Hydrant remove and reset and hydrant adjusted will be paid for at the respective Contract unit prices per Each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for crushed stone drainage well, connection to existing, tie rods, connection couplings, restraining glands, megalugs and extension sections, temporary hydrants, but all costs in connection therewith shall be included in the Contract unit prices bid.

ITEM 415. PAVEMENT MICROMILLING SQUARE YARD

The work under this item shall conform to the same requirements for Section 130 Pavement Milling within Section 450.

DESCRIPTION

415.20 General.

This work shall consist of micromilling and removal of existing Hot Mix Asphalt (HMA) pavement courses from the project by the Contractor. Micromilling shall be performed in conformity with the approved QC Plan. The Contractor shall present and discuss in sufficient detail the Quality Control information and activities related to milling at the Construction Quality Meeting required under Section 450. Unless otherwise specified, the milled material shall become the property of the Contractor.

CONSTRUCTION METHODS

415.60 General.

All construction procedures under Pavement Micromilling shall also conform to any of the following relevant provisions of Pavement Milling:

Milling Equipment Requirements.

The milling equipment shall be self-propelled with sufficient power, traction, and stability to remove the existing HMA pavement to the specified depth and cross-slope. The milling machine shall be capable of operating at a minimum speed of 10 feet per minute, designed so that the operator can at all times observe the milling operation without leaving the control area of the machine, and equipped with the following:

a) A built in automatic grade control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results.

b) Longitudinal controls capable of operating from any longitudinal grade reference, including string line, 30 foot ski minimum, 30 foot mobile string line minimum, or a matching shoe.

c) The transverse controls shall have an automatic system for controlling cross-slope at a given rate.

d) Cutting heads able to provide a minimum 6 foot cutting width and a 0 to 4 inch deep cut in one pass. The teeth on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture.

e) An integral pickup and conveying device to immediately remove milled material from the roadway and discharge the millings into a truck, all in one operation.

f) All necessary safety devices such as reflectors, headlights, taillights, flashing lights and back up signals so as to operate safely in both day and night.

g) A means of effectively limiting the amount of dust escaping from the milling and removal operation in accordance with local, State, and Federal air pollution control laws and regulations.

When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a smaller or lesser-equipped milling machine may be permitted when approved by the Engineer.

Sweeper Equipment Requirements.

The Contractor shall provide a sufficient number of mechanical sweepers to ensure that the milled surface is free of millings and debris at the end of each day's milling operations. Each

sweeper shall be equipped with a water tank, spray assembly to control dust, a pick-up broom, a dual gutter broom, and a dirt hopper. The sweepers shall be capable of removing millings and loose debris from the textured pavement.

Milling Operations.

The milling operations shall be scheduled to minimize the duration and placement of traffic on the milled surface. The milling operations shall not proceed more than 3 miles ahead of the paving operations. Under no circumstances shall the milled surface be left exposed to traffic for a period exceeding seven days. The Engineer may allow the Contractor to adjust the above limitations on milling production when necessary.

The Contractor shall coordinate milling and paving operations to minimize the exposure of milled surfaces to traffic. The Contractor shall ensure that milled surfaces are overlaid in a timely manner to avoid damage to the pavement structure. Any damage to the pavement structure resulting from extended exposure of the milled surface to traffic shall be repaired as directed by the Engineer at the Contractor's expense.

The existing pavement shall be removed to the average depth shown on the plans, in a manner that will restore the pavement surface to a uniform cross-section and longitudinal profile. The longitudinal profile of the milled surface shall be established using a 30 foot mobile ski, mobile string line, or stationary string line. The cross-slope of the milled surface shall be established by a second sensing device or by an automatic cross-slope control mechanism. The Contractor will be responsible for providing all grades necessary to remove the material to the proper line, grade, cross section, superelevation, and transitions shown on the plans or as directed by the Engineer. The requirement for automatic grade or slope controls may be waived by the Engineer in locations warranted by the situation, including intersections and closely confined areas.

The Engineer may adjust the average milling depth specified on the plans by ± 3/4" during each milling pass at no additional payment to minimize delamination of the underlying pavement course or to otherwise provide a more stable surface. If delamination or exposure of concrete occurs when milling a HMA pavement course from an underlying Portland Cement Concrete (PCC) pavement, the Contractor shall cease milling operations and consult the Engineer to determine whether to reduce the milling depth or make other adjustments to the operation.

Protection of Inlets and Utilities.

Throughout the milling operation, protection shall be provided around existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and shall be repaired at the Contractor's expense. To prevent the infiltration of milled material into the storm sewer system the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that falls into inlet openings or inlet grates shall be removed at the Contractor's expense.

Vertical Faces.

All permanent limits of the milled area shall be sawcut or otherwise neatly cut by mechanical means to provide a clean and sound vertical face. No vertical faces, transverse or longitudinal, shall be left exposed to traffic. If any vertical face is formed in an area exposed to traffic a temporary paved transition with a maximum 12:1 slope shall be established. If the milling machine is used to temporarily transition the milled pavement surface to the existing pavement surface, the temporary transition shall be constructed at a maximum 12:1 slope.

Opening to Traffic.

Prior to opening a milled area to traffic, the milled surface shall be thoroughly swept with a mechanical sweeper to remove all remaining millings and dust. This operation shall be conducted in a manner so as to minimize the potential for creation of a traffic hazard and to comply with local, State, and Federal air pollution control laws and regulations. Any damage to vehicular traffic as a result of milled material becoming airborne is the responsibility of the Contractor and shall be repaired at the Contractor's expense. Temporary pavement markings shall be placed in accordance with the provisions of Subsection 850.64.

Milled Surface Inspection.

The milled surface shall provide a satisfactory riding surface with a uniform textured appearance. The milled surface shall be free from gouges, excessive longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, non-uniform milling teeth, improper use of equipment, or otherwise poor workmanship. Any unsatisfactory surfaces produced shall be corrected by remilling at the Contractor's expense and to the satisfaction of the Engineer.

The Contractor shall perform Quality Control inspection of all work items addressed as specified in the table below. Inspection activities during milling of HMA pavement may be performed by qualified Production personnel (e.g. Skilled Laborers, Foremen, Superintendents). However, the Contractor's QC personnel shall have overall responsibility for QC inspection. The Contractor shall not rely on the results of Department Acceptance inspection for Quality Control purposes. The Engineer shall be provided the opportunity to monitor and witness all QC inspection.

The milled surface of each travel lane shall be divided into longitudinal Sublots of 500 feet. The Contractor shall perform a minimum of one random QC measurement within each Sublot with a 10 foot straightedge in the transverse direction across the milled surface. Additional selective QC measurements within each Sublot will be performed as deemed necessary by the QC personnel. All QC inspection results shall be recorded on NETTCP Inspection Report Forms. The Engineer will also randomly inspect a minimum of 25% of the Sublots. The Contractor shall perform surface texture measurements with a 10 foot straightedge in the transverse direction across the milled surface. The milled surface shall have a texture such that the variation from the edge of the straightedge to the top of ridges between any two ridge contact points shall not exceed 1/8 inch. The difference in height from the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 1/16". Any point in the surface not meeting these requirements shall be corrected as directed by the Engineer at the Contractor's expense.

In isolated areas where surface delamination between existing HMA layers or a surface delamination of HMA on Portland Cement Concrete causes a non-uniform texture to occur, the straightedge surface measurement requirements stated in the preceding paragraph may be waived, subject to the approval of the Engineer.

Minimum QC Inspection of Milling Operations

Inspection Component	Items Inspected	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Equipment	As specified in QC Plan	Per QC Plan	Per QC Plan	Per QC Plan
Environmental Conditions	Protection of Inlets & Utilities	Per QC Plan	Existing Surface	Visual Check
	Removal of Millings & Dust	Per QC Plan	Milled Surface	Visual Check
Workmanship	Milling Depth	Per QC Plan	Milled Surface	Check Measurement
	Cross-Slope & Profile	Per QC Plan	Milled Surface	Check Measurement
	Milled Surface Texture	Per QC Plan	Milled Surface	Visual Check
	Milled Surface Roughness	Once per 500 feet per milled lane	Milled Surface per Subsection 410.67	10 foot standard straightedge
	Sawcut Limit Vertical Face	Per QC Plan	Sawcut Limits	Visual Check

415.61 Micromilling Equipment Requirements.

The micromilling machine shall be equipped with a drum specifically designed to provide the surface specified below.

415.62 Control Strip.

The Contractor shall micromill a control strip. The control strip shall be 500 feet minimum in length with a uniformly textured surface and cross slope, as approved by the Engineer.

The micromilled surface of the control strip shall provide a satisfactory riding surface with a uniform textured appearance. The micromilled surface shall be free from gouges, excessive longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, non-uniform milling teeth, improper use of equipment, or otherwise poor workmanship. Any unsatisfactory surfaces produced in the control strip shall be corrected by additional micromilling at the Contractor's expense and to the satisfaction of the Engineer.

The micromilled pavement surface shall have a transverse pattern of 0.2 – 0.3 inch center to center of each strike area. The Contractor shall perform surface texture measurements with a 10 foot straightedge in the transverse direction across the milled surface. The milled surface shall

have a texture such that the variation from the edge of the straightedge to the top of ridges between any two ridge contact points shall not exceed 1/8 inch. The difference in height from the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 1/16". Any point in the surface not meeting these requirements shall be corrected as directed by the Engineer at the Contractor's expense.

415.67 Micromilled Surface Inspection.

The Contractor shall perform Quality Control inspection of all work items addressed under Section 415. The Contractor shall not rely on the results of Department Acceptance inspection for Quality Control purposes.

The micromilled surface shall meet the requirements of 415.62.

COMPENSATION

415.80 Method of Measurement.

Pavement micromilling will be measured for payment by the number of square yards of area from which the milling of existing HMA pavement has been completed and the work accepted. No area deductions will be made for minor unmilled areas such as catch basin inlets, manholes, utility boxes and any similar utility structures.

415.81 Basis of Payment.

Pavement micromilling, removal and disposal of existing HMA pavement will be paid for at the contract unit price per square yard. This price shall include all equipment, tools, labor, and materials incidental thereto. No additional payments will be made for multiple passes with the milling machine to remove the existing HMA surface to the grade specified.

No separate payments will be made for: performing handwork removal of existing pavement and providing protection around catch basin inlets, manholes, utility valve boxes and any similar structures; repairing surface defects as a result of the Contractor's negligence; providing protection to underground utilities from the vibration of the milling operation; sawcutting micromilled limits; installing and removing any temporary transition; removing and disposing of millings; furnishing a sweeper and sweeping after milling. The costs for these items shall be included in the contract unit price for Pay Item 415., Pavement Micromilling.

Asphalt for patching will be paid for under other respective item of work.

ITEM 450.9	**CONTRACTOR QUALITY CONTROL**	**TON**
ITEM 451.	**HMA FOR PATCHING**	**TON**
ITEM 452.	**ASPHALT EMULSION FOR TACK COAT**	**GALLON**
ITEM 453.	**HMA JOINT SEALANT**	**FOOT**
ITEM 455.23	**SUPERPAVE SURFACE COURSE – 12.5 (SSC-12.5)**	**TON**
ITEM 455.31	**SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC-12.5)**	**TON**
ITEM 455.42	**SUPERPAVE BASE COURSE – 37.5 (SBC-37.5)**	**TON**

Refer to Appendix for MassDOT Specification for above items. Note City of Waltham shall be substituted for any reference to Department and/or MassDOT.

ITEM 482.3 SAWING ASPHALT PAVEMENT FOOT

The work under this item shall conform to the relevant provisions of Section 120 of the Standard Specifications and the following:

DESCRIPTION

The work shall include the sawcutting of existing asphalt pavement where shown on the plans, and as directed by the Engineer.

CONSTRUCTION

Sawcut equipment shall be approved by the Engineer prior to commencing work.

The existing pavement shall be sawcut through its full depth, or to the elevation of the abutting proposed pavement subgrade, whichever is less, at all joints between existing and proposed pavements, and at all utility trenches through existing pavement to remain, to provide a uniform, vertical surface for the proposed pavement joint with the existing pavement.

Sawcut edges that become broken, ragged or undermined as a result of the Contractor's operations shall be shall be resawn prior to the placement of abutting proposed pavement at no additional cost.

Sawcut surfaces in asphalt pavement shall be sprayed or painted with a uniform thin coat of (RS-1) Asphalt Emulsion immediately before placement of hot mix asphalt material against the surface. Sawcut concrete surfaces shall be thoroughly wetted before placing new concrete.

COMPENSATION

Sawing asphalt pavement will be measured for payment by the foot sawcut, complete in place.

Sawing asphalt pavement will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental required to complete the work.

Saw cutting required for the installation of traffic signal equipment and conduit, street lighting equipment and conduit, water pipes, drainage pipes and structures shall be included as part of the respective item of work and shall not be included for payment under Item 482.3.

ITEM 670.1 WOOD RAIL FENCE AND POST FOOT

The work to be done under this item shall conform to all relevant provisions of Section 665 and the following:

The work included under this Item consists of installing, complete in place, a wood rail fence at the locations specified on the Detail Sheets or as directed by the Engineer.

The fence posts shall be 6" x 6" (nom.) pressured treated lumber with an exposed height of 4 feet. The posts shall be set in a minimum 6" cement concrete envelope for a depth of at least 2 feet. The posts shall be spaced 7'6" on center Each post shall have a decorative cap. Each post shall have three rail hole connections spaced at 6", 1'6" and 2'6" from the post cap respectfully.

The fence rails shall be 4" x 4" (nom.) pressure treated lumber with reduced sections at the post hole connections

Note all lumber shall be pressure treated with penta preservative solutions prior to installation. The entire wood rail fence and posts shall be stained with a weather resistant wood stain having a dark brown color, as approved by the Engineer.

Wood Rail Fence and Post shall be measured for payment by the linear foot end to end of the rail complete in place, including but not limited to rails, line posts, end posts, and corner posts, cement concrete foundations and wood stain.

Wood Rail Fence and Post shall be paid for at the Contract unit price per linear foot, which price shall include all labor, material (including cement concrete for foundations and wood stain), equipment and incidental costs required to complete the work to the satisfaction of the Engineer.

ITEM 697.1 SILT SACK EACH

Work under this item shall conform to the relevant provisions of Section 670 of the Standard Specifications and the following:

GENERAL

The work under this item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed

& Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

CONSTRUCTION

Silt sacks shall be installed in retained existing and proposed catch basins and drop inlets within the project limits and as required by the Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions, and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as directed by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically as directed by the manufacturer to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractors expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

COMPENSATION

Silt sacks will be measured for payment by the each, complete in place.

Silt sacks will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 701.	**CEMENT CONCRETE SIDEWALK**	**SQUARE YARD**
ITEM 701.1	**CEMENT CONCRETE SIDEWALK AT DRIVEWAYS**	**SQUARE YARD**
ITEM 701.2	**CEMENT CONCRETE WHEELCHAIR RAMP**	**SQUARE YARD**

The work to be done under this item shall conform to the relevant provisions of Section 701 of the Standard Specifications and the following:

DESCRIPTION

The depth of the cement concrete sidewalk and wheelchair ramp shall be 4 inches in thickness. The depth of the cement concrete sidewalk at driveways shall be 6 inches in thickness.

All concrete for sidewalks and wheelchair ramps shall contain a fibrous concrete reinforcement of 100% virgin polypropylene fibrillated fibers of multi-design gradation as manufactured by Fibermesh, Synthetic Industries, 4019 Industry Drive, Chattanooga, Tennessee - 37416 or an approved equal.

Use only 100% virgin polypropylene fibrillated fiber containing no reprocessed olefin materials and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. Application per cubic yard shall equal a minimum of 0.1% by volume (1.5 pounds per cubic yard). Fiber manufacturer must document evidence of 10 year satisfactory performance history, ISO 9002 certification of manufacturing facility, compliance with ASTM C-1116 Type III, 4.1.3, ASTM C-1116 Performance Level 1, I5 outlined in Section 21, Note 17 and an average minimum Residual Strength of 45 psi.

Detectible warning panels shall be installed as shown on the Plans and as detailed in the Construction Standard Details E 107.2.0 through E 107.6.5. The tile shall conform to the Americans with Disabilities Act (ADA) requirements. Detectable Warning Panels shall be incidental to the item.

COMPENSATION

Cement concrete sidewalk, cement concrete sidewalk at driveways and cement concrete wheelchair ramp will be measured for payment by the square yard, complete in place which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 705.1	**FLAGSTONE WALK REMOVED AND RESET**	**SQUARE YARD**
ITEM 706.1	**BRICK WALK REMOVED AND RELAID**	**SQUARE YARD**

The work under these items shall conform to the relevant provisions of Section 701. of the Standard Specifications and the following:

DESCRIPTION

The work under these items shall include the removal and resetting or relaying of privately owned walks at the back of the proposed sidewalk in order to transition the existing walkways to

the proposed sidewalk and accommodate any grade changes resulting from the proposed roadway and sidewalk construction. Lines and grades shall be consistent with the new sidewalk construction as shown on the plans and established by the Engineer.

The flagstone and brick walks shall be reused where possible. New flagstone and brick walks shall be similar in appearance to the walks which are removed or which abut a new or reconstructed walk. If existing bricks or flagstones are broken or if new units are necessary to reset the walks, they shall be of the same color and texture as the existing. All existing units shall be thoroughly cleaned before being set. All walks shall be laid on an 8" gravel foundation. If the existing base is of another material, that material may be used subject to the approval of the Engineer.

Cement mortar used to reset the bricks or flagstones shall conform to Material Specification M4.02.15.

It is the intention of this special provision that the reset flagstone and brick walks at the new locations shall conform as close as possible in every detail to the existing walks.

COMPENSATION

Flagstone walk and brick walk surface will be measured for payment by the Square Yard complete in place.

Flagstone walk and brick walk will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removing, resetting or furnishing and installing concrete or granite pavers, bricks and flagstones, cleaning and cement concrete base courses, but all costs in connection therewith shall be included in the Contact unit price bid.

Gravel for base material will be paid for separately under Item 151. - Gravel Borrow. Compaction of subgrade will be paid for separately under Item 170. - Fine Grading and Compacting.

ITEM 710.4	**BOUND - PLAIN GRANITE**	**EACH**
ITEM 711.	**BOUND REMOVED AND RESET**	**EACH**
ITEM 714.	**MONUMENT REMOVED AND RESET**	**EACH**

The work under these items shall conform to the relevant provisions of Section 710. of the Standard Specifications and the following:

DESCRIPTION

The work under these items shall include the installation and or the removal and resetting of granite bound as shown on the construction plans. The bounds shall be set at all P.C.'s, P.T.'s, and angle points on a two foot inset into the roadway layout. For bound to be installed in the roadway, it shall be equipped with an iron frame and cover and be flushed with roadway surface.

This iron frame and cover shall be manufactured by East Jordan Iron Works Model S208-6 or an approved equal.

COMPENSATION

Bound – Plain Granite and Bound Removed and Reset will be measured for payment by the Each complete in place.

Bound – Plain Granite and Bound Removed and Reset will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 756. NPDES STORMWATER POLLUTION PREVENTION PLAN LUMP SUM

This item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit.

Pursuant to the Federal Clean Water Act, effective March 10, 2003, construction activities which disturb one acre or more are required to apply to the U.S. Environmental Protection Agency (EPA) for coverage under the NPDES General Permit for Storm Water Discharges From Construction Activities. On July 1, 2003 (68 FR 39087), EPA published the final NPDES construction general permit for construction activity. On August 4, 2003 (68 FR 45817), EPA reissued the General Permit for the Commonwealth of Massachusetts and included state specific requirements.

The NPDES General Permit requires the submission of a Notice of Intent (NOI) to the U.S. EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a seven (7) day review period commencing from the date on which EPA enters the Notice into their database. The Contractor is advised that, based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (SWPPP) for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the SWPPP for review and approval. Filing fees associated with the notification and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The owner, MassDOT, and the operator, the Contractor, must submit separate NOIs. In cases where the municipality or other party has control over the plans and specifications or day-to-day site operations, said party must also submit a NOI. The Contractor is responsible to ensure that all required parties have submitted an NOI and shall provide proof of same to the Engineer.

The General Permit also requires the preparation and implementation of a SWPPP in accordance with the afore-mentioned statutes and regulations. The Plan will include the General Permit conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. It is the responsibility of the Contractor to prepare the SWPPP to meet the requirements of the most recently issued CGP. The Contractor shall submit the Plan to the Engineer for approval at least four weeks prior to any site activities. It is the responsibility of the Contractor to be familiar with the General Permit conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to this project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits.

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA Construction General Permit, provide all information required, and obtain any and all certifications as required by the Construction General Permit. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

Included in the General Permit conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.5 inches in twenty-four hours. The Contractor shall choose a qualified individual who will be on-site during construction to perform these inspections. The Engineer must approve the contractor's inspector. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the General Permit. Work associated with performance of inspections is not included under this Item. The Standard Specifications require adequate erosion control for the duration of the Contract. Inspection of these controls is considered incidental to the applicable items. This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items elsewhere in this contract which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved. Approval of final stabilization by the Engineer and

confirmation of submission of the NOT will be required prior to submission of the Resident Engineer's Final Estimate.

COMPENSATION

Payment for all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports and filing fees are included in the Lump Sum for this Item. Upon final acceptance of the SWPPP by the Department, a payment equal to 50% of the Contract Lump Sum price shall be paid. The remaining 50% of the Lump Sum shall be paid in 10% increments distributed equally throughout the remaining period of the Contract.

ITEM 767.12 COMPOST FILTER TUBE FOOT

The purpose of this item is to provide a linear, compost-filled tube for filtering suspended sediments from storm water flow. This item shall conform to the requirements of Section 751 and 767 of the Standard Specifications and the following.

MATERIALS

Material for the filter tubes shall be compost meeting M1.06.0, except that no manure or bio-solids shall be used. In addition, no kiln-dried wood or construction debris shall be allowed. Compost shall pass through a 3 inch sieve.

Tubes for compost filters shall be a minimum of 12 inches maximum of 18" in diameter, and shall be jute mesh or approved biodegradable material. Additional tubes shall be used at the direction of the Engineer.

Stakes for anchors, if required, shall be nominal 2x2 stakes.

CONSTRUCTION

Tubes of compost may be filled on site or shipped. Tubes shall be placed, filled and staked in place as required to ensure stability against water flows. All tubes shall be tamped to ensure good contact with soil.

The Contractor shall ensure that the filter tubes function as intended at all times. Tubes shall be inspected after each rainfall and at least daily during prolonged rainfall. The Contractor shall immediately correct all deficiencies, including, but not limited to, washout, overtopping, clogging due to sediment, and erosion. The contractor shall review location of tubes in areas where construction activity causes drainage runoff to ensure that the tubes are properly located for effectiveness. Where deficiencies exist, such as overtopping or wash-out, additional staking or compost material shall be installed as directed by the Engineer. Contractor shall remove sediment deposits as necessary to maintain the filters in working condition.

Filter tubes shall be removed by the Contractor when site conditions are sufficiently stable to prevent surface erosion, and after receiving permission to do so from the Engineer. All tube fabric shall be cut and removed and disposed of off-site by the Contractor. At the direction of the Engineer, the Contractor may rake out and seed mulch material so that it is no greater than 2 inches in depth on soil substrate.

COMPENSATION

Compost filter tubes will be measured for payment per foot, complete in place.

Compost filter tubes will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for required overlapping tubes, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 767.9 MATTING FOR EROSION CONTROL SQUARE YARD

Work under this item shall conform to the plans and the relevant provisions of Section 767 and the following:

DESCRIPTION

The work shall include the furnishing and placement of permanent erosion control matting for ditch and slope protection and stabilization as shown on the plans and as directed by the Engineer, after the placement of Loam Borrow and seed. Matting shall be placed on all slopes steeper than 1 vertical foot to 3 horizontal feet and all drainage swales.

MATERIALS

Furnish material that is clean, sound and free of rips or tears.

Stables shall be U-shaped with eight (8) inch legs and one (1) inch crowns from 6 gauge or larger wire.

Erosion control mats shall be undyed, untreated, biodegradable, jute, coconut coir, or other approved yarn woven into a plain weave mesh with approximately 0.65 to one (1) inch square openings.

Jute mesh shall be a uniform open plain weave fabricated from jute yarn that does not vary in thickness by more than ½ from its normal diameter. The mesh shall not exceed one (1) by one (1) inch in size and with an average weight of 0.5 kg/cm +/- 5% when tested in a standard atmospheric condition according to ASTM D 1776.

CONSTRUCTION METHODS

Install according to the manufacture's recommendations. Install mats to soil surfaces that are at final grade, stable, firm, and free of rocks or other obstructions.

Spread mats evenly and smoothly, without stretching, to ensure direct contact with the soil at all points. Unroll fabric parallel to the drainage flow direction. Drive all staples flush with soil surface.

Repair damage areas immediately. Restore the soil in damaged areas to finished grade, re-fertilize, and re-seed.

Place upslope mat end in a vertical, six (6) inch deep slot. Staple the mat end along the bottom of the slot at twelve (12) inch intervals. Backfill the slot and compact. Staple the outer edges at six (6) foot intervals. Overlap the abutting edges by four (4) inches. Staple the overlap at three (3) foot intervals.

Overlap the roll ends by eighteen (18) inches with the upslope end on top. Staple the overlap at twelve (12) inch intervals.

Turn the downslope mat end under six (6) inches of mat and staple along the fold at twelve (12) inch intervals. Staple throughout the mat at staggered two (2) foot intervals.

For swale installations, construct check slots every twenty-five (25) feet. Dig a six (6) inch slot perpendicular to the flow direction. Tuck 3 folds of mat into the slot. Staple the mat securely along the bottom of the slot and continue unrolling the fabric in the desired direction.

COMPENSATION

Matting for erosion control will be measured for payment by the square yard, complete in place. Overlapped matting will not be measured for payment.

Matting for erosion control will be paid for at the Contract unit price per square yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 804.3 **3 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC - (UL)** **FOOT**

The work under this item shall conform to the relevant provisions of Section 800 of the Standard Specifications and the following:

DESCRIPTION

The work shall include furnishing and installing 3-inch, non-metallic plastic conduit, for traffic signals systems in accordance with the plans. The conduit material shall be Schedule 80 polyvinyl chloride (PVC) plastic conduit.

Conduit in Grass or Planted Areas

Where new conduits are installed in grass and planted areas, work shall include placement of a minimum of 6-inch of loam borrow, seed, and any other materials replaced in kind to restore disturbed areas to their original condition. Any existing plants (bushes, flowers, etc.) removed or damaged as a result of this project shall be replaced in kind. No separate payment shall be made for this work, but all costs in connection therewith shall be included in the unit price for the conduit.

Conduit under Sidewalk or Median

Where conduit is installed in sidewalk or paved median areas, the work shall include excavating and backfilling of trenches, including necessary compaction. The cost to sawcut pavement and sidewalk, and to repair and/or replace damaged sidewalk and pavement surfaces shall be incidental to this item unless shown otherwise on the plans.

Conduit Crossing Roadways (Areas of Overlay**)**

Trenches in existing bituminous concrete pavements not subject to full depth reconstruction shall be sawcut to an 18-inch width. The existing pavements shall be sawcut through their full depth and the pavement removed. After conduit installation, the trench shall be backfilled with controlled density fill (CDF). CDF shall be Type 2E and shall be as specified in Section M4.08.0 of the Standard Specifications. CDF shall be flush with the bottom of the pavement box. The cost to sawcut pavement shall be incidental to this item unless shown otherwise on the plans.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

3 inch electrical conduit type NM – plastic - (UL) will be measured for payment per foot, complete in place.

3 inch electrical conduit type NM – plastic - (UL) will be paid for at the Contract unit price per foot, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment shall be made for sawcutting, excavation, CDF, concrete, asphalt, gravel, warning tape, sand bedding, or any other incidental materials required to install and temporarily restore and maintain conduit trenches, but all costs in connection therewith shall be included in the Contract unit price bid.

Payment will be made for the permanent restoration of all surfaces under the appropriate pay items.

ITEM 811.31 PULL BOX 12 X 12 INCHES – SD2.031 EACH

The work under these items shall conform to the relevant provisions of Section 800 of the Standard Specifications and the following:

DESCRIPTION

The work shall consist of furnishing and installing pull boxes for electrical connections in pavement, sidewalk, median, and planted areas. All pull boxes proposed in the roadway must be installed with a heavy duty frame and cover capable of sustained loading of H-20 or better in conformance with the Standard Specifications for Highways and Bridges at no additional cost. Where 3" signal conduit enters a pull box, the bottom of the conduit shall be 30-inch beneath the finished grade. Where 1½-inch loop lead-in conduit enters a pull box, the top of the conduit shall be 18-inch below finished grade. The cost to sawcut existing sidewalk and pavement, and to repair and/or replace damaged sidewalk and pavement surfaces (cement and bituminous concrete) as a result of pull box installation shall be considered incidental to these items unless otherwise shown on the plans.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Pull Box 12 X 12 inches–SD2.031 will be measured for payment by the each, complete in place.

Pull Box 12 X 12 inches–SD2.031 will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 811.37 ELECTRIC HANDHOLE ADJUSTED EACH

Work under this item shall consist of adjusting the frame and cover on an existing pre-cast electric hand hole so that the cover will be flush with the approved finished grade. Casting frames shall be set in a full mortar bed with bricks. All castings shall be set in a full concrete collar, conforming to Standard Detail 202.9.0.

COMPENSATION

Method of Measurement

Electric Hand Hole Adjusted will be paid for by each structure adjusted, complete and in place.

Basis of Payment

Electric Hand Hole Adjusted shall be at the Contract Unit Price Each, which price shall be full compensation all necessary labor, materials, tools and equipment costs necessary to complete the work as described above to the satisfaction of the Engineer.

ITEM 815.1 TRAFFIC CONTROL SIGNAL LUMP SUM

SCOPE OF TRAFFIC SIGNAL WORK

The work to be done under this item consists of furnishing and the installation of a new traffic control signal system, complete with vehicle loop detectors, signal posts, signal heads, mast arm assemblies, controller, cabinet, foundations, wire and cable, emergency vehicle preemption system, communication links for a traffic signal control system, electrical service connections and all other equipment, materials and incidental costs necessary to furnish, install and program a complete and functioning traffic control system as specified and as shown in the contract documents.

All work under these items shall conform to the relevant provisions of Section 800 of the Standard Specification, the 2009 Manual on Uniform Traffic Control Devices (MUTCD), and the following technical provisions:

The work under this item includes the supply and installation of traffic signal related items. It should be noted that due to the existing traffic signal system equipment currently in place in the City of Waltham, specific requirements have been included in these specifications that define equipment configuration options that differ from standard MassDOT traffic signal devices. This will allow the City to maintain a level of downward compatibility while also taking advantage of enhanced monitoring and control capability available with new national standards such as NEMA TS-2.

It should be noted that this traffic signal installation is to be included as part of the City of Waltham's computer based, traffic signal system, therefore specific requirements relating to system operation including intersection graphics and system map modifications, described under system requirements section, will be required.

The Contractor shall obtain an electrical permit from the City of Waltham Wire Inspector prior to construction. The Contractor shall notify the City of Waltham Wire Inspector 60 days prior to start of work. All traffic signal equipment and related items (such as pavement markings and signs) shall be in place and permission obtained from the City of Waltham Wire Inspector prior to the traffic signal being turned on stop and go operation.

SERVICE CONNECTIONS

The Contractor shall coordinate with the servicing utility company for installation of a new service meter to the new controller cabinet.

Service connections shown on the plans are approximate only. The Contractor shall determine exact locations from the servicing utility, arrange to complete the service connections, and be responsible for all charges incidental thereto.

A 100-ampere meter socket approved by the servicing utility company shall be furnished and installed on the side of the control cabinet by the serving utility company.

A 2" or greater PVC conduit shall be installed from the controller cabinet to the utility pole and/or electric manhole, which will supply electrical service to the controller cabinet. This conduit shall be encased in concrete where crossing roadways and/or driveways.

A separate spare 3 inch PVC Conduit shall be installed in the controller cabinet foundation to accommodate the interconnect cable ("Traffic Communications Cable") for future use.

FLASHING OPERATION

Changes from automatic flashing to stop-and-go operation and from stop-and-go to automatic flashing operation shall occur as set forth in Section 4D.28 of the 2009 MUTCD.

TRAFFIC SIGNAL EQUIPMENT

The traffic signal controller unit (CU), malfunction management unit (MMU) and all other ancillary traffic signal control components included in the traffic control cabinet shall comply with the National Electrical Manufacturers Association (NEMA) Standard No. TS 2-1998, Traffic Controller Assemblies with National Transportation Communications for ITS Protocol (NTCIP) Requirements.

TRAFFIC SIGNAL CONTROLLER

Controllers shall conform to Section 3, Controller Units of NEMA No. TS 2, Traffic Controller Assemblies. The controller unit shall meet all applicable requirements of the NEMA Standard Publication No. TS 2 Type 1 and the Department's 1995 Standard Specifications. Controllers shall utilize an input/output interface conforming to Section 3.3.1 of the NEMA TS 2 Standard for all input/output functions with the backpanel terminals and facilities, the malfunction management unit, detector rack assemblies and auxiliary devices.

The controller unit shall be a keyboard-entry menu-driven unit manufactured by Siemen/Eagle Signal, Model EPAC300m50 Series and conforming to the Standard Specifications, with internal time base coordination, emergency preemption, and programmatic capability. The controller shall be complete with a module, including modem card and physical connector, to support closed loop communication.

BUS INTERFACE UNITS

The Bus Interface Unit (BIU) shall comply with Section 8 of the NEMA TS 2 Standard. The BIU shall be fully interchangeable with any other manufacturer's unit and interchangeable in a NEMA TS 2 Type 1 cabinet assembly.

The BIU shall perform the interface function between Port 1 at the controller unit, the malfunction management unit, loop detector rack assembly, and the backpanel terminal and facilities.

As a minimum, two (2) LED indicators shall be provided on the BIU front panel. One indicator shall serve a dual use; as a power on indication and as a diagnostic indicator for proper operation of the device. The second indicator shall serve as a transmit indicator illuminating each time data is transmitted.

Note: Two (2) spare BIUs shall be provided within each cabinet.

MALFUNCTION MANAGEMENT UNITS

The malfunction management units (MMU) shall comply with Section 4 of the NEMA TS 2 standard. The MMU shall be capable of operating as either a Type 16 with 16 channels (8 vehicle, 4 pedestrian, 4 overlap) or a Type 12 with 12 channels (8 vehicle, 4 overlap). The MMU's supplied shall be configured to operate as Type 16 units.

The MMU's in either the Type 16 or Type 12 configuration shall be capable of operating in a NEMA TS 2 Type 2 cabinet, a NEMA TS 2 Type 1 cabinet, or a NEMA TS 1 cabinet without loss of functionality. The MMU shall be connected directly to the controller unit to support enhanced MMU monitoring of controller operations.

LOAD SWITCHES

Load switches shall comply with Subsection 6.2 of the NEMA TS 2 Standard. All load switches shall utilize optically isolated encapsulated modular solid-state relays. Discrete components on circuit boards are not acceptable.

Load switch indicator lights shall be LED-type and wired on the input side of the device.

Note: The controller cabinet assembly shall be initially supplied with a full complement of load switches to accommodate each available position of the backpanel.

FLASHER

Flashers shall comply with Subsection 6.3 of the NEMA TS 2 Standard and be equipped with two output indicator lights which will show flashing power out to the cabinet assembly.

FLASH TRANSFER RELAYS

Flash transfer relays shall comply with Subsection 6.4 of the NEMA TS 2 Standard.

The field electrical loading for flash operation shall be wired through the transfer relays such that the load on the 2-circuit flasher is as balanced as possible within the limitations of the signal phasing.

Note: The controller cabinet assembly shall be initially supplied with a full complement of flash transfer relays to accommodate each available position of the backpanel.

EMERGENCY VEHICLE PREEMPTION

The emergency vehicle preemption system shall be installed in the same cabinet as the controller. The system shall be compatible with the City's existing OPTICOM preemption equipment.

The emergency vehicle preemption control system shall consist of a data-encoded phase selector to be installed within the traffic control cabinet. This unit will serve to validate, identify, classify and record the signal from the optical detectors located on support structures at the intersection.

Upon receiving a valid signal from the detector, the phase selector shall generate a preempt call to the controller initiating a preemption operation as shown on the plans.

The optical detectors shall be single input, single output units used to control one approach. All traffic signal installations shall be supplied with a minimum of two optical detectors unless otherwise noted in the major item list.

The phase selector shall be a rack-mounted plug-in two or four channel, dual priority device. The phase selector shall plug into a shelf-mounted single card slot chassis. Programming the phase selector shall be via a PC-based computer utilizing unit specific software. One copy of software, on compact disc shall be supplied and licensed to the Department. A hard copy of final programming data shall be left in the control cabinet. The CONTRACTOR shall supply a complete set of interface cables for phase selector to laptop connection.

The CONTRACTOR shall install a confirmation strobe at the traffic signal location as shown on the plans. The confirmation strobe shall serve to validate to the driver of the emergency vehicle that the traffic signal has recognized the preemption call and will initiate the proper preemption sequence. The confirmation strobe shall have a clear/white lens.

The CONTRACTOR shall be responsible for the proper programming of the phase selector, orientation of the optical detectors, and all other work necessary to provide a complete and operating emergency vehicle preemption system.

The CONTRACTOR may be required to field adjust the location of the optical detectors for optimum line of sight detection in the presence of the Engineer to properly detect preemption calls from approaching vehicles.

The strobe light for the emergency vehicle pre emption system shall not be energized by a spare traffic signal conductor. It shall be connected to the cabinet by its own #14-4 wire.

VEHICLE DETECTOR AMPLIFIERS

The loop detector amplifiers shall be supplied as two-channel rack mounted units with programmable delay and extension timing, however, all delay and extension programming shall be completed internally in the controller unit.

A chart shall be permanently affixed to the controller cabinet door, which labels each amplifier channel. The chart shall indicate the detector number, street name, approach direction, lane assignment, corresponding phase and terminal number for each amplifier channel.

The detector lead-in cables shall also be similarly labeled, both in the controller cabinet and in the pull box containing the detector lead-in splice. This labeling and attachment shall be of durable materials such as brass or plastic, attached by wire or plastic ties. Adhesive attachment of the label shall not be acceptable.

Note: Control cabinet shall be supplied with two (2) spare, two-channel rack mounted loop amplifiers, in addition to the number indicated in the major items list on the plan sheets.

VEHICLE LOOP DETECTORS

Wire loop detectors shall be installed in the roadway for vehicle detection. In advance of the loop detector installation, the Contractor shall mark, on site, the loop detectors with any changes required by field conditions such as manholes. The loop detector layout shall be inspected and approved by the Engineer before the loop detectors are installed.

Loop wire shall be encased in a protected plastic tubing of PVC or polyethylene plastic, IMSA 51-5,0.25 inch outside diameter, and the wire may have cross-linked polyethylene insulation or it may have THHN/THWN insulation.

Splicing insulator shall be an approved re-enterable rigid body splices kit with a non-hardening sealing compound compatible with the wire insulation.

Splice and Connection: Splicing and connection shall be made in the pull box nearest the roadway loop sensor but not exceeding four loops per pull box. All loops included in a detector group as shown on the plans shall be spliced in a single pull box. Each lead and lead-in connector shall be stripped back and spliced using a pressure type wire connector applied with a crimping tool. Multiple loop sensors shall be identified as detailed on the plans.

Lead-in splicing shall be staggered to prevent contact with each other. each crimped splice shall be soldered and insulated. The insulation material shall be heat-shrink polyolefin. The shielded lead-in cable outer jacket and shield shall be stripped back sufficiently to ensure that the shield cannot come into contact with the spliced conductors. Follow the instructions of the kit manufacturer for this procedure when installing the re-enterable splice kit.

A chart shall be permanently affixed to the controller cabinet door, which labels each amplifier channel. The chart shall indicate the detector number, street name, approach direction, lane assignment, corresponding phase and terminal number for each amplifier channel.

The detector lead-in cables shall also be similarly labeled, both in the controller cabinet and in the pull box containing the detector lead-in splice. This labeling and attachment shall be of durable materials such as brass or plastic, attached by wire or plastic ties. Adhesive attachment of the label shall not be acceptable.

NOTE WELL: The above splice shall be done on the day of the loop wire installation to prevent the entrance of any moisture into the plastic tubing.

The lead-in conductors shall be connected to the appropriate terminals in the controller cabinet, by using crimped or soldered terminal ends. The heat source for soldering shall be electrical not exceeding 30W capacity.

Testing of Loops: The following test procedure shall be performed in the presence of the Engineer before and after the loop sensor is sealed in the pavement as detailed below. The cost of equipment, labor, and materials to perform such testing and similar re-testing following repairs, replacement, or adjustment of any detector within the project area shall be included in the contract unit price for this Item.

After installation of wire loop sensors in the roadway and installation of shielded lead-in connecting the loop sensors to the controller cabinet, each loop sensor and lead-in combination shall be tested (at the controller cabinet) for proper installation. The resistance from lead to lead of the same loop shall not exceed three (3) ohms per one thousand (1000) feet as measured by a high quality meter suitable for measurements of low resistance in the range of 1 to 6 ohms.

A megohm meter test at 500 volts DC shall be made between the two leads of a loop/lead-in combination temporarily spliced together, but otherwise disconnected from all terminals, and the shield drain wire and the earth ground connection. These resistances shall be at least one hundred (100) megohms.

A megohm meter test at 500 volts DC shall be made between lead-in shield and the earth ground rod. This resistance shall be at least one hundred (100) megohms.

The meter used for these tests shall be checked for calibration each day of use by using a resistor block of ±5% resistors simulating loads of 1 megohm, 20 megohm and 100 megohms. The observed meter reading shall be ±10% of the nominal resistor load.

If any loop sensor and lead-in combination fails to pass any one of the four (4) tests, it shall be repaired and then re-tested on two occasions at least two (2) weeks apart and then shall pass on each re-test occasion. If the loop sensor lead-in combination does not pass all these re-tests, a new loop sensor and/or lead-in shall be installed, and shall pass these tests, at no additional cost.

After the above tests have been satisfactorily completed, all loop sensor/shielded lead-in inductance shall be measured and a written report of the results shall be filed with the Engineer and a copy stored with the “box prints” at the intersection.

TRAFFIC CONTROLLER CABINET

The controller cabinets shall conform to the NEMA TS 2 Type 1 Standards, Section 7. Cabinet size shall be as shown below. It should be noted that approximate cabinet dimensions are in inches. The Cabinet shall be a pole-mounted type and shall be mounted on the mast arm shaft as shown on the plan.

NEMA TS 2 Cabinet	**Cabinet Size** (Nominal) (HxWxD*)	Back Panel	Mounting	Malfunction Management Unit
NEMA Size 6	56”x44”x27”	12-Position	Ground	16 Channel

* Approximate cabinet dimensions are provided in inches.

The control cabinet shall be made of aluminum with an interior and exterior painted aluminum finish.

Note: The control cabinet shall be initially wired with a “D” harness. All wires for this harness shall be properly terminated on the backpanel.

The cabinet shall also be wired with a normally closed switch connected to a user defined input to the controller for remote monitoring of the control cabinets’ door open status. The controller cabinet shall also be supplied with a Manual Police Button to manually control the operations of the traffic signal via the Police Door Access Panel.

Controller cabinet foundations shall not obstruct a sidewalk or crosswalk so that passage by physically challenged persons is impaired.

The following requirements are applicable to each signalized location and are designed for effective use of a laptop computer in conjunction with traffic signal controllers. These requirements are also designed to permit all engineers, electricians and technicians (including those who are disabled but ambulatory) to work in the cabinet in a safe, effective and comfortable manner. To this extent, the following meets applicable ADA requirements.

1. Furnish and install one slide-out/slide-in shelf or swing-out/swing-in shelf appropriate for the size and load of a laptop computer. This moveable shelf shall support the bottom of the laptop computer at a height between 3'-4" and 3'-8" above finished grade in front of the cabinet.

2. Both the firmware and software version in each timer unit shall be the same throughout the project, and shall be the latest version available on the market. In addition, the contractor shall promptly furnish to the owner and install all upgraded versions of both firmware and software through the last day of the inspection period, guarantee period or warranty period, whichever date is later.

3. The contractor shall furnish one cable with each new timer unit to connect a controller timing mechanism to a laptop computer. This cable shall have a termination at one end to match the controller. It shall have a termination on the other end to match the type of serial port found on laptop computers, usually DB9. This cable shall be wired to provide serial RS232C communication between the controller and the computer.

4. Payment for the work described above shall be deemed to be incidental to and included in the prices bid for various items of traffic signal work, and no additional payment shall be made for the work described above.

TESTING OF GROUNDING SYSTEM

The Contractor shall perform testing of the equipment grounding system in the presence of the Engineer in accordance with the Standard Specifications.

POSTS AND BASES

Signal posts and bases shall be steel shafts with octagonal bases. Signal base foundations shall not obstruct a sidewalk so that passage by physically challenged persons is impaired.

MAST ARMS, STRAIN POLES AND FOUNDATIONS

Mast arm foundations shall not obstruct a sidewalk so that passage by physically challenged persons is not impaired. Mast arms and foundations shall be fabricated and constructed in conformance with MassDOT's Mast Arm & Foundation Details Standard Drawings included in the plans.

All mast arms shall be galvanized steel monolevers with shoe bases, unless otherwise directed. The pole and arm shaft shall be fabricated from commercial quality hot rolled steel. The shaft shall have only one (1) longitudinal, automatically, electrically welded joint, and shall have no intermediate horizontal joints or welds. **Only one (1) length of steel sheet shall be used, which shall be formed into a continuously tapered shaft, having a taper length of 0.14" per foot.**

Acceptance of Type II mast arm poles and strain poles shall be contingent upon review and approval of the shop drawings submitted by the Contractor. Longhand design calculations shall be submitted for all Type II Mast Arms and strain pole assembly.

Based on the soil boring logs and the blow counts included in the plans, the foundations shall be to the depths noted below.

Location	Mast Arm Length	Foundation Depth	Foundation Diameter
Sta. 7+02, 35.5' RT	40' - Heavy Loads	12'-0"	4'-6" (18 #10 vert. bars)
Sta. 7+20, 26' LT	25' - Heavy Loads	8'-0" **	5'-0" (23 #10 vert. bars)
Sta. 7+77.5, 35' LT	30' - Heavy Loads	11'-0"	4'-0" (18 #9 vert. bars)
Sta. 8+14.5, 25.4' RT	25' - Heavy Loads	11'-0"	4'-0" (18 #9 vert. bars)

(**due to refusal (ledge) at a depth of 8'-0", a wider foundation, 5'-0" diameter is specified)

Foundations for Signal Posts, Mast Arm Poles, and Controller Cabinets foundations shall be constructed using 4000 psi, ¾ inch, 610 Cement Concrete Masonry conforming to the relevant provisions of Section M4 of the Standard Specifications and the following:

1. Reinforcing steel shall be ASTM A-615, Grade 60.

2. The top forming of cast-in-place units shall extend downward for a minimum of 24" on the side of any foundation. The lower portions of all foundations shall be placed directly against undisturbed earth. No forms or reinforcing for foundations for mast arm poles, span wire poles and control cabinets shall be set nor shall concrete be placed until the excavation has been inspected by the Engineer and his approval to proceed has been given.

SIGNAL HEADS

Signal heads shall be rigid mounted on mast arms, with the bottom of all signals at the same height. All traffic signal lenses shall be 12" in diameter unless otherwise noted on the plans. Louvered backplates shall be 5" provided on all signal heads as noted on the plans. All signal heads shall be equipped with light emitting diode (L.E.D.) 12" modules as noted on the plans.

Signal heads shall be made of aluminum. Signal heads shall be installed with cut tunnel visors unless otherwise noted on the major items list on the plans.

TRAFFIC SIGNAL LED MODULES

The LED module shall be an approved item from MassDOT's Traffic Control Devices Approved Equipment List. See "Traffic Controls" under "Qualified Construction Materials" on the MassDOT website:

http://www.mhd.state.ma.us/downloads/trafficMaterials/TrafficSignalControls_1011.pdf

To prevent the LED module warranty from being voided, the connecting leads on the module shall not be cut. The original LED module leads shall be connected to the signal head terminal block as continuous wire without splices.

The LED signal module will be replaced or repaired by the manufacturer if it exhibits one of the following:

1. A failure due to workmanship or material defects within the first 60 months of field operation
2. A greater than 40 percent light output degradation or a fall below minimum intensity levels (as defined by the latest ITE performance specifications) within the first 36 months of field operation.

PEDESTRIAN HEADS

Pedestrian head shall be 16"x18" aluminum housing with cap visor. Pedestrian head indications shall be illuminated L.E.D. type displaying the graphical symbols of a walking person and/or upraised hand. Each visual pedestrian indication shall be complemented by a time display indication. Each time display indication shall be self-programming and microprocessor based, with red LEDs used in the display. The time display will countdown the amount of time remaining in each flashing don't walk time interval for viewing by the ambulatory public.

All LED indications on the pedestrian signal shall have an automatic dimming circuit for night illumination to reduce long-term degradation to the LEDs. The countdown pedestrian signal shall use a three wire configuration for walk, don't walk and neutral, so as units can easily be retrofitted to existing locations.

PEDESTRIAN PUSH BUTTONS

Pedestrian push button controls shall be raised from or flush with their housings and shall be a minimum of 2" in the smallest dimension. The force required to activate the controls shall be no greater than 5-lbs.

Each push button shall be complemented with an audible and vibro-tactile indication with and LED confirmation light. Each separately phased pedestrian movement shall have its own distinctive audible emanation in order for visually impaired pedestrians to discriminate which phase is appropriate given his or her destination and/or direction of travel.

The audible emanation shall be a percussion type sound. No buzzer or ringing type sounds will be acceptable. The output level of the audible pedestrian signal shall vary in intensity with significant fluctuations in ambient noise conditions. At a minimum, the output level shall vary in intensity from daytime to nighttime operations.

Note: The pedestrian sign & saddle shall include a R10-3E educational sign to supplement the countdown pedestrian signals. The R10-3E sign shall not be provided with any directional arrow.

Pedestrian push buttons shall be located as close as practicable to the sidewalk curb ramp serving the controlled crossing and shall permit operation from a clear ground space. A maximum mounting height of 42 inches above the finish sidewalk grade shall be used for pedestrian push buttons.

PAINTING

All new traffic signal equipment shall be painted in accordance to the relevant provision of Section 815 of the Standard Specifications and the following:

Controller Cabinet	(Exterior)	-	Black
	(Interior)	-	Aluminum
Posts and Bases		-	Black
Mast arms & Mast arm poles		-	Black
Signal housings	(Back)	-	Black
	(Front)	-	Flat Black
Signal housing supports & mounting hardware		-	Black
Visors of signal housing	(Outside)	-	Black
	(Inside)	-	Flat Black
Louvers		-	Flat Black
Meter socket		-	Black

SOFTWARE

All local controller, malfunction management unit, loop detector amplifier and emergency vehicle preemption software shall be supplied with the latest available revision. Any software upgrades released by the manufacturer shall be supplied at no additional cost to the City of Waltham for a period of five years after acceptance of the traffic signal installation.

DOCUMENTATION

Each programmable local hardware component (i.e. controller, malfunction management unit, loop detector amplifier, emergency vehicle preemption phase selector) shall be initially programmed by the Contractor based on information contained on the plans.

Note: Three bound sets of hard copy programming per device shall be supplied to the City of Waltham Wires Department by the CONTRACTOR.

Upon final acceptance of the signal by the City, the CONTRACTOR shall supply an 8½"x11" or 11"x17" laminated copy of the traffic signal design plan and sequence and timing chart to be left in the cabinet documentation envelope mounted on the inside of the cabinet door.

FINAL INSPECTION

The Contractor shall arrange, through the City of Waltham's Inspector of Wires, for a final inspection of the signal system. At a minimum, representatives from the Contractor, the Design Engineer and the City shall be present.

AS-BUILT TRAFFIC LAYOUT PLANS

It will be the responsibility of the contractor to provide As-Built traffic signal layout plans, indicating all signal equipment, detectors, conduits, pullbox, complete with as-built timing and sequence, major item list, power-pole number and meter number. The Contractor shall provide the final As-Built Plan in hard copy and electronic AUTOCAD files to the City of Waltham prior to the Final Acceptance of the signal system. If desired, the Contractor may hire an ENGINEER or the DESIGN ENGINEER for a fee for preparing the Traffic Signal Permit and electronic version.

OWNERSHIP AND MAINTENANCE

Upon acceptance of the traffic signal system by the City of Waltham Wires Department, the Contractor shall turn over all guarantees and warranties to the City, where applicable. In turn, the City shall assume ownership and maintenance of the signal system.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work under Item 815.1 shall be paid for at the Contract lump sum price per item, which price shall include all labor, material, equipment and incidental costs required to install the new signal equipment complete and operating as specified.

No separate payment shall be made for the maintenance of existing signal installations during construction. The removal and stacking of all existing traffic signal equipment shall be paid for at

the lump sum price of Item 816.80 which shall be full compensation of all labor material, equipment and incidental costs required to complete the work as specified under that item.

Conduit will be paid for separately under Item 804.03, 3 Inch Electrical Conduit. Pull boxes shall be paid for separately under Item 811.31, Pull Box 12 x 12 Inches.

ITEM 824.61 HIGHWAY WARNING SIGN (W3-5b) - ILLUMINATED LUMP SUM

The work under these items shall conform to the relevant provisions of Section 824 of the Standard Specifications and the following:

CONSTRUCTION

The contractor shall furnish and install highway warning sign W3-5b with illumination as provided by Light Emitting Diodes (L.E.D.), in place, together with standard 8' traffic signal post support and at no additional cost, all required mounting hardware and related equipment necessary for complete and functional operation of the installation as shown on the plans and herein described.

The materials for this work shall conform to the following requirements:

1. The W3-5b sign shall be 36" x 36" and in conformance with MassDOT Sign Standard.

2. Characters shall be displayed in a full horizontal and vertical matrix. Character heights shall conform to MassDOT Sign Standard.

3. The LEDs shall have 1.4 candle luminous intensity and 22 degrees viewing angle. The lighting system shall be controlled automatically by a photocell, utilizing pulse width modulation. This system adjusts the lighting intensity, for daytime, nighttime and adverse weather conditions

4. The sign shall provide light indication in one direction only and there shall be no movable parts to affect message illumination or legibility.

5. It shall be possible to view the message only when the sign is illuminated. No message shall be visible when the sign is not illuminated. No phantom word or legend shall appear to be illuminated under any ambient light condition.

6. All nuts and bolts used in the assembly shall be stainless steel and a weatherproof gasket shall be inserted between the back housing and all bearing surfaces. All components shall be mounted so that there are no external protrusions.

7. The complete sign shall include a standard aluminum case fabricated from 0.125" thick approved aluminum alloy.

8. The entire front face of the sign shall be protected by a sheet of polycarbonate mounted in the door frame. Lens material shall be 1/8" thick clear polycarbonate with vandal resistant properties.

9. Message colors for W3-5b (Ill.) sign shall be ITE yellow. The message panel shall be black. The sign panel shall be yellow in accordance with the requirements of the MUTCD with respect to warning signs.

10. Transformer shall be used to reduce the incoming electrical power (nominal 120 volts AC but the level of the incoming voltage is not guaranteed) to 10.8 volts AC. The transformers shall have Class A insulation and shall be rated at 48.5 volt-amps or higher.

11. The sign unit shall be capable of continuous operation over a temperature range of -35^{o}F to +165^{o}F.

12. Electrical connection shall be provided by a barrier type terminal strip for connection of field wires. Wire access is accomplished through one of the mounting hubs.

13. All surfaces of the sign housing, inside and out, shall be finished with three coats of the best quality infrared oven-baked paint before assembly. The finished color shall be black.

14. The sign messages for W3-5b (Ill.) shall have Message 1 and Message 2 as further described below. Message 1 is the fail-safe mode and shall be illuminated when Message 2 is not called.

    Message 1 will be displayed when a green indication is displayed on signal heads “A”, “B” and “C” should read as follows:

    SIGNAL
    AHEAD

    Message 2 will be displayed when a normal red is displayed on signal heads “A”, “B” and “C” and should read as follows:

    RED
    SIGNAL
    AHEAD

15. The complete sign assembly, including LEDs, shall carry a one year warranty beginning on the date of final acceptance of the contract work and any defects caused by manufacturing or materials or installation procedure shall be repaired or replaced by the contractor at no cost to the City of Waltham during that period.

COMPENSATION
Highway warning sign (W3-5b)–illuminated will be paid for at the Contract unit prices per Lump Sum, which price shall include all labor, materials, equipment and incidental costs required to complete the work

ITEM 874. STREET NAME SIGN EACH

The work under this item shall conform to the relevant provision of Section 828 of the Standard Specifications and the following:

DESCRIPTION
The work shall include the furnishing and installation of street name signs at the intersections shown on the plans.

The quantity of street names may be increased or decreased by the Engineer depending upon actual field conditions encountered.

All sign panels shall be aluminum conforming to the requirements of Subsection 828.42 and the Pavement Marking and Signing Plan. The first letter of the street name shall be 6" in height Series C, while the remaining street name letters shall be 4.5" lowercase Series C (i.e. Faunce). The 'secondary' legend (i.e. Rd) shall be 4.5" uppercase and lowercase Series C as shown on the Sign Summary Plans. The text and border (legends) on the sign shall be white while the sign background shall be green. Signs shall have legends on both sides and include a city shield.

Also included under this item are all hardware, brackets, bolts, etc., necessary to attach the panels to P5 posts.

Sign support P5 posts will be supplied for under Item 847.1

METHOD OF MEASURMENT AND BASIS OF PAYMENT
Street name sign will be measured for payment by the each, complete in place.

Street name sign will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

ITEM 874.2 TRAFFIC SIGN REMOVED AND RESET EACH

GENERAL
The work under this Item shall conform to the relevant provisions of Section 828 of the Standard Specifications and the following.

CONSTRUCTION

The Contractor shall carefully remove all existing signs, attachment hardware and sign support posts as shown on the Drawings and as directed by the Engineer. Existing foundations shall be removed to a depth of at least 6 inches below the existing ground and the holes backfilled with gravel. The surface shall be patched with a material to match the existing ground or as directed by the Engineer.

Signs and attachment hardware shall be satisfactorily stored and protected until reset in the proposed work. Sign support posts shall be disposed of in a satisfactory manner. New sign support posts shall be provided as called for under Item 847.1.

Signs and attachment hardware lost, damaged or otherwise made unsuitable for reuse while being removed, transported, stored or reset shall be replaced with new material at no additional cost. New attachment hardware shall be furnished and installed as necessary to replace any missing or unusable existing hardware.

COMPENSATION

Traffic sign removed and reset will be measured for payment by the each, complete in place.

Traffic sign removed and reset will be paid for at the Contract unit price per Each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for dismantling, storing and resetting of the signs as designated above, the excavation and disposal of the existing foundation and the supplying and placing of compacted gravel backfill where foundations and posts are removed, and the patching of the existing surface, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 874.4 TRAFFIC SIGN REMOVED AND STACKED EACH

GENERAL

The work under this item shall conform to the relevant provisions of Section 828 of the Standard Specifications and the following:

CONSTRUCTION

The work to be done under this Item shall include the dismantling, removal and stacking of existing signs and supports not required for reuse on this project, transporting said signs and supports from the work site to a location to be determined by the City and carefully stacking said signs and supports as directed by the City. The work also includes the removal and disposal of the existing sign foundations.

Signs and attached hardware shall be carefully removed from their supports. The supports and existing foundations shall be removed below the existing ground and the holes backfilled with gravel. The surface shall be patched with a material to match the existing ground or as directed

by the Engineer. The Contractor shall be responsible for the signs, and shall replace or repair any damage due to his operations with no additional compensation.
If signs are attached to existing light poles, utility poles or traffic poles, only the sign and attached hardware shall be removed and stacked.

COMPENSATION
Measurement for Item 874.4, Traffic Sign Removed and Stacked, will be on a per each basis.

Payment for Item 874.4, Traffic Sign Removed and Stacked, will be at the Contract unit price, each, which price shall be full compensation for dismantling, loading, transporting and stacking of the signs and supports as designated above, the excavation and disposal of the existing foundation and the supplying and placing of compacted gravel backfill where foundations and posts are removed, and the patching of the existing surface, including all labor, material and incidentals to complete the work as shown on the Plans and as directed by the Engineer.

END OF TECHNICAL SPECIFICATIONS

BID TAB

ROADWAY & TRAFFIC SIGNAL IMPROVEMENT PROJECT
TRAPELO ROAD AT FOREST STREET
WALTHAM, MASSACHUSETTS
SCHEDULE OF BID PRICES

Item No.	Approx. Qty.	Item Description	Unit	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
101	0.25	Clearing And Grubbing At	A			$ -	
102.51	13	Individual Tree Protection **At**	EA			$ -	
103	10	Tree Removed - Diameter Under 24 Inches **At**	EA			$ -	
104	1	Tree Removed - Diameter 24 Inches And Over **At**	EA			$ -	
120	2200	Earth Excavation **At**	CY			$ -	
141.1	70	Test Pit For Exploration **At**	CY			$ -	
146	7	Drainage Structure Removed At	EA			$ -	
150	30	Ordinary Borrow At	CY			$ -	
150.1	20	Special Borrow At	CY			$ -	
151	1300	Gravel Borrow At	CY			$ -	
156	20	Crushed Stone At	TON			$ -	
170	4500	Fine Grading And Compacting At	SY			$ -	
180.1	1	Health And Safety Plan At	LS			$ -	

Sub Total or this Page $_____

ROADWAY & TRAFFIC SIGNAL IMPROVEMENT PROJECT
TRAPELO ROAD AT FOREST STREET
WALTHAM, MASSACHUSETTS
SCHEDULE OF BID PRICES

Item No.	Approx. Qty.	Item Description	Unit	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
180.2	16	Implementation Of Health And Safety Plan At	HR			$ -	
180.3	16	Personnel Protection Level C Upgrade At	HR			$ -	
187.3	20	Removal And Disposal Of Drainage Structure Sediments At	CY			$ -	
187.31	700	Removal And Disposal Of Drainage Pipe Sediments At	FT			$ -	
201	10	Catch Basin At	EA			$ -	
220	60	Drainage Structure Adjusted At	EA			$ -	
220.3	3	Drainage Structure Change In Type At	EA			$ -	
220.7	32	Sanitary Structure Adjusted At	EA			$ -	
220.8	1	Sanitary Structure Remodeled At	EA			$ -	
222.3	55	Frame And Grate (Or Cover) Municipal Standard At	EA			$ -	
223.2	52	Frame And Grate (Or Cover) Removed And Discarded At	EA			$ -	
227.4	5	Masonry Plug At	SF			$ -	
241.12	150	12 Inch Reinforced Concrete Pipe At	FT			$ -	

Sub Total for this Page $_____

ROADWAY & TRAFFIC SIGNAL IMPROVEMENT PROJECT
TRAPELO ROAD AT FOREST STREET
WALTHAM, MASSACHUSETTS
SCHEDULE OF BID PRICES

Item No.	Approx. Qty.	Item Description	Unit	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
242.12	1	12 Inch Reinforced Concrete Pipe Flared End At	EA			$ -	
258	45	Stone For Pipe Ends At	SY			$ -	
302.08	20	8 Inch Ductile Iron Water Pipe (Rubber Gasket) At	FT			$ -	
357.06	5	6 Inch Gate Box At	EA			$ -	
358	48	Gate Box Adjusted At	EA			$ -	
376.2	1	Hydrant - Removed And Reset At	EA			$ -	
376.5	3	Hydrant - Adjusted At	EA			$ -	
381.3	32	Service Box Adjusted At	EA			$ -	
402	200	Dense Graded Crushed Stone For Sub-Base At	CY			$ -	
415	8100	Pavement Micromilling At	SY			$ -	
431	200	High Early Strength Cement Concrete Base Course At	SY			$ -	
440	3000	Calcium Chloride For Roadway Dust Control At	LB			$ -	
443	6	Water For Roadway Dust Control At	MGL			$ -	

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ROADWAY & TRAFFIC SIGNAL IMPROVEMENT PROJECT
TRAPELO ROAD AT FOREST STREET
WALTHAM, MASSACHUSETTS
SCHEDULE OF BID PRICES

Item No.	Approx. Qty.	Item Description	Unit	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
450.9	1880	Contractor Quality Control At	TON			$ -	
451	20	HMA For Patching At	TON			$ -	
452	800	Asphalt Emulsion For Tack Coat At	GAL			$ -	
453	6000	HMA Joint Sealant At	FT			$ -	
455.23	1000	Superpave Surface Course - 12.5 (Ssc - 12.5) At	TON			$ -	
455.31	300	Superpave Intermediate Course – 12.5 (Sic –12.5) At	TON			$ -	
455.42	500	Superpave Base Course - 37.5 (Sbc - 37.5) At	TON			$ -	
472	20	Hot Mix Asphalt For Miscellaneous Work At	TON			$ -	
482.3	4500	Sawing Asphalt Pavement At	FT			$ -	
506	2200	Granite Curb Type VB - Straight At	FT			$ -	
506.1	500	Granite Curb Type VB - Curved At	FT			$ -	
509	380	Granite Transition Curb For Wheelchair Ramps - Straight At	FT			$ -	
509.1	310	Granite Transition Curb For Wheelchair Ramps - Curved At	FT			$ -	

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ROADWAY & TRAFFIC SIGNAL IMPROVEMENT PROJECT
TRAPELO ROAD AT FOREST STREET
WALTHAM, MASSACHUSETTS
SCHEDULE OF BID PRICES

Item No.	Approx. Qty.	Item Description	Unit	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
514	12	Granite Curb Inlet - Straight At	EA			$ -	
515	1	Granite Curb Inlet - Curved At	EA			$ -	
580	1000	Curb Removed And Reset At	FT			$ -	
594	2200	Curb Removed And Discarded At	FT			$ -	
595	12	Curb Inlet Removed And Discarded At	EA			$ -	
596	22	Curb Corner Removed And Discarded At	EA			$ -	
622.1	225	Steel W Beam Highway Guard (Single Faced/Wood Posts) At	FT			$ -	
622.3	50	Steel W Beam Highway Guard - Curved(Single Faced/Wood Posts) At	FT			$ -	
627.1	2	Steel W Beam Terminal Section (Single Faced) At	EA			$ -	
669	200	Fence Removed And Stacked At	FT			$ -	
670	60	Fence Removed And Discarded At	FT			$ -	
670.1	200	Wood Rail Fence and Post At	FT			$ -	
685	7	Stone Masonry Wall In Cement Mortar At	CY			$ -	

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ROADWAY & TRAFFIC SIGNAL IMPROVEMENT PROJECT
TRAPELO ROAD AT FOREST STREET
WALTHAM, MASSACHUSETTS
SCHEDULE OF BID PRICES

Item No.	Approx. Qty.	Item Description	Unit	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
691	40	Balance Stone Wall Removed And Rebuilt At	FT			$ -	
697.1	27	Silt Sack At	EA			$ -	
701	1500	Cement Concrete Sidewalk At	SY			$ -	
701.1	550	Cement Concrete Sidewalk At Driveways At	SY			$ -	
701.2	400	Cement Concrete Wheelchair Ramp At	SY			$ -	
702	50	Hot Mix Asphalt Walk Surface At	TON			$ -	
703	60	Hot Mix Asphalt Driveway At	TON			$ -	
705.1	5	Flagstone Walk Removed And Reset At	SY			$ -	
706.1	10	Brick Walk Removed And Relaid At	SY			$ -	
710.4	23	Bound - Plain Granite At	EA			$ -	
711	11	Bound Removed And Reset At	EA			$ -	
714	1	Monument Removed And Reset At	EA			$ -	
748	1	Mobilization At	LS			$ -	

Sub Total for this Page $_____

ROADWAY & TRAFFIC SIGNAL IMPROVEMENT PROJECT
TRAPELO ROAD AT FOREST STREET
WALTHAM, MASSACHUSETTS
SCHEDULE OF BID PRICES

Item No.	Approx. Qty.	Item Description	Unit	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
751	300	Loam Borrow At	CY			$ -	
756	1	NPDES Stormwater Pollution Prevention Plan At	LS			$ -	
765	1900	Seeding At	SY			$ -	
767.12	390	Compost Filter Tube At	FT			$ -	
767.2	200	Hay Mulch At	SY			$ -	
767.9	250	Matting For Erosion Control At	SY			$ -	
769	250	Pavement Milling Mulch Under Guard Rail At	FT			$ -	
804.3	700	3 Inch Electrical Conduit Type NM - Plastic -(UL) At	FT			$ -	
811.31	11	Pull Box 12 X 12 Inches - Sd2.031 At	EA			$ -	
811.37	1	Electric Handhole Adjusted At	EA			$ -	
815	1	Traffic Control Signal At	LS			$ -	
824.61	1	Highway Warning Sign - Illuminated At	LS			$ -	
831	30	Roadside Guide Sign (D6/D8) - Aluminum Panel(Type A) At	SF			$ -	

Allowance for the Relocation of the Utilities $10,000

Allowance for Police Detail $10,000

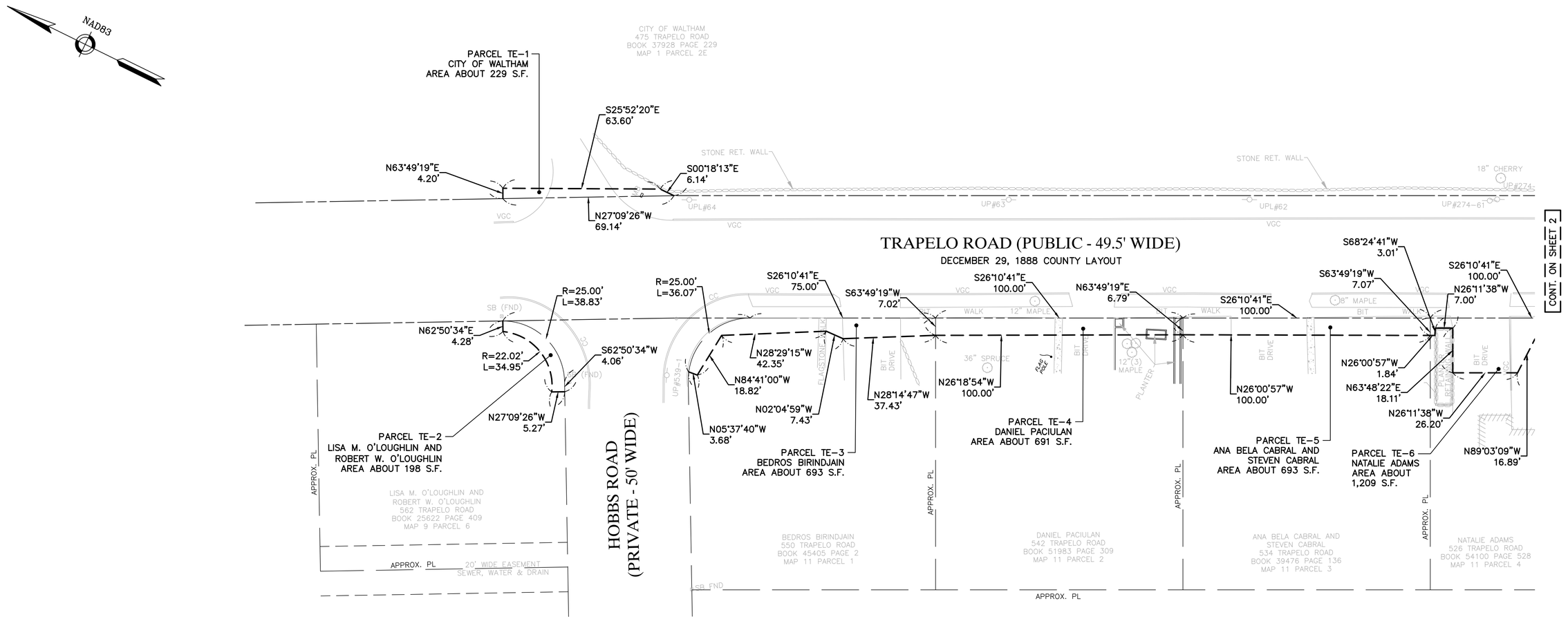
Sub Total for this Page $ _____

ROADWAY & TRAFFIC SIGNAL IMPROVEMENT PROJECT
TRAPELO ROAD AT FOREST STREET
WALTHAM, MASSACHUSETTS
SCHEDULE OF BID PRICES

Item No.	Approx. Qty.	Item Description	Unit	Unit Price Dollars	Unit Price Cents	Amount Dollars	Amount Cents
832	240	Warning-Regulatory And Route Marker - Alum. Panel (Type A) At	SF			$ -	
833.5	10	Demountable Reflectorized Delineator - Guard Rail At	EA			$ -	
833.7	2	Delineation For Guard Rail Termini At	EA			$ -	
841.4	2	Supports For Guide Sign (D8-4 Inch Tubular Post) Steel At	EA			$ -	
847.1	40	Sign Sup (N/Guide)+Rte Mkr W/1 Brkway Post Assembly - Steel At	EA			$ -	
851	50	Safety Controls For Construction Operations At	UD			$ -	
852	750	Safety Signing For Construction Operations At	SF			$ -	
853.1	8	Portable Breakaway Barricade Type III At	EA			$ -	
854.014	4500	Temporary Paving Markings - 4 In. (Painted) At	FT			$ -	
854.034	2500	Temporary Pavement Markings - 4 In. (Removable Tape) At	FT			$ -	
856	20	Special Lighting Unit (Flashing Arrow) At	UD			$ -	
859	2600	Reflectorized Drum At	DD			$ -	
864.04	400	Pavement Arrows And Legends Refl. White (Thermoplastic) At	SF			$ -	

Sub Total For this Page $_____

GRAND TOTAL for ALL PAGES $_____



NOTE:

PARCELS TE–1 THROUGH TE–34 ARE TEMPORARY CONSTRUCTION EASEMENTS TO BE TAKEN BY THE CITY OF WALTHAM.

PLANS PREPARED BY:
GREENMAN–PEDERSEN, INC.
181 BALLARDVALE ST., SUITE 202
WILMINGTON, MA 01887

DATE _____

NOTE:

APPROVAL NOT REQUIRED, UNDER THE SUBDIVISION CONTROL LAW, BY THE BOARD OF SURVEY & PLANNING

_____ CLERK

BOARD OF SURVEY & PLANNING
CITY OF WALTHAM, MASS.

0 10 20 30 40 60 FEET

TO OBTAIN METERS MULTIPLY FEET BY 0.3048

PLAN SHOWING TEMPORARY CONSTRUCTION EASEMENTS
FOR THE PURPOSE OF TRANSPORTATION IMPROVEMENTS
ON

TRAPELO ROAD AND FOREST STREET
WALTHAM, MA

OVER

LANDS OF VARIOUS OWNERS

SCALE: 1"=20' FEET
STEPHEN A. CASAZZA, P.E.
CITY COUNCIL ORDER NO. XXXXX

NOVEMBER, 2012
CITY ENGINEER
APPROVED NOVEMBER X, 2012

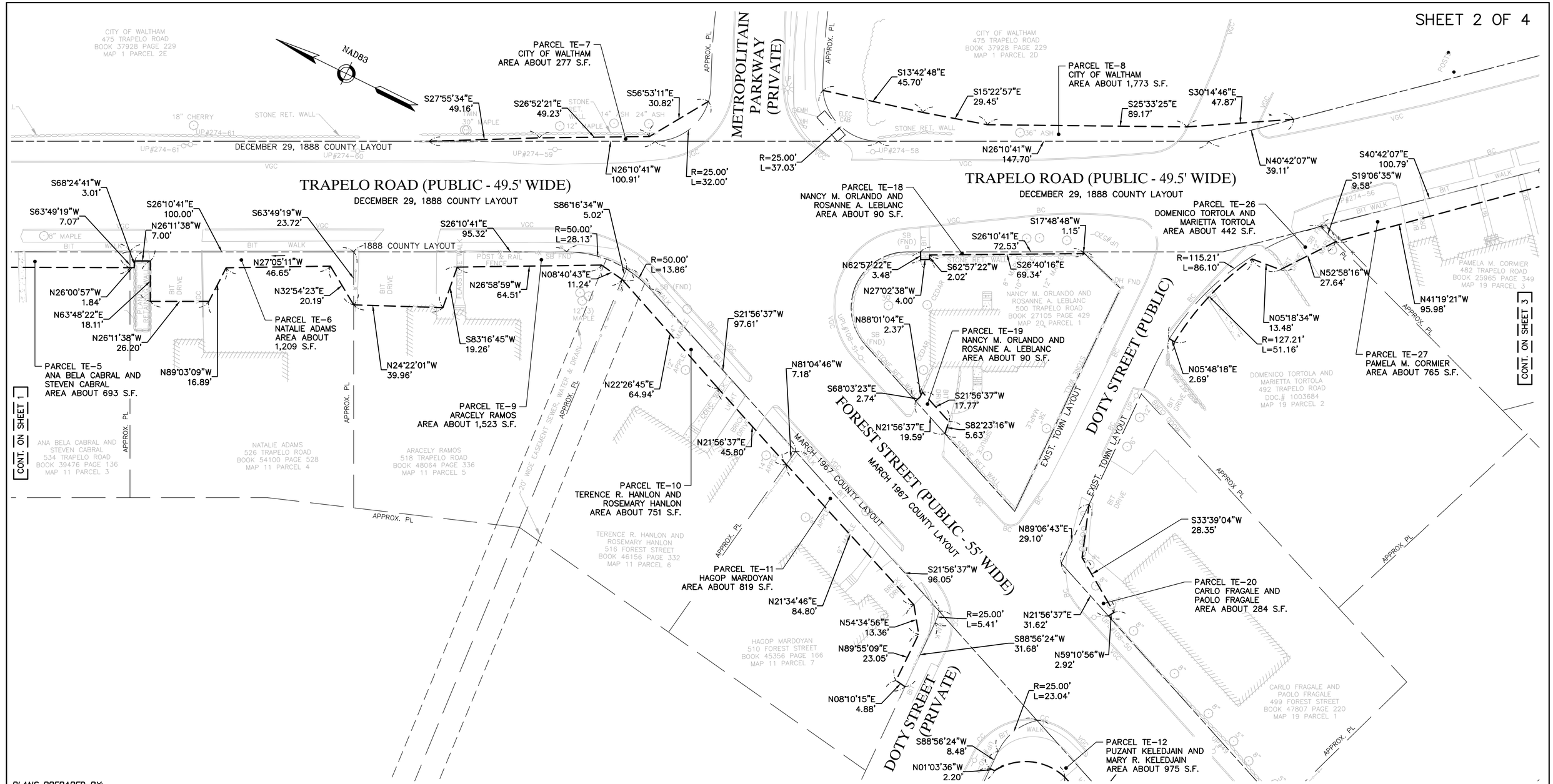
THE PROPERTY LINES SHOWN HEREON ARE THOSE DIVIDING EXISTING OWNERSHIP, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

PROGRESS PRINT 11/1/2012

_____

DATE _____



PLANS PREPARED BY:

GREENMAN–PEDERSEN, INC.
181 BALLARDVALE ST., SUITE 202
WILMINGTON, MA 01887

RESERVED FOR REGISTRY USE ONLY

GRAPHIC SCALE
0 10 20 30 40 60 FEET
1" = 20'

THE PROPERTY LINES SHOWN HEREON ARE THOSE DIVIDING EXISTING OWNERSHIP, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

PROGRESS PRINT 11/2/2012

DATE _____

NAD83

PARCEL TE–34
CITY OF WALTHAM
AREA ABOUT 1,929 S.F.

40' WIDE SEWER EASEMENT
PLAN BOOK 107 PLAN 6

CITY OF WALTHAM
475 TRAPELO ROAD
BOOK 37928 PAGE 229
MAP 1 PARCEL 2D

S42°51'32"E
163.97'

S40°15'59"E
278.45'

S49°17'53"W
4.05'

N40°42'07"W
442.30'

30" MAPLE
36" ASH
24" MAPLE
24" ASH
30" OAK
POST
VGC
BIT
WALK
UP#51
PL
CONC. BD. FND.

TRAPELO ROAD (PUBLIC - 49.5' WIDE)
DECEMBER 29, 1888 COUNTY LAYOUT

S40°42'07"E
100.79'

S49°17'54"W
6.25'

S40°41'39"E
51.53'

S43°50'57"W
2.99'

N45°23'47"W
51.98'

N41°19'21"W
95.98'

PAMELA M. CORMIER
482 TRAPELO ROAD
BOOK 25965 PAGE 349
MAP 19 PARCEL 3

PARCEL TE–27
PAMELA M. CORMIER
AREA ABOUT 765 S.F.

PARCEL TE–28
WILLIAM H. CARTER AND
ROSEMARY CARTER
AREA ABOUT 264 S.F.

WILLIAM H. CARTER AND
ROSEMARY CARTER
478 TRAPELO ROAD
BOOK 23195 PAGE 273
MAP 19 PARCEL 4

APPROX. PL

S40°42'07"E
51.01'

S49°17'53"W
5.72'

S40°42'07"E
70.00'

S49°17'53"W
5.72'

S40°42'07"E
70.00'

R=20.00'
L=31.42'

N80°07'49"W
16.25'

N43°03'57"W
55.48'

N40°42'07"W
70.00'

N49°17'53"E
7.23'

N40°38'02"W
3.01'

S49°21'58"W
8.91'

PARCEL TE–29
MARGARET M. ARCHIBALD
AREA ABOUT 542 S.F.

MARGARET M. ARCHIBALD
468 TRAPELO ROAD
BOOK 17764 PAGE 497
MAP 21 PARCEL 1

PARCEL TE–30
GASPAR S. LOPICCOLO AND
CHRISTINE A. LOPICCOLO
AREA ABOUT 400 S.F.

GASPAR S. LOPICCOLO AND
CHRISTINE A. LOPICCOLO
462 TRAPELO ROAD
BOOK 8468 PAGE 490
MAP 21 PARCEL 2

S40°42'07"E
51.00'

S49°17'53"W
12.91'

N32°09'04"W
48.39'

N40°42'07"W
22.15'

PARCEL TE–31
EDWARD A. JOAQUIN
AREA ABOUT 732 S.F.

EDWARD A. JOAQUIN
456 TRAPELO ROAD
BOOK 41671 PAGE 357
MAP 21 PARCEL 3

PARCEL TE–33
440 TRAPELO ROAD
REALTY TRUST, U/D/T
AREA ABOUT 120 S.F.

R=20.00'
L=31.37'

R=12.49'
L=18.25'

N49°22'20"E
8.65'

N48°17'45"W
55.87'

N41°24'23"W
3.02'

PARCEL TE–32
LENA O. KASSARDJIAN,
SILVIA M. BIKARIAN AND
NERSES BIKARIAN
AREA ABOUT 602 S.F.

LENA O. KASSARDJIAN,
SILVIA M. BIKARIAN AND
NERSES BIKARIAN
450 TRAPELO ROAD
BOOK 50395 PAGE 246
MAP 21 PARCEL 4

S40°42'07"E
5.87'

DECEMBER 29, 1888
COUNTY LAYOUT

R=20.00'
L=31.42'

S49°17'53"W
3.00'

N40°42'07"W
5.87'

R=17.00'
L=26.77'

S49°09'20"W
5.07'

S49°40'35"W
4.93'

N49°17'53"E
5.00'

N40°42'07"W
2.97'

440 TRAPELO ROAD
REALTY TRUST, U/D/T
440 TRAPELO ROAD
BOOK 54975 PAGE 525
MAP 22 PARCEL 1

DH FND

SHADE STREET
(PUBLIC - 40' WIDE)

ALDERWOOD ROAD
(PUBLIC - 40' WIDE)
FEBRUARY 14, 1956 TOWN LAYOUT

CONT. ON SHEET 2

PLANS PREPARED BY:

GREENMAN–PEDERSEN, INC.
181 BALLARDVALE ST., SUITE 202
WILMINGTON, MA 01887

RESERVED FOR REGISTRY USE ONLY

GRAPHIC SCALE
0 10 20 30 40 60 FEET
1" = 20'

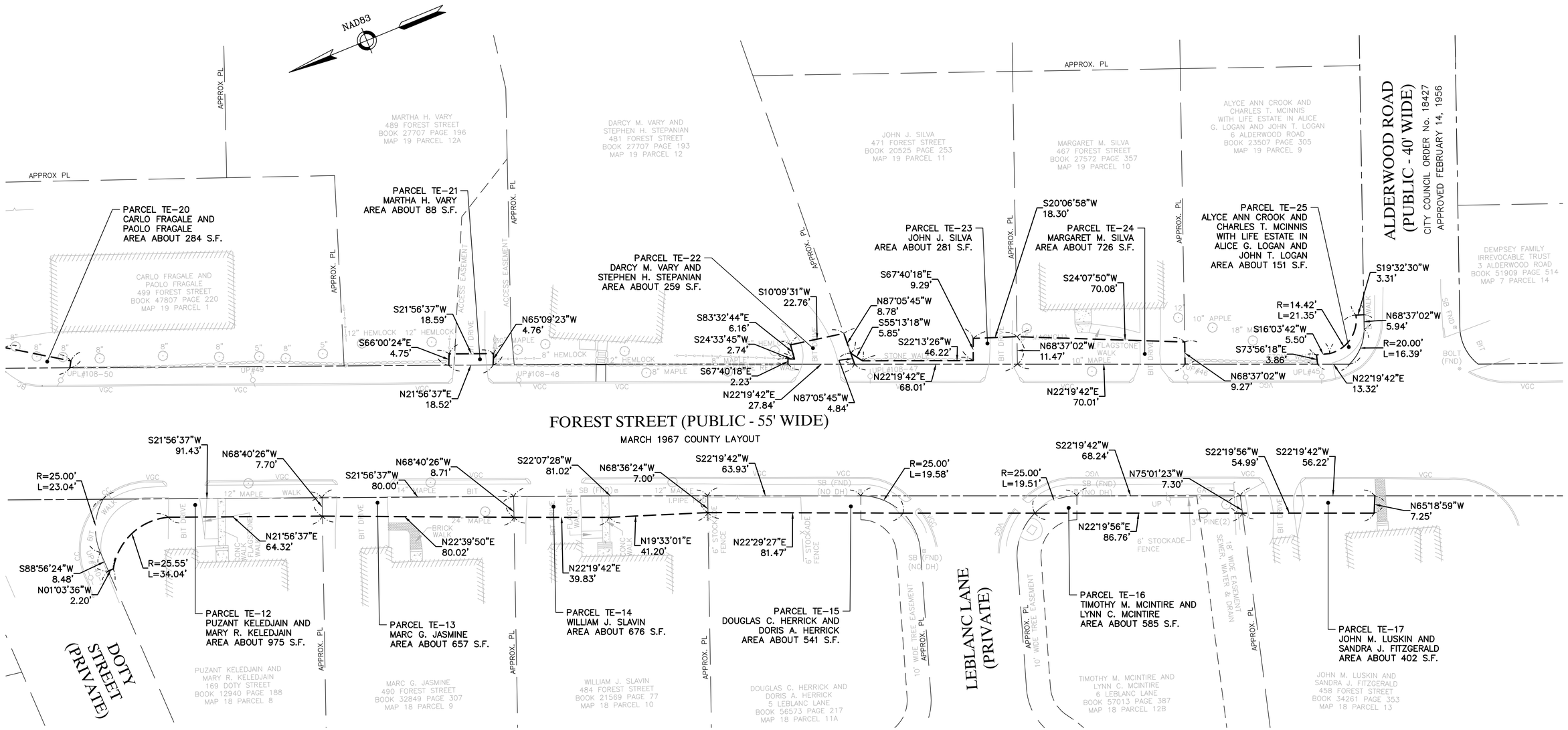
THE PROPERTY LINES SHOWN HEREON ARE THOSE DIVIDING EXISTING OWNERSHIP, AND THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED, AND THAT NO NEW LINES FOR DIVISION OF EXISTING OWNERSHIP OR FOR NEW WAYS ARE SHOWN.

I CERTIFY THAT THIS PLAN HAS BEEN PREPARED IN CONFORMITY WITH THE RULES AND REGULATIONS OF THE REGISTERS OF DEEDS OF THE COMMONWEALTH OF MASSACHUSETTS.

PROGRESS PRINT 11/1/2012

DATE _____

CONT. ON SHEET 2



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PROGRESS PRINT 11/1/2012

_____

DATE _____

TEMPORARY EASEMENTS

PARCEL DESCRIPTION

PARCEL TE-1

BEGINNING AT A POINT on the northeasterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, N 63° 49' 19" E for a distance of 4.20 feet;
Thence, S 25° 52' 20" E for a distance of 63.60 feet;
Thence, S 00° 18' 13" E for a distance of 6.14 feet;
Thence N 27° 09' 26" W a distance of 69.14 feet to the **POINT OF BEGINNING**;
Containing about 229 square feet

PARCEL TE-2

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, by a curve turning to the right having a radius of 25.00 feet, for a distance of 38.83 feet;
Thence, S 62° 50' 34" W for a distance of 4.06 feet;
Thence, N 27° 09' 26" W for a distance of 5.27 feet;
Thence by a curve turning to the left having a radius of 22.02 feet, for a distance of 34.95 feet;
Thence N 62° 50' 34" E a distance of 4.28 feet to the **POINT OF BEGINNING**;
Containing about 198 square feet

PARCEL TE-3

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 26° 10' 41" E a distance of 75.00 feet;
Thence, S 63° 49' 19" W for a distance of 7.02 feet;
Thence, N 28° 14' 47" W for a distance of 37.43 feet;
Thence, N 2° 04' 59" W for a distance of 7.43 feet;
Thence, N 28° 29' 15" W for a distance of 42.35 feet;
Thence, N 84° 41' 00" W for a distance of 18.82 feet;
Thence, N 05° 37' 40" W for a distance of 3.68 feet;
Thence by a curve turning to the right having a radius of 25.00 feet for a distance of 36.07 feet to the **POINT OF BEGINNING**;
Containing about 693 square feet

PARCEL TE-4

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 26° 10' 41" E for a distance of 100.00 feet;
Thence, S 63° 49' 19" W a distance of 6.79 feet;
Thence, N 26° 18' 54" W for a distance of 100.00 feet;
Thence, N 63° 49' 19" E for a distance of 7.02 feet to the **POINT OF BEGINNING**;
Containing about 691square feet

PARCEL TE-5

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 26° 10' 41" E for a distance of 100.00 feet;
Thence, S 63° 49' 19" W for a distance of 7.07 feet;
Thence, N 26° 00' 57" W for a distance of 100.00 feet;
thence N 63° 49' 19" E a distance of 6.79 feet to the **POINT OF BEGINNING**;
Containing about 693 square feet

PARCEL TE-6

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 26° 10' 41" E for a distance of 100.00 feet;
Thence, S 63° 49' 19" W for a distance of 23.72 feet;
Thence, N 32° 54' 23" E for a distance of 20.19 feet;
Thence N 27° 05' 11" W a distance of 46.65 feet;
Thence, N 89° 03' 09" W for a distance of 16.89 feet;
Thence, N 26° 11' 38" W for a distance of 26.20 feet;
Thence, N 63° 48' 22" E for a distance of 18.11 feet;
Thence, N 26° 11' 38" W for a distance of 7.00 feet;
Thence, S 68° 24' 41" W for a distance of 3.01 feet;
Thence, N 26° 00' 57" W for a distance of 1.84 feet;
Thence, N 63° 49' 19" E for a distance of 7.07 feet to the **POINT OF BEGINNING**;
Containing about 1,209 square feet

PARCEL TE-7

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 27° 55' 34" E for a distance of 49.16 feet;
Thence, S 26° 52' 21" E for a distance of 49.23 feet;
Thence, S 56° 53' 11" E for a distance of 30.82 feet;
Thence, by a curve turning to the right having a radius of 25.00 feet for a distance of 32.00 feet.
Thence, N 26° 10' 41" W for a distance of 100.91 feet to the **POINT OF BEGINNING**;
Containing about 277 square feet

PARCEL TE-8

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, by a curve turning to the right having a radius of 25.00 feet for a distance of 37.03 feet;
Thence, S 13° 42' 48" E for a distance of 45.70 feet;
Thence, S 15° 22' 57" E for a distance of 29.45 feet;
Thence, S 25° 33' 25" E for a distance of 89.17 feet;
Thence, S 30° 14' 46" E for a distance of 47.87 feet;
Thence, N 40° 42' 07" W for a distance of 39.11 feet;

Thence N 26° 10' 41" W a distance of 147.70 feet to the **POINT OF BEGINNING**;
Containing about 1,773 square feet

PARCEL TE-9

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 26° 10' 41" E for a distance of 95.32 feet;
Thence, by a curve turning to the right having a radius of 50.00 feet for a distance of 28.13 feet;
Thence, S 86° 16' 34" W for a distance of 5.02 feet;
Thence, N 8° 40' 43" E for a distance of 11.24 feet;
Thence, N 26° 58' 59" W a distance of 64.51 feet;
Thence, S 83° 16' 45" W for a distance of 19.26 feet
Thence, N 24° 22' 01" W for a distance of 39.96 feet;
Thence, N 63° 49' 19" E for a distance of 23.72 feet to the **POINT OF BEGINNING**;
Containing about 1,523 square feet

PARCEL TE-10

BEGINNING AT A POINT on the westerly location line of the March 1967 County Layout of Forest Street; thence, by a curve turning to the right having a radius of 50.00 feet for a distance of 13.86 feet;
Thence, S 21° 56' 37" W for a distance of 97.61 feet;
Thence, N 81° 04' 46" W for a distance of 7.18 feet;
Thence, N 21° 56' 37" E for a distance of 45.80 feet;
Thence, N 22° 26' 45" E for a distance of 64.94 feet;
Thence, N 86° 16' 34" E for a distance of 5.02 feet to the **POINT OF BEGINNING**.
Containing about 751 square feet

PARCEL TE-11

BEGINNING AT A POINT on the westerly location line of the March 1967 County Layout of Forest Street; thence, S 21° 56' 37" W a distance of 96.05 feet;
Thence, by a curve turning to the right having a radius of 25.00 feet for a distance of 5.41 feet;
Thence, S 88° 56' 24" W for a distance of 31.68 feet;
Thence, N 8° 10' 15" E for a distance of 4.88 feet;
Thence, N 89° 55' 09" E for a distance of 23.05 feet;
Thence, N 54° 34' 56" E for a distance of 13.36 feet;
Thence, N 21° 34' 46" E for a distance of 84.80 feet;
Thence, S 81° 04' 46" E for a distance of 7.18 feet to the **POINT OF BEGINNING**;
Containing about 819 square feet

PARCEL TE-12

BEGINNING AT A POINT on the westerly location line of the March 1967 County Layout of Forest Street; thence, S 21° 56' 37”W for a distance of 91.43 feet;
Thence, N 68° 40' 26" W for a distance of 7.70 feet;

Thence, N 21° 56' 37" E for a distance of 64.32 feet;
Thence, by a curve turning to the left having a radius of 25.55 feet for a distance of 34.04 feet;
Thence, N 1° 03' 36" W for a distance of 2.20 feet;
Thence, N 88° 56' 24" E for a distance of 8.48 feet;
Thence, by a curve turning to the right having a radius of 25.00 feet for a distance of 23.04 feet to the **POINT OF BEGINNING**.
Containing about 975 square feet

PARCEL TE-13

BEGINNING AT A POINT on the westerly location line of the March 1967 County Layout of Forest Street; thence, S 21° 56' 37" W for a distance of 80.00 feet;
Thence, N 68° 40' 26" W for a distance of 8.71 feet;
Thence, N 22° 39' 50" E for a distance of 80.02 feet;
thence S 68° 40' 26" E a distance of 7.70 feet to the **POINT OF BEGINNING**;
Containing about 657 square feet

PARCEL TE-14

BEGINNING AT A POINT on the westerly location line of the March 1967 County Layout of Forest Street; thence, S 22° 07' 28" W a distance of 81.02 feet;
Thence, N 68° 36' 24" W for a distance of 7.00 feet;
Thence, N 19° 33' 01" E for a distance of 41.20 feet;
Thence, N 22° 19' 42" E for a distance of 39.83 feet;
Thence, S 68° 40' 26" E for a distance of 8.71 feet to the **POINT OF BEGINNING**;
Containing about 676 square feet

PARCEL TE-15

BEGINNING AT A POINT on the westerly location line of the March 1967 County Layout of Forest Street; thence, S 22° 19' 42" W a distance of 63.93 feet;
Thence, by a curve turning to the right having a radius of 25.00 feet for a distance of 19.58 feet;
Thence, N 22° 29' 27" E for a distance of 81.47 feet;
Thence, S 68° 36' 24" E for a distance of 7.00 feet to the **POINT OF BEGINNING**;
Containing about 541 square feet

PARCEL TE-16

BEGINNING AT A POINT on the westerly location line of the March 1967 County Layout of Forest Street; thence, S 22° 19’ 42" W for a distance of 68.24 feet;
Thence, N 75° 01' 23" W for a distance of 7.30 feet;
Thence, N 22° 19' 56" E for a distance of 86.76 feet;
Thence, by a curve turning to the right having a radius of 25.00 feet for a distance of 19.51 feet;
to the **POINT OF BEGINNING**.
Containing about 585 square feet

PARCEL TE-17

BEGINNING AT A POINT on the westerly location line of the March 1967 County Layout of Forest Street; thence, S 22° 19' 42" W a distance of 56.22 feet;
Thence, N 65° 18' 59" W for a distance of 7.25 feet;
Thence, N 22° 19' 56" E for a distance of 54.99 feet;
Thence, N 75° 01' 23" W for a distance of 7.30 feet to the **POINT OF BEGINNING**;
Containing about 402 square feet

PARCEL TE-18

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 26° 10' 41" E for a distance of 72.53 feet;
Thence, S 17° 48' 48" W for a distance of 1.15 feet;
Thence, N 26° 40' 16" W for a distance of 69.34 feet;
Thence, S 62° 57' 22" W for a distance of 2.02 feet;
Thence, N 27° 02' 38" W for a distance of 4.00 feet;
Thence, N 62° 57' 22" E a distance of 3.48 feet to the **POINT OF BEGINNING**;
Containing about 90 square feet

PARCEL TE-19

BEGINNING AT A POINT on the easterly location line of the March 1967 County Layout of Forest Street; thence, N 21° 56' 37" E for a distance of 19.59 feet;
Thence, S 68° 03' 23" E for a distance of 2.74 feet;
Thence, N 88° 01' 04" E for a distance of 2.37 feet;
Thence, S 21° 56' 37" W for a distance of 17.77 feet;
Thence, S 82° 23' 16" W a distance of 5.63 feet to the **POINT OF BEGINNING**;
Containing about 90 square feet

PARCEL TE-20

BEGINNING AT A POINT on the easterly location line of the March 1967 County Layout of Forest Street; thence, N 21° 56' 37" E for a distance of 31.62 feet;
Thence, N 89° 06' 43" E for a distance of 29.10 feet;
Thence, S 71° 18' 48" W for a distance of 23.97 feet;
Thence, S 33° 39' 04" W for a distance of 28.35 feet;
Thence, N 59° 10' 56" W a distance of 2.92 feet to the **POINT OF BEGINNING**;
Containing about 284 square feet

PARCEL TE-21

BEGINNING AT A POINT on the easterly location line of the March 1967 County Layout of Forest Street; thence, N 21° 56' 37" E for a distance of 18.52 feet;
Thence, S 66° 00' 24" E for a distance of 4.75 feet;

Thence, S 21° 56' 37" W for a distance of 18.59 feet;
Thence, N 65° 09' 23" W a distance of 4.76 feet to the **POINT OF BEGINNING**;
Containing about 88 square feet

PARCEL TE-22

BEGINNING AT A POINT on the easterly location line of the March 1967 County Layout of Forest Street; thence, N 22° 19' 42" E for a distance of 27.84 feet;
Thence, S 67° 40' 18" E for a distance of 2.23 feet;
Thence, S 24° 33' 45" W for a distance of 2.74 feet;
Thence, S 83° 32' 44" E a distance of 6.16 feet;
Thence, S 10° 09' 31" W for a distance of 22.76 feet;
Thence, N 87° 05' 45" W for a distance of 13.62 feet to the **POINT OF BEGINNING**;
Containing about 259 square feet

PARCEL TE-23

BEGINNING AT A POINT on the easterly location line of the March 1967 County Layout of Forest Street; thence, N 22° 19' 42" E for a distance of 68.01 feet;
Thence, S 87° 05' 45" E for a distance of 4.84 feet;
Thence, S 55° 13' 18" W for a distance of 5.85 feet;
Thence, S 22° 13' 26" W for a distance of 46.22 feet;
Thence, S 67° 40' 18" E a distance of 9.29 feet;
Thence, S 20° 06' 58" W for a distance of 18.30 feet;
Thence, N 68° 37' 02" W for a distance of 11.47 feet to the **POINT OF BEGINNING**;
Containing about 281 square feet

PARCEL TE-24

BEGINNING AT A POINT on the easterly location line of the March 1967 County Layout of Forest Street; thence, N 22° 19' 42" E for a distance of 70.01 feet;
Thence, S 68° 37' 02" E a distance of 11.47 feet;
Thence, S 24° 07' 50" W for a distance of 70.08 feet;
Thence, N 68° 37' 02" W for a distance of 9.27 feet to the **POINT OF BEGINNING**;
Containing about 726 square feet

PARCEL TE-25

BEGINNING AT A POINT on the easterly location line of the March 1967 County Layout of Forest Street; thence, N 22° 19' 42" E for a distance of 13.32 feet;
Thence, S 73° 56' 18" E for a distance of 3.86 feet;
Thence, S 16° 03' 42" W for a distance of 5.50 feet;
Thence, by a curve turning to the left having a radius of 14.42 feet for a distance of 21.35 feet;
Thence, S 19° 32' 30" W for a distance of 3.31 feet;

Thence N 68° 37' 02" W a distance of 5.94 feet;
Thence by a curve turning to the right having a radius of 20.00 feet, for a distance of 16.39 feet to the **POINT OF BEGINNING**;
Containing about 151 square feet

PARCEL TE-26

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 19° 06' 35" W for a distance of 9.58 feet;
Thence, N 52° 58' 16" W for a distance of 27.64 feet;
Thence, N 5° 18' 34" W for a distance of 13.48 feet;
Thence, by a curve turning to the left having a radius of 127.21 feet for a distance of 51.16 feet;
Thence, N 5° 48' 18" E for a distance of 2.69 feet;
Thence, by a curve turning to the right having a radius of 115.21 feet for a distance of 86.10 feet to the **POINT OF BEGINNING**.
Containing about 442 square feet

PARCEL TE-27

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 40° 42' 07" E for a distance of 100.79 feet;
Thence, S 49° 17' 54" W for a distance of 6.25 feet;
Thence, N 41° 19' 21" W for a distance of 95.98 feet;
Thence, N 19° 06' 35" E a distance of 9.58 feet to the **POINT OF BEGINNING**;
Containing about 765 square feet

PARCEL TE-28

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 40° 41' 39" E for a distance of 51.53 feet;
Thence, S 43° 50' 57" W for a distance of 2.99 feet;
Thence, N 45° 23' 47" W for a distance of 51.98 feet;
Thence N 49° 17' 54" E a distance of 6.25 feet to the **POINT OF BEGINNING**;
Containing about 264 square feet

PARCEL TE-29

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 40° 42' 07" E for a distance of 51.01 feet;
Thence, S 49° 17' 53" W for a distance of 5.72 feet;
Thence, N 43° 03' 57" W for a distance of 55.48 feet;
Thence, N 80° 07' 49" W for a distance of 16.25 feet;
Thence, S 49° 21' 58" W for a distance of 8.91 feet;
Thence, N 40° 38' 02" W for a distance of 3.01 feet;
Thence, N 49° 17' 53" E for a distance of 7.23 feet;

Thence, by a curve turning to the right having a radius of 20.00 feet for a distance of 31.42 feet to the **POINT OF BEGINNING**.
Containing about 542 square feet

PARCEL TE-30

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 40° 42' 07" E for a distance of 70.00 feet;
Thence, S 49° 17' 53" W for a distance of 5.72 feet;
Thence, N 40° 42' 07" W for a distance of 70.00 feet;
Thence N 49° 17' 53" E a distance of 5.72 feet to the **POINT OF BEGINNING**;
Containing about 400 square feet

PARCEL TE-31

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 40° 42' 07" E for a distance of 70.00 feet;
Thence, S 49° 17' 53" W for a distance of 12.91 feet;
Thence, N 40° 42' 07" W for a distance of 22.15 feet;
Thence, N 32° 09' 04" W for a distance of 48.39 feet;
thence N 49° 17' 53" E a distance of 5.72 feet to the **POINT OF BEGINNING**;
Containing about 732 square feet

PARCEL TE-32

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 40° 42' 07" E for a distance of 51.00 feet;
Thence, by a curve turning to the right having a radius of 20.00 feet for a distance of 31.37 feet;
Thence, S 49° 09' 20" W for a distance of 5.07 feet;
Thence, N 41° 24' 23" W for a distance of 3.02 feet;
Thence, N 49° 22' 20" E for a distance of 8.65 feet;
Thence, by a curve turning to the left having a radius of 12.49 feet for a distance of 18.25 feet;
Thence, N 48° 17' 45" W for a distance of 55.87 feet;
Thence N 49° 17' 53" E a distance of 12.91 feet to the **POINT OF BEGINNING**;
Containing about 602 square feet

PARCEL TE-33

BEGINNING AT A POINT on the southwesterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 40° 42' 07" E for a distance of 5.87 feet;
Thence, S 49° 17' 53" W for a distance of 3.00 feet;
Thence, N 40° 42' 07" W for a distance of 5.87 feet;
Thence, by a curve turning to the left having a radius of 17.00 feet for a distance of 26.77 feet;
Thence, S 49° 40' 35" W for a distance of 4.93 feet;
Thence, N 40° 42' 07" W for a distance of 2.97 feet;

Thence, N 49° 17' 53" E for a distance of 5.00 feet;
Thence, by a curve turning to the right having a radius of 20.00 feet for a distance of 31.42 feet to the **POINT OF BEGINNING**.
Containing about 120 square feet

PARCEL TE-34

BEGINNING AT A POINT on the northeasterly location line of the December 29, 1988 County Layout of Trapelo Road; thence, S 42° 51' 32" E for a distance of 163.97 feet;
Thence, S 40° 15' 59" E for a distance of 278.45 feet;
Thence, S 49° 17' 53" W for a distance of 4.05 feet;
Thence N 40° 42' 07" W a distance of 442.30 feet to the **POINT OF BEGINNING**;
Containing about 1,929 square feet

ROADWAY & TRAFFIC SIGNAL IMPROVEMENT PROJECT

TRAPELO ROAD & FOREST STREET

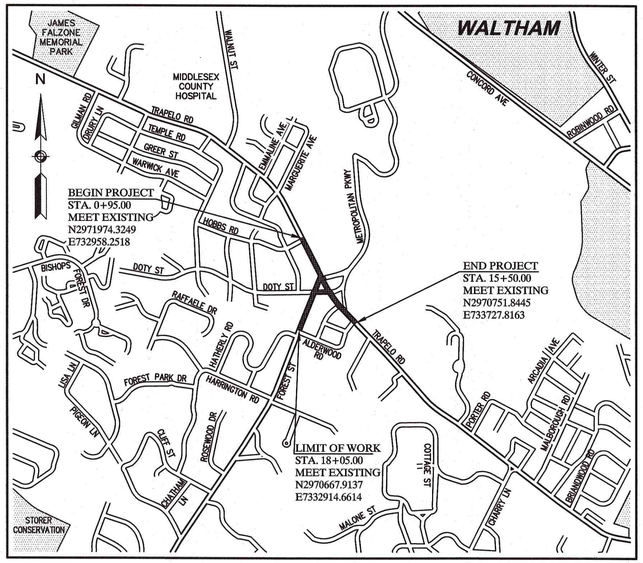
IN THE CITY OF

WALTHAM

MIDDLESEX COUNTY

COMMONWEALTH OF MASSACHUSETTS

INDEX



PROJECT LOCATION MAP

SCALE: 1"=1000'

GRAPHIC SCALE

0 500 1000 1500 2000 3000 FEET

LENGTH OF PROJECT= xxx FEET = xx MILE

THE 1988 MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES; THE SUPPLEMENTAL SPECIFICATIONS, DATED JUNE 15, 2012; THE 2012 CONSTRUCTION STANDARD DETAILS; 1996 CONSTRUCTION AND TRAFFIC STANDARD DETAILS (TRAFFIC STANDARD DETAILS ONLY); THE 2009 "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" WITH MASSACHUSETTS AMENDMENTS; THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING; AND THE LATEST EDITION OF AMERICAN STANDARD FOR NURSERY STOCK; AND ALL AMENDMENTS WILL GOVERN.

NOTES:

1. ALL MEASUREMENTS ARE IN ENGLISH UNITS.
2. SEPARATE SPECIAL PROVISIONS ARE A PART OF THIS CONTRACT.

DESIGN DESIGNATION

	TRAPELO ROAD (N. OF FOREST STREET)	TRAPELO ROAD (S. OF FOREST STREET)	FOREST STREET
DESIGN SPEED:	35 MPH	35 MPH	30 MPH
ADT (2012):	14,211	11,526	7,477
ADT (2022):	16,168	13,114	8,508
K:	8.2%	8.0%	8.1%
D:	54% NB	57% SB	56% WB
T (PEAK HOUR):	1.94%	3.14%	3.64%
T (AVERAGE DAY):	2.59%	5.57%	4.20%
DHV:	1,321	1,052	692
DDHV:	718	596	386
FUNCTIONAL CLASSIFICATION:	URBAN MINOR ARTERIAL (NON-NHS ROAD)	URBAN MINOR ARTERIAL (NON-NHS ROAD)	URBAN COLLECTOR (NON-NHS ROAD)

TITLE SHEET & INDEX

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
Engineers, Architects, Planners, Construction Engineers & Inspectors
181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

COMMONWEALTH OF MASSACHUSETTS
JOHN W. DIAZ
CIVIL
No. 40436
REGISTERED PROFESSIONAL ENGINEER

8/02/12

NO.	REVISION	DATE

DESIGN/DRAWN BY: RJD/RJD
CHECK BY: JWD/GJH
DATE: 7/13/2012
SCALE: AS NOTED
JOB NO.: MAX–2012005.00
FILE NAME: 12005.00_CS
DRAWING NO.: 1 OF 68

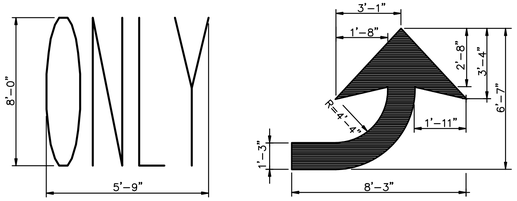
GENERAL LEGEND

EXISTING	PROPOSED	
		STATE BOUNDARY LINE
		CITY, TOWN OR COUNTY BOUNDARY LINE
		STATE HIGHWAY LAYOUT LINE
		CITY, TOWN OR COUNTY LAYOUT LINE
		EASEMENT LINE
		PROPERTY LINE
WF		EDGE OF VEGETATED WETLAND/WETLAND FLAG
		HIGHWAY/PROPERTY BOUND (TYPE NOTED)
N00°00'00"E +93.16	PT N00°00'00"E +93.16	CONSTRUCTION/SURVEY BASELINE
		TREE (TYPE & SIZE NOTED)
		EDGE OF WOODS/SHRUBS
		HANDICAP RAMP
		BENCH
MB	MB	MAIL BOX
PM	PM	PARKING METER
		SIGN
x x x	x x x	FENCE (SIZE & TYPE AS NOTED)
		HIGHWAY GUARD (TYPE AS NOTED)
		BALANCED WALL (SIZE & TYPE AS NOTED)
		RETAINING WALL (SIZE & TYPE AS NOTED)
76	76	CONTOURS
x100.00 , 100.15 /100.00	x100.00 , 100.15 /100.00	SPOT ELEVATION, TOP AND BOTTOM CURB
EOP	EOP	CURB OR BERM (TYPE AS NOTED)
		EDGE OF PAVEMENT (NO CURB OR BERM)
		BACK OF SIDEWALK
		TOP OR BOTTOM OF SLOPE (CUT OR FILL)
		SAWCUT LINE
		APPROX. COLD PLANING/TRANSITION AREA
		GRANITE RUBBLE BLOCK PAVEMENT
		SCORED CONCRETE PAVEMENT
	B-1	BORINGS, PAVEMENT CORES (SEE SPEC. PROV.)
D		DRAIN LINE
UD	UD	UNDERDRAIN (PERFORATED)
		DIRECTION OF FLOW
		PAVED WATERWAY
DMH	DMH	DRAIN MANHOLE
CB,GI,DI	CB,GI,DI	CATCH BASIN, DROP OR GUTTER INLET
CBCI,GICI	CBCI,GICI	CATCH BASIN (OR GUTTER INLET) WITH CURB INLET
LB		LEACHING BASIN
FE		FLARED END
HDWL		HEADWALL
S	S	SEWER LINE
SMH	SMH	SEWER MANHOLE
CS	CS	COMBINED SEWER LINE
CSMH	CSMH	COMBINED SEWER MANHOLE
FMGV	FMGV	FORCE MAIN GATE VALVE
W	W	WATER MAIN
WMH	WMH	WATER MANHOLE
HYD		HYDRANT
FA,FSP	FA,FSP	FIRE ALARM BOX, FIRE STAND PIPE
		REDUCER
CS,WSO		CURB STOP OR WATER SHUT OFF
WG	WG	WATER GATE
G	G	GAS MAIN
GG	GG	GAS GATE
GSO	GSO	GAS SHUT OFF
E	E	ELECTRICAL LINE OR DUCT
		ELECTRICAL CONDUIT
EMH	EMH	ELECTRICAL MANHOLE
EHH		ELECTRICAL HANDHOLE
PB	PB	PULL BOX (12" x 12")
JB,SB	JB,SB	ELECTRICAL JUNCTION OR SWITCH BOX
LCC		ELECTRICAL LOAD CENTER CABINET W/FDN
LP		LIGHT POLE
UP		UTILITY POLE
GUY	GUY	GUY WIRE & ANCHOR
T	T	TELEPHONE LINE OR DUCT
TMH	TMH	TELEPHONE MANHOLE
ST	ST	STEAM LINE
STMH	STMH	STEAM MANHOLE/TUNNEL HATCH
		PLUG OR CAP
		DELINEATOR
OHW		OVERHEAD WIRES
CATV		CABLE TV

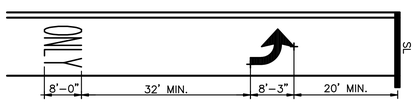
PAVEMENT MARKING LEGEND

EXISTING	PROPOSED	
SL	SL	STOP LINE – 12"
CW	CW OR CW	CROSSWALK – 2–12" WHITE LINES 9' ON CENTER. LONGITUDINAL LINES ARE 12" WHITE LINES 3' ON CENTER.
SWLL	SWLL	SOLID WHITE LANE LINE – 4" (6" IN SHLO)
SWEL	SWEL	SOLID WHITE EDGE LINE – 4" (6" IN SHLO)
SWGL	SWGL	SOLID WHITE GORE LINE – 12"
BWLL	BWLL	*BROKEN WHITE LANE LINE – 4" (6" IN SHLO)
BYLL	BYLL	*BROKEN YELLOW LANE LINE – 4" (6" IN SHLO)
WGL	WGL	WHITE GORE LINE – 12"
DWL	DWL	**DOTTED WHITE LINE – 4" (6" IN SHLO)
DYL	DYL	**DOTTED YELLOW LINE – 4" (6" IN SHLO)
SYL	SYL	SOLID YELLOW LINE – 4" (6" IN SHLO)
SYEL	SYEL	SOLID YELLOW EDGE LINE – 4" (6" IN SHLO)
SYGL	SYGL	SOLID YELLOW GORE LINE – 12"
YGL	YGL	YELLOW GORE LINE – 12"
DYL	DYL	DOUBLE YELLOW LINE – 2–4" (6" IN SHLO)
DYCL	DYCL	DOUBLE YELLOW CENTER LINE – 2–4" (6" IN SHLO)
		PAVEMENT ARROW & LEGEND
		PAVEMENT ARROWS

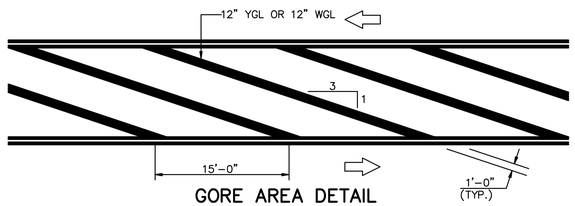
*BROKEN LANE LINES TO BE 10' IN LENGTH WITH 30' GAP (TYP.)
**DOTTED LINE TO BE 3' IN LENGTH WITH 9' GAP FOR LANE DROP/ADD MARKINGS
**DOTTED LINE TO BE 2' IN LENGTH WITH 4' GAP FOR LINE EXTENSIONS



NOTE:
ARROW & ONLY=APPROX. 46 SQ.FT.



ARROW & ONLY DETAIL
NOT TO SCALE



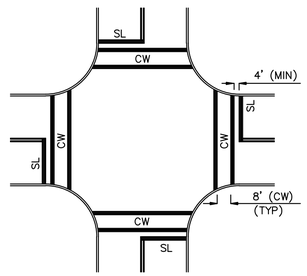
GORE AREA DETAIL
NOT TO SCALE

GENERAL ABBREVIATIONS

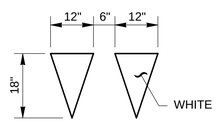
ABAN	ABANDON
ACCMP	ASPHALT COATED CORRUGATED METAL PIPE
ADJ	ADJUST
APPROX	APPROXIMATE
BC	BOTTOM OF CURB
BD	BOUND
BIT CONC	BITUMINOUS CONCRETE
BO	BY OTHERS
BM	BENCH MARK
BW	BOTTOM OF WALL
CEM CONC	CEMENT CONCRETE
CC	CENTER OF CURVE
CCB	CAPE COD BERM
CI	CURB INLET
CIP	CAST IRON PIPE
CIT	CHANGE IN TYPE
CLR	CLEARANCE
CLF	CHAIN LINK FENCE
CLDI	CEMENT LINED DUCTILE IRON
CMP	CORRUGATED METAL PIPE
CONST	CONSTRUCTION
CP	CENTER POINT
CPP	CORRUGATED PLASTIC PIPE
COND	CONDUIT
DIP	DUCTILE IRON PIPE
DR	DRIVEWAY
ELEV OR EL	ELEVATION
EOP	EDGE OF PAVEMENT
ETW	EDGE OF TRAVELED WAY
EXIST	EXISTING
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
FDN	FOUNDATION
FND	FOUND
FWD	FILLED WITH DEBRIS
GRAN	GRANITE
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HP	HIGH POINT
HYD	HYDRANT
INV	INVERT
LB	LOAM BORROW
LO	LAYOUT
MAX	MAXIMUM
MIN	MINIMUM
MHB	MASSACHUSETTS HIGHWAY BOUND
MHD	MASSACHUSETTS HIGHWAY DEPARTMENT
MLB	MODIFIED LOAM BORROW
MON	MONUMENT
NIC	NOT IN CONTRACT
NGVD	NATIONAL GEODETIC VERTICAL DATUM
N/F	NOW OR FORMERLY
OHW	OVERHEAD WIRE
PC	POINT OF CURVE
PCC	POINT OF COMPOUND CURVE
PGL	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE
PRC	POINT OF REVERSE CURVE
PROP	PROPOSED
PT	POINT OF TANGENT
PVC	POINT OF VERTICAL CURVE
PVCC	POINT OF VERTICAL COMPOUND CURVE
PVCP	POLYVINYLCHLORIDE PIPE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
PVRC	POINT OF VERTICAL REVERSE CURVE
PVT	POINT OF VERTICAL TANGENT
PWW	PAVED WATERWAY
R	RADIUS
R&D	REMOVE AND DISPOSE
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
REM	REMOVE
REMOD	REMODEL
RCP	REINFORCED CONCRETE PIPE
RET	RETAIN
ROW	RIGHT OF WAY
RR	RAILROAD
SB	STONE BOUND
SB/DH	STONE BOUND/DRILL HOLE
SHLD	SHOULDER
SHLO	STATE HIGHWAY LAYOUT
SSD	STOPPING SIGHT DISTANCE
STA	STATION
STL	STEEL
TBM	TEMPORARY BENCH MARK
TC	TOP OF CURB
TOS	TOP OF SLOPE
TS	TRAFFIC SIGNAL
TSV & B	TAPPING SLEEVE, VALVE AND BOX
TYP	TYPICAL
TW	TOP OF WALL
UC	UNDER CONSTRUCTION
USGS	U.S. GEOLOGICAL SURVEY
UP	UTILITY POLE
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
WCR	WHEELCHAIR RAMP

GENERAL NOTES

1. TOPOGRAPHICAL AND EXISTING CONDITION INFORMATION WAS OBTAINED FROM A SURVEY PERFORMED BY HAYNER/SWANSON INC., NASHUA, NH AND SUPPLEMENTED WITH ADDITIONAL SURVEY PERFORMEND BY GREENMAN–PEDERSEN, INC. THE VERTICAL DATUM OF THIS PLAN IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 1988). THE COORDINATES SHOWN HEREON ARE DERIVED FROM THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM (GPS DISKS 214P/214R) AS REFERENCED TO THE NORTH AMERICAN DATUM OF 1983.
2. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO LOCATE EXACTLY AND TO PRESERVE ANY AND ALL UNDERGROUND UTILITIES. CALL "DIG–SAFE" 1–888–DIGSAFE (344–7233) AT LEAST 72 HOURS BEFORE COMMENCING CONSTRUCTION.
3. WHERE AN EXISTING UNDERGROUND UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
4. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.
5. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
6. THE TERM "PROPOSED" (PROP.) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS, OR, WHERE APPLICABLE, RE–USING EXISTING MATERIALS IDENTIFIED AS "REMOVE & RESET" (R&R).
7. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS NOTED OTHERWISE.
8. ALL PROPOSED PAVEMENT MARKINGS SHALL BE THERMOPLASTIC.
9. ALL EXISTING STATE, COUNTY, CITY AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATIONS ARE NOT GUARANTEED.
10. ALL TRANSVERSE JOINTS, AND ALL LONGITUDINAL JOINTS BETWEEN NEW SURFACE PAVEMENT AND EXISTING SURFACE PAVEMENT TO REMAIN SHALL BE COATED WITH A HOT POURED RUBBERIZED ASPHALT SEALANT MEETING THE REQUIREMENTS OF FEDERAL SPECIFICATION NUMBER SS–S–1401.
11. ALL DISTURBED AREAS NOT DESIGNATED TO BE PAVED SHALL HAVE LOAM BORROW PLACED AND SEEDED. THE LOAM BORROW SHALL HAVE A MINIMUM DEPTH OF 4 INCHES AND SHALL BE PLACED FLUSH WITH THE TOP OF THE ADJACENT CURB, EDGING, BERM OR PAVEMENT SURFACE.
12. THE LIMIT OF WORK AREA SHALL BE THE STREET RIGHT OF WAY UNLESS SHOWN OTHERWISE.
13. ALL PROPERTY LINES BETWEEN ABUTTERS ARE APPROXIMATE ONLY.
14. PRIOR TO THE START OF ANY NEW UTILITY WORK, ALL ELEVATIONS OF EXISTING UTILITIES IN THOSE AREAS ARE TO BE VERIFIED. THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY SHOULD ANY DISCREPANCIES OCCUR.
15. ALL CASTINGS SHALL BE SET FLUSH WITH FINISHED GRADE.
16. ALL GATE BOXES, SERVICE BOXES AND PUBLICLY OWNED MANHOLE FRAMES AND COVERS SHALL BE ADJUSTED TO GRADE BY THE CONTRACTOR.
17. SHOP DRAWINGS OF ALL CASTINGS, PRECAST CONCRETE STRUCTURES, PIPE AND MANUFACTURED COMPONENTS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO ORDERING.
18. ALL NEW SIDEWALKS AND DRIVEWAY GRADES SHALL MATCH EXISTING GRADES AT BACK OF SIDEWALK LINE UNLESS SHOWN OTHERWISE ON THE PLANS AND CROSS–SECTIONS.
19. THE CONTRACTOR SHALL TAKE EVERY PRECAUTION TO PROTECT ALL EXISTING TREES AND ROOTS THAT ARE NOT DESIGNATED FOR REMOVAL.
20. CONTRACTOR TO CONTACT ENGINEER PRIOR TO INSTALLATION OF BOUNDS FOR FINAL LOCATIONS.



TYPICAL CROSSWALK MARKINGS
NOT TO SCALE



YIELD LINE MARKINGS
NOT TO SCALE

GENERAL LEGEND, ABBREVIATIONS, AND NOTES

TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
Engineers, Architects, Planners, Construction Engineers & Inspectors
181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

NO.	REVISION	DATE

DESIGN/DRAWN BY: TQN/TQN
CHECK BY: JWD/GJH
DATE: 7/13/2012
SCALE: AS NOTED
JOB NO.: MAX–2012005.00
FILE NAME: 12005.00_LE
DRAWING NO.: 2 OF 68

TEST BORING LOG — SHEET 1

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

ATC Associates
Site: Mast Arms
Trapelo Road/Forest Street
Waltham, MA

BORING B-1
PROJECT NO. 12-0532
DATE: June 1, 2012

Ground Elevation:
Date Started: May 31, 2012
Date Finished: May 31, 2012
Driller: PG
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1	9"	0-2'0"	3-8-10-5		Dry, brown, loose fine and medium sand, some gravel, little organics.
5		2	7"	5'0"-7'0"	3-2-9-11		Dry, brown, loose fine sand, little medium sand, little silt, trace organics, trace gravel.
10		3	12"	10'0"-12'0"	10-35-35-41		Wet, brown, dense fine and medium sand and gravel, trace silt.
15						12'6"	Refusal with hollow stem augers at 12'6". Water encountered at 9'0" upon completion.
20							
25							
30							
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Trace	0 to 10%	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	Little	10 to 20%	
	Some	20 to 35%	
	And	35% to 50%	

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG — SHEET 2

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

ATC Associates
Site: Mast Arms
Trapelo Road/Forest Street
Waltham, MA

BORING B-2
PROJECT NO. 12-0532
DATE: June 1, 2012

Ground Elevation:
Date Started: May 31, 2012
Date Finished: May 31, 2012
Driller: PG
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1	6"	0-2'0"	5-7-8-8		Dry, brown, loose fine and medium sand, some gravel, trace organics.
5		2	3"	5'0"-7'0"	12-13-14-21		Dry, brown, medium dense, fine and medium sand and gravel.
10						8'0"	Refusal with hollow stem augers at 8'0". No water encountered upon completion.
15							
20							
25							
30							
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Trace	0 to 10%	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	Little	10 to 20%	
	Some	20 to 35%	
	And	35% to 50%	

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG — SHEET 3

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

ATC Associates
Site: Mast Arms
Trapelo Road/Forest Street
Waltham, MA

BORING B-3
PROJECT NO. 12-0532
DATE: June 1, 2012

Ground Elevation:
Date Started: May 31, 2012
Date Finished: May 31, 2012
Driller: PG
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1	15"	0-2'0"	6-8-9-17		Dry, brown, medium dense, fine and medium sand, some gravel, trace organics.
5		2	15"	5'0"-7'0"	1-3-1-1		Dry, brown, very loose fine sand.
10		3	12"	10'0"-12'0"	10-35-33-45		Dry, brown, dense fine and medium sand, some gravel.
15						12'6"	Refusal with hollow stem augers at 12'6". No water encountered upon completion.
20							
25							
30							
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Trace	0 to 10%	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	Little	10 to 20%	
	Some	20 to 35%	
	And	35% to 50%	

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG — SHEET 4

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

ATC Associates
Site: Mast Arms
Trapelo Road/Forest Street
Waltham, MA

BORING B-4
PROJECT NO. 12-0532
DATE: June 1, 2012

Ground Elevation:
Date Started: May 31, 2012
Date Finished: May 31, 2012
Driller: PG
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS

DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Sample Pen/Rec	Sample Depth	Sample Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1	9"	0-2'0"	3-5-3-3		Dry, brown, very loose, fine and medium sand, some gravel, trace organics.
5		2	6"	5'0"-7'0"	4-3-15-24		Dry, brown, medium dense, fine and medium sand and gravel.
10		3	18"	10'0"-12'0"	28-57-52-50		Dry, brown, very dense, fine and medium sand, some gravel.
15		4	11"	15'0"-17'0"	9-7-18-25		Wet, brown, medium dense, fine and medium sand and gravel.
						17'6"	Refusal with hollow stem augers at 17'6". Water encountered at 14'0" upon completion.
20							
25							
30							
35							
39							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.	Trace	0 to 10%	
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.	Little	10 to 20%	
	Some	20 to 35%	
	And	35% to 50%	

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

ATC ASSOCIATES INC.

Sample Description

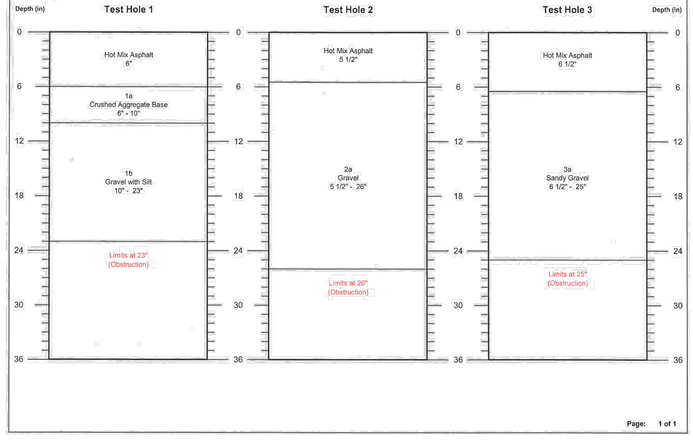
Core No.	Description	Source
C-1a	Crushed Aggregate Base	Core Test Hole #1 6"-10"
C-1b	Gravel with Silt	Core Test Hole #1 10"-23"
C-2a	Gravel	Core Test Hole #2 5 1/2"-26"
C-2b	Sand Gravel	Core Test Hole #2 6 1/2"-25 "

Washed Sieve Analysis (% passing by weight)
(% passing by weight)

Sieve Size (mm)	C-1a	C-1b	C-2a	C-2b
4" (100.0)			100	
3 (75.0)		100	93	
2 (50.0)		98	85	100
1 1/2 (37.5)	100	87	84	95
1 (25.0)	97	77	76	91
3/4 (19.0)	90	68	70	87
1/2 (12.5)	67	61	62	79
3/8 (9.5)	53	55	58	73
#4 (4.75)	36	42	50	64
10 (2.00)	24	32	41	51
20 (.850)	16	25	32	35
40 (.425)	13	20	22	20
50 (.300)	10	17	17	16
80 (.180)	9	14	11	11
200 (.075)	6.1	9.0	5.0	6.5

ATC Associates, Inc.
40 Strafello Drive, Unit G, Avon, MA 02322
Phone: (508) 588-0889 Fax: (508) 588-2414

PROJECT: Forest St. & Trapello Rd. Waltham, MA
DATE: May 31, 2012
CLIENT: Greenman-Pedersen Inc.
ATC PROJECT NUMBER: 25.13351.0028-1
WEATHER: Clear 80's
ATC INSPECTOR: Kurt Royer
LOG PREPARED BY: Antonio Rodrigues



Page: 1 of 1

NOTE:
FOR SOIL BORING AND PAVEMENT CORE LOCATIONS, SEE THE CONSTRUCTION PLANS

SOIL BORING LOGS & PAVEMENT CORES

TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS

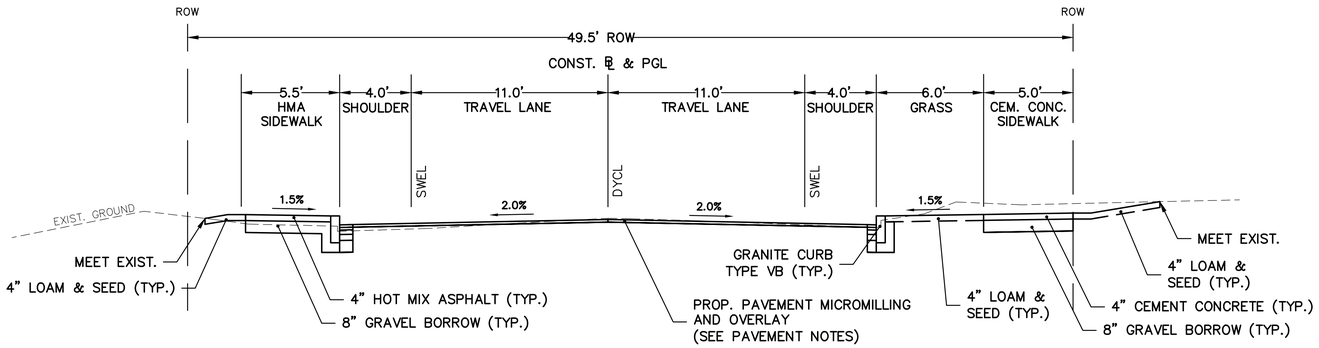
PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
Engineers, Architects, Planners, Construction Engineers & Inspectors
181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

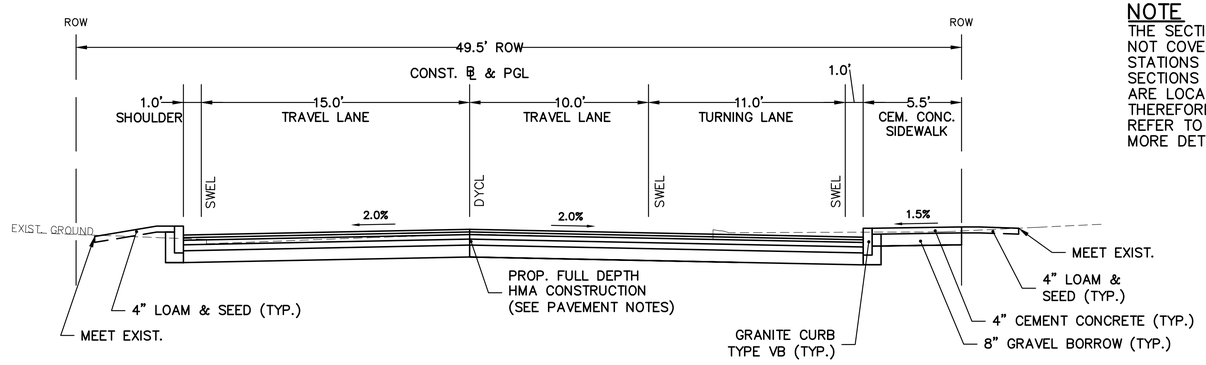
NO.	REVISION	DATE

DESIGN/DRAWN BY: RJD/RJD
CHECK BY: JWD/GJH
DATE: 7/13/2012
SCALE: AS NOTED
JOB NO.: MAX-2012005.00
FILE NAME: 12005.00_TP
DRAWING NO.: 3 OF 68



TYPICAL SECTION – TRAPELO ROAD

STA. 11+00 TO 15+00
SCALE: 1"=4'

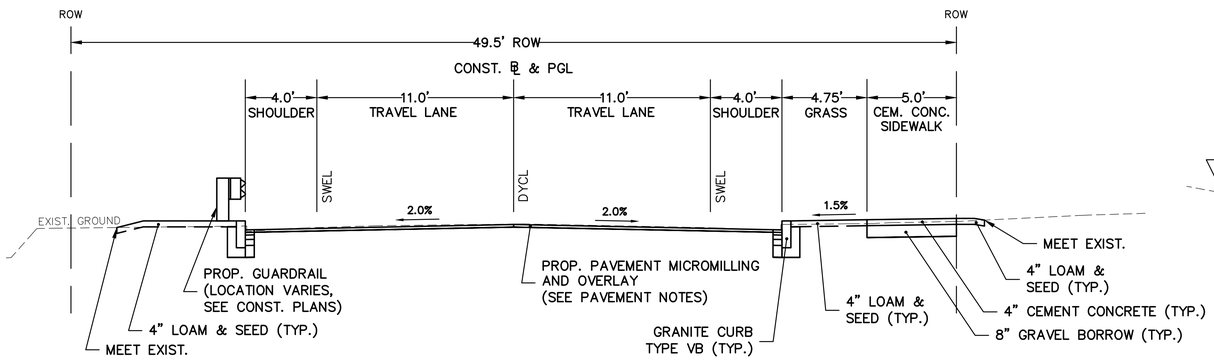


TYPICAL SECTION – TRAPELO ROAD

STA. 8+00 TO 11+00
SCALE: 1"=4'

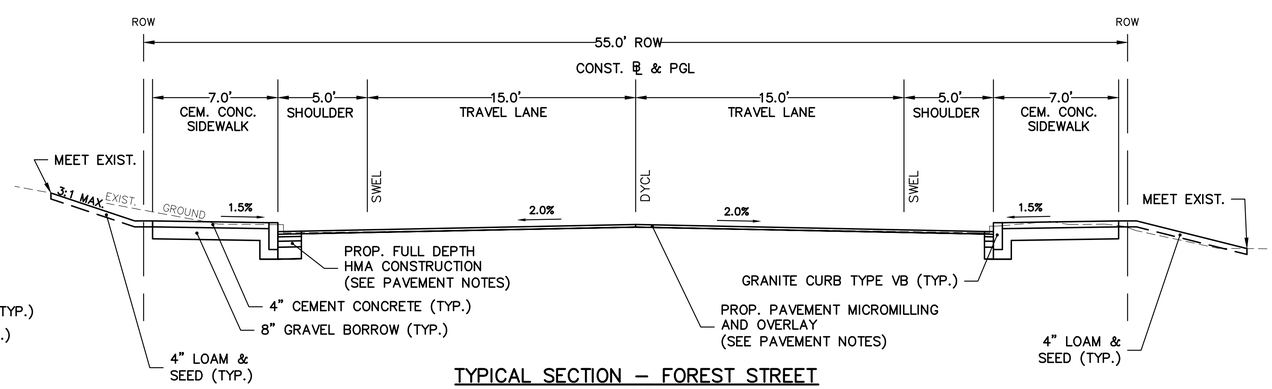
NOTE

THE SECTIONS OF PROPOSED ROADWAY NOT COVERED IN THE RANGE OF STATIONS ASSOCIATED WITH THE TYPICAL SECTIONS ARE EITHER IN TRANSITION OR ARE LOCATED AT INTERSECTIONS AND THEREFORE HAVE NOT BEEN SHOWN. REFER TO CROSS SECTION SHEETS FOR MORE DETAILS.



TYPICAL SECTION – TRAPELO ROAD

STA. 2+00 TO 4+00
SCALE: 1"=4'



TYPICAL SECTION – FOREST STREET

STA. 14+50 TO 18+05
SCALE: 1"=4'

PAVEMENT NOTES

PROPOSED FULL DEPTH HMA CONSTRUCTION

SURFACE COURSE:	3 1/2" HOT MIX ASPHALT PLACED IN TWO LAYERS; 1 3/4" HOT MIX ASPHALT SURFACE COURSE TYPE OVER 1 3/4" HOT MIX ASPHALT INTERMEDIATE COURSE TYPE B OVER
BASE COURSE:	3 1/2" HMA BASE COURSE OVER
SUBBASE:	4" DENSE GRADED CRUSHED STONE OVER 8" GRAVEL BORROW (TYPE B) (OR TO DEPTH OF EXIST. GRAVEL SUB BASE COMPACTED IN PLACE, WHICHEVER IS GREATER)

PROPOSED FULL DEPTH HMA CONSTRUCTION LESS THAN 4' WIDE

SURFACE COURSE:	3 1/2" HOT MIX ASPHALT PLACED IN TWO LAYERS; 1 3/4" HOT MIX ASPHALT SURFACE COURSE TYPE OVER 1 3/4" HOT MIX ASPHALT INTERMEDIATE COURSE TYPE B OVER
BASE COURSE:	8" HIGH EARLY STRENGTH CEMENT CONCRETE BASE OVER
SUBBASE:	6" GRAVEL BORROW (TYPE B) (OR TO DEPTH OF EXIST. GRAVEL SUB BASE COMPACTED IN PLACE, WHICHEVER IS GREATER)

PAVEMENT MICROMILLING & OVERLAY

SURFACE COURSE:	1 3/4" HOT MIX ASPHALT SURFACE COURSE TYPE B OVER
SURFACE MILLING:	MIN. 1 3/4" PAVEMENT MICROMILLING TO ACHIEVE A 2% CROSS SLOPE

PROPOSED CEMENT CONCRETE SIDEWALK, ISLAND & WHEELCHAIR RAMPS

SURFACE COURSE:	4" CEMENT CONCRETE (AIR ENTRAINED 4000 PSI, 3/4", 610) OVER
SUBBASE:	8" GRAVEL BORROW (TYPE B)

PROPOSED CEMENT CONCRETE SIDEWALK THROUGH DRIVEWAY

SURFACE COURSE:	6" CEMENT CONCRETE (AIR ENTRAINED 4000 PSI, 3/4", 610) OVER
SUBBASE:	8" GRAVEL BORROW (TYPE B)

PROPOSED HOT MIX ASPHALT DRIVEWAY

SURFACE COURSE:	3 1/2" HOT MIX ASPHALT PLACED IN TWO LAYERS; 1 1/2" HOT MIX ASPHALT SURFACE COURSE – TOP COURSE MATERIAL OVER 2" HOT MIX ASPHALT INTERMEDIATE COURSE – BINDER COURSE MATERIAL
SUBBASE:	8" GRAVEL BORROW (TYPE B)

PROPOSED HOT MIX ASPHALT WALK

SURFACE COURSE:	2 1/2" HOT MIX ASPHALT PLACED IN TWO LAYERS; 1 1/4" HOT MIX ASPHALT SURFACE COURSE – TOP COURSE MATERIAL OVER 1 1/4" HOT MIX ASPHALT INTERMEDIATE COURSE – BINDER COURSE MATERIAL
SUBBASE:	8" GRAVEL BORROW (TYPE B)

TYPICAL SECTIONS

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
Engineers, Architects, Planners, Construction Engineers & Inspectors
181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

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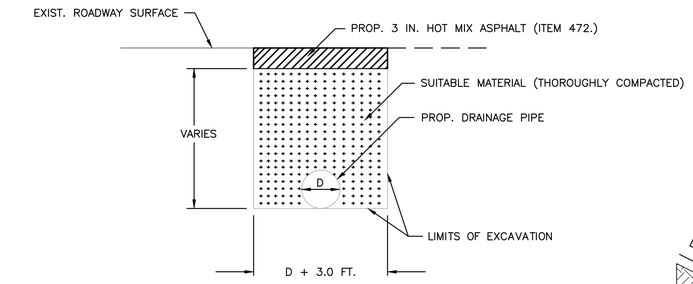
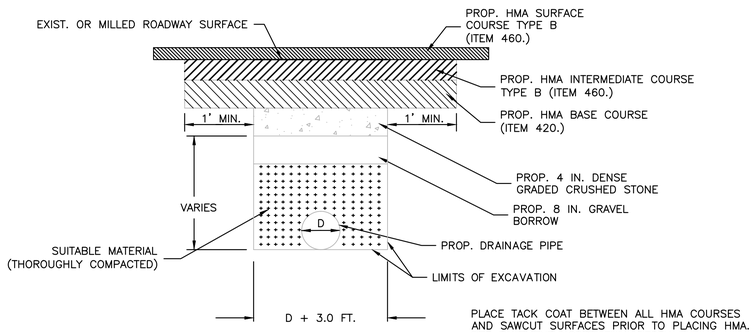
JOB NO.: MAX-2012005.00
FILE NAME: 12005.00_TYP
DRAWING NO.: 4 OF 68



TEMPORARY PATCH

(IN AREAS OF FULL DEPTH PAVEMENT RECONSTRUCTION)

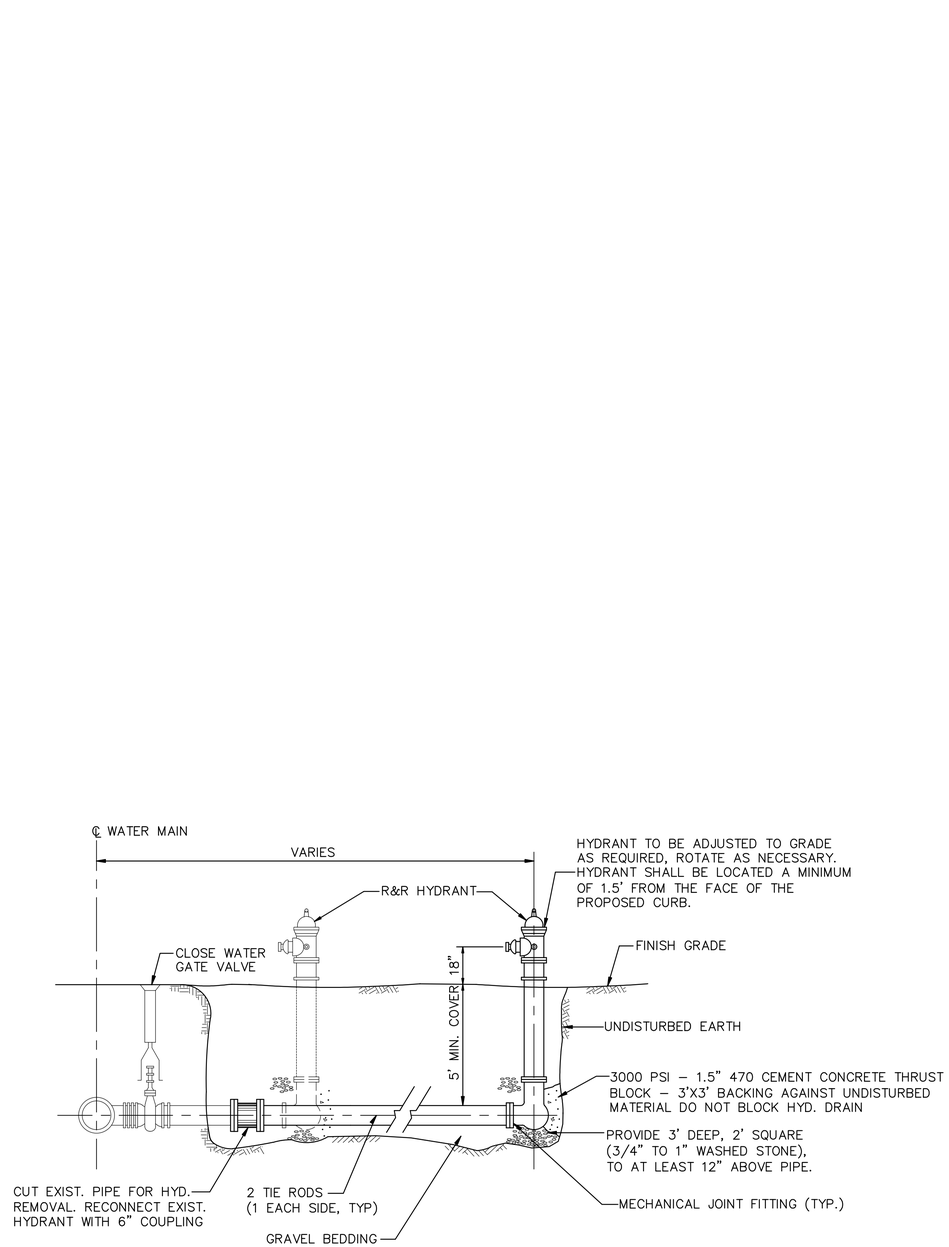


PERMANENT PATCH

(IN AREAS OF MILLING AND PAVEMENT OVERLAY)

DRAINAGE TRENCH DETAIL

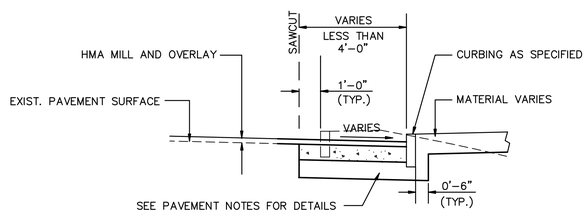
NOT TO SCALE



TYPICAL HYDRANT RELOCATION

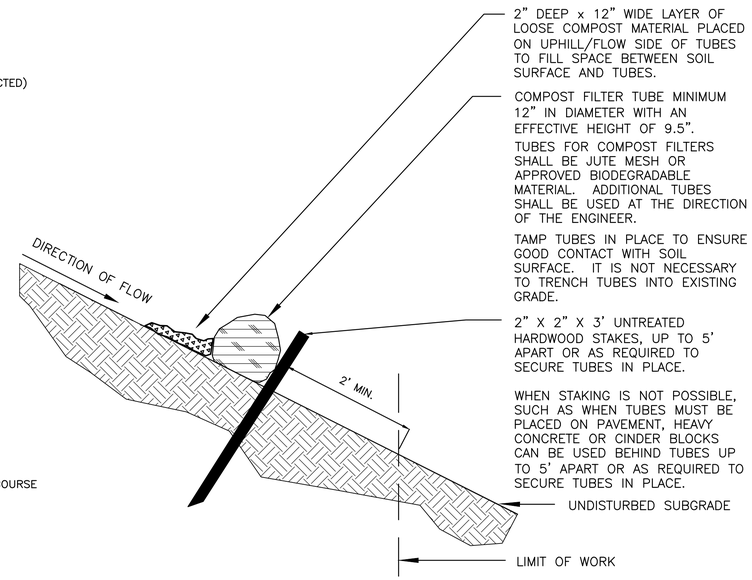
NOT TO SCALE

NOTE: ALL WATER GATES & HYDRANTS TO OPEN LEFT



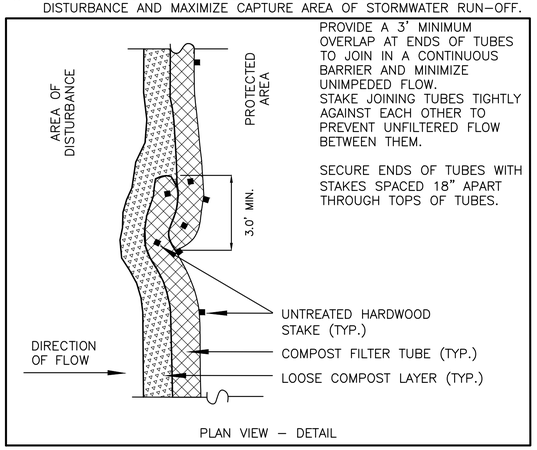
ROADWAY WIDENING < 4'–0"

NOT TO SCALE



GENERAL NOTES:

1. PROVIDE A MINIMUM TUBE DIAMETER OF 12" FOR SLOPES UP TO 50' IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPES OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
2. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
3. DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
4. CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN–OFF.



SINGLE COMPOST FILTER TUBE DETAIL

NOT TO SCALE

CONSTRUCTION & EROSION CONTROL DETAILS

TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS

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Trapelo Road & Forest Street
Waltham, Massachusetts

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Waltham, Massachusetts

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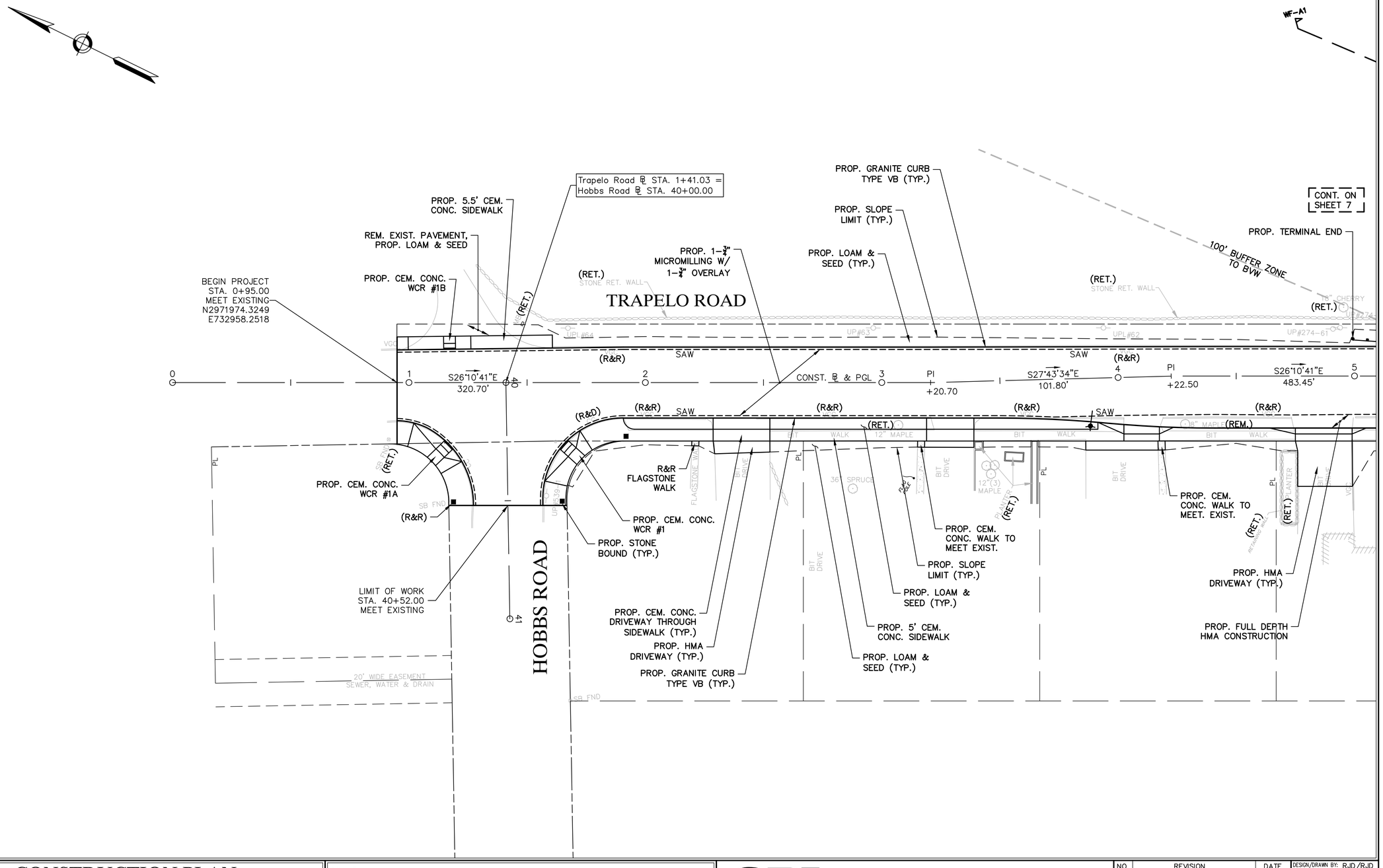
DRAWING NO.: 5 OF 68



GRAPHIC SCALE
0 10 20 30 40 60 FEET

CONSTRUCTION PLAN

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
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TRAPELO ROAD
FOREST STREET
DOTY STREET
Trapelo Road
CONSTRUCTION ℄
CURVE DATA
Δ=14°31'26"
R=410.00
T=52.25
L=103.93
Forest Street
CONSTRUCTION ℄
CURVE DATA
Δ=41°52'42"
R=85.50
T=32.72
L=62.49
Trapelo Road ℄ STA. 7+50.00 =
Forest Street ℄ STA. 10+00.00
Trapelo Road ℄ STA. 9+37.07 =
Doty Street (E) ℄ STA. 60+00.00
Forest Street ℄ STA. 12+21.47 =
Doty Street (E) ℄ STA. 62+01.48
Forest Street ℄ STA. 12+20.89 =
Doty Street (W) ℄ STA. 50+00.00
CONT. ON SHEET 6
CONT. ON SHEET 8
CONT. ON SHEET 9
100' BUFFER ZONE TO BVW
LIMIT OF WORK MEET EXISTING
PROP. GRANITE CURB TYPE VB (TYP.)
PROP. STEEL W BEAM HIGHWAY GUARD (TYP.)
PROP. TERMINAL END
PROP. LOAM & SEED (TYP.)
PROP. SLOPE LIMIT (TYP.)
PROP. FULL DEPTH HMA CONSTRUCTION
PROP. STONE BOUND (TYP.)
SOIL BORING (TYP.)
PROP. LOAM & SEED
PROP. CEM. CONC. SIDEWALK (WIDTH VARIES)
PROP. CEM. CONC. WCR #3
PROP. STONE BOUND W/FRAME & COVER (TYP.)
REM. EXIST. PAVEMENT, PROP. LOAM & SEED
PI +22.50
S26°10'41"E 483.45'
CONST. ℄ & PGL
9 PC +05.95
10 PT +09.88
PAVEMENT CORE (TYP.)
PROP. CEM. CONC. WCR #2
PROP. CEM. CONC. WCR #4
PROP. CEM. CONC. WCR #5
PROP. CEM. CONC. WCR #6
PROP. CEM. CONC. WCR #7
R&R SB
PROP. 5.5' CEM. CONC. SIDEWALK
PROP. VERT. GRAN. LOT CURB
PROP. HMA WALK TO MEET EXIST.
PROP. HMA DRIVEWAY (TYP.)
REM. OLD PAVEMENT, PROP. LOAM & SEED
PROP. CEM. CONC. WALK
PROP. HMA WALK TO MEET EXIST.
PROP. 5' CEM. CONC. SIDEWALK (TYP.)
PROP. CEM. CONC. WALK TO MEET. EXIST.
R&R FLAGSTONE WALK
PROP. CEM. CONC. DRIVEWAY THROUGH SIDEWALK (TYP.)
PROP. POST & RAIL FENCE (TYP.)
PROP. HMA DRIVEWAY (TYP.)
PROP. 5.5' CEM. CONC. SIDEWALK
PROP. CEM. CONC. WALK TO MEET EXIST.
R&R BRICK DRIVEWAY
PROVIDE 36"(MIN.) CLEARANCE
PROVIDE 4.5'x5.0' TREE PIT
PROP. CEM. CONC. WCR #12
PROP. CEM. CONC. WCR #13
PROP. CEM. CONC. SIDEWALK (VARIABLE WIDTH)
PROP. 1-3/4" MICROMILLING W/ 1-3/4" OVERLAY
R&S EXIST. FENCE
PROP. CEM. CONC. WCR #14
PROP. CEM. CONC. WCR #15
END PROP. CEM. CONC. SIDEWALK; MEET EXIST.
PROP. 6" TO 0" REVEAL GRAN. TRANSITION
LIMIT OF WORK STA. 50+65.00 MEET EXISTING
S21°56'37"W 359.13'
PROP. CEM. CONC. SIDEWALK (VARIABLE WIDTH) (TYP.)
PAVEMENT CORE
APPROX PL

GRAPHIC SCALE	CONSTRUCTION PLAN	PROJECT: Roadway & Traffic Signal Improvement Project, Trapelo Road & Forest Street, Waltham, Massachusetts	GPI Greenman-Pedersen, Inc.
0 10 20 30 40 60 FEET	TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS	PREPARED FOR: Waltham Transportation & Parking Department, 119 School Street, Waltham, Massachusetts	Engineers, Architects, Planners, Construction Engineers & Inspectors. 181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887. Tel: (978) 570-2999 Fax: (978) 658-3044. http://www.gpinet.com

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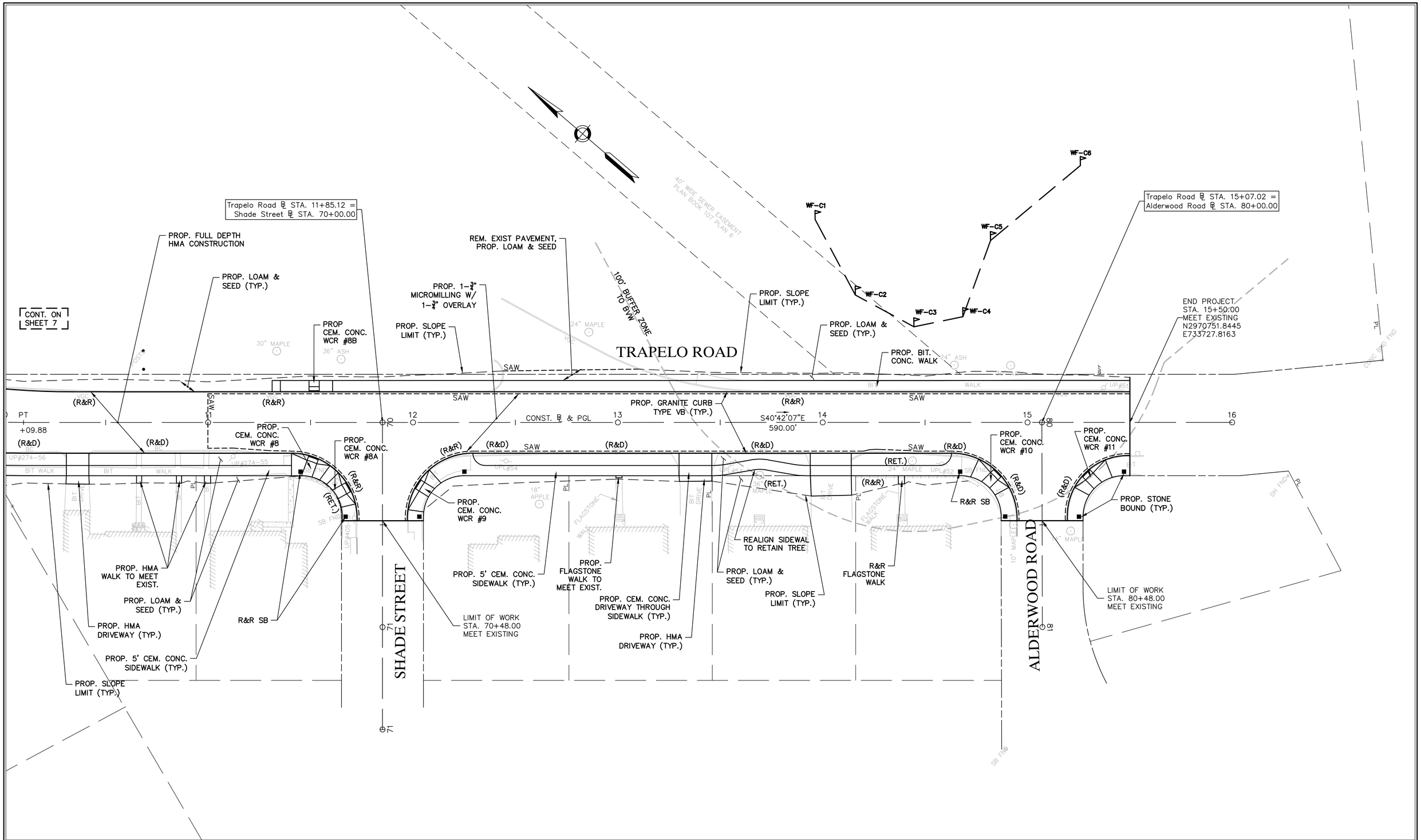

GRAPHIC SCALE
0 10 20 30 40 60 FEET

CONSTRUCTION PLAN

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
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Waltham, Massachusetts

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CONT. ON SHEET 7

PROX PL

ALDERWOOD ROAD

FOREST STREET

DOTY STREET

PROP. HMA DRIVEWAY (TYP.)

PROP. 7.0' CEM. CONC. SIDEWALK (TYP.)

PROP. CEM. CONC. DRIVEWAY THROUGH SIDEWALK (TYP.)

PROP. LOAM & SEED (TYP.)

PROP. SLOPE LIMIT (TYP.)

PROP. STONE BOUND (TYP.)

END PROP. CEM. CONC. SIDEWALK MEET EXIST.

PROP. STONE BOUND (TYP.)

PROP. CEM. CONC. WCR #18

R&S GRAN. CURB CORNER (TYP.)

PROP. GRANITE CURB TYPE VB (TYP.)

PROP. CEM. CONC. WCR #16

PROP. CEM. CONC. WCR #17

PROP. CEM. CONC. WCR #19

S21°56'37"W 359.13'

S22°19'42"W 432.17'

PI +47.83

CONST. ℄ & PGL

PROP. CEM. CONC. WCR #15

PROP. 1–¾" MICROMILLING W/ 1–¾" OVERLAY

R&S GRAN. CURB CORNER (TYP.)

R&R IRON PIPE

PROP. CEM. CONC. WALK TO MEET. EXIST.

PROP. CEM. CONC. DRIVEWAY THROUGH SIDEWALK (TYP.)

LIMIT OF WORK STA. 50+65.00 MEET EXISTING

PROP. CEM. CONC. SIDEWALK (VARIABLE WIDTH) (TYP.)

PROP. HMA DRIVEWAY (TYP.)

PROVIDE 36" (MIN.) CLEARANCE

PROP. 4'x5' TREE PIT

PROP. CEM. CONC. WALK TO MEET. EXIST.

PROP. SLOPE LIMIT (TYP.)

PROP. LOAM & SEED (TYP.)

LIMIT OF WORK MEET EXISTING

RET. PLANTER

PROP. LOAM & SEED (TYP.)

PROP. CEM. CONC. WALK TO MEET EXIST.

PROP. 7.5' CEM. CONC. SIDEWALK (TYP.)

LIMIT OF WORK STA. 18+05.00 MEET EXISTING N2970667.9137 E732914.6614

GRAPHIC SCALE
0 10 20 30 40 60 FEET

CONSTRUCTION PLAN

TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

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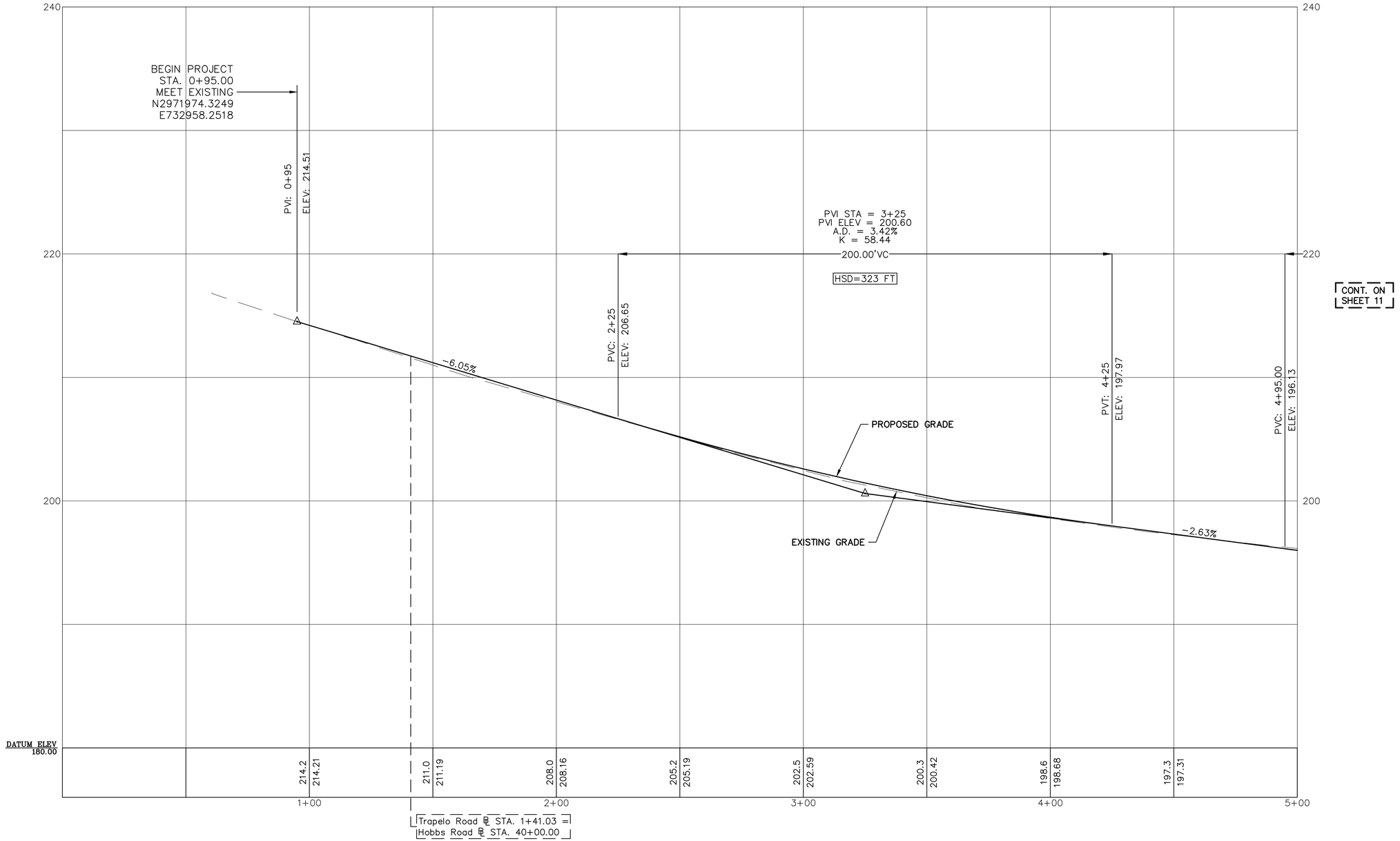

VERTICAL SCALE
0 2 4 6 8 12 FEET
0 10 20 30 40 60 FEET
HORIZONTAL SCALE

CONSTRUCTION PROFILE
TRAPELO ROAD

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
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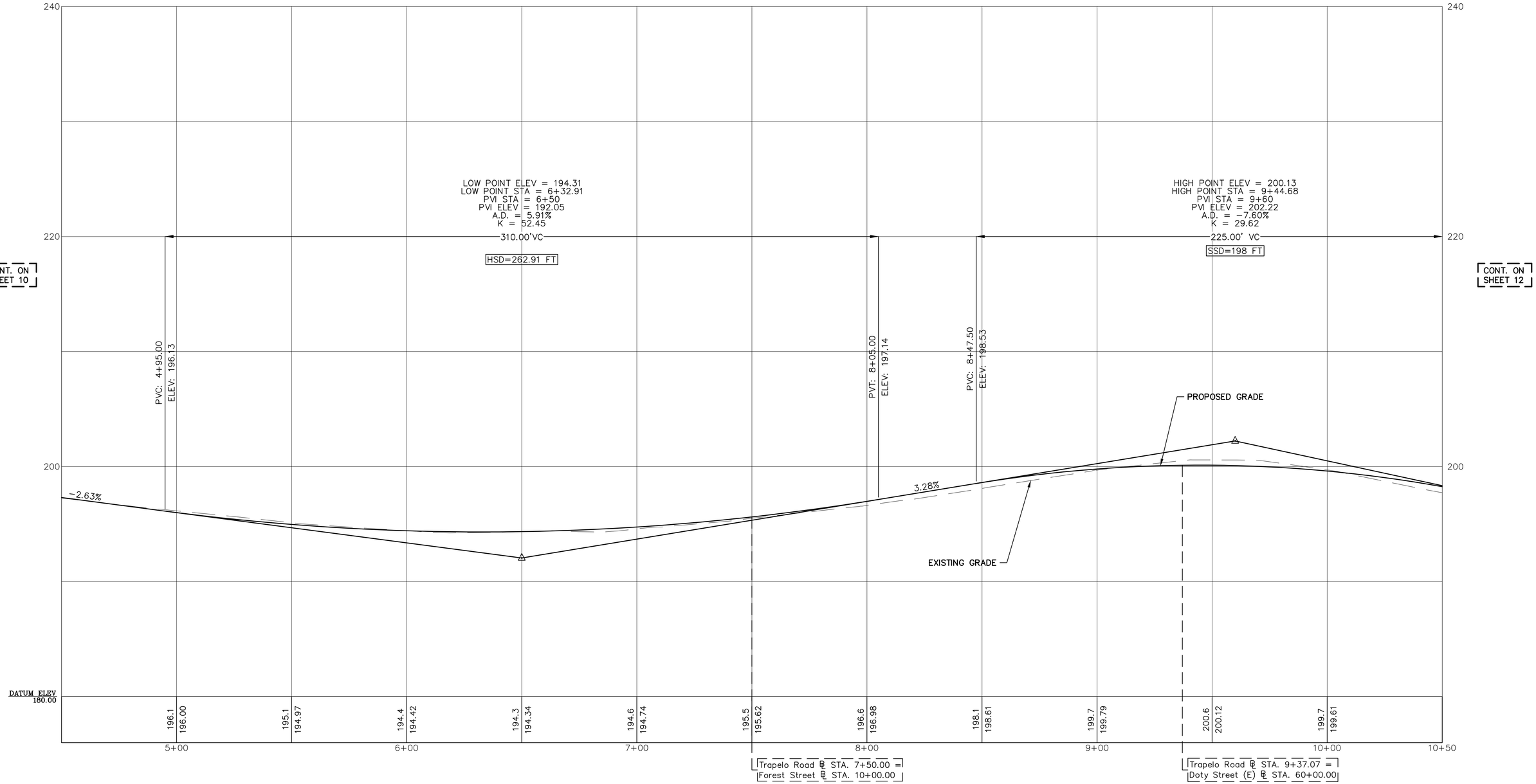

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CONSTRUCTION PROFILE
TRAPELO ROAD

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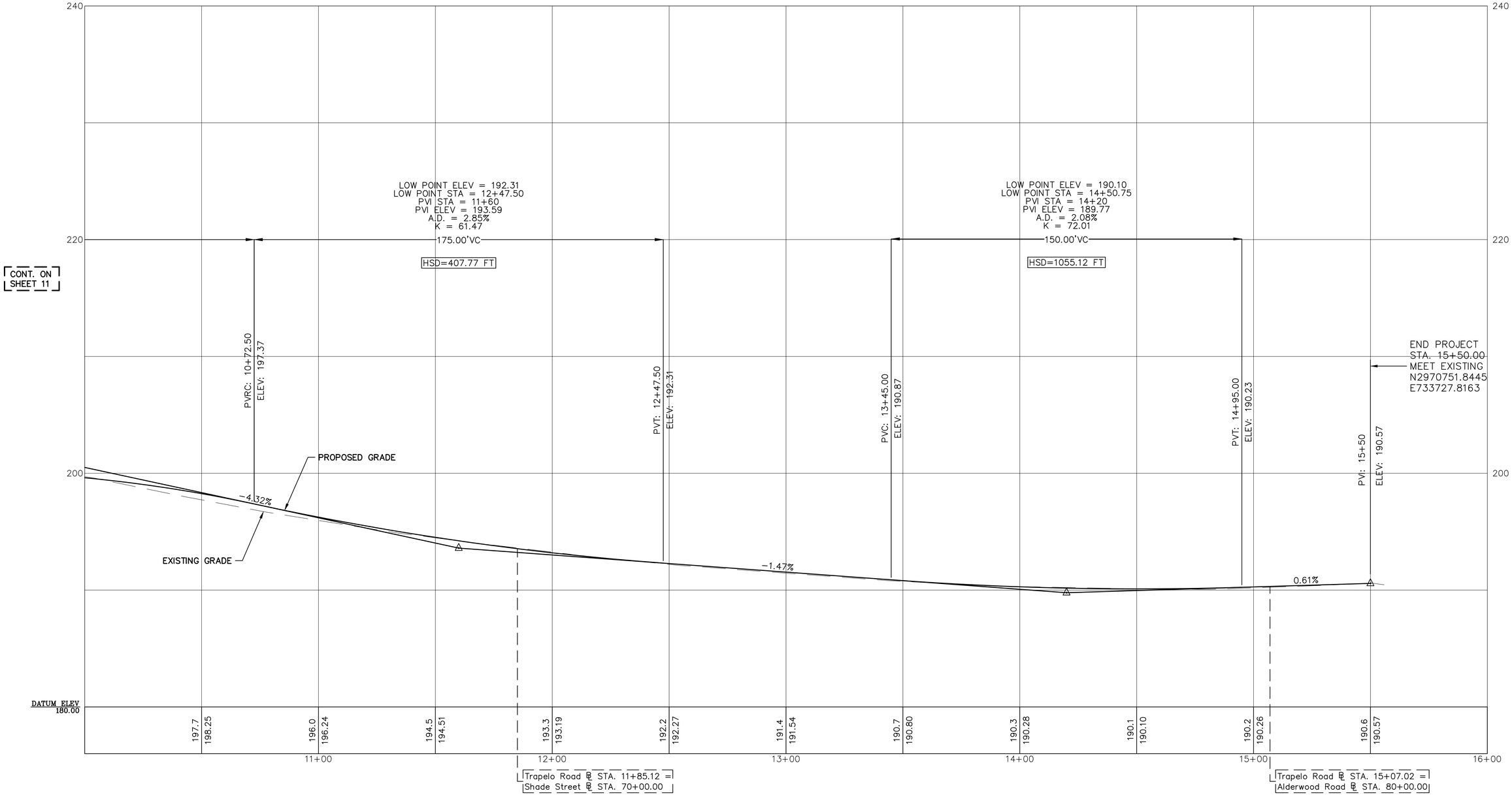

VERTICAL SCALE
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TRAPELO ROAD

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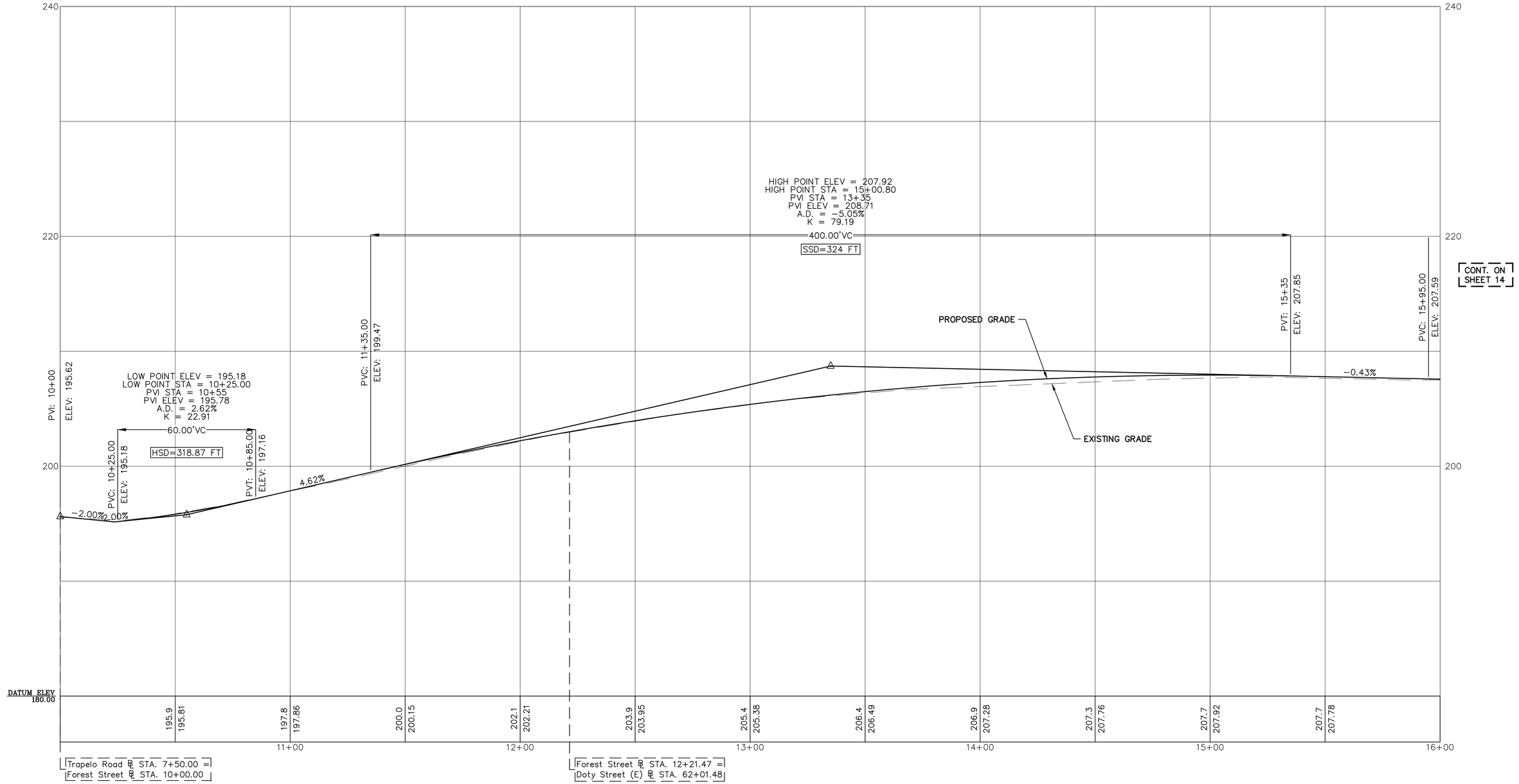

VERTICAL SCALE
0 2 4 6 8 12 FEET
0 10 20 30 40 60 FEET
HORIZONTAL SCALE

CONSTRUCTION PROFILE
FOREST STREET

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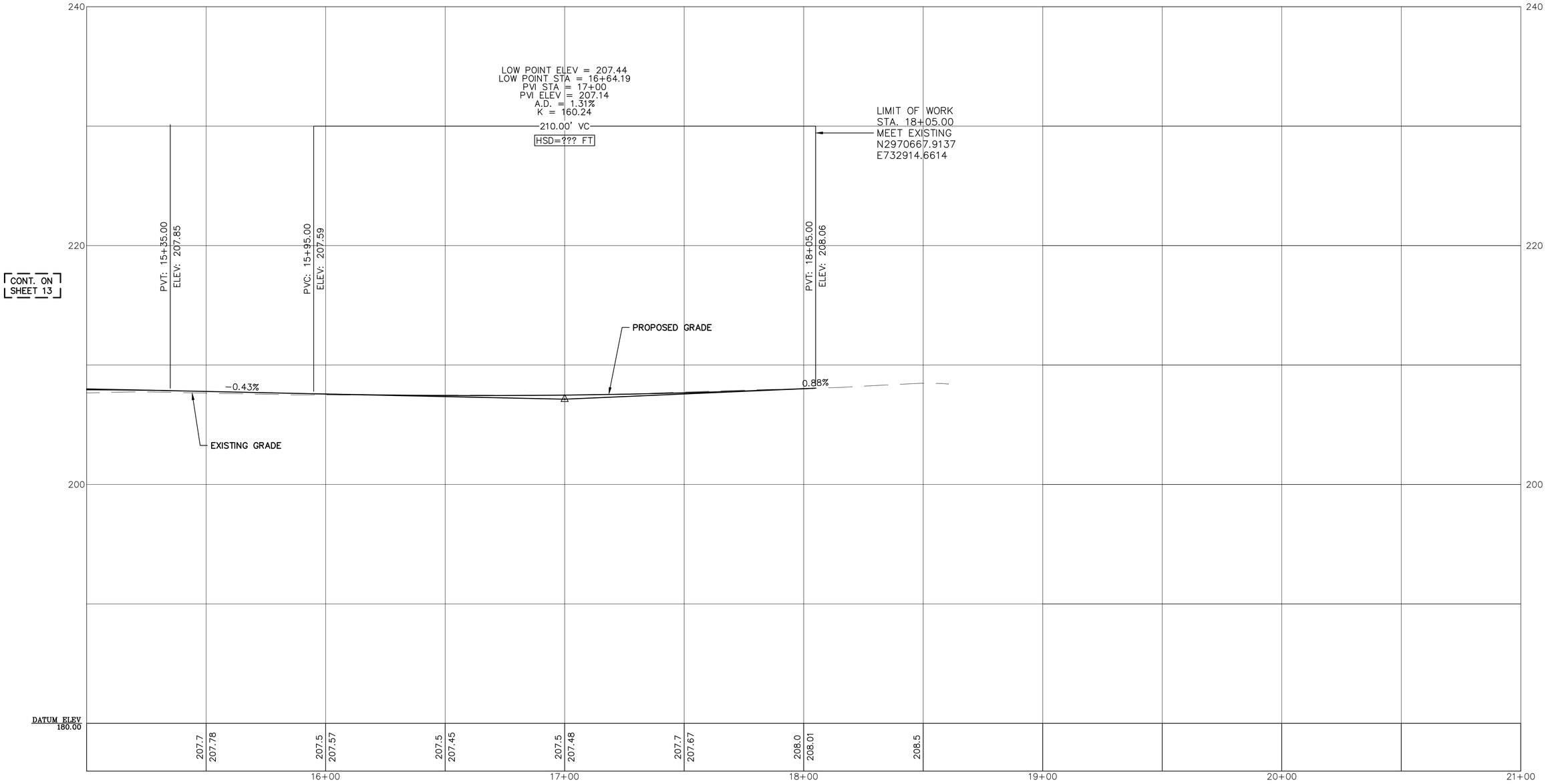

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FOREST STREET

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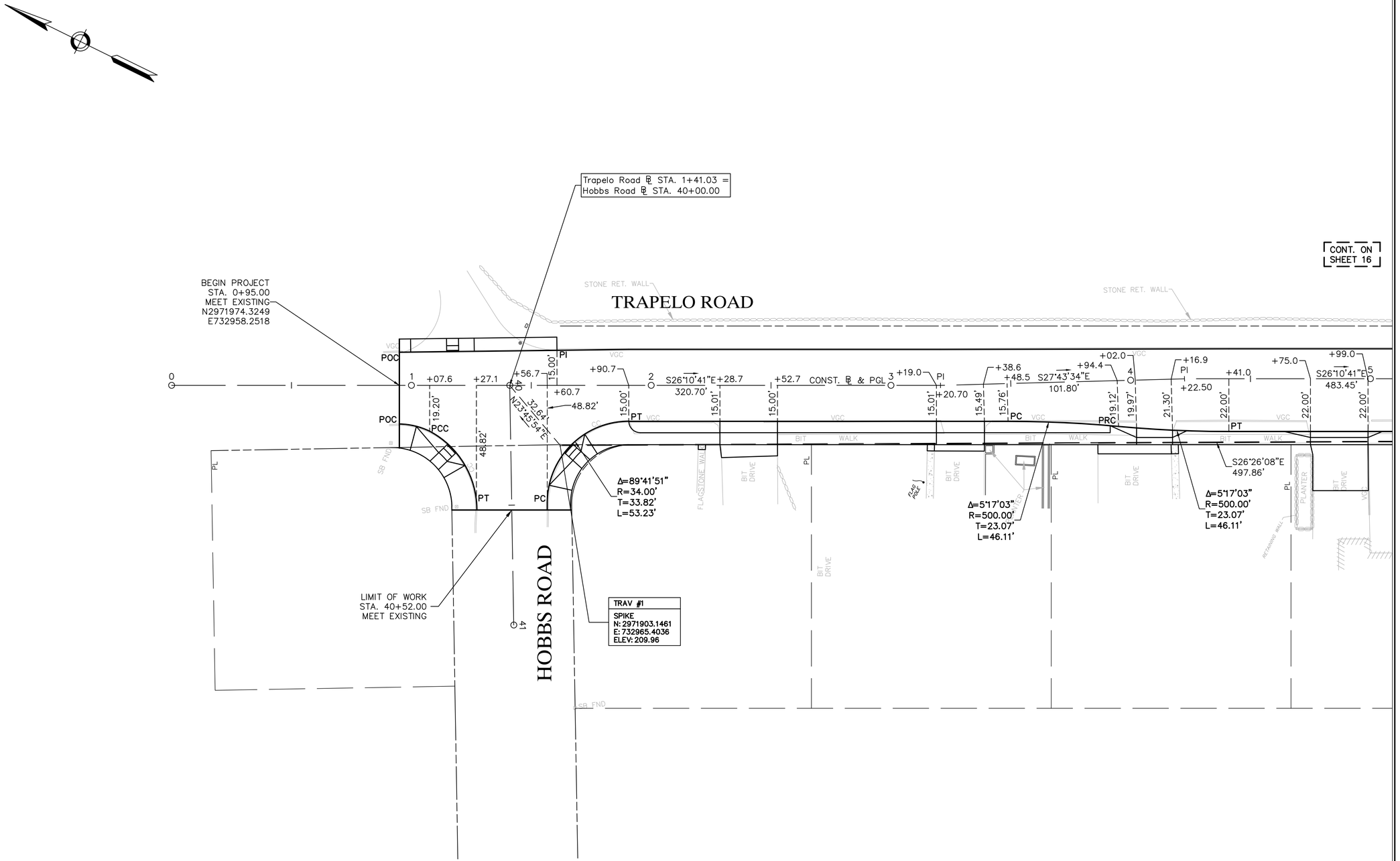
181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

NO.	REVISION	DATE

DESIGN/DRAWN BY:	RJD/RJD
CHECK BY:	JWD/GJH
DATE:	7/13/2012
SCALE:	AS NOTED
JOB NO.:	MAX-2012005.00
FILE NAME:	12005.00_PR
DRAWING NO.:	14 OF 68



GRAPHIC SCALE
0 10 20 30 40 60 FEET

CURB TIE PLAN

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

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DRAWING NO.: 15 OF 68

CONT. ON SHEET 15

CONT. ON SHEET 17

TRAPELO ROAD

TRAPELO ROAD

LIMIT OF WORK MEET EXISTING

Trapelo Road ℄ STA. 7+50.00 = Forest Street ℄ STA. 10+00.00

Trapelo Road ℄ STA. 9+37.07 = Doty Street (E) ℄ STA. 60+00.00

Trapelo Road CONSTRUCTION ℄ CURVE DATA
Δ=14°31'26"
R=410.00
T=52.25
L=103.93

TRAV #3
DRILL HOLE
N: 2971194.2181
E: 733371.4453
ELEV: 199.72

Δ=1°50'52" R=500.00' T=8.06' L=16.13'

Δ=1°50'52" R=335.00' T=5.40' L=10.80'

Δ=60°58'39" R=30.00' T=17.66' L=31.93'

Δ=82°38'36" R=25.00' T=21.98' L=36.06'

Δ=14°31'26" R=395.00' T=50.33' L=100.13'

S40°49'58"E 353.02'

S40°42'07"E 590.00'

S26°10'41"E 483.45'

S35°01'21"E 321.31'

S26°10'41"E 483.45'

CONST. ℄ & PGL

S26°26'08"E 497.86'

Δ=5°17'03" R=500.00' T=23.07' L=46.11'

N03°07'49"W 65.12'

S58°38'27"E 47.50'

Δ=68°13'57" R=40.00' T=27.10' L=47.64'

S07°47'06"W 266.35'

Δ=20°06'39" R=100.00' T=17.73' L=35.10'

S21°56'37"W 359.13'

Δ=67°58'44" R=30.75' T=20.73' L=36.48'

Δ=25°30'28" R=100.00' T=22.63' L=44.52'

Δ=116°15'43" R=15.00' T=24.13' L=30.44'

Δ=38°23'30" R=40.00' T=13.93' L=26.80'

Δ=55°01'25" R=35.00' T=18.23' L=33.61'

Δ=5°16'01" R=425.00' T=19.55' L=39.07'

DOTY STREET

FOREST STREET

LIMIT OF WORK MEET EXISTING

Δ=103°26'43" R=10.00' T=12.67' L=18.05'

Δ=60°53'06" R=10.00' T=5.88' L=10.63'

APPROX ℄

TRAV #2
STONE BOUND
N: 2971457.3463
E: 733187.0463
ELEV: 194.75

TRAV #7
PK NAIL
N: 2971193.4476
E: 733150.9670
ELEV: 202.62

Forest Street CONSTRUCTION ℄ CURVE DATA
Δ=41°52'42"
R=85.50
T=32.72
L=62.49

Forest Street ℄ STA. 12+21.47 = Doty Street (E) ℄ STA. 62+01.48

Δ=66°57'34" R=25.00' T=16.53' L=29.22'

Forest Street ℄ STA. 12+20.89 = Doty Street (W) ℄ STA. 50+00.00

Δ=114°04'06" R=27.00' T=41.63' L=53.75'

S32°10'24"W 259.78'

CONST. ℄ & PGL

LIMIT OF WORK STA. 50+65.00 MEET EXISTING

CONT. ON SHEET 18

GRAPHIC SCALE
0 10 20 30 40 60 FEET

CURB TIE PLAN

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
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CONT. ON SHEET 16
14°31'26"
395.00'
50.33'
100.13'
S40°49'58"E
353.02'
Trapelo Road ℄ STA. 11+85.12 =
Shade Street ℄ STA. 70+00.00
TRAV #4
DRILL HOLE
N: 2970927.1160
E: 733602.1621
ELEV: 190.58
TRAPELO ROAD
Trapelo Road ℄ STA. 15+07.02 =
Alderwood Road ℄ STA. 80+00.00
END PROJECT
STA. 15+50.00
MEET EXISTING
N2970751.8445
E733727.8163
S40°42'07"E
590.00'
CONST. ℄ & PGL
S40°42'07"E
590.00'
S29°38'22"E
211.40'
N68°03'35"E
22.64'
TRAV #5
PK NAIL
N: 2970743.3807
E: 733706.8130
ELEV: 190.38
Δ=91°47'49"
R=32.00'
T=33.02'
L=51.27'
Δ=91°47'49"
R=32.00'
T=33.02'
L=51.27'
Δ=91°47'26"
R=32.00'
T=33.02'
L=51.27'
Δ=96°35'57"
R=29.50'
T=33.11'
L=49.74'
12.40' 12.12'
SHADE STREET
LIMIT OF WORK
STA. 70+48.00
MEET EXISTING
ALDERWOOD ROAD
LIMIT OF WORK
STA. 80+48.00
MEET EXISTING
148.13'
S70°23'26"W
TRAV #6
STONE BOUND
N: 2970693.6681
E: 733567.2763
ELEV: 189.02
S12°25'20"W
296.59'

GRAPHIC SCALE

0 10 20 30 40 60 FEET

CURB TIE PLAN

TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS

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DRAWING NO.:	17 of 68

CONT. ON SHEET 16

Forest Street ℄ STA. 12+21.47 =
Doty Street (E) ℄ STA. 62+01.48

PROX PL

FOREST STREET

ALDERWOOD ROAD

PC
S32°10'24"W
259.78'
+97.4
+87.5
CONST. ℄ & PGL
+34.5
+13.4
13
S21°56'37"W
359.13'
+68.2
+89.2
14
+16.4
+32.3
PI
+47.83
+47.7
+69.8
15
+62.0
+78.0
+84.6
16
+15.2
+40.7
+47.0
+50.7
+77.4
17
+02.9
+12.9
S22°19'42"W
432.17'
+57.6
+68.6
18
+80.0
PT
POT
N05°22'43"E
167.62'
N16°06'13"W
41.16'
45.23'
258.32'
N16°57'42"W

Δ=90°31'24"
R=25.00'
T=25.23'
L=39.50'
POC

TRAV #9
BOLT
N: 2970628.3663
E: 732926.0789
ELEV: 207.83

Δ=114°04'06"
R=27.00'
T=41.63'
L=53.75'
POT
15.23'
POC
15.33'

DOTY STREET

LIMIT OF WORK
STA. 50+65.00
MEET EXISTING

TRAV #8
STONE BOUND
N: 2970973.5565
E: 733012.6369
ELEV: 207.88

S37°16'50"E
29.55'
S21°40'07"W
191.87'
37.97'
40.25'

Δ=60°53'06"
R=35.00'
T=20.57'
L=37.19'
POC

Δ=67°16'13"
R=33.00'
T=21.95'
L=38.74'
POC

LIMIT OF WORK
MEET EXISTING

LIMIT OF WORK
STA. 18+05.00
MEET EXISTING
N2970667.9137
E732914.6614

BIT DRIVE
BIT WALK
FLAGSTONE WALK
CONC WALK
BRICK WALK
6' STOCKADE FENCE
I.PIPE FND
SB FND (NO DH)
GATE
BOLT
VGC
PL

GRAPHIC SCALE
0 10 20 30 40 60 FEET

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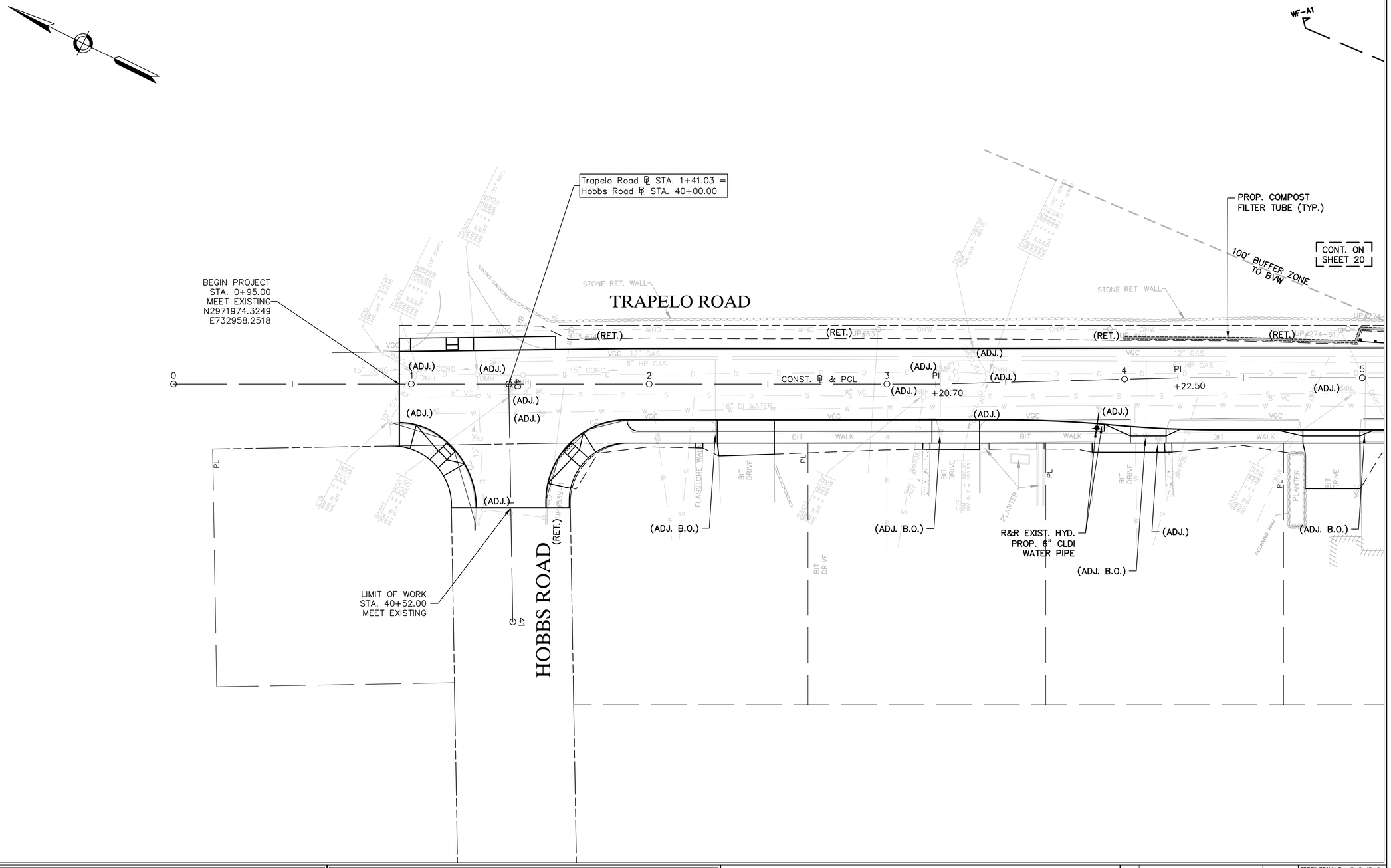

GRAPHIC SCALE
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DRAINAGE & UTILITY PLAN

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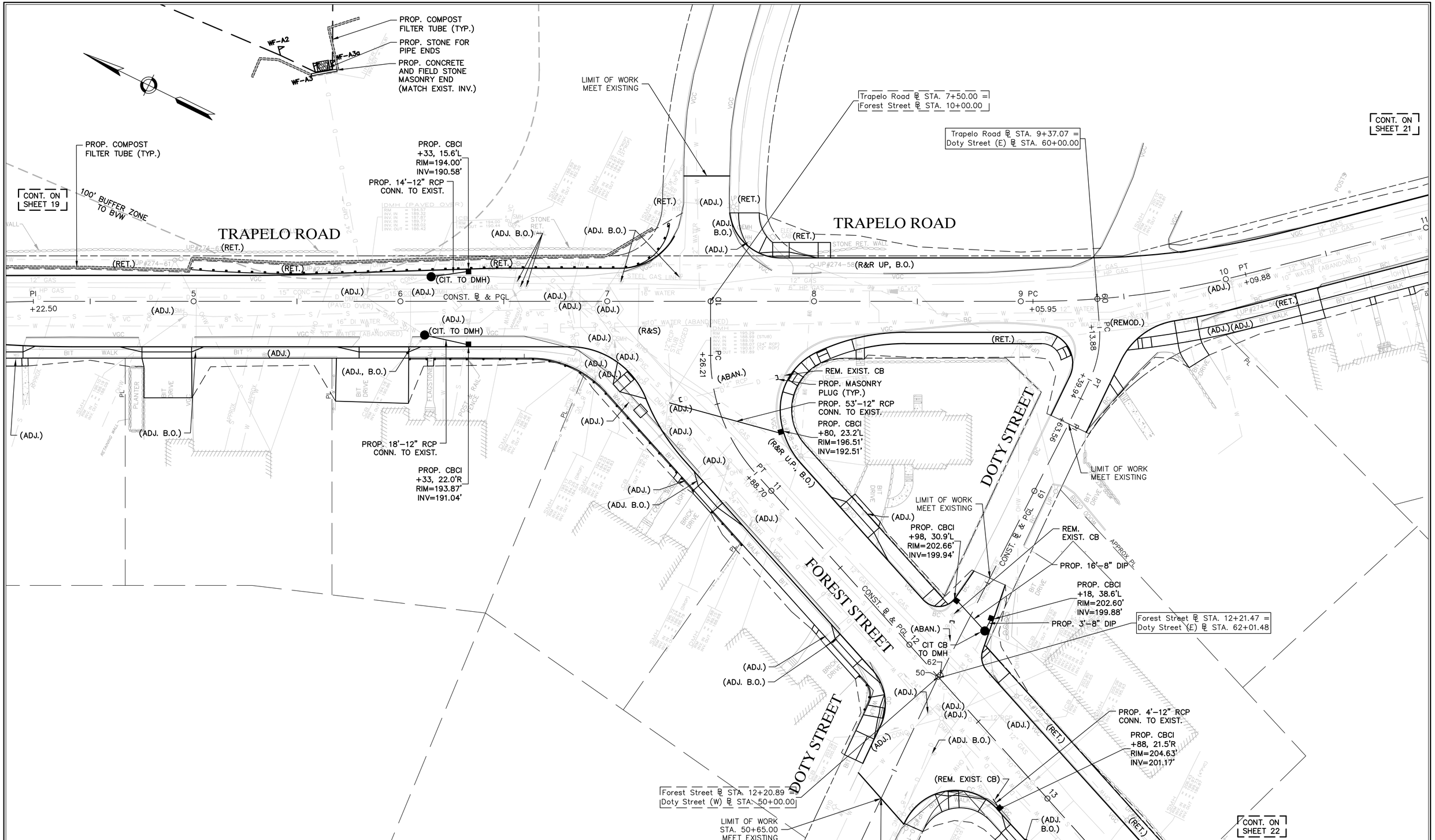
DRAWING NO.: 19 OF 68



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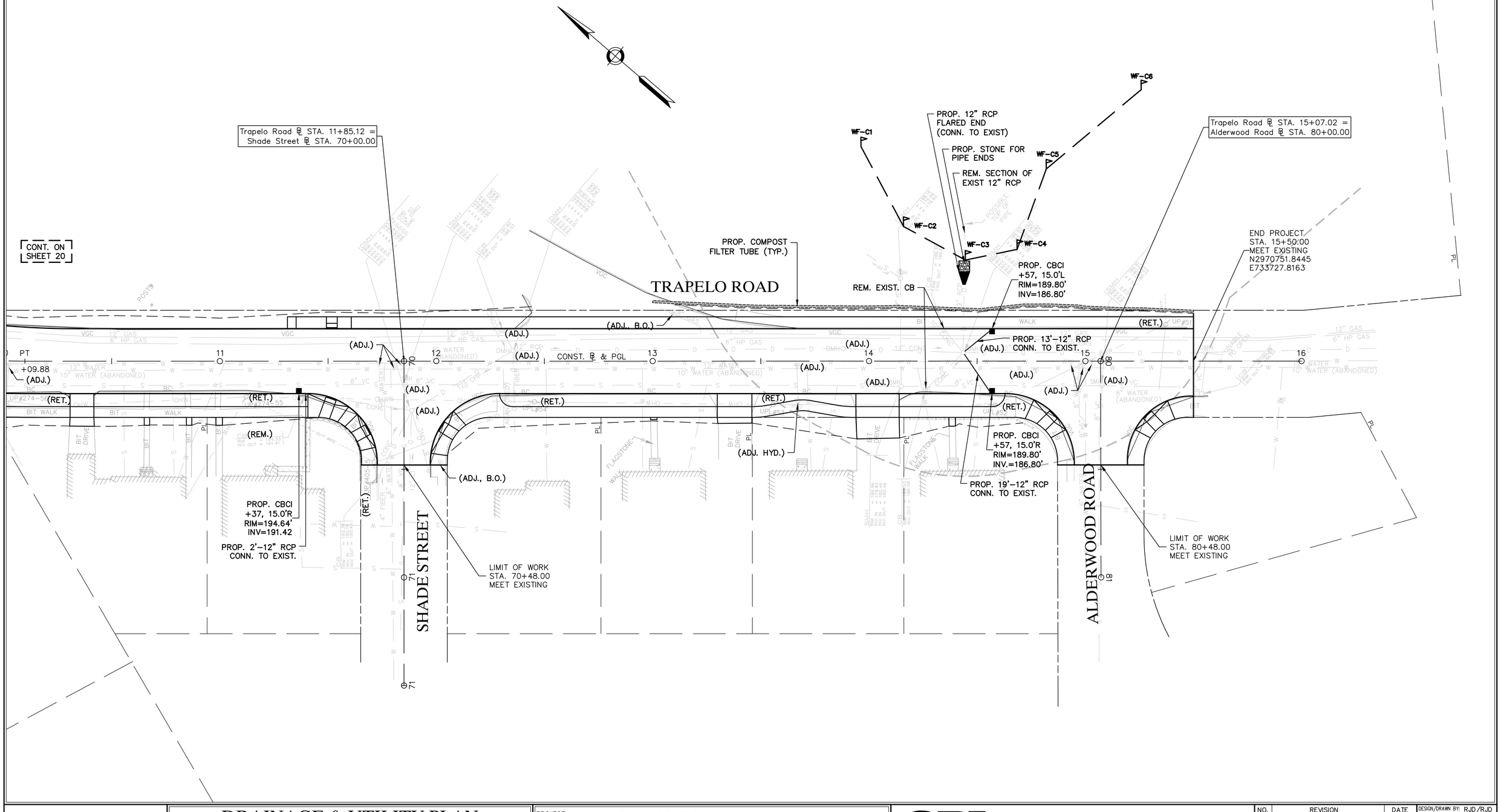

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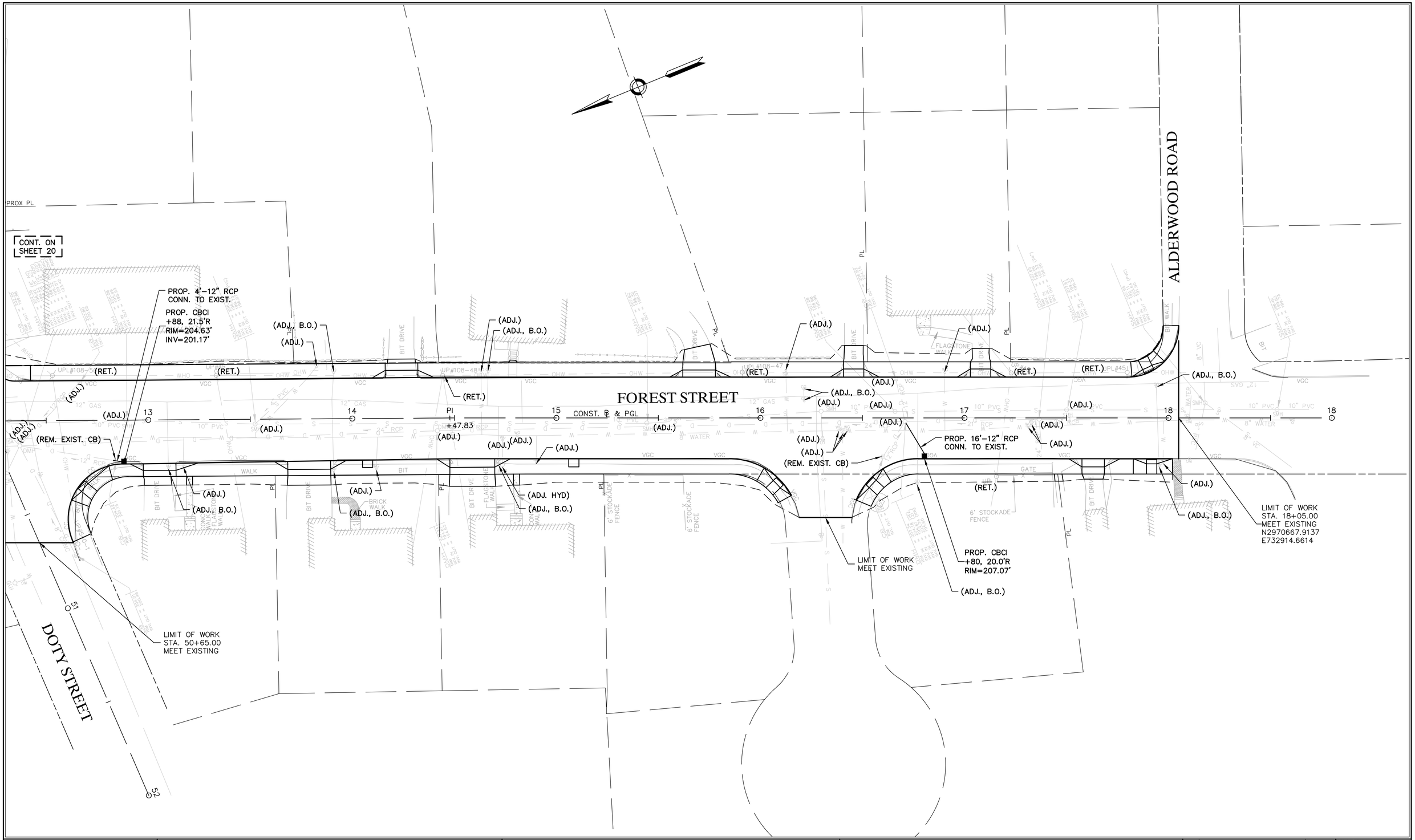

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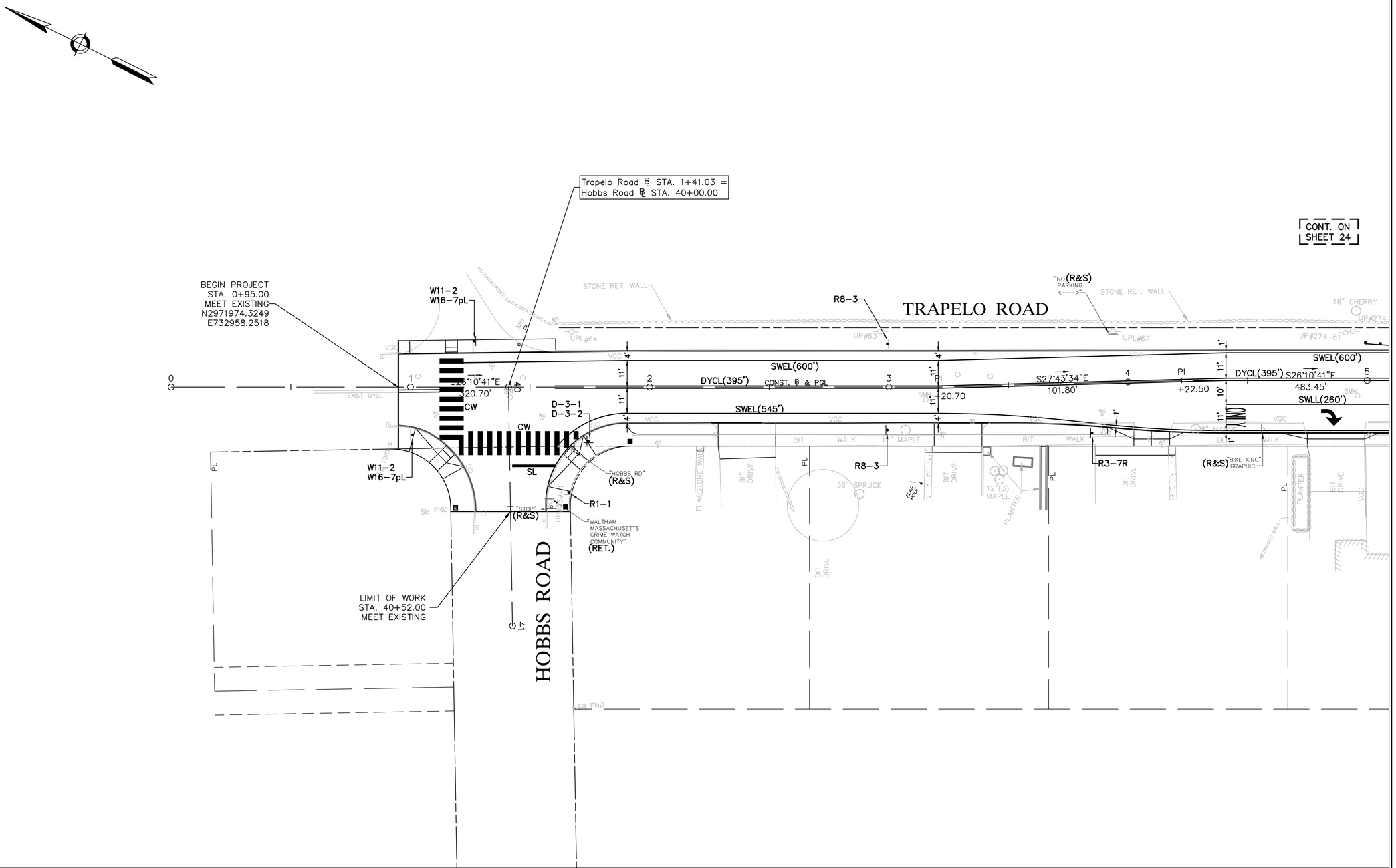

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PAVEMENT MARKING & SIGNING PLAN

TRAPELO ROAD & FOREST STREET
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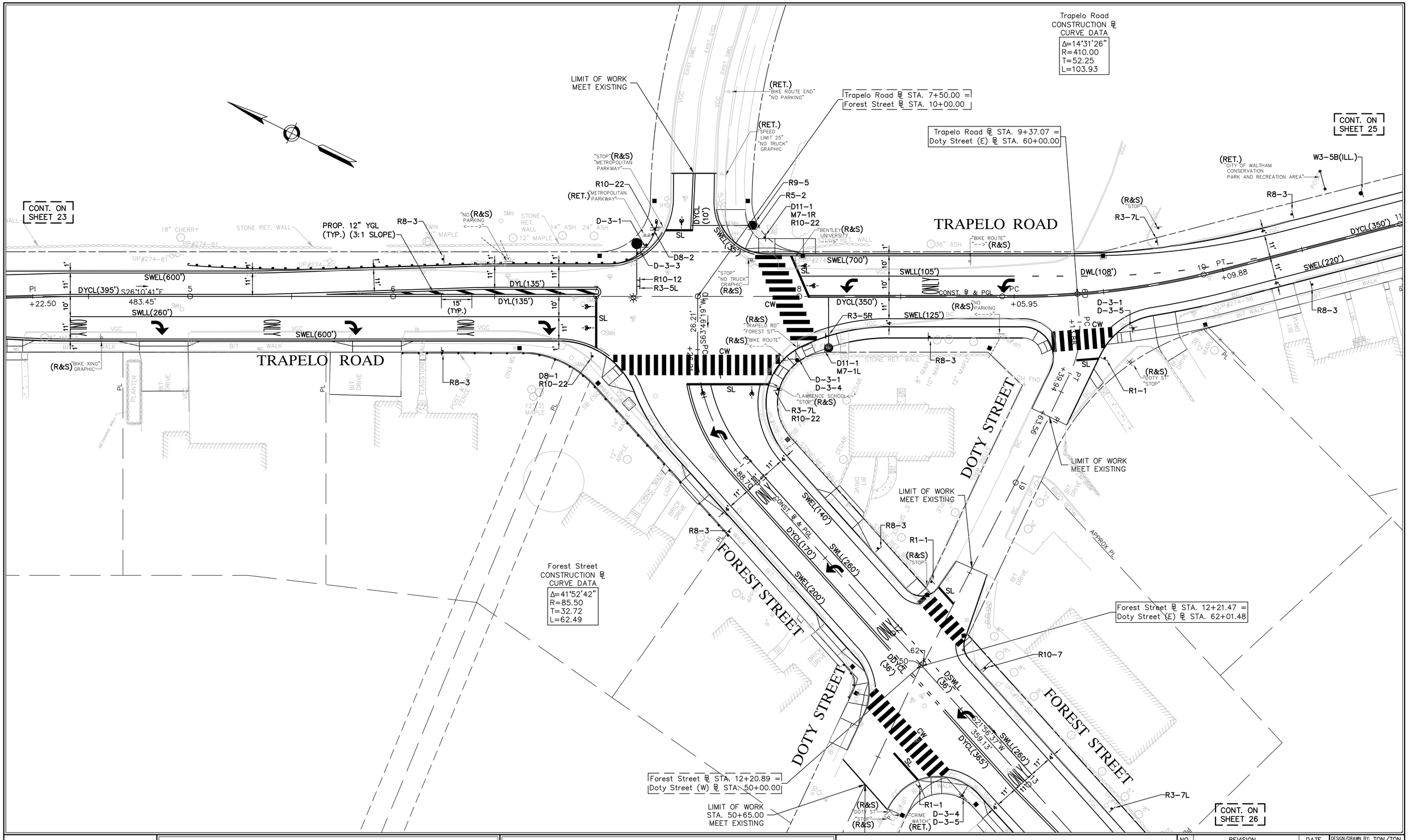

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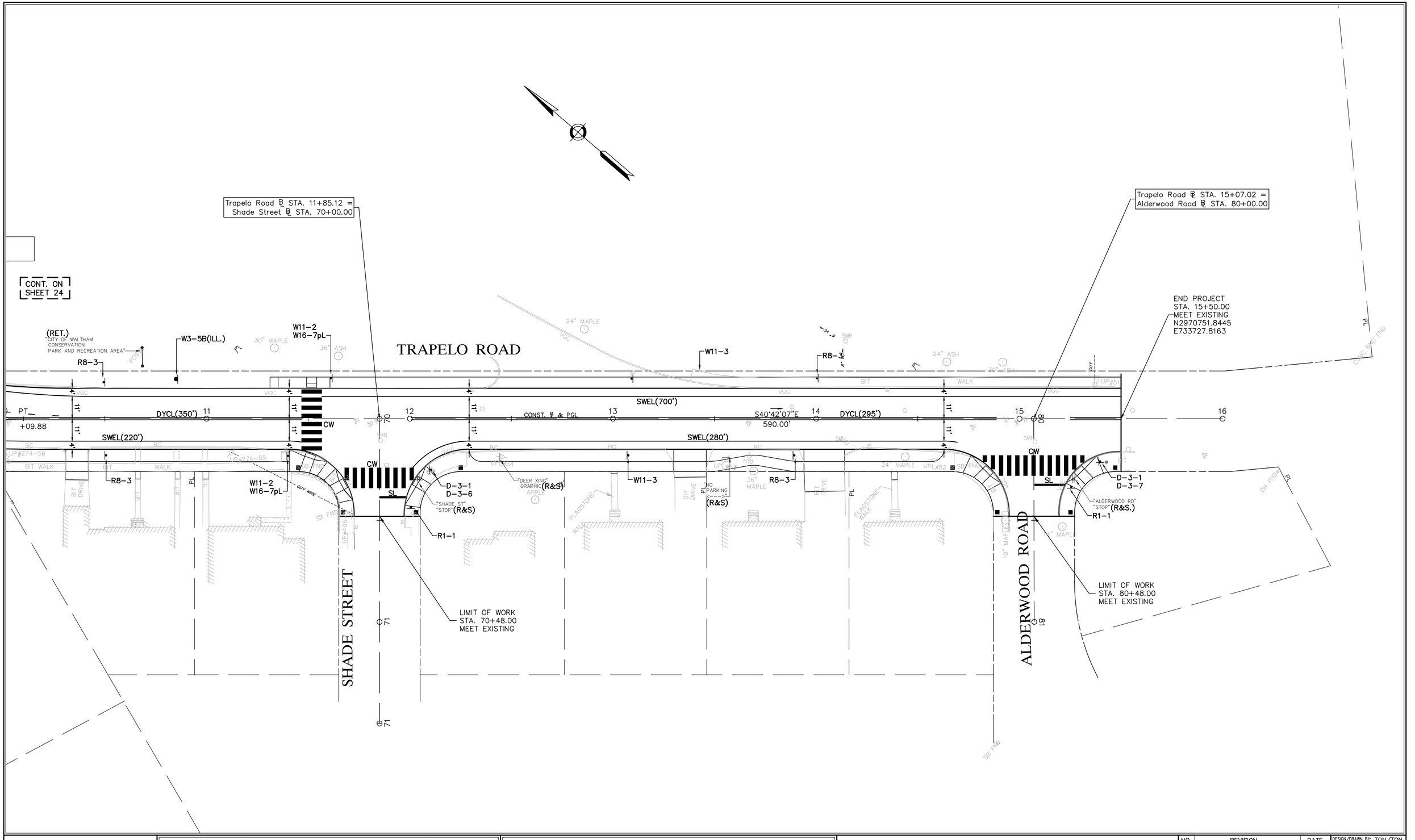

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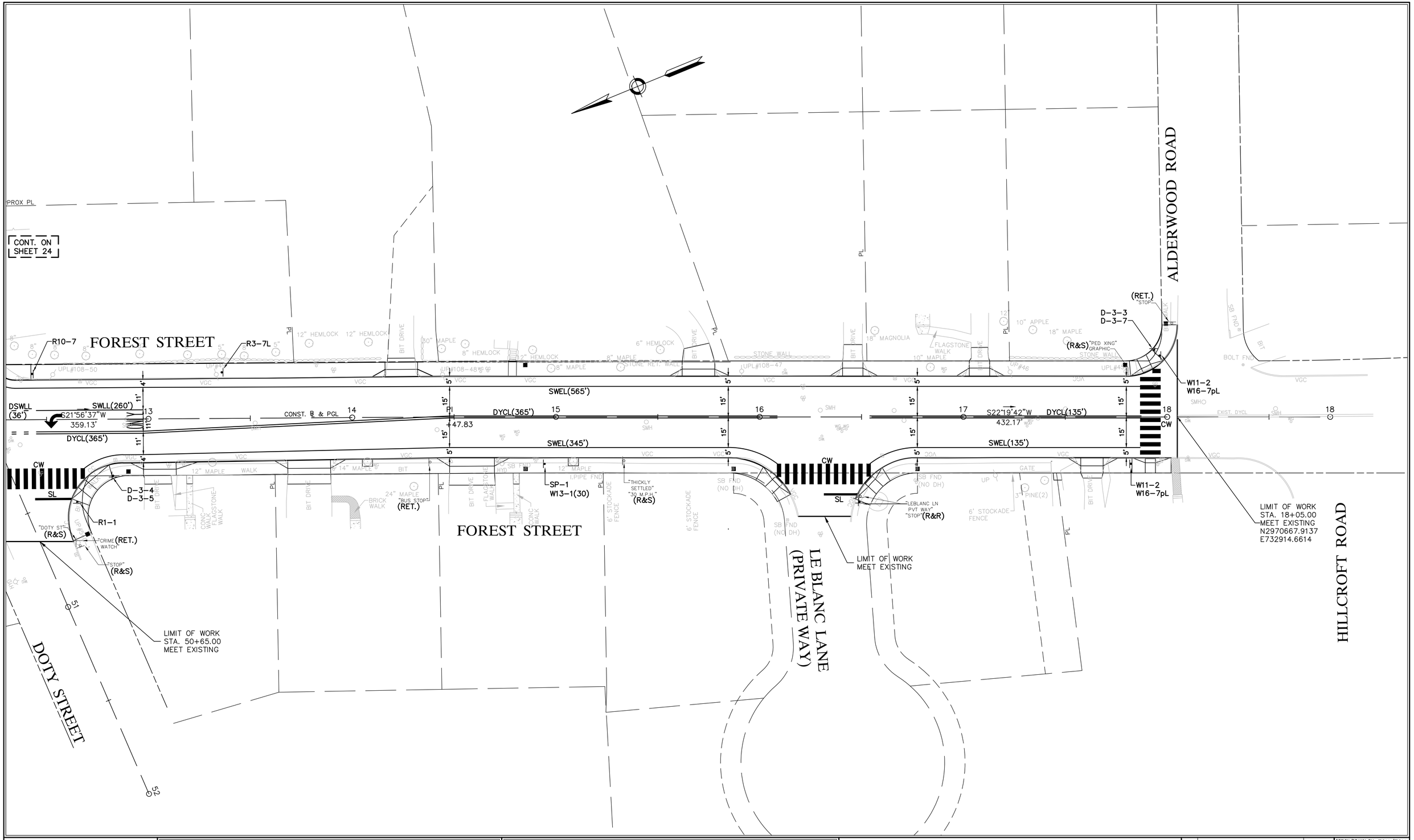

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DRAWING NO.: 26 OF 68

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (INCHES)		NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA IN SQUARE FEET	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING		BACK-GROUND	LEGEND	BORDER			
R1-1	30"	30"	STOP	MUTCD STANDARD		6	MUTCD STANDARD			P5 (6 REQ'D)	6.25	37.50
R3-5L	30"	36"	ONLY	MUTCD STANDARD		1	MUTCD STANDARD			MNT ON MAST ARM	7.50	7.50
R3-5R	30"	36"	ONLY	MUTCD STANDARD		1	MUTCD STANDARD			MNT ON MAST ARM	7.50	7.50
R3-7L	30"	30"	LEFT LANE MUST TURN LEFT	MUTCD STANDARD		3	MUTCD STANDARD			P5 (3 REQ'D)	6.25	18.75
R3-7R	30"	30"	RIGHT LANE MUST TURN RIGHT	MUTCD STANDARD		1	MUTCD STANDARD			P5 (1 REQ'D)	6.25	6.25
R5-2	30"	30"		MUTCD STANDARD		1	MUTCD STANDARD			MNT ON M.A. SHAFT	6.25	6.25
R8-3	24"	30"	NO PARKING	MUTCD STANDARD		11	MUTCD STANDARD			P5 (11 REQ'D)	5.00	55.00
R9-5	12"	18"	USE PED SIGNAL	MUTCD STANDARD		1	MUTCD STANDARD			MNT ON M.A. SHAFT	1.50	1.50
R10-7	24"	30"	DO NOT BLOCK INTERSECTION	MUTCD STANDARD		1	MUTCD STANDARD			P5 (1 REQ'D)	5.00	5.00
R10-12	30"	36"	LEFT TURN YIELD ON GREEN	MUTCD STANDARD		1	MUTCD STANDARD			MNT ON MAST ARM	7.50	7.50
R10-22	18"	24"	TO REQUEST GREEN WAIT ON	MASSDOT STANDARD		4	MASSDOT STANDARD			1 w/D8-1; 1 w/D8-2; 1 w/R3-7L; 1 w/D11-1	3.00	12.00
W3-5B(ILL.)	36"	36"	(RED) SIGNAL AHEAD	MASSDOT STANDARD		1	MASSDOT STANDARD			PAY UNDER ITEM 824.61		
W11-2	30"	30"		MUTCD STANDARD		6	MUTCD STANDARD			P5 (6 REQ'D)	6.25	37.50
W11-3	30"	30"		MUTCD STANDARD		2	MUTCD STANDARD			P5 (2 REQ'D)	6.25	12.50
W13-1(30)	30"	30"	30 MPH	MUTCD STANDARD		1	MUTCD STANDARD			MNT w/SP-1	6.25	6.25
W16-7pL	24"	12"		MUTCD STANDARD		6	MUTCD STANDARD			MNT w/W11-2	2.00	12.00

IDENTIFI-CATION NUMBER	SIZE OF SIGN		TEXT	TEXT DIMENSIONS (INCHES)		NUMBER OF SIGNS REQUIRED	COLOR			POST SIZE AND NUMBER REQUIRED	UNIT AREA IN SQUARE FEET	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING		BACK-GROUND	LEGEND	BORDER			
SP-1	30"	30"	THICKLY SETTLED	R=0.5" 5"C 5" (0.5" BORDER; 0.5" INDENT)	13.5" 3" 13.5"	1	YELLOW	BLACK	BLACK	P5 (1 REQ'D)	6.25	6.25
M7-1L	12"	9"		MUTCD STANDARD		1	MUTCD STANDARD			MNT w/D11-1	0.75	0.75
M7-1R	12"	9"		MUTCD STANDARD		1	MUTCD STANDARD			MNT w/D11-1	0.75	0.75
D-3-1 (PBS)	VAR.	12"	Trapelo Rd	6"C/4.5"C 4.5"C	3" 3"	6	MUTCD STANDARD			4 ON P5; 1 ON MA SHAFT; 1 ON SIGNAL PST	PAY UNDER ITEM 874.	
D-3-2 (PBS)	VAR.	12"	Hobbs Rd	6"C/4.5"C 4.5"C	3" 3"	1	MUTCD STANDARD			MNT w/D-3-1	PAY UNDER ITEM 874.	
D-3-3 (PBS)	VAR.	12"	Metropolitan Pkwy	6"C/4.5"C 4.5"C	3" 3"	1	MUTCD STANDARD			MNT ON M.A. SHAFT	PAY UNDER ITEM 874.	
D-3-4 (PBS)	VAR.	12"	Forest St	6"C/4.5"C 4.5"C	3" 3"	2	MUTCD STANDARD			2 ON P5; 1 MNT ON SIGNAL POST	PAY UNDER ITEM 874.	
D-3-5 (PBS)	VAR.	12"	Doty St	6"C/4.5"C 4.5"C	3" 3"	2	MUTCD STANDARD			1 w/D-3-1; 1 w/D-3-4	PAY UNDER ITEM 874.	
D-3-6 (PBS)	VAR.	12"	Shade St	6"C/4.5"C 4.5"C	3" 3"	1	MUTCD STANDARD			MNT w/D-3-1	PAY UNDER ITEM 874.	
D-3-7 (PBS)	VAR.	12"	Alderwood Rd	6"C/4.5"C 4.5"C	3" 3"	2	MUTCD STANDARD			1 w/D-3-1; 1 w/D-3-4	PAY UNDER ITEM 874.	
D8-1 (PBS) (REV. ARROW)	48"	36"	BENTLEY UNIVERSITY	6"C 6"C 8"X36" ARROW	3" 3" 3" 7"	1	GREEN H/I	SILVER/ WHITE H/I	WHITE H/I	PAY UNDER ITEM 841.4	12.00	12.00
D8-2 (PBS) (REV. ARROW)	48"	42"	PHINEAS LAWRENCE SCHOOL	6"C 6"C 6"C 8"X36" ARROW	2.5" 2.5" 2.5" 2.5" 7"	1	GREEN H/I	SILVER/ WHITE H/I	WHITE H/I	PAY UNDER ITEM 841.4	14.00	14.00
D11-1	30"	24"	BIKE ROUTE	MUTCD STANDARD		2	MUTCD STANDARD			1 ON P5; 1 MNT ON M.A. SHAFT	5.00	10.00

NOTES:

1. ALL WARNING, REGULATORY AND ROUTE MARKERS SHALL BE FABRICATED WITH HIGH INTENSITY ENCAPSULATED LENS REFLECTIVE SHEETING (SEE SECTION M9.30.0) TYPE III OR IV.
2. ALL SIGNS NOTED AS "(R&R)" SHALL BE MOUNTED ON NEW P5 POSTS OR AS OTHERWISE INDICATED.
3. ALL P5 POSTS SHALL BE TELESCOPIC SQUARE TYPE POSTS.
4. QUANTITIES OF SIGNS AND POSTS SHOWN ON THIS SHEET MAY DIFFER FROM THE PAVEMENT MARKING AND SIGNING PLANS. WHERE DIFFERENCES OCCUR, THE PAVEMENT MARKINGS AND SIGNING PLANS SHALL PREVAIL.

GRAPHIC SCALE
0 10 20 30 40 60 FEET

TRAFFIC SIGN SUMMARY

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
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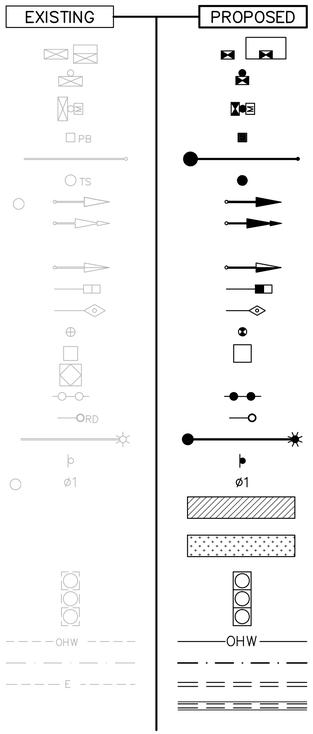
JOB NO.: MAX-2012005.00
FILE NAME: 12005.00_PM&S
DRAWING NO.: 27 OF 68



TRAFFIC SIGNAL LEGEND

CONTROL CABINET GROUND MOUNTED (WITH & WITHOUT CONC. PAD)
CONTROL CABINET POLE MOUNTED
FLASHING BEACON CONTROL & METER PEDESTAL
PULL BOX (12" x 12" OR AS NOTED)
MAST ARM, SHAFT & BASE (ARM LENGTH AS NOTED)
SIGNAL POST & BASE (ALPHA–NUMERIC DESIGNATION NOTED)
VEHICULAR SIGNAL HEAD (ALPHA–NUMERIC DESIGNATION NOTED)
VEHICULAR SIGNAL HEAD, OPTICALLY PROGRAMMED (ALPHA–NUMERIC DESIGNATION NOTED)
FLASHING BEACON (ALPHA–NUMERIC DESIGNATION NOTED)
PEDESTRIAN SIGNAL HEAD (ALPHA–NUMERIC DESIGNATION NOTED)
EMERGENCY PREEMPTION DETECTOR (OPTICOM)
PEDESTRIAN PUSH BUTTON, SIGN & SADDLE
WIRE LOOP DETECTOR (6' x 6' OR AS NOTED)
HIGH MAST POLE OR TOWER
MAGNETOMETER
RADAR DETECTOR
SIGNAL & LIGHTING MAST ARM
TRAFFIC SIGN & POST
CONTROLLER PHASE ACTUATED
ZONE OF DETECTION FOR SPECIAL DETECTORS
ZONE OF VISIBILITY FOR PROGRAMMED SIGNAL
TRAFFIC SIGNAL HEAD (12" LENSES OR AS NOTED)
OVERHEAD WIRE(S)
DIRECT BURIAL CABLE
TRAFFIC SIGNAL CONDUIT
CONDUIT CROSSING ROADWAY WITH FLOWABLE FILL

GENERAL ABBREVIATIONS

MAX	MAXIMUM
MIN	MINIMUM
BO	BY OTHERS
PROP	PROPOSED
R & D	REMOVE AND DISPOSE
R & R	REMOVE AND RESET
R & S	REMOVE AND STACK
REM	REMOVE
RET	RETAIN

TRAFFIC SIGNAL ABBREVIATIONS

R	STEADY CIRCULAR RED
Y	STEADY CIRCULAR AMBER
G	STEADY CIRCULAR GREEN
RL	STEADY RED LEFT ARROW
YL	STEADY AMBER LEFT ARROW
GL	STEADY GREEN LEFT ARROW
GV	STEADY GREEN VERTICAL ARROW
RR	STEADY RED RIGHT ARROW
YR	STEADY AMBER RIGHT ARROW
GR	STEADY GREEN RIGHT ARROW
FR	FLASHING CIRCULAR RED
FY	FLASHING CIRCULAR AMBER
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
W	WALK – LUNAR WHITE
DW	DON'T WALK – PORTLAND ORANGE
FDW	FLASHING DON'T WALK – PORTLAND ORANGE
L	DETECTOR – LOCK
NL	DETECTOR – NON–LOCK
	VEHICLE MOVEMENT
	PEDESTRIAN MOVEMENT
	PERMISSIVE VEHICULAR MOVEMENT
•	DETECTOR CONTROLLING PHASE

ONLY SHOWN ON PHASING DIAGRAMS

DON'T WALK / WALK

GENERAL NOTES

1. ALL EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS NOTED OTHERWISE.
2. ALL PROPOSED PAVEMENT MARKINGS SHALL BE THERMOPLASTIC.

TRAFFIC SIGNAL NOTES

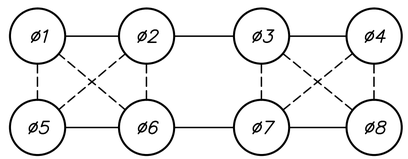
1. SEE CONSTRUCTION AND TRAFFIC PLANS FOR ADDITIONAL DETAILS.
2. PROPOSED CONTROLLERS SHALL BE A NEMA TS2, KEYBOARD ENTRY, MENU–DRIVEN TYPE WITH INTERNAL COORDINATION CAPABILITIES, UNLESS OTHERWISE NOTED IN MAJOR ITEMS.
3. POLE–MOUNTED SIGNALS SHALL BE MOUNTED TO PROVIDE A 2–FOOT MINIMUM CLEARANCE BETWEEN VERTICAL PROJECTION OF THE CURBLINE AND THE SIGNAL HEAD. WHEN FEASIBLE, INSTALL AT BACK OF SIDEWALK UNLESS OTHERWISE NOTED. PROVIDE SPECIAL MOUNTING HARDWARE AS REQUIRED.
4. CONSTRUCTION OF THE TRAFFIC CONTROL SIGNAL SYSTEMS SHOWN ON THE FOLLOWING DRAWINGS SHALL CONFORM TO THE MASSACHUSETTS HIGHWAY DEPARTMENT'S "STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES", 1988 ED. AS AMENDED, AND THE FEDERAL HIGHWAY ADMINISTRATION'S "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", 2009 EDITION AS AMENDED.
5. ALL TRAFFIC CONTROL SIGNAL EQUIPMENT SHALL BE SUPPLIED IN ACCORDANCE WITH THE CITY OF WALTHAM'S TRAFFIC SIGNAL SPECIFICATION AND IS SUBJECT TO THE APPROVAL OF THE DESIGN ENGINEER AND/OR THE CITY OF WALTHAM WIRES DEPARTMENT.
6. ALL OVERHEAD CONDUCTORS FOR SIGNAL HOUSINGS SHALL BE STRANDED WIRE.
7. ALL PROPOSED WIRE LOOP DETECTORS SHALL BE CENTERED WITHIN RESPECTIVE LANES UNLESS OTHERWISE NOTED AND CUT IN THE BASE PAVEMENT COURSE.
8. ALL PROPOSED LENSES SHALL HAVE TUNNEL VISORS.
9. ALL MAST ARM MOUNTED SIGNALS SHALL BE RIGIDLY MOUNTED.
10. FLASHING OPERATION PER M.U.T.C.D., SECTION 4D.28 TO SECTION 4D.31
11. IF THE ASSIGNED RIGHT OF WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT SHALL NOT CHANGE DURING THE CHANGE INTERVAL(S).
12. ALL NEW TRAFFIC CONTROLLER CABINETS SHALL BE EQUIPPED WITH A LEVER–TYPE METER BY–PASS. SPECIFICATIONS FOR THE BY–PASS MUST BE APPROVED BY THE APPROPRIATE UTILITY COMPANY.
13. WHERE CALLED FOR ON THE PLANS, THE PROPOSED LOCATIONS OF THE OPTICAL DETECTOR UNITS AND CONFIRMATION BEACON ARE PERCEIVED BEST BUT NOT FINAL. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ENSURE OPTIMUM PLACEMENT IN COOPERATION WITH THE LOCAL MUNICIPALITY'S FIRE FIGHTING DEPARTMENT. THE OPTICAL DETECTOR UNITS SHALL HAVE AN UNOBSTRUCTED LINE–OF–SIGHT VIEW ALONG THE ROUTE OF APPROACHING PRIORITY VEHICLE.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING AND VERIFYING THAT THERE IS SUFFICIENT CLEARANCE BETWEEN ALL PROPOSED TRAFFIC SIGNAL POLES AND EXISTING AND RELOCATED OVERHEAD UTILITY LINES. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR COORDINATING WITH THE AFFECTED UTILITY COMPANIES RELATIVE TO THE SCOPE OF ANY REQUIRED RELOCATIONS. THIS SHALL BE PERFORMED WITHIN TEN DAYS AFTER AWARD OF THE CONTRACT.
15. THE CONTRACTOR SHALL REMOVE AND DELIVER ALL EXISTING TRAFFIC SIGNAL EQUIPMENT WITHIN THE PROJECT LIMITS TO THE APPROPRIATE OWNER'S MAINTENANCE DEPOT EXCEPT FOR LOCATIONS NOTED ON THE PLANS.
16. THE TRAFFIC CONTROLLER AND CABINET ASSEMBLY SHALL BE CAPABLE OF RUNNING A FLASHING YELLOW ARROW (FYA) FOR LEFT TURN PROTECTED/PERMISSIVE PHASING IF DESIRED.
17. THE TRAFFIC CONTROLLER AND CABINET ASSEMBLY SHALL BE CAPABLE OF ACCOMMODATING ACCESSIBLE PEDESTRIAN SIGNALS (APS) IF DESIRED.

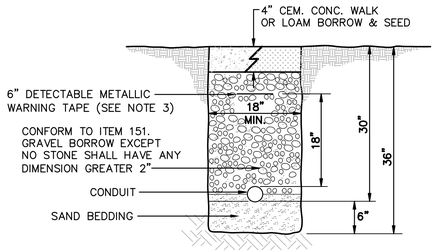
LOOP DETECTOR NOTES

1. SEE LOOP DETECTOR DETAIL SHEET FOR SPLICE PATTERN AND OTHER INFORMATION.
2. DELAY AND EXTENSION TIMES ARE IN SECONDS.
3. DELAY TIME SHALL BE EFFECTIVE ONLY DURING THE RED PORTION OF THE PHASE THAT IS CALLED BY A DETECTOR.

NEMA DUAL RING PHASING NOTES

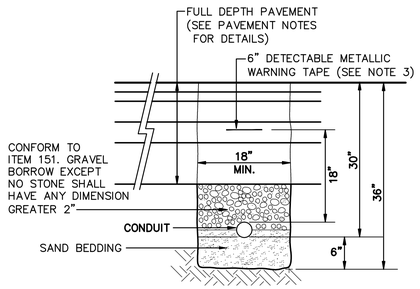
1. PHASES ASSOCIATED BY A SOLID LINE SHALL NOT OPERATE CONCURRENTLY.
2. PHASES ASSOCIATED BY A DASHED LINE MAY OPERATE CONCURRENTLY.





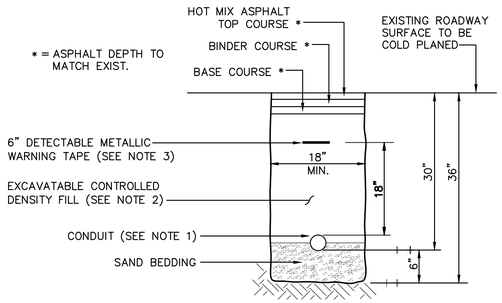
TRAFFIC SIGNAL CONDUIT TRENCH DETAIL (IN SIDEWALK OR LANDSCAPE AREA)

NOT TO SCALE



TRAFFIC SIGNAL CONDUIT TRENCH DETAIL (IN ROADWAY WITHIN FULL DEPTH AREA)

NOT TO SCALE



NOTES:

1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM–PLASTIC (UL), WITH PULL ROPE, UNLESS OTHERWISE APPROVED BY MASSDOT.
2. CONTROLLED DENSITY FILL SHALL MEET THE REQUIREMENTS OF SUBSECTION M4.08.0.
3. WARNING TAPE COLOR SHALL BE PER APWA STANDARDS.
4. HMA BINDER/BASE COURSE SHALL BE PAID FOR UNDER ITEM 472.
5. HMA TOP COURSE SHALL BE PAID FOR UNDER ITEM 460.
6. EXCAVATABLE CONTROLLED DENSITY FILL ONLY REQUIRED IN CONDUIT TRENCHES LOCATED WITHIN AREAS OF EXIST. ROADWAY PAVEMENT THAT DOES NOT REQUIRE FULL DEPTH PAVEMENT CONSTRUCTION.

TRAFFIC SIGNAL CONDUIT TRENCH DETAIL (IN ROADWAY TO BE MILLED)

NOT TO SCALE

TRAFFIC SIGNAL LEGEND, NOTES AND DETAILS

TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
Engineers, Architects, Planners, Construction Engineers & Inspectors
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NO.	REVISION	DATE

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CHECK BY:	JWD/GJH
DATE:	7/13/2012
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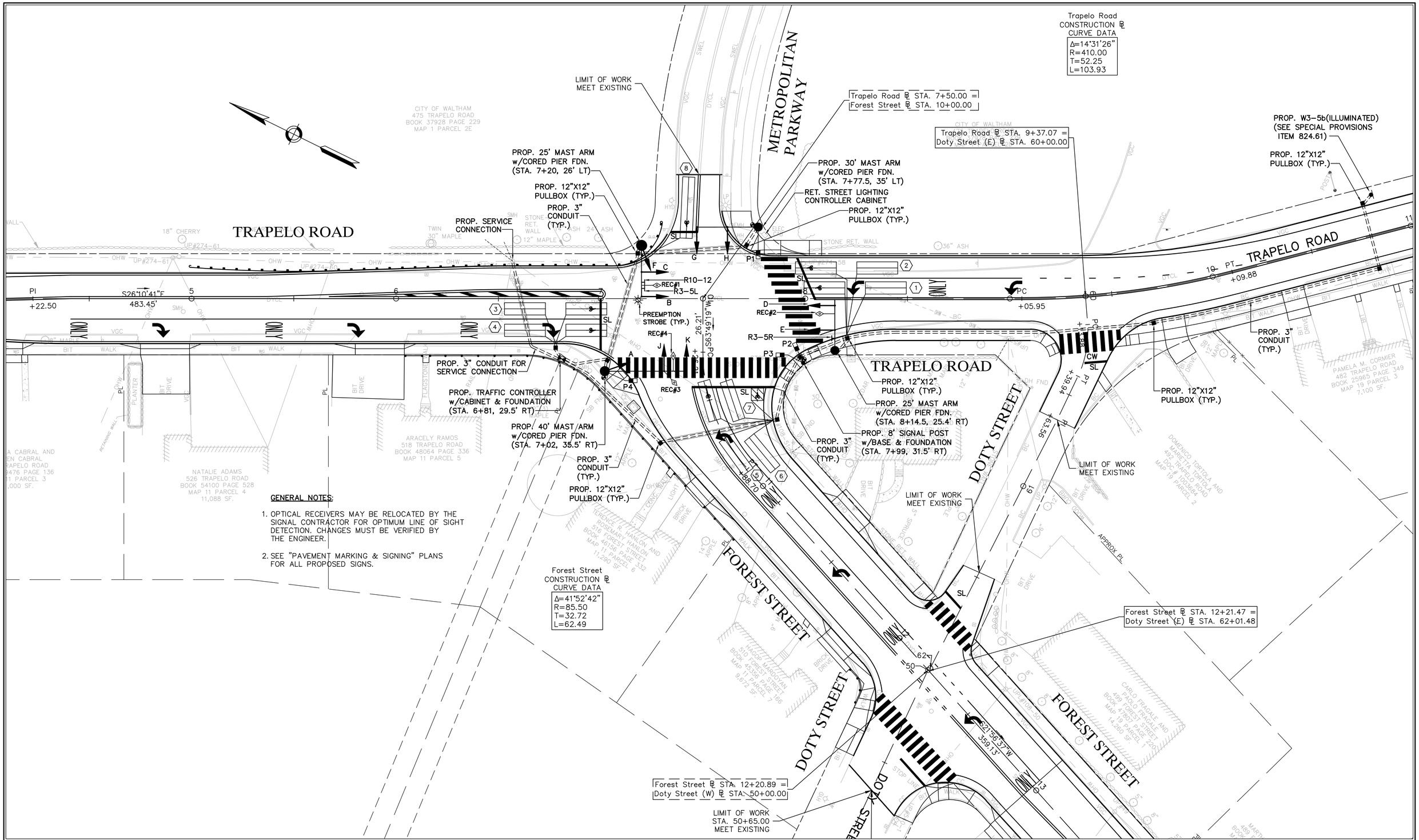
JOB NO.:	MAX–2012005.00
FILE NAME:	12005.00_TS
DRAWING NO.:	28 OF 68



GENERAL NOTES:

1. OPTICAL RECEIVERS MAY BE RELOCATED BY THE SIGNAL CONTRACTOR FOR OPTIMUM LINE OF SIGHT DETECTION. CHANGES MUST BE VERIFIED BY THE ENGINEER.
2. SEE "PAVEMENT MARKING & SIGNING" PLANS FOR ALL PROPOSED SIGNS.

GRAPHIC SCALE
0 10 20 30 40 60 FEET

TRAFFIC SIGNAL PLAN

TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

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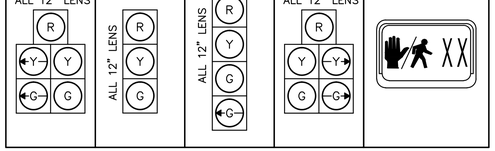
PROPOSED SIGNALS

A,B	C,D,H,J	F,G,K	E	$P_1 - P_4$
ALL 12" LENS	ALL 12" LENS	ALL 12" LENS	ALL 12" LENS	

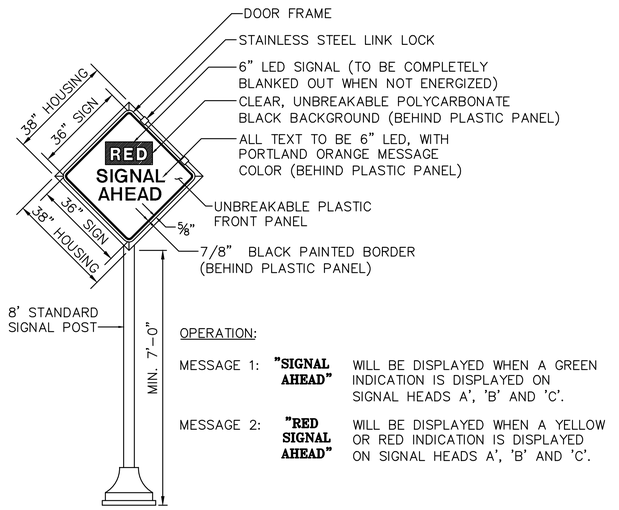


NOTES:

1. ALL INDICATIONS SHALL BE "LED" TYPE LENS IN ACCORDANCE WITH THE SPECIAL PROVISIONS.
2. ALL OVERHEAD SIGNALS SHALL BE RIGIDLY MOUNTED. ALL SIGNAL HEADS SHALL BE EQUIPPED WITH CUT TUNNEL VISORS AND 5" LOUVERED BACKPLATES.
3. ALL PEDESTRIAN DISPLAY SHALL BE "FULL" DISPLAYS. NO OUTLINE SYMBOL SHALL BE PERMITTED.

TRAFFIC CONTROLLER DATA

PARAMETER	SELECTION
PHASE ASSIGNMENTS	STD. NEMA
OVERLAPS	STD. NEMA
RINGS	DUAL
DUAL ENTRY	ON (ø2 & ø6)
SIMULTANEOUS GAP OUT DISABLED	YES (ø2 & ø6)
MINIMUM YELLOW IN SECONDS	3
MAX II BY INTERNAL CLOCK	YES
NIGHT TIME FLASH BY INTERNAL CLOCK	NOT USED



OPERATION:

MESSAGE 1: **"SIGNAL AHEAD"** WILL BE DISPLAYED WHEN A GREEN INDICATION IS DISPLAYED ON SIGNAL HEADS A', 'B' AND 'C'.

MESSAGE 2: **"RED SIGNAL AHEAD"** WILL BE DISPLAYED WHEN A YELLOW OR RED INDICATION IS DISPLAYED ON SIGNAL HEADS A', 'B' AND 'C'.

W3-5b(ILL.)
HIGHWAY WARNING SIGN ILLUMINATED DETAIL

SEE ITEM 824.61 IN THE SPECIAL PROVISIONS FOR DETAILS.

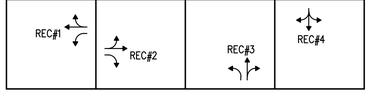
MAJOR ITEMS REQUIRED

QUANTITY	DESCRIPTION
1	TRAFFIC CONTROLLER & CABINET NEMA TS2-TYPE 1 w/FDN.
1	SERVICE CONNECTION (OVERHEAD FROM UTILITY POLE)
1	40' MAST ARM ASSEMBLY, BASE & FDN. (HEAVY LOADS)
1	30' MAST ARM ASSEMBLY, BASE & FDN. (HEAVY LOADS)
2	25' MAST ARM ASSEMBLY, BASE & FDN. (HEAVY LOADS)
1	8" SIGNAL POST, BASE & FDN.
4	SIGNAL HEAD, 3 SECTION
3	SIGNAL HEAD, 4 SECTION
3	SIGNAL HEAD, 5 SECTION
4	PEDESTRIAN HOUSING GRAPHIC LED WITH COUNTDOWN TIMER
3	AUDIBLE & VIBRO-TACTILE PEDESTRIAN PUSHBUTTON INTEGRATED R10-3E(NO ARROW) SIGN & SADDLE w/LED CONFIRMATION LIGHT
13	ROADWAY VEHICLE LOOP DETECTOR (QUADRUPOLE TYPE)
1	BICYCLE LOOP DETECTOR TYPE D-2
6	DUAL CHANNEL LOOP DETECTOR AMPLIFIER INCL. TWO SPARES
11	PULL BOX 12"x12" - SD2.031 (PAY SEPARATELY UNDER ITEM 811.31)
4	UNIDIRECTIONAL SINGLE CHANNEL OPTICAL DETECTOR (RECEIVER)
2	PREEMPTION 2-CHANNEL PHASE SELECTOR
1	PREEMPTION CONFIRMATION STROBE (CLEAR)
	PLUS ALL MISCELLANEOUS EQUIPMENT AND MATERIAL NECESSARY TO PROVIDE A COMPLETE OPERATING TRAFFIC CONTROL SIGNAL.

ALL SIGNAL EQUIPMENTS INCLUDING MAST ARMS, TRAFFIC SIGNAL POSTS, CONTROLLER CABINET, ETC. SHALL BE PAINTED BLACK IN ACCORDANCE WITH THE SPECIAL PROVISIONS.

EMERGENCY VEHICLE PREEMPTION

NB	SB	EB	WB
PREEMPT#1	PREEMPT#2	PREEMPT#3	PREEMPT#4

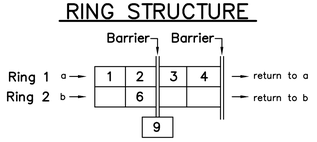


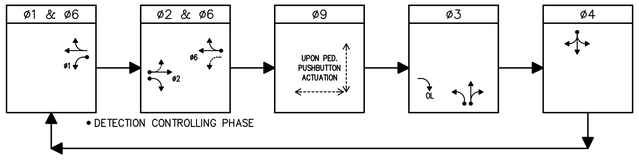
EMERGENCY VEHICLE PREEMPTION OPERATION

1. EMERGENCY VEHICLE PREEMPTION SIGNAL SHALL BE OPTICALLY TRANSMITTED BY OPTICAL EMITTERS MOUNTED IN EMERGENCY VEHICLES AND RECEIVED BY OPTICAL DETECTORS (RECEIVERS) LOCATED AT THE INTERSECTION.
2. PREEMPTION SIGNALS SHALL BE SERVICED ON A FIRST COME FIRST SERVED BASIS.
3. IN RESPONSE TO A PREEMPTION SIGNAL RECEIVED BY OPTICAL DETECTOR REC#1 (OR REC#2, REC#3, REC#4), THE CONTROLLER SHALL HOLD OR ADVANCE TO AND HOLD IN EMERGENCY VEHICLE PREEMPTION SIGNAL #1 (OR #2, #3, #4) GREEN FOR A MINIMUM OF TEN (10) SECONDS OR UNTIL PREEMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME THE RELEVANT CLEARANCE INTERVALS AND SERVICE THE SUBSEQUENT EMERGENCY VEHICLE PREEMPTION SIGNAL IF NECESSARY. NORMAL SIGNAL OPERATION SHALL RESUME PROVIDED THAT ALL PREEMPTION SIGNALS HAVE CEASED.
4. NORMAL VEHICLE CLEARANCES SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PREEMPTION DEMAND.
5. PREEMPTION STROBE SHALL BE ILLUMINATED WHENEVER ANY EMERGENCY VEHICLE PREEMPTION SIGNAL IS ON.

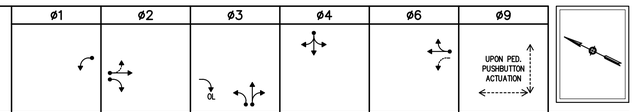
PREFERENTIAL PHASE SEQUENCE

RING STRUCTURE





FULLY-ACTUATED ☑ ISOLATED ☑
SEMI-ACTUATED ☐ COORDINATED ☐
PRE-TIMED ☐ WIRE ☐ TBCU ☐



SEQUENCE AND TIMING

STREET	DIRECTION	HOUSINGS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	FLASH OPER.
TRAPELO ROAD	NB	A,B	G/GL	Y/YL	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FY
TRAPELO ROAD	NB	C	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FY
TRAPELO ROAD	SB	D	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	FY
TRAPELO ROAD	SB	E	R	R	R	G	Y	R	R/GRR	/YR	R	R	R	R	R	R	R	R	R	R	FY
FOREST STREET	EB	F,G	R	R	R	R	R	R	G/GL	Y	R	R	R	R	R	R	R	R	R	R	FR
FOREST STREET	EB	H	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	FR
METROPOLITAN PARKWAY	WB	J	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	FR
METROPOLITAN PARKWAY	WB	K	R	R	R	R	R	R	R	R	R	G/GL	Y	R	R	R	R	R	R	R	FR
PEDESTRIAN	ALL	P1-P8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	OUT
TIMING IN SECONDS																					
MINIMUM INITIAL			6			10			6			6			10						EMERGENCY
PASSAGE			2			2			2			2			2						
MAXIMUM 1 (ALL OTHER TIMES)			10			30			20			10			30						
MAXIMUM 2 (MON-FRI: 3pm-6pm)			10			36			22			10			36						
CHANGE				4.0	2.0		4.0	2.0		3.5	2.0		3.5	2.0		4.0	2.0				
PEDESTRIAN																		7	22	3	
RECALL			OFF			SOFT			OFF			OFF			SOFT			OFF			
MEMORY			NON-LOCKING			NON-LOCKING			NON-LOCKING			NON-LOCKING			NON-LOCKING			LOCKING			

LOOP DETECTOR DATA

DETECTOR NO.	NO. OF SEGMENTS	LOOP SIZE	SPLICE PATTERN	NO. OF TURNS	ø CALLED	ø EXT.	MODE A=PULSE B=PRES.	DELAY TIME	EXT. TIME
1	2	6'X20'	PARALLEL	QUADRUPOLE TYPE	1	1 &6	B	-	-
2	2	6'X20'	PARALLEL	QUADRUPOLE TYPE	6	6	B	-	-
3	2	6'X20'	PARALLEL	QUADRUPOLE TYPE	2	2	B	-	-
4	2	6'X20'	PARALLEL	QUADRUPOLE TYPE	1	1	B	-	-
5	2	6'X20'	PARALLEL	QUADRUPOLE TYPE	3	3	B	-	-
6	2	6'X20'	PARALLEL	QUADRUPOLE TYPE	3	3	B	-	-
7	1	6'X6'	-	BICYCLE TYPE D-2	3	3	B	-	-
8	1	6'X30'	-	QUADRUPOLE TYPE	4	4	B	5 SEC	-

GRAPHIC SCALE
0 10 20 30 40 60 FEET

TRAFFIC SIGNAL PLAN

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
Engineers, Architects, Planners, Construction Engineers & Inspectors
181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

NO.	REVISION	DATE

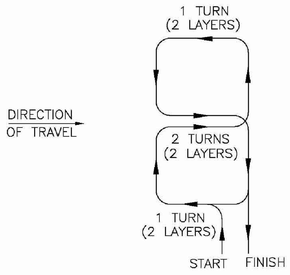
DESIGN/DRAWN BY: TQN/TQN
CHECK BY: JWD/GJH
DATE: 7/13/2012
SCALE: AS NOTED
JOB NO.: MAX-2012005.00
FILE NAME: 12005.00_TS
DRAWING NO.: 30 OF 68

WALTHAM
TRAPELO RD @ FOREST ST/METROPOLITAN PKWY

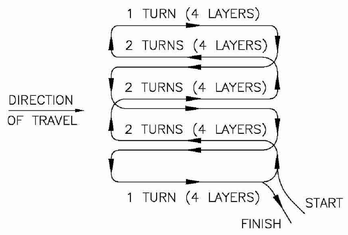
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.	NFA	31	68
PROJECT FILE NO.			

BICYCLE LOOP DETECTOR DETAILS

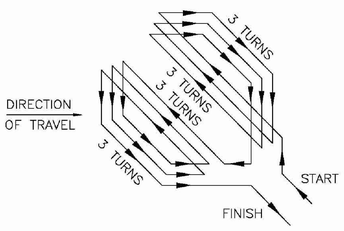
WINDING DETAILS



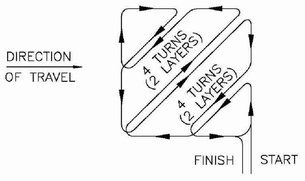
TYPE Q DETECTOR



TYPE D–Q DETECTOR

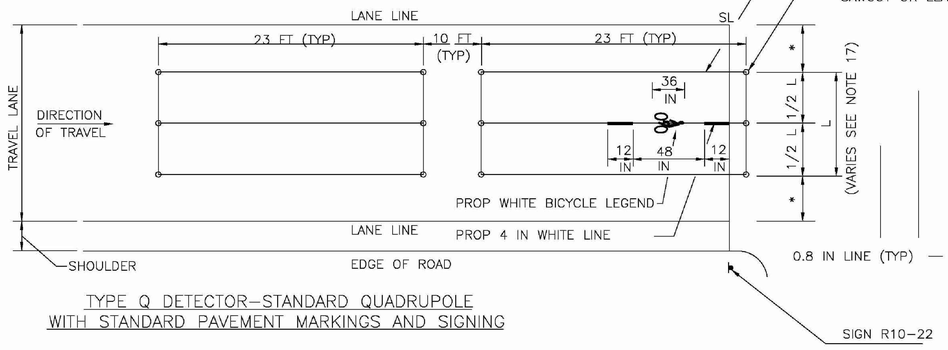


TYPE D–1 DETECTOR



TYPE D–2 DETECTOR

INSTALLATION DETAILS



TYPE Q DETECTOR–STANDARD QUADRUPOLE
WITH STANDARD PAVEMENT MARKINGS AND SIGNING

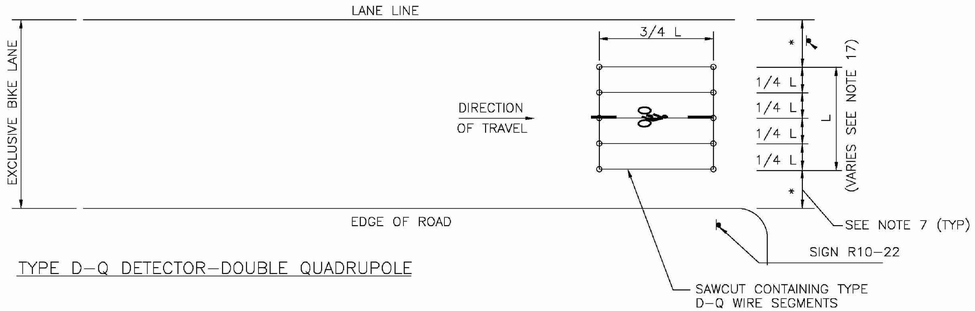
SIGN R10–22

SIGN BORDER:
R=1.5, TH=0.5, INS=.38

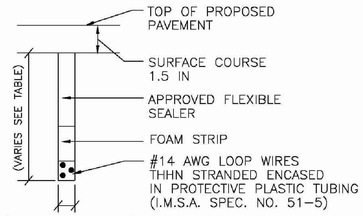
WHITE BACKGROUND
BLACK LEGEND AND LINES

NOTE: ALL SIGN DIMENSIONS IN INCHES

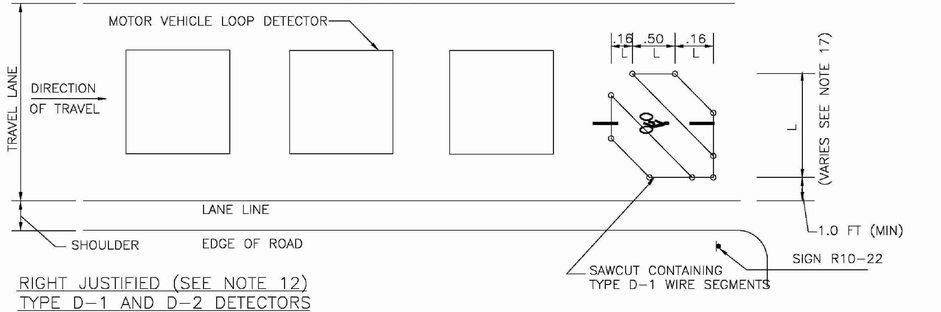
NOTE: SIGN PANEL NOT SHOWN TO SCALE



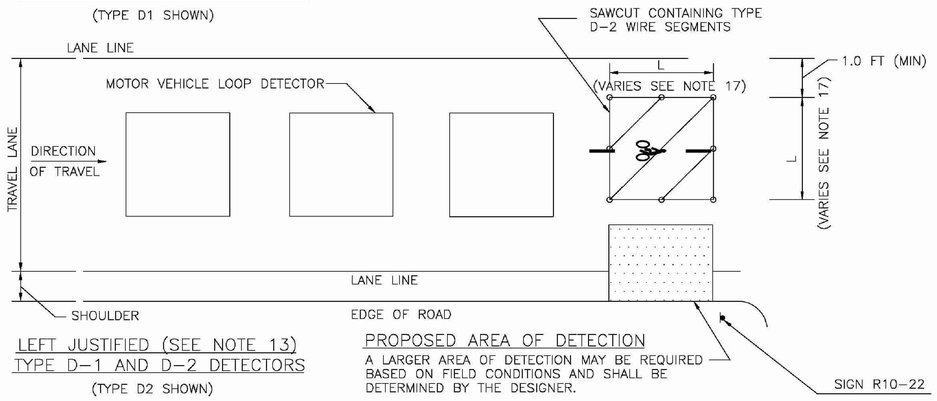
TYPE D–Q DETECTOR–DOUBLE QUADRUPOLE



SECTION THRU LOOP DETECTOR



RIGHT JUSTIFIED (SEE NOTE 12)
TYPE D–1 AND D–2 DETECTORS
(TYPE D1 SHOWN)



LEFT JUSTIFIED (SEE NOTE 13)
TYPE D–1 AND D–2 DETECTORS
(TYPE D2 SHOWN)

PROPOSED AREA OF DETECTION
A LARGER AREA OF DETECTION MAY BE REQUIRED BASED ON FIELD CONDITIONS AND SHALL BE DETERMINED BY THE DESIGNER.

SAWCUT SLOT DEPTH GUIDE		
TURNS OF WIRE	SLOT SIZE	
	DEPTH (IN)	WIDTH (IN)
1	1.5	0.5
2	1.5	0.5
3	1.5	0.5
4	2.0	0.5
5	2.0	0.5
6	2.0	0.5
7	2.0	0.5
8	2.0	0.5

NOTES:

1. REFER TO VEHICLE LOOP DETECTOR DETAIL SHEET FOR ADDITIONAL NOTES AND CONSTRUCTION DETAILS.
2. ALL DETAILS ARE GRAPHICAL WITH NO SCALE.
3. THE NUMBER, SIZE, LOCATION AND LENGTH OF DETECTION AREA VARIES AND SHALL BE DETERMINED BY THE DESIGNER REFER TO TRAFFIC SIGNAL PLAN.
4. BICYCLE LOOPS SHALL BE CONNECTED TO SEPARATE LOOP DETECTOR AMPLIFIERS CAPABLE OF HIGHER LEVELS OF SENSITIVITY.
5. BICYCLE LOOPS SHALL BE INSTALLED IN THE BASE COURSE OF EXISTING PAVEMENT. THE EXISTING PAVEMENT SHALL BE COLD PLANED TO THE BASE COURSE AND SAWCUT FOR LOOP INSTALLATION.
6. SIGNS AND PAVEMENT MARKINGS SHALL BE INSTALLED FOR ALL BICYCLE DETECTORS TO INFORM CYCLISTS OF THE DETECTION AREA.
7. * OFFSETS FROM LANE LINE EQUAL UNLESS OTHERWISE NOTED. SEE PLANS.
8. TYPE Q DETECTORS SHALL BE WIRED IN A FIGURE EIGHT PATTERN WITH A DOUBLE LAYER DESIGN ("2–4–2") WITH 2 TURNS IN THE PERIMETER SLOTS AND 4 TURNS IN THE CENTER SLOT AS SHOWN IN THE WINDING DETAIL.
9. BICYCLES WILL BE DETECTED WITHIN 4 IN. OF THE INTERIOR LONGITUDINAL LOOP WIRES FOR TYPE Q AND D–Q DETECTORS.
10. PROVIDE 3 TURNS FOR TYPE D–1 DETECTORS.
11. INSTALL 2 LAYERS OF WIRE WOUND IN THE SAME DIRECTION IN BOTH LAYERS FOR TYPE D–2 DETECTORS. THE RESULT IS 4 TURNS IN EACH DIAGONAL.
12. RIGHT JUSTIFIED LOOP DETECTORS SHALL BE CONSIDERED FOR THE FOLLOWING CONDITIONS:
    a) BICYCLE STOPPING ON THE RIGHT SIDE OF A THRU TRAVEL LANE.
    b) BICYCLE STOPPING ON THE RIGHT SIDE OF AN EXCLUSIVE LEFT TURN LANE.
13. LEFT JUSTIFIED LOOP DETECTORS SHALL BE CONSIDERED FOR THE FOLLOWING CONDITIONS:
    a) BICYCLE STOPPING ON THE LEFT SIDE OF A SHARED LEFT/THRU LANE.
    b) BICYCLE STOPPING JUST TO THE RIGHT OF THE CENTERLINE WHEN TURNING LEFT ON A TWO–LANE ROADWAY.
14. RECTANGULAR LOOP DETECTORS SHALL BE CONSIDERED FOR BICYCLES STOPPING ON EITHER THE LEFT OR RIGHT SIDE OF A TWO–LANE ROADWAY. THE MINIMUM OFFSET FROM LANE LINE OR CURB LINE SHALL BE 1.0 FT.
15. PAVEMENT CORES OR TEST PITS MAY BE REQUIRED TO DETERMINE THE DEPTH OF EXISTING PAVEMENT AND CONFIRM THAT THE DETECTION OPTION CHOSEN AND CORRESPONDING WINDING PATTERN CAN BE ACCOMMODATED.
16. THESE DETAILS APPLY TO BICYCLE LOOPS INSTALLED IN ROADWAYS. PUSH BUTTON ACTUATION SHALL BE CONSIDERED FOR RECREATIONAL BIKE PATHS.
17. THE MINIMUM DIMENSION FOR L SHALL BE 6 FT MIN. FOR DETECTORS TYPE D–Q, D–1 & D–2. FINAL DIMENSIONS SHALL BE DETERMINED BY THE DESIGN ENGINEER.

NOTE: REVISED FEBRUARY 22, 2006

IN CHARGE OF JWD
DESIGNED BY TQN
DRAWN BY TQN
CHECKED BY JWD/GJH

MASSACHUSETTS HIGHWAY DEPARTMENT
TRAFFIC ENGINEERING
REVISED FEBRUARY 22, 2006

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

WALTHAM
TRAPELO RD @ FOREST ST/METROPOLITAN PKWY

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.	NFA	32	68
PROJECT FILE NO.			

STANDARD DRAWINGS
TYPE II MAST ARMS

INDEX

THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, HIGHWAY DIVISION 1988 STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, THE ENGLISH EDITION OF SUPPLEMENTAL SPECIFICATIONS DATED JUNE 6, 2006, THE AMENDMENTS TO THE STANDARD AND SUPPLEMENTAL SPECIFICATIONS, THE 1977 CONSTRUCTION STANDARDS, THE ENGLISH EDITION OF SUPPLEMENTAL DRAWINGS DATED APRIL 2003, THE 2001 "STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS" WITH LATEST REVISIONS, THE 2003 "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" WITH LATEST REVISIONS, THE 1990 "STANDARD DRAWINGS FOR SIGNS AND SUPPORTS," AND THE 2004 EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK, WILL GOVERN.

MAST ARM & FOUNDATION

Details Standard Drawings

NOTES

1. For these standard drawings the Design Wind Speed for all Mast Arm Structures shall be **130 MPH**.

2. For these standard drawings the Design Wind Speed for mast arm foundations located in the following counties: Plymouth, Bristol, Barnstable, Dukes, and Nantucket counties in District 5 and Berkshire county in District 1 shall be **130 MPH**. The design wind speed for mast arm foundations for the remainder of the state shall be **110 MPH.**

3. For these standard drawings the mast arm structure design life shall be 25 years.

4. For these standard drawings the Fatigue Category no. 2 was used and truck induced gusts were excluded in the design.

5. These standard drawings do not apply for mast arm structures at intersections with an ADT greater than 40,000 vehicles and a truck percentage of greater than 10%. The responsibility for the design of mast structures and foundations will rest with the design engineer. The structure design life will be 50 years and the fatigue category shall be no. 1. The design wind speed criteria shall be as shown in Notes Nos. 1 & 2. The design will be submitted to MassDOT for review and comment.

6. For strain pole, dual mast arm designs, or mast arms longer than 45 feet, notes 1, 2, 3 and 4 will apply, if ADT (>40,000 vehicles) and truck percentage (10%) criterion is met, note 5 design criteria (50 year design life, fatigue category no. 1, wind design speed notes 1 and 2) will apply. The responsibility for the design of these structures and foundations will rest with the design engineer. The design will be submitted to MassDOT for review and comment.

IN CHARGE OF JWD
DESIGNED BY TON
DRAWN BY TON
CHECKED BY JWD/G.H.

NO.	REVISION	DATE

Moving Massachusetts Forward
massDOT Highway

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISON

RECOMMENDED FOR APPROVAL

Neil E. Boudreau 2/11/11
TRAFFIC ENGINEER DATE

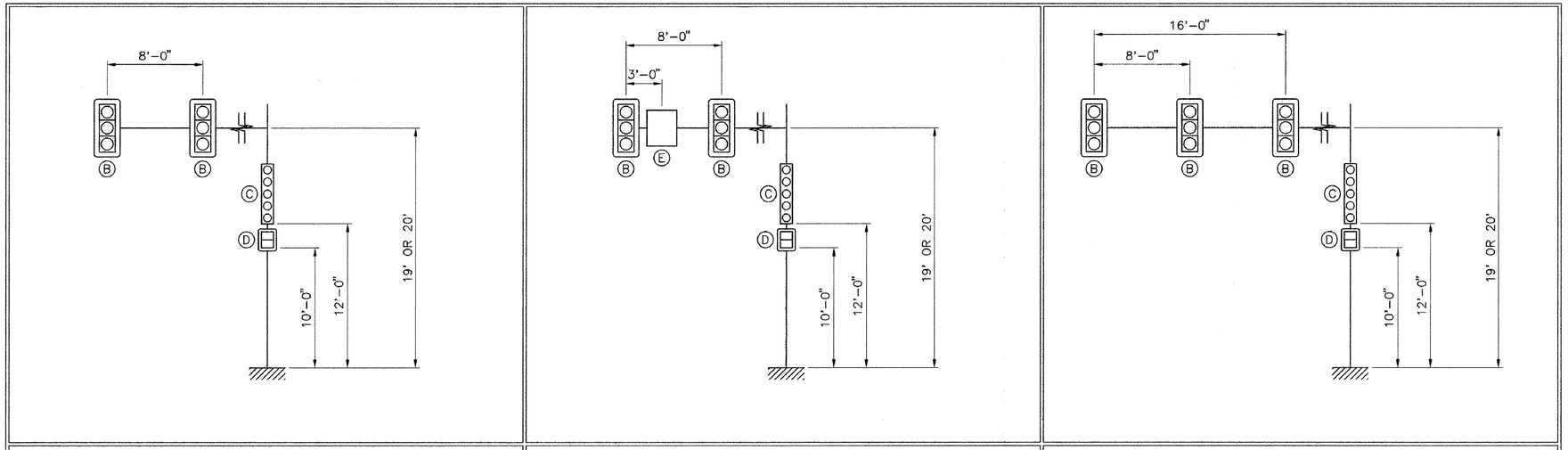
Raymond W. Cody P.E. 2/17/11
BRIDGE ENGINEER DATE

Frank A. Tramontozzi 2/24/2011
CHIEF ENGINEER DATE

WALTHAM
TRAPELO RD @ FOREST ST/METROPOLITAN PKWY

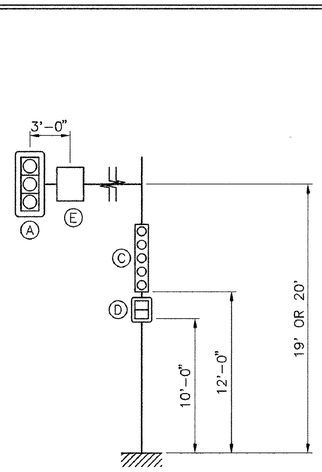
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.	NFA	33	68
PROJECT FILE NO.			

STANDARD DRAWINGS
TYPE II MAST ARMS



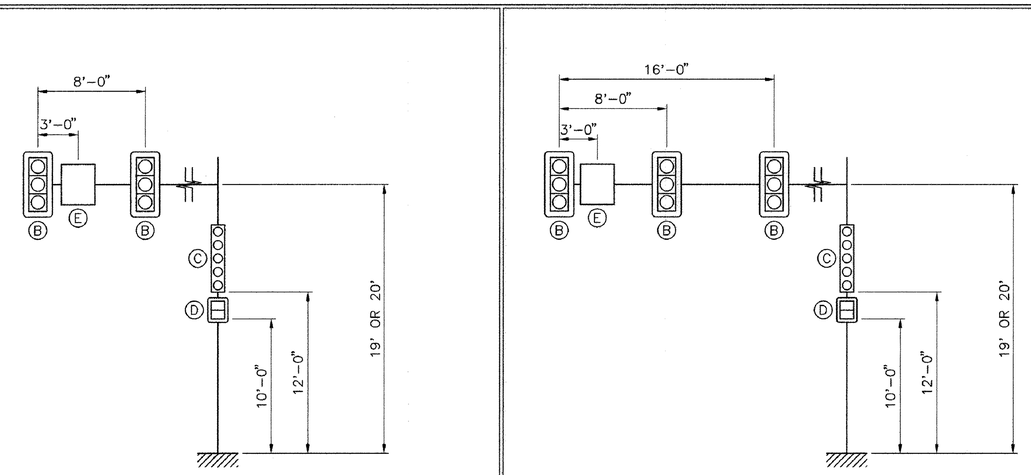
20', 25', 40' & 45' SPANS | 30' SPAN | 35' SPAN

LOAD DEFINITIONS – LIGHT LOADS



15' SPAN

SHORT SPAN LOADING



20' & 25' SPANS | 30', 35', 40' & 45' SPANS

LOAD DEFINITIONS – MEDIUM LOADS

DEVICE	DESCRIPTION	PROJ. AREA (FT~2)	WEIGHT (LBS)
Ⓐ	3 SECTION, 3 WAY SIGNAL	13.50	202
Ⓑ	3 SECTION, 1 WAY SIGNAL	8.67	74
Ⓒ	5 SECTION, 1 WAY SIGNAL	13.33	110
Ⓓ	DUAL PEDESTRIAN SIGNAL	8.00	80
Ⓔ	30" X 36" REGULATORY SIGN	7.50	23

NOTE: ALL SIGNALS HAVE 5.0" BACKPLATES

IN CHARGE OF JWD
DESIGNED BY TDN
DRAWN BY TDN
CHECKED BY JWD/GJH

MONTH_DD,_YYYY	ISSUED FOR CONSTRUCTION

Moving Massachusetts Forward. massDOT Highway

STANDARD DRAWINGS

TYPE II MAST ARMS
LIGHT, MEDIUM & SHORT SPAN
LOAD DIAGRAMS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Frank A. Tramontozzi 2/24/2011
CHIEF ENGINEER

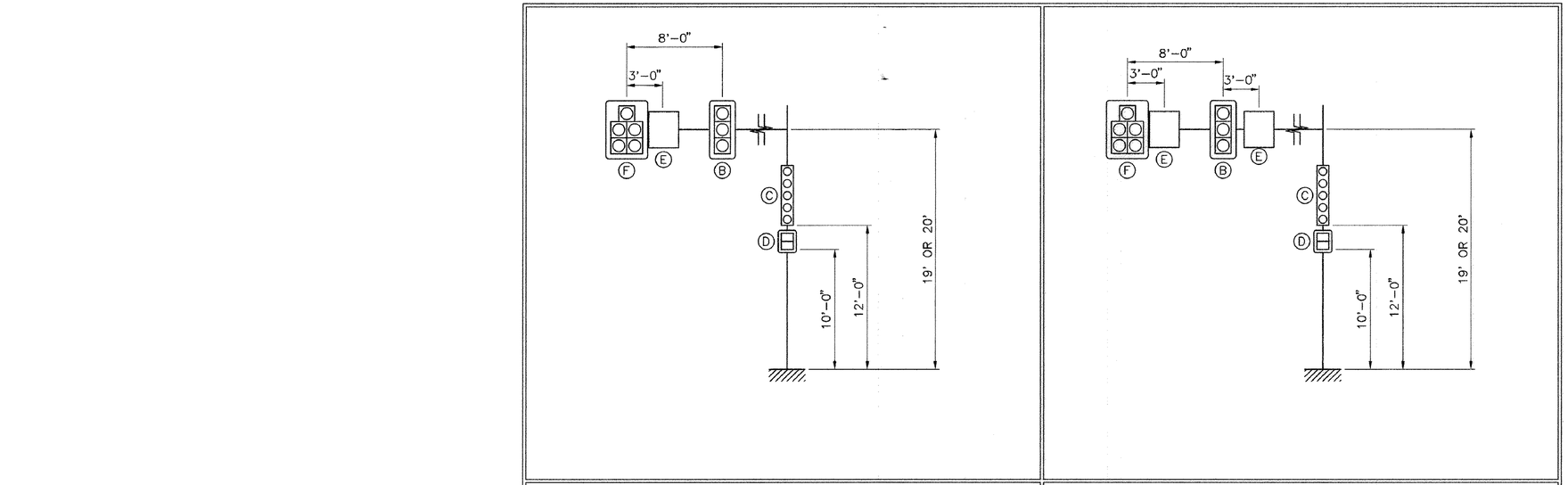
BRIDGE ENGINEER | TRAFFIC ENGINEER

SHEET 2 OF 5 SHEETS

WALTHAM
TRAPELO RD @ FOREST ST/METROPOLITAN PKWY

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.	NFA	34	68
PROJECT FILE NO.			

STANDARD DRAWINGS
TYPE II MAST ARMS



20' SPAN | 25' SPAN | 30' SPAN | 35' SPAN | 40' & 45' SPANS

LOAD DEFINITIONS – HEAVY LOADS

DEVICE	DESCRIPTION	PROJ. AREA (FT~2)	WEIGHT (LBS)
(A)	3 SECTION, 3 WAY SIGNAL	18.29	202
(B)	3 SECTION, 1 WAY SIGNAL	8.67	74
(C)	5 SECTION, 1 WAY SIGNAL	13.33	110
(D)	DUAL PEDESTRIAN SIGNAL	8.00	80
(E)	30" X 36" REGULATORY SIGN	7.50	23
(F)	5 SECTION, 2 WAY SIGNAL	21.95	215

NOTE: ALL SIGNALS HAVE 5.0" BACKPLATES

IN CHARGE OF JWD
DESIGNED BY TON
DRAWN BY TON
CHECKED BY JWD/GJH

MONTH_DD,_YYYY | ISSUED FOR CONSTRUCTION

Moving Massachusetts Forward
massDOT Highway

STANDARD DRAWINGS

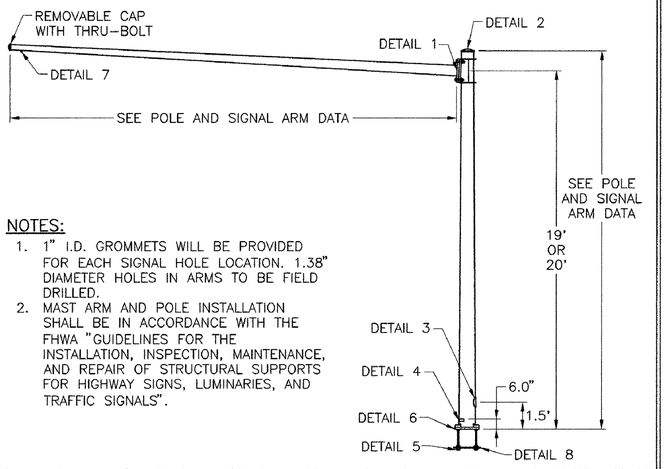
TYPE II MAST ARMS
HEAVY LOAD DIAGRAMS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Frank A. Tramontozzi 2/24/2011
CHIEF ENGINEER

BRIDGE ENGINEER | TRAFFIC ENGINEER

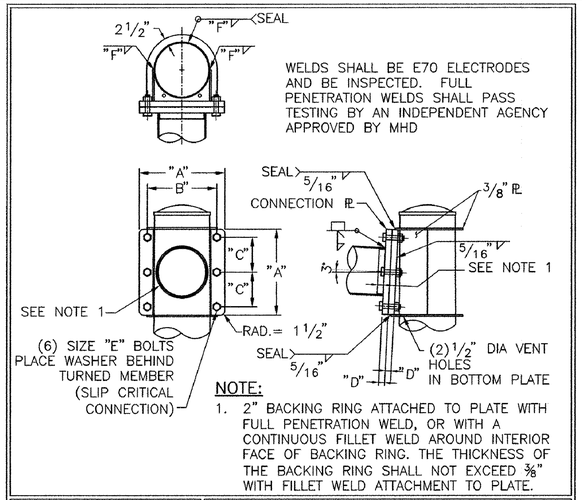
SHEET 3 OF 5 SHEETS



NOTES:

1. 1" I.D. GROMMETS WILL BE PROVIDED FOR EACH SIGNAL HOLE LOCATION. 1.38" DIAMETER HOLES IN ARMS TO BE FIELD DRILLED.
2. MAST ARM AND POLE INSTALLATION SHALL BE IN ACCORDANCE WITH THE FHWA "GUIDELINES FOR THE INSTALLATION, INSPECTION, MAINTENANCE, AND REPAIR OF STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS".

MAST ARM ELEVATION

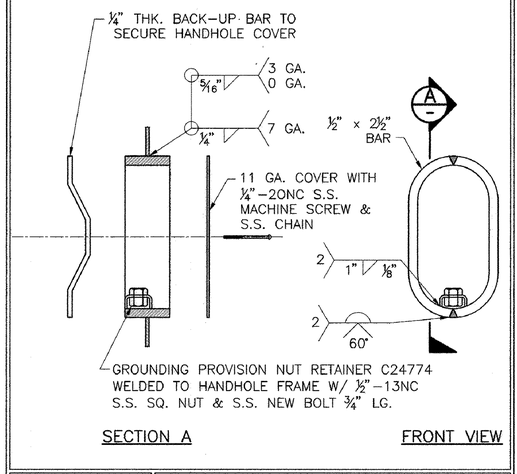


WELDS SHALL BE E70 ELECTRODES AND BE INSPECTED. FULL PENETRATION WELDS SHALL PASS TESTING BY AN INDEPENDENT AGENCY APPROVED BY MHD

NOTE:

1. 2" BACKING RING ATTACHED TO PLATE WITH FULL PENETRATION WELD, OR WITH A CONTINUOUS FILLET WELD AROUND INTERIOR FACE OF BACKING RING. THE THICKNESS OF THE BACKING RING SHALL NOT EXCEED 3/8" WITH FILLET WELD ATTACHMENT TO PLATE.

DETAIL 1 | SIGNAL ARM ATTACHMENT

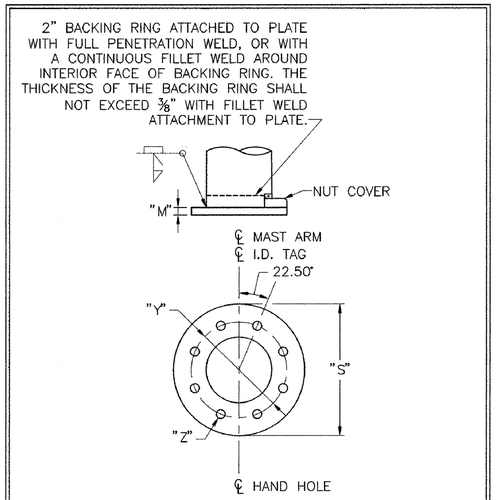


DETAIL 3 | 4"x8" HANDHOLE

WALTHAM
TRAPELO RD @ FOREST ST/METROPOLITAN PKWY

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MASS.	NFA	35	68
PROJECT FILE NO.			

STANDARD DRAWINGS
TYPE II MAST ARMS

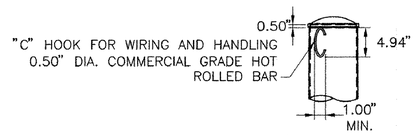


DETAIL 6 | POLE BASE

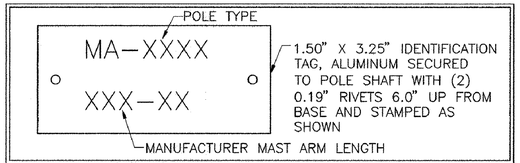
MATERIAL DATA

COMPONENT	DESIGNATION	YIELD (KSI)	COMPONENT	DESIGNATION	YIELD (KSI)
POLE TUBE	ASTM A595 GR. A	55	ARM TUBE	ASTM A595 GR. A	55
POLE BASE PLATE	AASHTO M270	50	ARM CONNECTION PLATE	AASHTO M270	50
ANCHOR BOLTS	AASHTO M314	55	ARM CONNECTING BOLTS	AASHTO M164 **	
GALVANIZING	AASHTO M111 OR M232				

** BOLTS WHICH ACCUMULATE RUST OR DIRT SHALL BE DISCARDED.



DETAIL 2 | POLE TOP



DETAIL 4 | I.D. TAG

POLE AND SIGNAL ARM DATA – LIGHT LOADS

LOCATIONS	SIGNAL ARM TUBE				POLE TUBE				POLE BASE				ANCHOR BOLT		SIGNAL ARM ATTACHMENT DATA					
	SPAN (FT)	FIXED END DIA. (IN)	FREE END DIA. (IN)	WALL THK.	BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	WALL THK.	PLATE CIRCLE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "M" (IN)	HOLE "Z" (IN)	DIA. "K" (IN)	EMBED. LENGTH "J" (IN)	"A" (IN)	"B" (IN)	"C" (IN)	"D" (IN)	"E" (IN)	"F" (IN)
	15.00	9.00	6.90	7 GA.	12.00	9.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	19.00	15.00	7.50	1.00	1.00	0.188
	20.00	9.00	6.20	7 GA.	12.00	9.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	19.00	15.00	7.50	1.00	1.00	0.188
	25.00	10.00	6.50	7 GA.	13.00	10.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	20.00	16.00	8.00	1.00	1.00	0.188
	30.00	12.50	8.30	3 GA.	15.50	12.56	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	23.50	19.00	9.50	1.25	1.25	0.250
	35.00	13.00	8.10	3 GA.	16.00	13.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	24.50	20.00	10.00	1.25	1.25	0.250
	40.00	13.00	7.40	3 GA.	16.00	13.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	24.50	20.00	10.00	1.25	1.25	0.250
	45.00	13.50	7.20	3 GA.	16.50	13.56	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.313

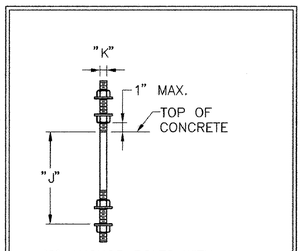
POLE AND SIGNAL ARM DATA – MEDIUM LOADS

LOCATIONS	SIGNAL ARM TUBE				POLE TUBE				POLE BASE				ANCHOR BOLT		SIGNAL ARM ATTACHMENT DATA					
	SPAN (FT)	FIXED END DIA. (IN)	FREE END DIA. (IN)	WALL THK.	BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	WALL THK.	PLATE CIRCLE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "M" (IN)	HOLE "Z" (IN)	DIA. "K" (IN)	EMBED. LENGTH "J" (IN)	"A" (IN)	"B" (IN)	"C" (IN)	"D" (IN)	"E" (IN)	"F" (IN)
	15.00	9.00	6.90	7 GA.	12.00	9.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	19.00	15.00	7.50	1.00	1.00	0.188
	20.00	10.00	7.20	3 GA.	13.00	10.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	20.00	16.00	8.00	1.00	1.00	0.250
	25.00	11.00	7.50	3 GA.	14.00	11.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	23.50	19.00	9.50	1.25	1.25	0.250
	30.00	13.00	8.80	3 GA.	16.00	13.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	23.50	19.00	9.50	1.25	1.25	0.250
	35.00	14.00	9.10	3 GA.	17.00	14.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.250
STA 7+02, 35.5' RT	40.00	15.00	9.40	3 GA.	18.00	15.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.250
	45.00	16.00	9.70	0 GA.	19.00	16.06	21.00	0 GA.	29.50	24.00	1.50	1.813	1.50	36.00	29.50	24.00	12.00	1.75	1.50	0.313

POLE AND SIGNAL ARM DATA – HEAVY LOADS

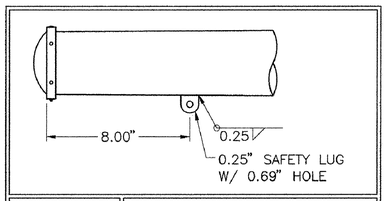
LOCATIONS	SIGNAL ARM TUBE				POLE TUBE				POLE BASE				ANCHOR BOLT		SIGNAL ARM ATTACHMENT DATA					
	SPAN (FT)	FIXED END DIA. (IN)	FREE END DIA. (IN)	WALL THK.	BASE DIA. (IN)	TOP DIA. (IN)	LENGTH (FT)	WALL THK.	PLATE CIRCLE "S" (IN)	BOLT CIRCLE "Y" (IN)	THK. "M" (IN)	HOLE "Z" (IN)	DIA. "K" (IN)	EMBED. LENGTH "J" (IN)	"A" (IN)	"B" (IN)	"C" (IN)	"D" (IN)	"E" (IN)	"F" (IN)
	15.00	9.00	6.90	7 GA.	12.00	9.06	21.00	7 GA.	29.50	24.00	1.50	1.813	1.50	36.00	19.00	15.00	7.50	1.00	1.00	0.188
	20.00	12.50	9.70	3 GA.	15.50	12.56	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	24.00	19.00	9.50	1.25	1.25	0.250
SEE NOTE 1 LEFT	25.00	14.00	10.50	3 GA.	17.00	14.06	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.250
STA 7+77.5, 35' LT	30.00	15.50	11.30	3 GA.	18.50	15.56	21.00	3 GA.	29.50	24.00	1.50	1.813	1.50	36.00	27.50	22.00	11.00	1.50	1.50	0.250
	35.00	16.50	11.60	0 GA.	19.50	16.56	21.00	0 GA.	34.50	28.00	1.75	2.063	1.75	36.00	29.50	24.00	12.00	1.75	1.50	0.313
	40.00	17.50	11.90	0 GA.	20.50	17.56	21.00	0 GA.	34.50	28.00	1.75	2.063	1.75	36.00	29.50	24.00	12.00	1.75	1.50	0.313
	45.00	18.50	12.20	0 GA.	21.50	18.56	21.00	0 GA.	34.50	28.00	1.75	2.063	1.75	36.00	31.50	26.00	13.00	2.00	1.50	0.313

NOTE 1:
25' Span–Heavy Loads
Sta. 7+20, 26' LT
Sta. 8+14.5, 25.4' RT

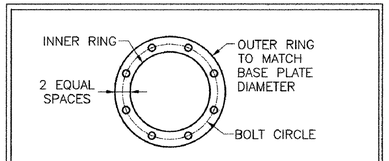


(8) ANCHOR BOLTS WITH (4) HEX NUTS, (4) FLAT WASHERS, AND (1) LOCK-WASHER PER BOLT.

DETAIL 5 | ANCHOR BOLT



DETAIL 7 | SAFETY HANGER LUG



DETAIL 8 | ANCHOR PLATE

IN CHARGE OF JWD
DESIGNED BY TON
DRAWN BY TON
CHECKED BY JWD/GJH

MONTH_DD,_YYYY	ISSUED FOR CONSTRUCTION

Moving Massachusetts Forward.
massDOT Highway

STANDARD DRAWINGS

TYPE II MAST ARMS
DETAILS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Frank A. Tramontozzi 3/24/2011
CHIEF ENGINEER
BRIDGE ENGINEER
Neil E. Boudreau
TRAFFIC ENGINEER

SHEET 4 OF 5 SHEETS

PIER FOUNDATIONS FOR 110 MPH WIND SPEED ZONE

LIGHT LOADING CONDITIONS

SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS		
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS
DRY SAND	3'–6"	6'–0"	18–#8	3'–6"	8'–0"	18–#8	3'–6"	8'–0"	18–#8	3'–6"	9'–0"	18–#8
WET SAND	3'–6"	7'–0"	18–#8	3'–6"	9'–0"	18–#8	3'–6"	9'–0"	18–#8	3'–6"	9'–0"	18–#8
CLAY (MEDIUM STIFF)	3'–6"	11'–0"	18–#8	3'–6"	12'–0"	18–#8	3'–6"	12'–0"	18–#8	3'–6"	12'–0"	18–#8
ALLUVIAL	3'–6"	8'–0"	18–#8	3'–6"	10'–0"	18–#8	3'–6"	10'–0"	18–#8	3'–6"	11'–0"	18–#8

MEDIUM LOADING CONDITIONS

SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS		
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS
DRY SAND	3'–6"	7'–0"	18–#8	3'–6"	9–0"	18–#8	4'–0"	9–0"	18–#9	4'–6"	8'–0"	18–#10
WET SAND	3'–6"	8'–0"	18–#8	3'–6"	9'–0"	18–#8	4'–0"	10'–0"	18–#9	4'–6"	9'–0"	18–#10
CLAY (MEDIUM STIFF)	3'–6"	11'–0"	18–#8	3'–6"	12'–0"	18–#8	4'–0"	13'–0"	18–#9	4'–6"	14'–0"	18–#10
ALLUVIAL	3'–6"	9'–0"	18–#8	3'–6"	10'–0"	18–#8	4'–0"	11'–0"	18–#9	4'–6"	10'–0"	18–#10

HEAVY LOADING CONDITIONS

SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS		
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS
DRY SAND	3'–6"	8'–0"	18–#8	4'–0"	9'–0"	18–#9	4'–6"	10'–0"	18–#10	5'–0"	9'–0"	23–#10
WET SAND	3'–6"	8'–0"	18–#8	4'–0"	10'–0"	18–#9	4'–6"	11'–0"	18–#10	5'–0"	10'–0"	23–#10
CLAY (MEDIUM STIFF)	3'–6"	12'–0"	18–#8	4'–0"	14'–0"	18–#9	4'–6"	15'–0"	18–#10	5'–0"	16'–0"	23–#10
ALLUVIAL	3'–6"	10'–0"	18–#8	4'–0"	11'–0"	18–#9	4'–6"	12'–0"	18–#10	5'–0"	12'–0"	23–#10

PIER FOUNDATIONS FOR 130 MPH WIND SPEED ZONE

LIGHT LOADING CONDITIONS

SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS		
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS
DRY SAND	3'–6"	7'–0"	18–#8	3'–6"	9'–0"	18–#8	3'–6"	10'–0"	18–#8	3'–6"	10'–0"	18–#8
WET SAND	3'–6"	8'–0"	18–#8	3'–6"	10'–0"	18–#8	3'–6"	11'–0"	18–#8	3'–6"	11'–0"	18–#8
CLAY (MEDIUM STIFF)	3'–6"	12'–0"	18–#8	3'–6"	13'–0"	18–#8	3'–6"	13'–0"	18–#8	3'–6"	13'–0"	18–#8
ALLUVIAL	3'–6"	9'–0"	18–#8	3'–6"	12'–0"	18–#8	3'–6"	12'–0"	18–#8	3'–6"	13'–0"	18–#8

MEDIUM LOADING CONDITIONS

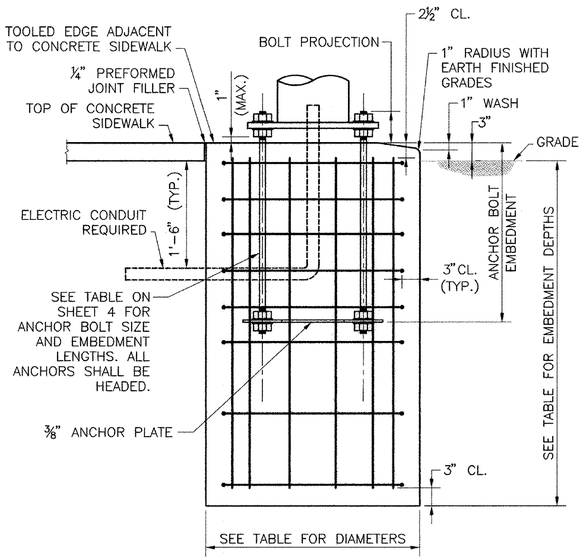
SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS		
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS
DRY SAND	3'–6"	8'–0"	18–#8	3'–6"	10'–0"	18–#8	4'–0"	11'–0"	18–#9	4'–6"	10'–0"	18–#10
WET SAND	3'–6"	8'–0"	18–#8	3'–6"	11'–0"	18–#8	4'–0"	12'–0"	18–#9	4'–6"	11'–0"	18–#10
CLAY (MEDIUM STIFF)	3'–6"	12'–0"	18–#8	3'–6"	14'–0"	18–#8	4'–0"	15'–0"	18–#9	4'–6"	15'–0"	18–#10
ALLUVIAL	3'–6"	10'–0"	18–#8	3'–6"	13'–0"	18–#8	4'–0"	13'–0"	18–#9	4'–6"	12'–0"	18–#10

HEAVY LOADING CONDITIONS

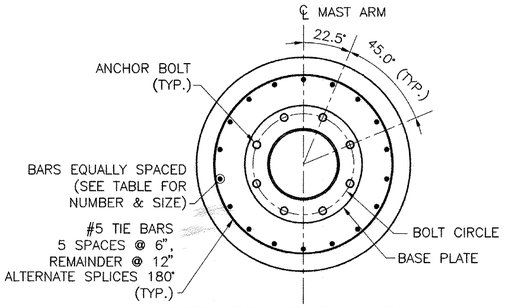
SOIL TYPE	15' & 20' MAST ARMS			25' & 30' MAST ARMS			35' & 40' MAST ARMS			45' MAST ARMS		
	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS	DIAMETER	DEPTH	VERTICAL BARS
DRY SAND	3'–6"	9'–0"	18–#8	4'–0"	11'–0"	18–#9	4'–6"	12'–0"	18–#10	5'–0"	11'–0"	23–#10
WET SAND	3'–6"	10'–0"	18–#8	4'–0"	12'–0"	18–#9	4'–6"	13'–0"	18–#10	5'–0"	12'–0"	23–#10
CLAY (MEDIUM STIFF)	3'–6"	14'–0"	18–#8	4'–0"	15'–0"	18–#9	4'–6"	16'–0"	18–#10	5'–0"	17'–0"	23–#10
ALLUVIAL	3'–6"	11'–0"	18–#8	4'–0"	13'–0"	18–#9	4'–6"	15'–0"	18–#10	5'–0"	14'–0"	23–#10

NOTES:

1. FOUNDATIONS SHALL BE 4000 PSI, 1½", 565 CEMENT CONCRETE.
2. REINFORCEMENT SHALL BE ASTM A615 GRADE 60.
3. ANCHOR BOLTS SHALL BE SET BY TEMPLATE.
4. PROVIDE FOR ELECTRICAL CONDUIT.
5. EXCAVATION SHALL BE BY THE AUGER METHOD TO THE NEAT LINES OF THE OUTSIDE DIMENSION OF THE FOUNDATIONS WITHOUT DISTURBING THE SOIL AROUND AND BELOW THE PROPOSED FOUNDATION BOTTOM. ALTERNATE METHODS OF EXCAVATION MAY BE SUBMITTED TO MASSHIGHWAY FOR APPROVAL IF THEY MEET THE REQUIREMENTS LISTED IN NOTES 6, 7, AND 8.
6. THE EARTH WALLS OF THE FOUNDATION SHALL BE ADEQUATELY AND SECURELY PROTECTED AT ALL TIMES AGAINST CAVE–INS, DISPLACEMENT OF THE SURROUNDING EARTH AND FOR THE EXCLUSION OF GROUND WATER. THIS MAY BE DONE BY THE USE OF STEEL CYLINDER LINERS OR CASINGS THAT ARE APPROVED BY MASSHIGHWAY. IF LINERS ARE USED THEY MAY BE RECLAIMED PROVIDED THAT THEY ARE WITHDRAWN AS THE CONCRETE IS BEING PLACED, MAINTAINING A SUFFICIENT HEAD OF CONCRETE WITHIN THE LINER TO PREVENT REDUCTION IN THE FOUNDATION DIAMETER AND TO PREVENT EXTRANEOUS MATERIAL FROM FALLING IN FROM THE SIDES AND MIXING WITH THE CONCRETE.
7. IF THE SOIL IS DISTURBED OR REMOVED BEYOND THE NEAT LINES OF THE OUTSIDE DIMENSION OF THE FOUNDATION, IT SHALL BE REPLACED WITH CONCRETE. ANY ADDITIONAL COST FOR THE CONCRETE SHALL BE PAID FOR BY THE CONTRACTOR.
8. SPECIAL CARE SHOULD BE GIVEN TO AREAS WHERE WET SOIL IS ENCOUNTERED, TO INSURE THAT THE PREAUGERED HOLE DOES NOT COLLAPSE. THIS MAY REQUIRE THE USE OF STEEL CYLINDER LINERS OR CASINGS TO HOLD THE SOIL IN PLACE UNTIL READY FOR CONCRETE PLACEMENT. THE STEEL CYLINDERS OR CASINGS SHALL BE WITHDRAWN AS THE FOUNDATION CONCRETE IS PLACED.
9. DETERMINATION OF EXISTING SOIL CONDITIONS SHALL BE MADE BY THE DESIGN ENGINEER.
10. IF LEDGE OR POOR SOIL IS ENCOUNTERED (i.e. ONE WHICH DOES NOT APPLY TO THE DESIGN TABLES SHOWN ON THIS SHEET), AN ALTERNATIVE DESIGN SHALL BE PROVIDED BY THE DESIGN ENGINEER. DECISIONS MADE IN NOTES 8 AND 9 SHALL BE SUBMITTED TO MASSHIGHWAY FOR APPROVAL. IF UTILITIES OR OTHER UNDERGROUND OBSTRUCTIONS ARE ENCOUNTERED, THE CONTRACTOR SHALL BACKFILL THE AREA TO ITS ORIGINAL CONDITION UNTIL AN ALTERNATE DESIGN HAS BEEN PROVIDED BY THE ENGINEER.



PIER FOUNDATION DETAIL
NO SCALE



PIER FOUNDATION PLAN
NO SCALE

MONTH_DD,_YYYY	ISSUED FOR CONSTRUCTION

Moving Massachusetts Forward
massDOT Highway

STANDARD DRAWINGS

TYPE II MAST ARMS
CORED PIER FOUNDATIONS

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

Frank A. Tramontozzi 2/24/2011
CHIEF ENGINEER

BRIDGE ENGINEER — TRAFFIC ENGINEER: Neil E. Boudreau

IN CHARGE OF JWD
DESIGNED BY TQN
DRAWN BY TQN
CHECKED BY JWD/GJH

TRAFFIC MANAGEMENT NOTES

GENERAL

1. ALL TRAFFIC MANAGEMENT AND WORK ZONE TRAFFIC CONTROL MEASURES SHALL CONFORM TO THE 2003 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (M.U.T.C.D.), MASSHIGHWAY'S "STANDARD DETAILS AND DRAWINGS FOR THE DEVELOPMENT OF TRAFFIC MANAGEMENT PLANS", THE STANDARD SPECIFICATIONS, AND THE FOLLOWING NOTES.

2. THE TRAFFIC MANAGEMENT PLANS CONTAINED HEREIN ARE GIVEN AS A GUIDE FOR TYPICAL WORK ZONE TRAFFIC CONTROL APPLICATIONS FOR THE TYPES OF WORK ANTICIPATED FOR THIS PROJECT. THEY ARE NOT INTENDED TO COVER ALL POSSIBLE CONSTRUCTION OPERATIONS WHICH THE CONTRACTOR MAY CHOOSE TO EMPLOY. WORK ZONE TRAFFIC CONTROL FOR OTHER CONSTRUCTION OPERATIONS OR OTHER TRAFFIC SITUATIONS IF APPLICABLE SHALL BE IN ACCORDANCE WITH THE REFERENCES LISTED IN NOTE NO. 1 AND AS APPROVED OR DIRECTED BY THE ENGINEER.

3. LANE RESTRICTIONS MAY NOT REMAIN OVERNIGHT OR DURING NON-WORKING HOURS, AFTER EACH WORKING DAY, TRAFFIC CONTROL DEVICES THAT ARE NOT REQUIRED SHALL BE MOVED OFF THE ROADWAY OR FULL DEPTH CONSTRUCTION AREA AND PLACED SO AS NOT TO IMPEDE PEDESTRIAN AREAS, ABUTTER ACCESS OR CAUSE CONFUSION TO MOTORISTS. IN CERTAIN CIRCUMSTANCES, AND ONLY WITH THE APPROVAL OF MHD AND THE ENGINEER, LANE RESTRICTIONS MAY REMAIN OVERNIGHT.

4. CONTRACTOR SHALL PROVIDE A SAFE TEMPORARY PEDESTRIAN ACCESS WHERE EXISTING SIDEWALKS OR OTHER PEDESTRIAN AREAS ARE AFFECTED BY CONSTRUCTION WORK. CONTRACTOR SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT AND SIMILAR OPERATIONS.

5. PLACE ALL CONSTRUCTION SIGNING, TRAFFIC CONTROL DEVICES AND TEMPORARY PAVEMENT MARKINGS FOR EACH PHASE PRIOR TO COMMENCEMENT OF CONSTRUCTION.

6. ONE (1) THRU TRAVEL LANE HAVING A MINIMUM WIDTH OF 11'-0" SHALL BE PROVIDED FOR BOTH DIRECTIONS (LANE MAY BE SHARED AND DIRECTION OF TRAVEL TO ALTERNATE UNDER POLICE OFFICER CONTROL) DURING ALL PHASES OF CONSTRUCTION AS SHOWN ON THE TRAFFIC MANAGEMENT PLANS, UNLESS OTHERWISE DIRECTED BY THE ENGINEER. MINIMUM LANE WIDTH IS MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.

7. WHEN WORK INFRINGES UPON THE TRAVELED WAY, WORK SHALL BE RESTRICTED TO OFF-PEAK HOURS ONLY (NORMALLY 9:00am TO 4:00pm, MONDAY TO FRIDAY). THIS DOES NOT APPLY TO THE DETOUR WHICH MAY REMAIN IN PLACE OVERNIGHT. THE CONTRACTOR SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF ROAD CLOSURE.

8. TAPER LENGTH FORMULAE FOR CHANNELIZATION DEVICES:
   ENGLISH UNITS:
   $L = WxS$ FOR SPEED EQUAL TO OR GREATER THAN 45 M.P.H.
   $L = WS^2/60$ FOR SPEED EQUAL TO OR LESS THAN 40 M.P.H.
   WHERE: L = MIN. LENGTH OF TAPER, S = POSTED SPEED, W = OFFSET WIDTH.

9. ADVISORY SPEED LIMIT, IF USED, SHALL BE SET IN THE FIELD BY THE ENGINEER. W13-1 PLATES SHALL BE USED WHERE APPROPRIATE.

10. FLASHING ARROW PANEL SHALL BE SET IN "ARROW MODE" WHEN USED FOR ACTUAL LANE CLOSURES ONLY. FOR SHOULDER CLOSURES, BULBS TO BE ILLUMINATED IN A NON-DIRECTIONAL CAUTION CONFIGURATION TO AVOID UNNECESSARY LANE SHIFTS.

11. DISTANCES SHOWN ON THE TRAFFIC MANAGEMENT PLANS ARE A GUIDE ONLY, AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.

GRADE DIFFERENCES

12. WHERE THERE IS A LONGITUDINAL DIFFERENCE IN ELEVATION BETWEEN EXISTING PAVEMENT AND ADJACENT TRAVEL SURFACE (UNDER REPAIR OR RECONSTRUCTION), THE CONTRACTOR SHALL PATCH A TEMPORARY BIT. CONC. WEDGE WITH A 12:1 (OR FLATTER) SLOPE FOR SMOOTH TRANSITION. SEE DETAIL, THIS SHEET.

13. CROSS-SECTIONAL GRADE DIFFERENCES IN EXCESS OF 2" DURING NON-WORKING HOURS WILL REQUIRE DELINEATION BY USE OF REFLECTORIZED DRUMS.

14. CROSS-SECTIONAL GRADE DIFFERENCES IN EXCESS OF 4" DURING NON-WORKING HOURS SHALL BE PROTECTED BY BACKFILLING WITH A WEDGE OF EARTHWORK TO BE COMPACTED AT 4:1 SLOPE AND WILL ALSO REQUIRE DELINEATION BY USE OF DRUMS.

15. A MINIMUM SLOPE OF 4:1 MUST BE MAINTAINED AFTER WORKING HOURS DURING SUBBASE AND BASE COURSE INSTALLATION ALONG EDGE OF THE TRAVELWAY (SEE DETAIL, THIS SHEET). A MINIMUM SLOPE OF 8:1 MUST BE MAINTAINED ON ALL ABUTTER ACCESS DRIVES AND A MINIMUM SLOPE OF 12:1 MUST BE MAINTAINED ON ALL SIDEWALKS.

CONSTRUCTION SIGNING

16. THE FIRST CONSTRUCTION SIGN IN A SERIES ON EACH APPROACH TO THE PROJECT SHALL BE FLUORESCENT ORANGE, HIGH PERFORMANCE (OR HIGH INTENSITY) SHEETING.

17. ALL CONSTRUCTION SIGNS SHALL BE BLACK LEGEND ON A REFLECTORIZED ORANGE BACKGROUND UNLESS OTHERWISE NOTED.

18. CONSTRUCTION SIGNING SHOWN ON THE ADVANCE SIGNING PLAN SHALL REMAIN IN PLACE FOR THE ENTIRE PROJECT DURATION, UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

19. STANDARD ORANGE OR FLUORESCENT RED-ORANGE FLAGS (16"x16" MIN.) MAY BE ATTACHED TWO (2) EACH ON ALL ADVANCE WARNING SIGNS. FLAGS SHALL NOT INTERFERE WITH A CLEAR VIEW OF THE SIGN FACE.

20. EXISTING GUIDE SIGNS SHALL BE TEMPORARILY RESET AS DIRECTED BY THE ENGINEER.

21. ALL SIGNS, INCLUDING EXISTING, THAT ARE NOT REPRESENTATIVE OF ACTUAL WORK CONDITIONS SHALL BE EITHER COVERED OR REMOVED WHEN NOT APPLICABLE.

22. IF USED, ALL W20-4 AND W20-5 SIGNS SHALL BE TAKEN DOWN OR COVERED AT THE CLOSE OF EACH DAY UNLESS LANE RESTRICTIONS ARE PERMITTED TO REMAIN OVERNIGHT IN ACCORDANCE WITH NOTE NO. 3 ABOVE.

23. USE W20-8/W20-7a SIGNS ONLY WHILE POLICE/FLAGGERS ARE DIRECTING TRAFFIC. THEY SHALL BE TAKEN DOWN OR COVERED AT THE CLOSE OF EACH DAY OR WHEN NOT IN USE.

PAVEMENT MARKINGS

24. PAVEMENT MARKINGS WHICH ARE NO LONGER APPLICABLE SHALL BE REMOVED. APPLY TEMPORARY MARKINGS WHERE SHOWN ON THE TRAFFIC MANAGEMENT PLANS.

25. ON PROJECTS WHERE PAVEMENT OVERLAY IS NOT DESIGNATED, EXISTING PAVEMENT MARKINGS WHICH ARE IN CONFLICT WITH TEMPORARY TRAFFIC CONTROLS SHOULD BE COVERED TEMPORARILY WITH BLACKOUT TAPE, AS DIRECTED BY THE ENGINEER, FOR THE FULL DURATION OF THE PHASE IN PROGRESS. TEMPORARY PAINTED OR REMOVABLE TAPE MARKINGS SHALL BE USED AS NECESSARY FOR ALL PHASES OF CONSTRUCTION. EXISTING MARKINGS ARE GENERALLY NOT COVERED FOR SHORT TERM SET-UPS.

CHANNELIZATION

26. THE MAXIMUM SPACING BETWEEN CHANNELIZATION DEVICES (DRUMS OR CONES) SHALL BE APPROXIMATELY EQUAL IN FEET TO THE POSTED SPEED LIMIT. THE MINIMUM SPACING SHALL BE 20' O.C.

27. REFLECTORIZED CONES SHALL BE MINIMUM 28" HIGH, 36" CONES ARE RECOMMENDED.

28. FLASHING OR STEADY BURN WARNING LIGHTS SHALL ALSO BE USED ON BARRICADES, JERSEY BARRIERS OR WHERE DIRECTED BY THE ENGINEER.

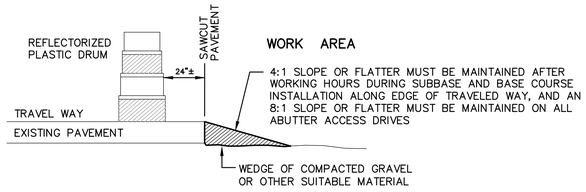
29. PLASTIC DRUMS WITH SOME FORM OF LIGHTING DEVICE MOUNTED ON THEM MUST PASS THE CRITERIA SET FORTH IN NCHRP 350 "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES." IF THEY DO NOT MEET THESE CRITERIA, THEY MUST BE REMOVED FROM THE PROJECT.

30. TEMPORARY IMPACT ATTENUATORS MUST MEET THE PERFORMANCE STANDARDS OF NCHRP 350.

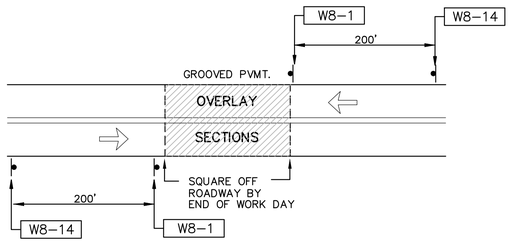
31. SIGNS AND SIGN SUPPORT LOCATED ON OR NEAR THE TRAVELED WAY MUST PASS THE CRITERIA SET FORTH IN NCHRP 350 "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES." IF THEY DO NOT MEET THIS CRITERIA, THEY MUST BE REMOVED FROM THE PROJECT.

TRAFFIC MANAGEMENT LEGEND

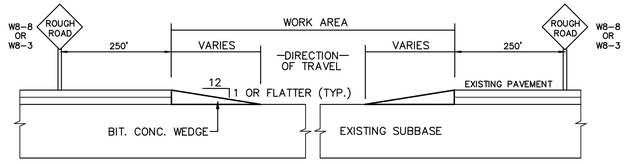
- WORK AREA
- DIRECTION OF TRAVEL
- REFLECTORIZED DRUM
- FLAGGER/POLICE
- PORTABLE TYPE II BARRICADE (4' WIDE, MIN.)
- FLASHING ARROW BOARD (30"x 60" STD. SIZE WITH 13 LAMPS, MIN.)
- PORTABLE DOUBLE-FACES JERSEY BARRIER
- PORTABLE IMPACT ATTENUATOR
- PAVEMENT MARKINGS TO COVER OR REMOVE (SEE NOTE 24)



AFTER WORK HOURS TREATMENT
FOR LATERAL SLOPING

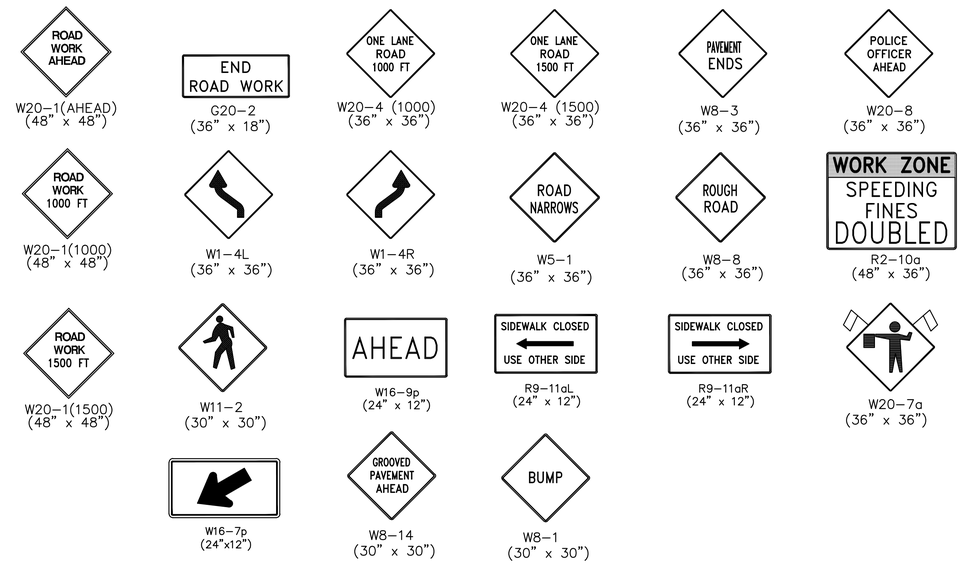


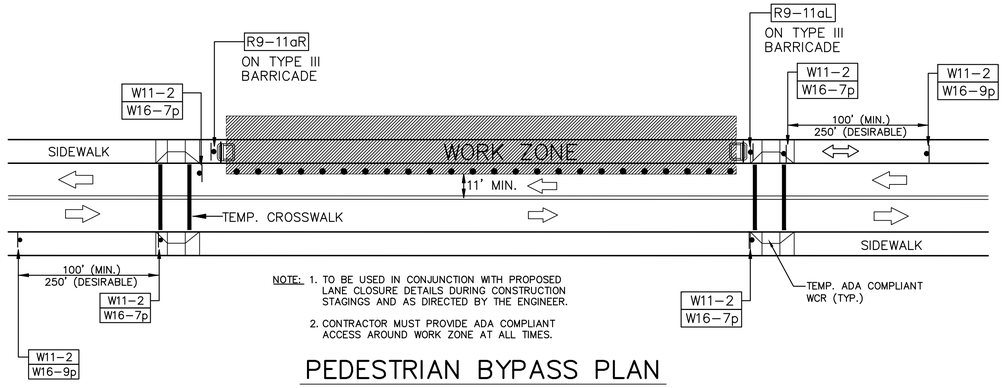
AFTER WORK HOURS TREATMENT
FOR AREAS RECEIVING OVERLAY



TEMPORARY RAMP

SIGN LEGEND





NOTE: 1. TO BE USED IN CONJUNCTION WITH PROPOSED LANE CLOSURE DETAILS DURING CONSTRUCTION STAGINGS AND AS DIRECTED BY THE ENGINEER.

2. CONTRACTOR MUST PROVIDE ADA COMPLIANT ACCESS AROUND WORK ZONE AT ALL TIMES.

PEDESTRIAN BYPASS PLAN

NOT TO SCALE

TEMPORARY TRAFFIC CONTROL PLAN

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

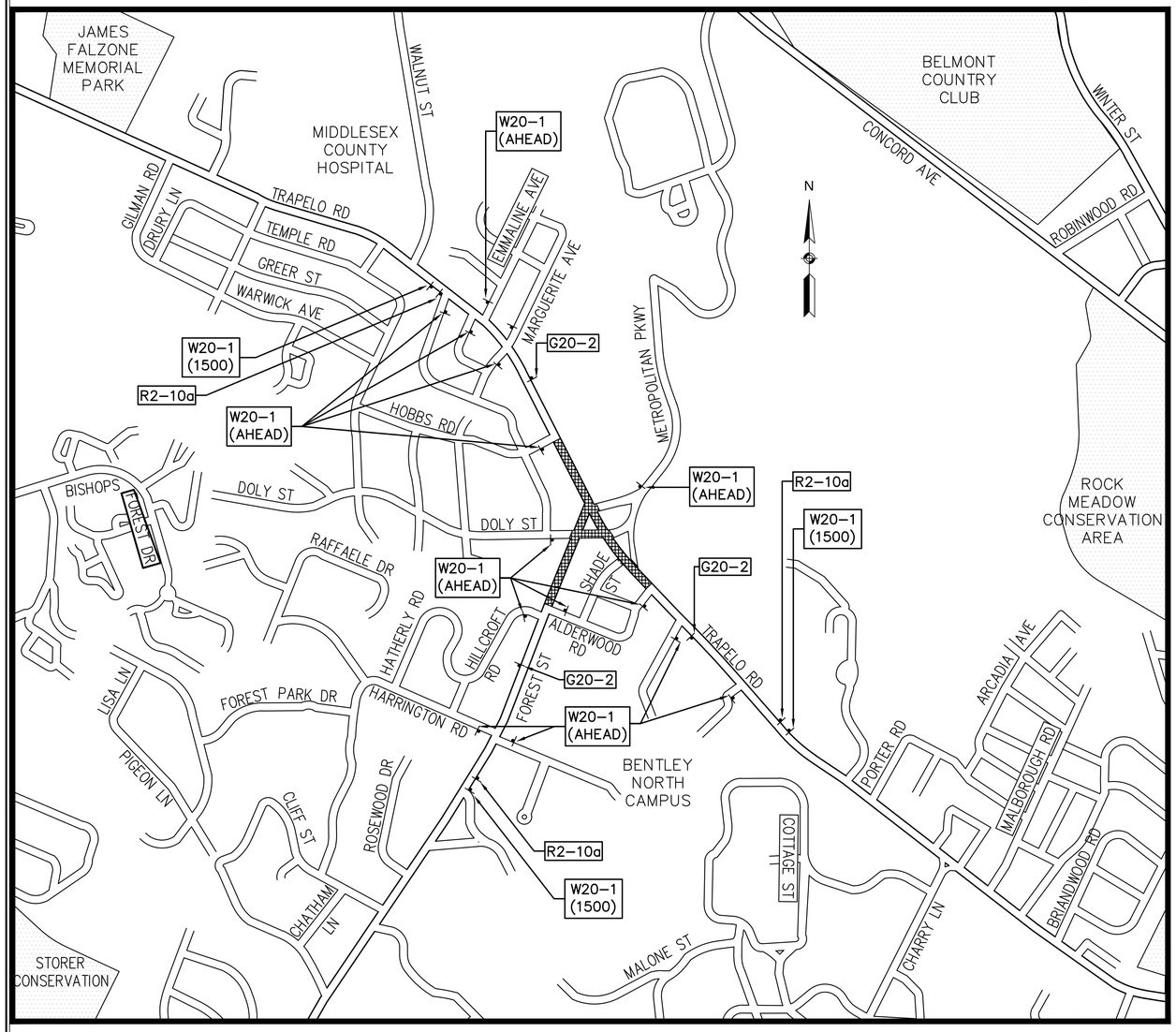
PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
Engineers, Architects, Planners, Construction Engineers & Inspectors
181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

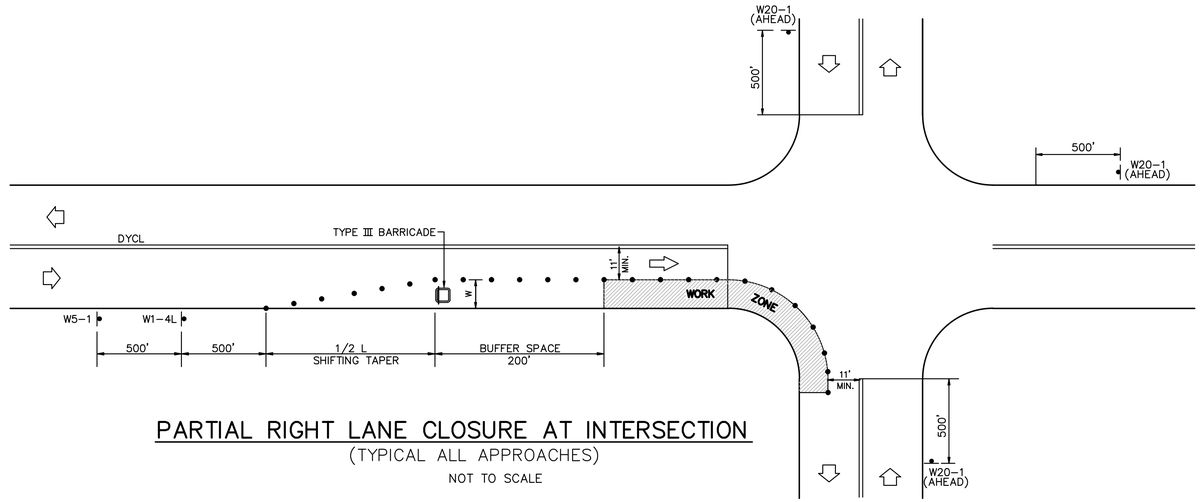
NO.	REVISION	DATE

DESIGN/DRAWN BY: TQN/TQN
CHECK BY: JWD/GJH
DATE: 7/13/2012
SCALE: AS NOTED
JOB NO.: MAX-2012005.00
FILE NAME: 12005.00_TTCP
DRAWING NO.: 37 OF 68



ADVANCE WARNING SIGN PLAN

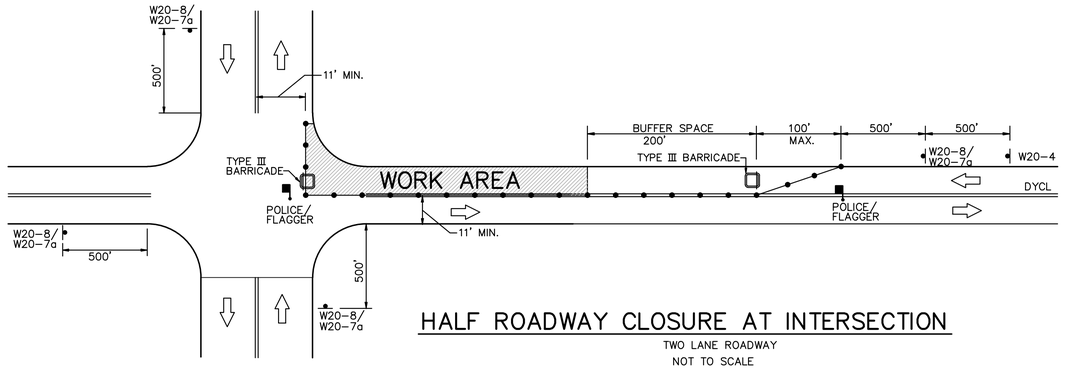
(SCALE: 1"=500')



PARTIAL RIGHT LANE CLOSURE AT INTERSECTION

(TYPICAL ALL APPROACHES)

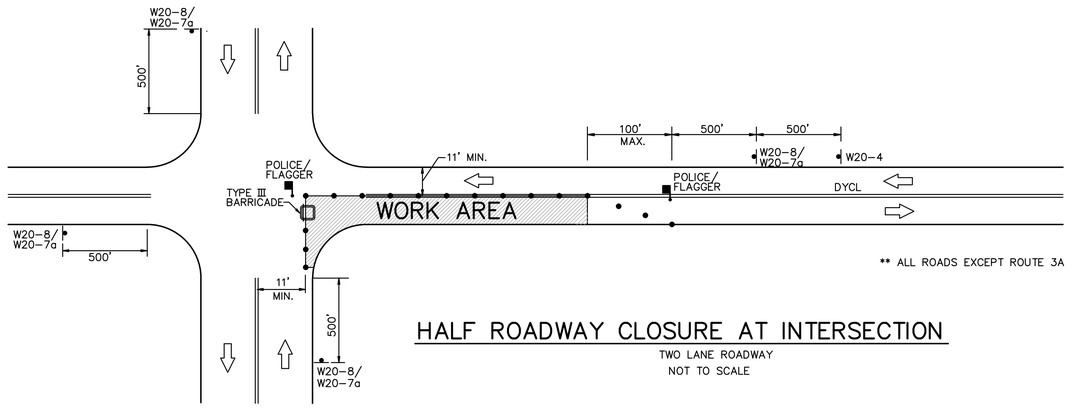
NOT TO SCALE



HALF ROADWAY CLOSURE AT INTERSECTION

TWO LANE ROADWAY

NOT TO SCALE



** ALL ROADS EXCEPT ROUTE 3A

HALF ROADWAY CLOSURE AT INTERSECTION

TWO LANE ROADWAY

NOT TO SCALE

TEMPORARY TRAFFIC CONTROL PLAN

TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS

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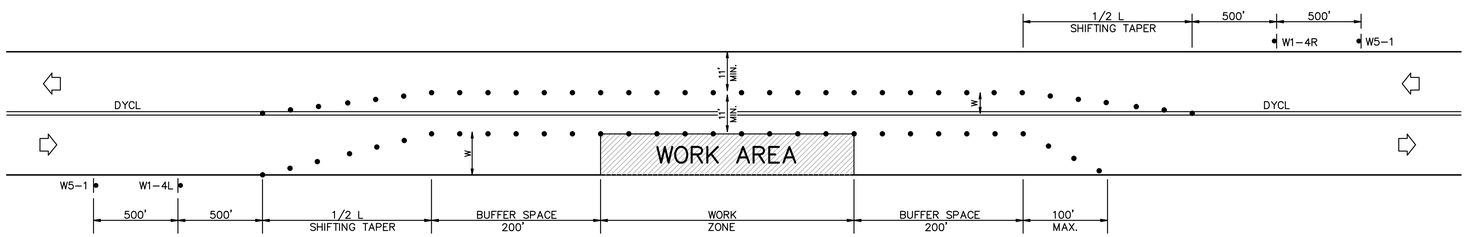
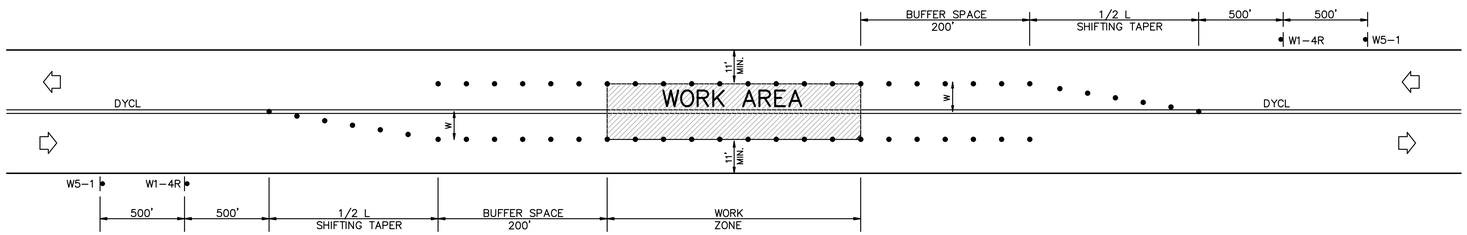
DRAWING NO.: 38 OF 68



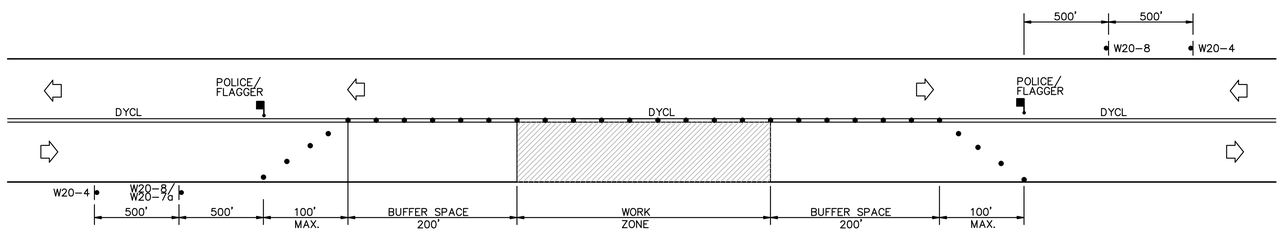
PARTIAL RIGHT LANE CLOSURE

TWO LANE ROADWAY WITH PARTIAL LANE CLOSURE
NOT TO SCALE



CENTER ROADWAY CLOSURE

TWO LANE ROADWAY WITH CENTER OF ROAD CLOSED
NOT TO SCALE



HALF ROADWAY CLOSURE

(RIGHT SIDE WORK ZONE – MIRROR IMAGE FOR LEFT SIDE WORK ZONE)
NOT TO SCALE

TEMPORARY TRAFFIC CONTROL PLAN

TRAPELO ROAD & FOREST STREET WALTHAM, MASSACHUSETTS

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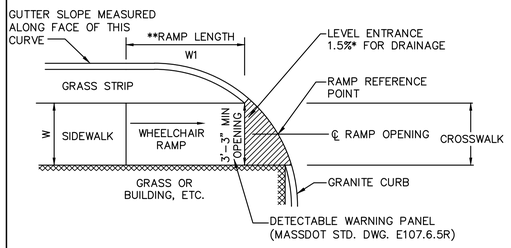
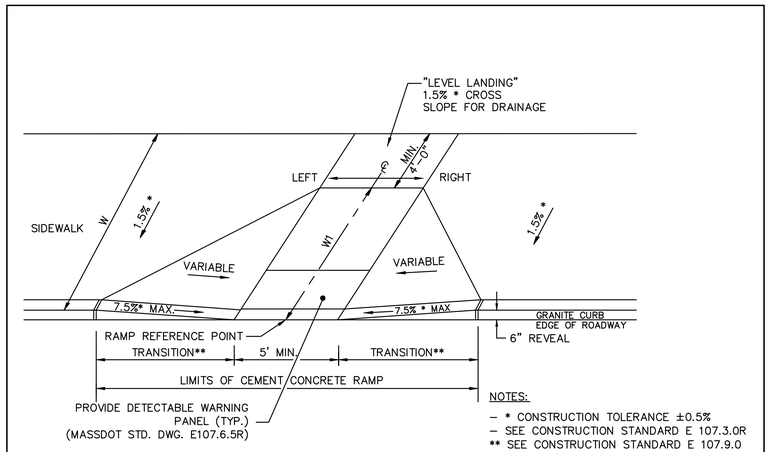
WHEELCHAIR RAMP SINGLE DIRECTION WITH LEVEL ENTRANCE AND LANDSCAPE STRIP



NOTES:
- * CONSTRUCTION TOLERANCE ±0.5%
- SEE CONSTRUCTION STANDARD E 107.6.0R
** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	RAMP REFERENCE POINT		WIDTH OF SIDEWALK (W)	WIDTH OF OPENING	ROADWAY GUTTER SLOPE	LENGTH OF RAMP (W1)
	STATION	OFFSET				
7	9+51.20	23.50' RT	5.0'	5.0'	−1.0%	6.5'

WHEELCHAIR RAMP PARALLEL PERPENDICULAR



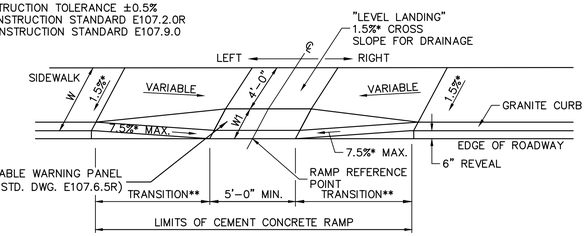
NOTES:
- * CONSTRUCTION TOLERANCE ±0.5%
- SEE CONSTRUCTION STANDARD E 107.3.0R
** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	RAMP REFERENCE POINT		LENGTH OF PRIMARY RAMP (W1)	WIDTH OF SIDEWALK	WIDTH OF RAMP MIN. 5'−0"	DEPTH OF LEVEL LANDING MIN. 4'−0"	ROADWAY GUTTER SLOPE	TRANSITION LENGTH	
	STATION	OFFSET						LEFT SIDE	RIGHT SIDE
2	7+11.68	35.60' RT	9.51' ①	14.78'	5.0'	4.0'	1.7%	11.0'	6.5'

① VARIABLE WIDTH, MEASURED AT CTR OF RAMP

WHEELCHAIR RAMP PARALLEL PERPENDICULAR (NARROW SIDEWALK − W > 6.5')

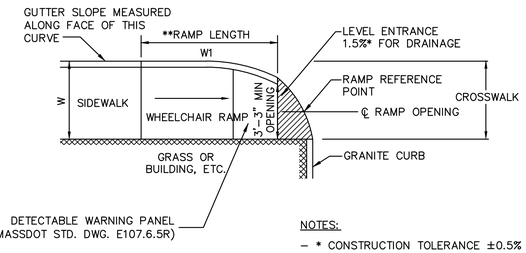
NOTES:
- * CONSTRUCTION TOLERANCE ±0.5%
- SEE CONSTRUCTION STANDARD E107.2.0R
** SEE CONSTRUCTION STANDARD E107.9.0



WCR #	RAMP REFERENCE POINT		LENGTH OF PRIMARY RAMP (W1)	WIDTH OF SIDEWALK (W)	WIDTH OF RAMP MIN. 5'−0"	DEPTH OF LEVEL LANDING MIN. 4'−0"	ROADWAY GUTTER SLOPE	TRANSITION LENGTH	
	STATION	OFFSET						LEFT SIDE	RIGHT SIDE
1	1+65.47	26.19' RT	4.75'	9.75'	5.0'	5.0'	5.7%	6.5'	15.0'
1A	1+16.96	26.25' RT	5.20'	10.2'	5.0'	5.0'	4.2%	6.5'	15.0'
3	7+84.03	21.00' LT	2.50'	7.5'	5.0'	4.6'	3.3%	6.5'	14.0'
8	11+51.56	16.89' RT	2.50'	9.9' ①	5.0'	7.4'	−1.9%	6.5' ②	9.0'
8A	11+68.68	31.43' RT	2.50'	7.4' ①	5.0'	4.9'	−1.9%	6.5'	5.4' ②
9	12+06.07	29.98' RT	2.50'	8.0'	5.0'	5.5'	2.9%	6.5'	11.0'
10	14+74.16	24.47' RT	2.50'	9.9' ①	5.0'	7.4'	1.9%	6.6' ②	9.0'
11	15+28.38	24.51' RT	2.50'	8.5' ①	5.6'	6.0'	1.8%	9.0'	6.5'
14	12+16.65	31.15' RT	2.50'	9.2' ①	5.0'	6.7'	2.4%	11.0'	6.5'
15	12+66.70	31.24' RT	2.50'	8.6' ①	5.0'	6.1'	3.1%	14.0'	6.5'
16	16+09.85	30.75' RT	2.50'	7.5'	5.0'	5.0'	0.5%	6.5'	7.67'
17	16+53.16	30.60' RT	2.50'	7.5'	5.0'	5.0'	0.5%	6.5'	7.67'
18	17+90.74	22.45' LT	2.50'	7.5'	5.0'	5.0'	1.0%	7.67'	6.5'
19	17+91.75	20.00' RT	2.50'	7.5'	5.0'	5.0'	1.0%	7.67'	6.5'

① WIDTH VARIES, MEASURED AT CTR OF RAMP
② 3" CURB REVEAL

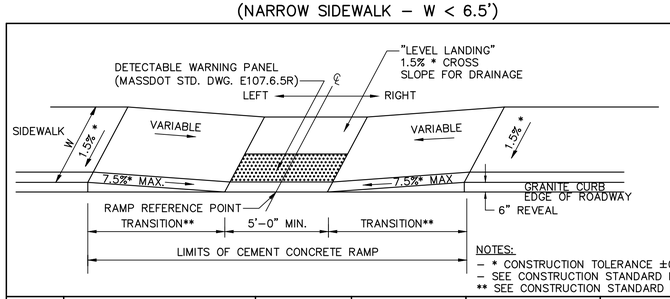
WHEELCHAIR RAMP SINGLE DIRECTION WITH LEVEL ENTRANCE



NOTES:
- * CONSTRUCTION TOLERANCE ±0.5%
- SEE CONSTRUCTION STANDARD E 107.6.0R
** SEE CONSTRUCTION STANDARD E 107.9.0

WCR #	RAMP REFERENCE POINT		WIDTH OF SIDEWALK W	WIDTH OF OPENING	ROADWAY GUTTER SLOPE	LENGTH OF RAMP (W1)
	STATION	OFFSET				
12	11+97.27	25.25' LT	7.5'	3.5'	3.8%	6.5'
13	12+25.39	25.25' LT	7.5'	3.5'	3.8%	14.0'

WHEELCHAIR RAMP PARALLEL PERPENDICULAR (NARROW SIDEWALK − W < 6.5')



NOTES:
- * CONSTRUCTION TOLERANCE ±0.5%
- SEE CONSTRUCTION STANDARD E107.2.1R
** SEE CONSTRUCTION STANDARD E107.9.0

WCR #	RAMP REFERENCE POINT		WIDTH OF SIDEWALK (W)	WIDTH OF RAMP MIN. 5'−0"	ROADWAY GUTTER SLOPE	TRANSITION LENGTH	
	STATION	OFFSET				LEFT	RIGHT
1B	1+17.26	14.10' LT	5.5'	5.0'	−5.9%	15.0'	6.5'
4	8+03.44	23.70' RT	5.5'	5.0'	3.9%	14.0'	3.25' ②
5	7+88.70	35.64' RT	5.5'	5.0'	3.9%	5.5' ②	15.0'
6	9+22.73	24.03' RT	5.5'	5.0'	> 5%	6.5' ③	6.5'
8B	11+51.74	15.00' LT	5.5'	5.0'	−3.5%	14.0'	6.5'

② 3" CURB REVEAL
③ GRASS (MIN. TRANSITION)

NOTE:
SOME GRANITE TRANSITION PIECES ARE LONGER THAN THE REQUIRED LENGTH SHOWN IN CONSTRUCTION STANDARD E107.9.0.

WHEELCHAIR RAMP DETAILS

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

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Trapelo Road & Forest Street
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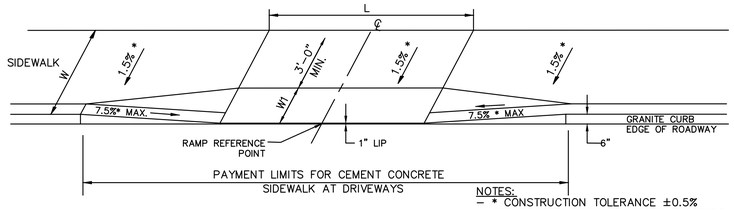
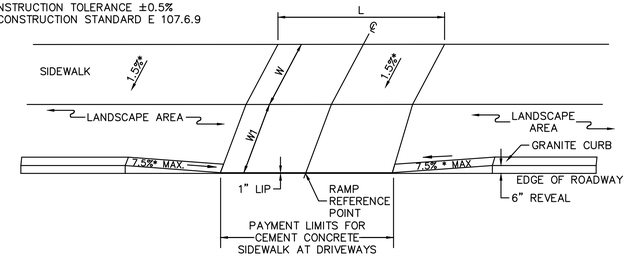


NOTES:
- * CONSTRUCTION TOLERANCE ±0.5%
- SEE CONSTRUCTION STANDARD E 107.7.0
** SEE CONSTRUCTION STANDARD E 107.9.0

	RAMP REFERENCE POINT		LENGTH OF PRIMARY RAMP (W1)	WIDTH OF SIDEWALK (W)	WIDTH OF DRIVEWAY (L)	DEPTH OF LEVEL LANDING MIN. 3'-0"	ROADWAY GUTTER SLOPE	TRANSITION LENGTH	
DWY #	STATION	OFFSET						LEFT	RIGHT
3	4+09.35	RT	3.5'	6.5'	15.0'	3.0'	2.6%	6.5'	11.0'
4	4+87.03	RT	2.5'	5.5'	24.0'	3.0'	2.6%	6.5'	11.0'
5	5+92.06	RT	2.5'	5.5'	24.0'	3.0'	0.0%	6.5'	6.5'
10	10+83.09	RT	3.25'	6.25'	14.0'	3.0'	4.6%	15.0'	6.5'
11	11+38.13	LT	4.0'	7.5'	20.0'	3.5'	4.6%	6.5'	15.0'
12	11+81.90	RT	3.25'	6.25'	16.0'	3.0'	4.0%	15.0'	6.5'
13	13+05.46	RT	3.3'	6.3'	16.0'	3.0'	2.4%	11.0'	6.5'
14	13+78.74	RT	3.6	7.1'	21.0'	3.5'	1.6%	9.0'	6.5'
15	14+24.32	LT	3.6	7.1'	16.0'	3.5'	0.9%	6.5'	7.67'
16	14+58.83	RT	4.2'	7.7'	22.0'	3.5'	0.3%	7.67'	6.5'
17	15+69.98	LT	3.5'	7.0'	16.0'	3.5'	0.5%	7.67'	6.5'
18	16+45.71	LT	4.0'	7.5'	10.0'	3.5'	0.0%	6.5'	6.5'
19	17+07.91	LT	4.0'	7.5'	10.0'	3.5'	0.3%	6.5'	7.67'
20	17+63.09	RT	4.0'	7.5'	11.0'	3.5'	0.6%	7.67'	6.5'

SIDEWALK THROUGH DRIVEWAYS

NOTES:
- * CONSTRUCTION TOLERANCE ±0.5%
- SEE CONSTRUCTION STANDARD E 107.6.9



	RAMP REFERENCE POINT		LENGTH OF PRIMARY RAMP (W1)	WIDTH OF SIDEWALK (W)	WIDTH OF DRIVEWAY (L)	ROADWAY GUTTER SLOPE	TRANSITION LENGTH	
DWY #	STATION	OFFSET					LEFT SIDE	RIGHT SIDE
1	2+41.05	RT	4.75'	5.0'	24.0'	5.9%	6.5'	6.5'
2	3+28.09	RT	4.75'	5.0'	20.0'	4.1%	6.5'	6.5'
6	9+77.57	RT	6.0'	5.0'	11.0'	1.2%	6.5'	6.5'
7	10+36.26	RT	6.0'	5.0'	11.0'	3.1%	6.5'	6.5'
8	13+38.13	RT	6.0'	5.0'	16.0'	1.5%	6.5'	6.5'
9	14+04.14	RT	6.0'	5.0'	20.0	0.6%	6.5'	6.5'

SIDEWALK THROUGH DRIVEWAYS
AT LANDSCAPING STRIP

WHEELCHAIR RAMP DETAILS

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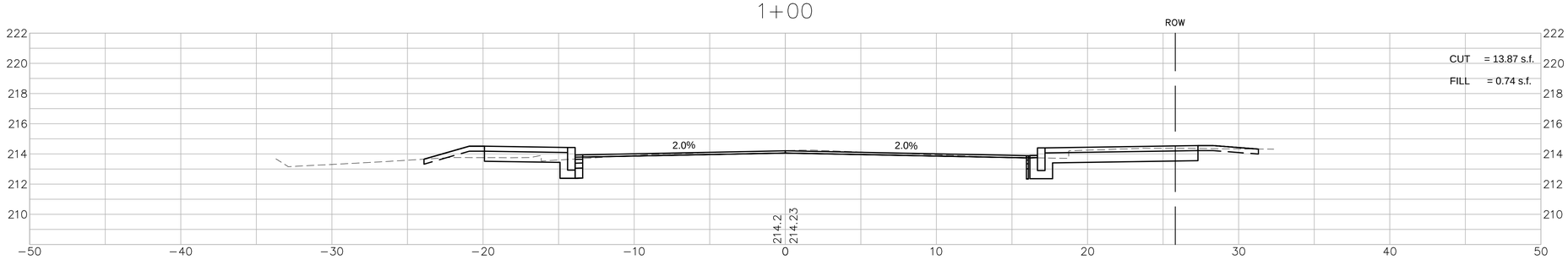

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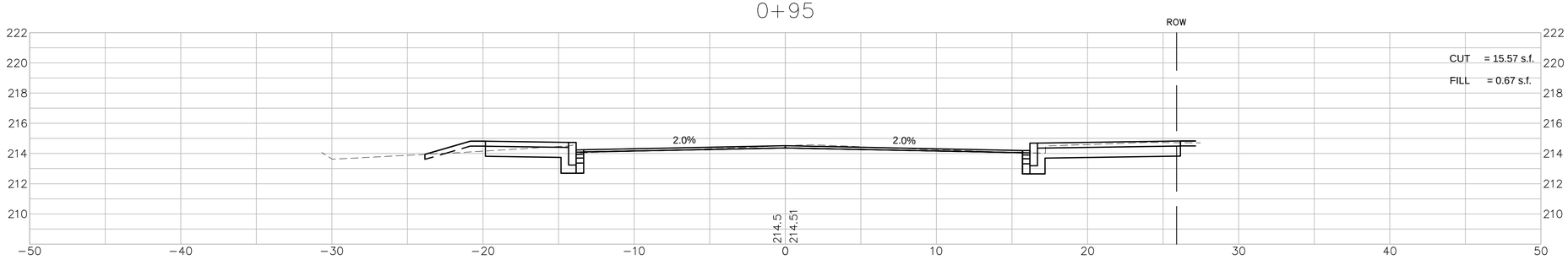

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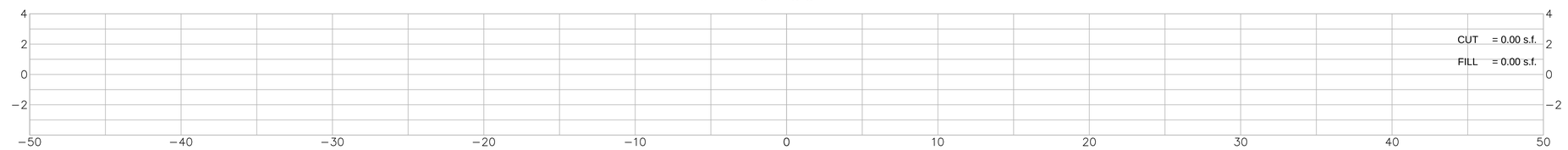

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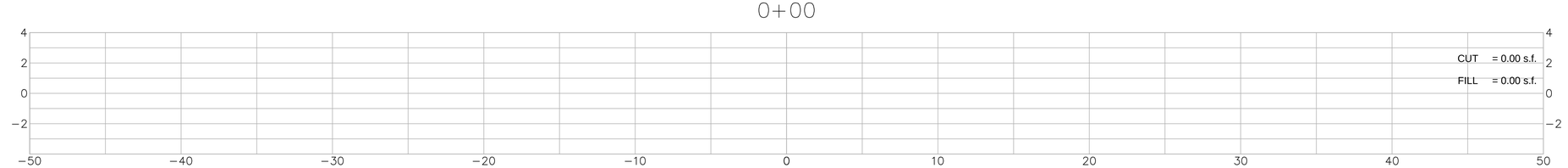

GRAPHIC SCALE
0 2 4 6 8 12 FEET

CROSS SECTIONS

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
Engineers, Architects, Planners, Construction Engineers & Inspectors
181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

NO.	REVISION	DATE

DESIGN/DRAWN BY: RJD/RJD
CHECK BY: JWD/GJH
DATE: 7/13/2012
SCALE: AS NOTED
JOB NO.: MAX-2012005.00
FILE NAME: 12005.00_XS
DRAWING NO.: 42 OF 68

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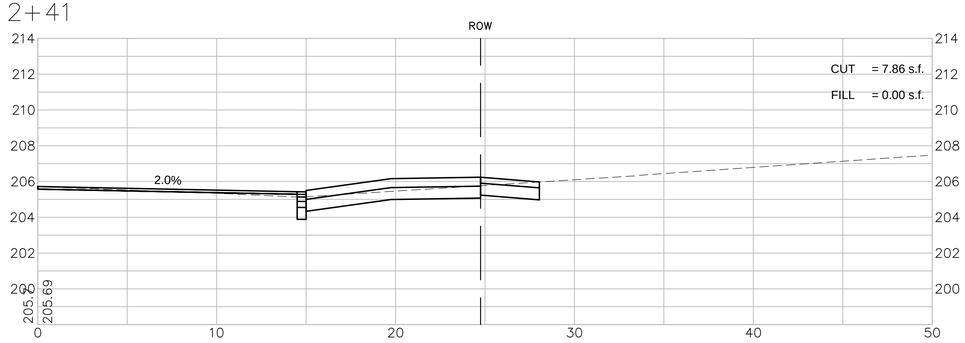

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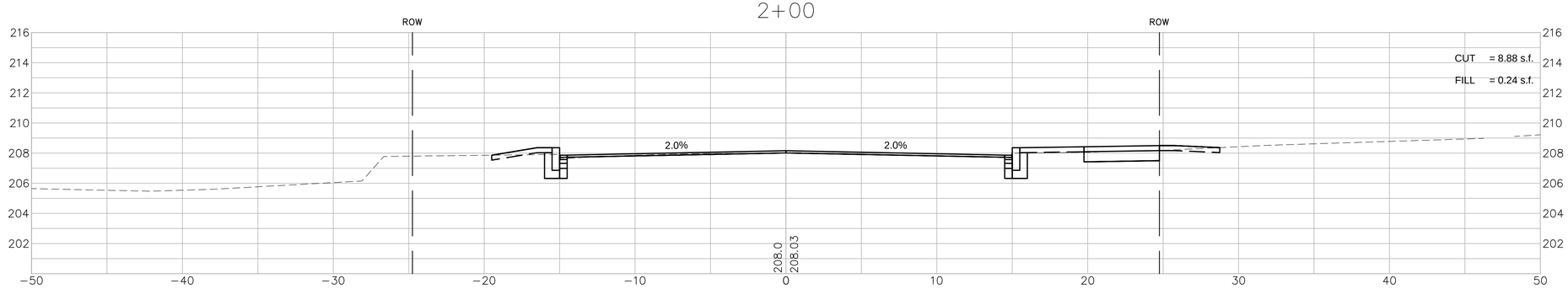

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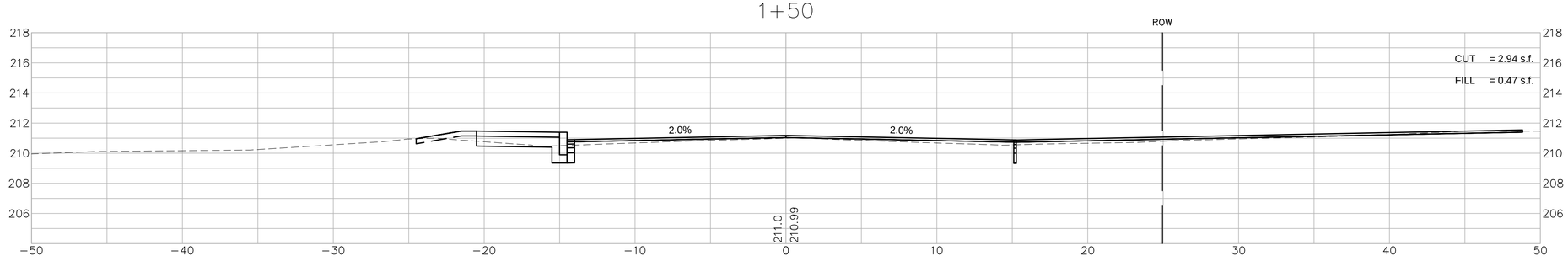

GRAPHIC SCALE
0 2 4 6 8 12 FEET

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FILE NAME: 12005.00_XS
DRAWING NO.: 43 OF 68

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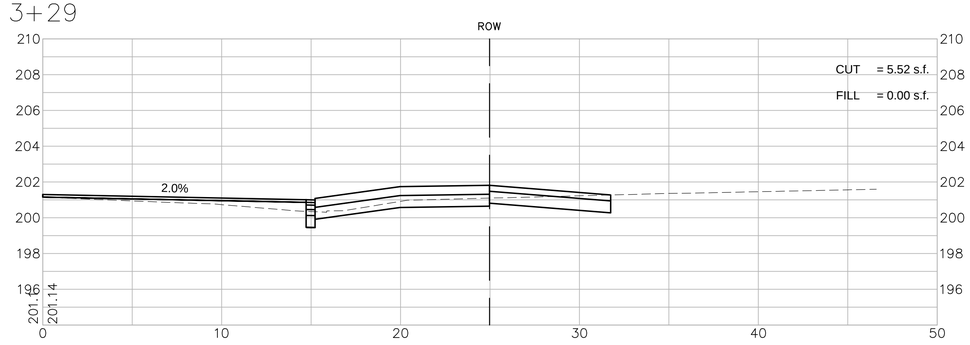

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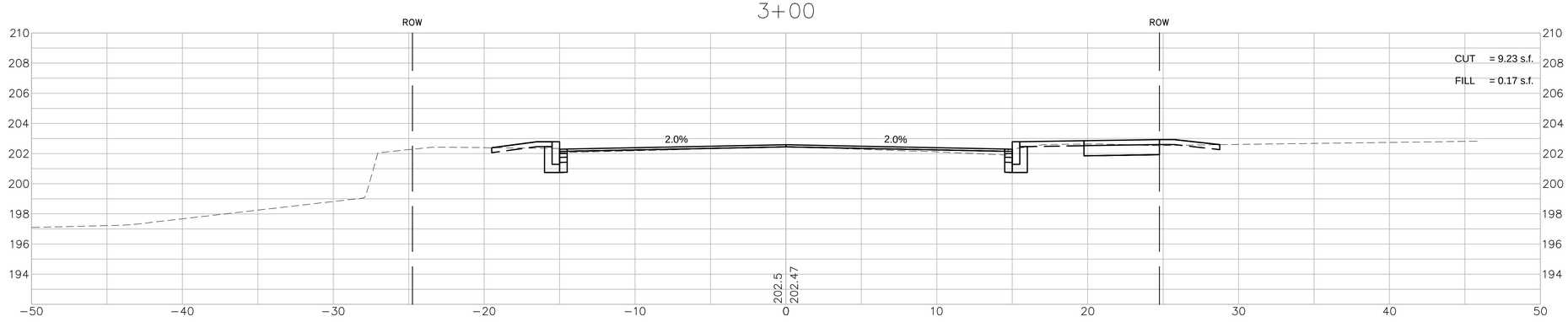

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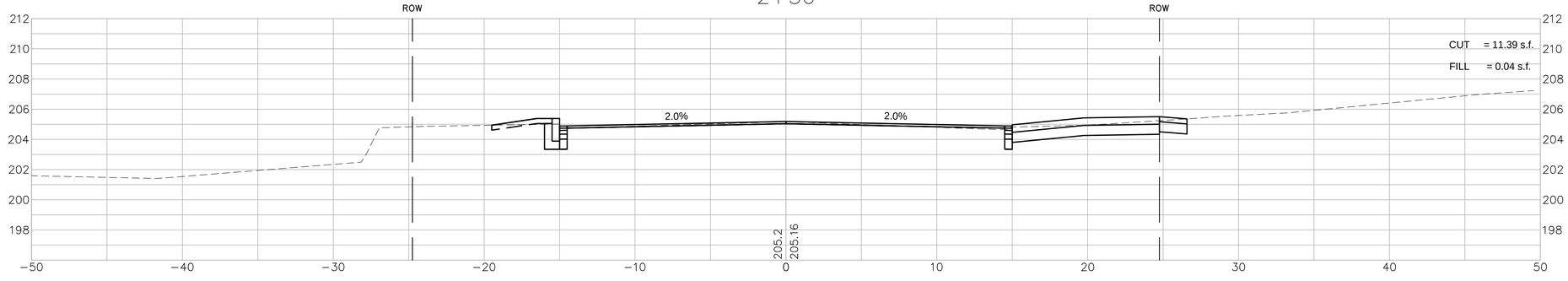

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DRAWING NO.: 44 OF 68

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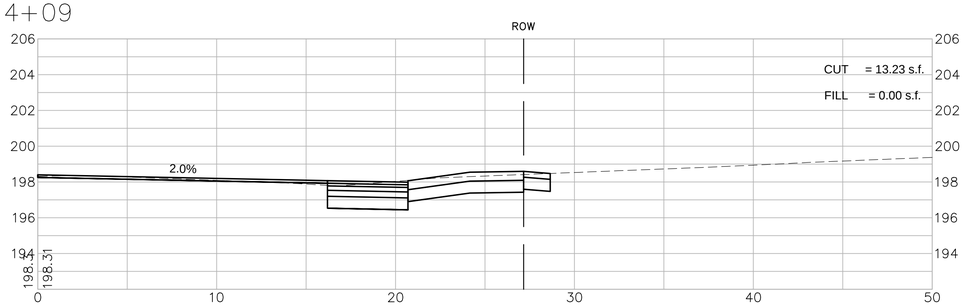

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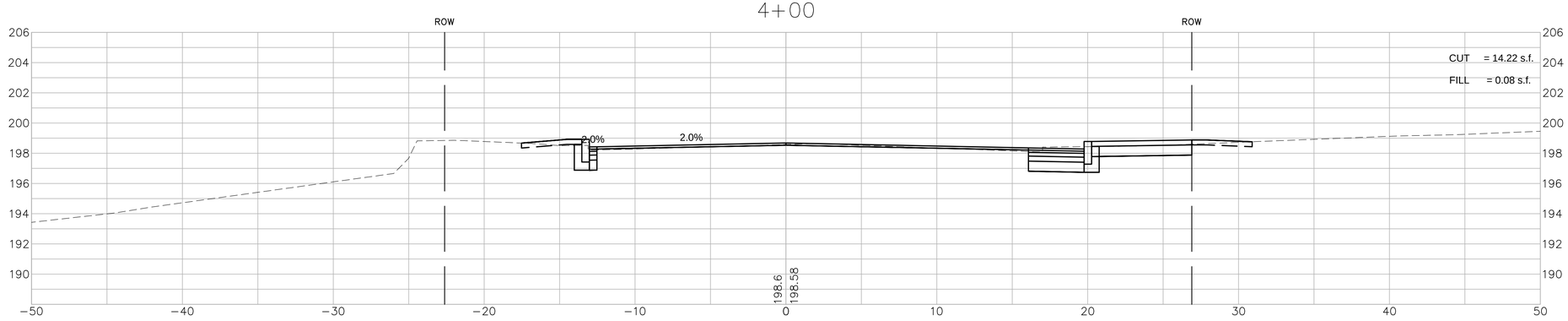

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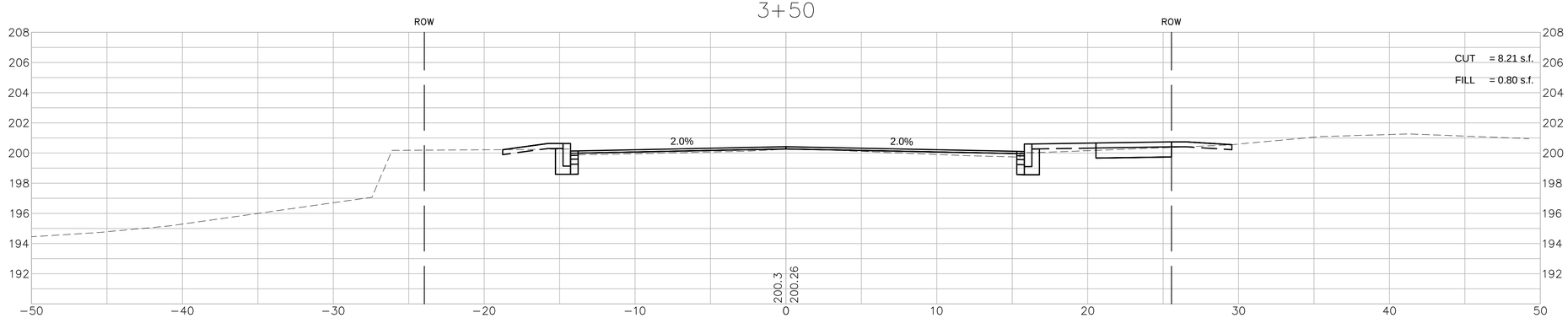

GRAPHIC SCALE
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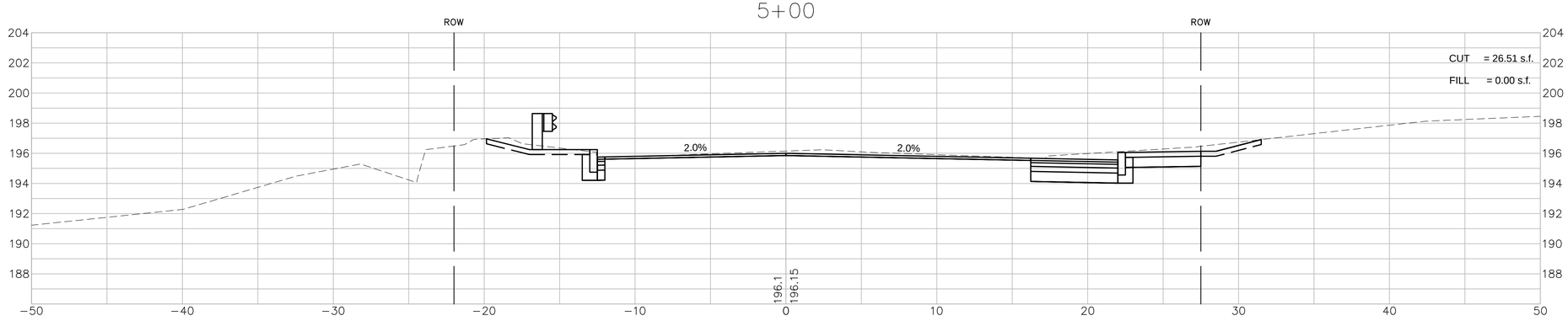
5+00



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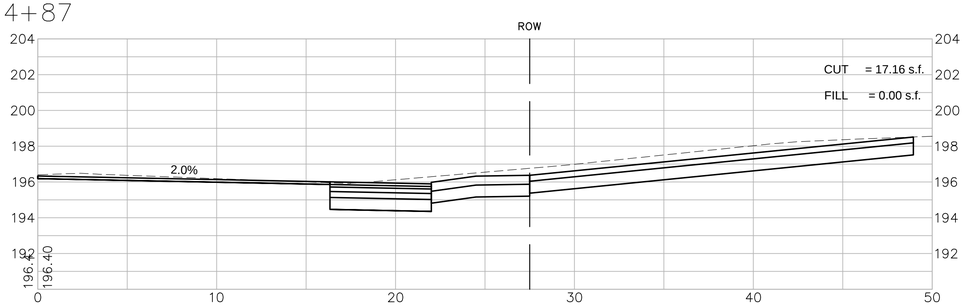

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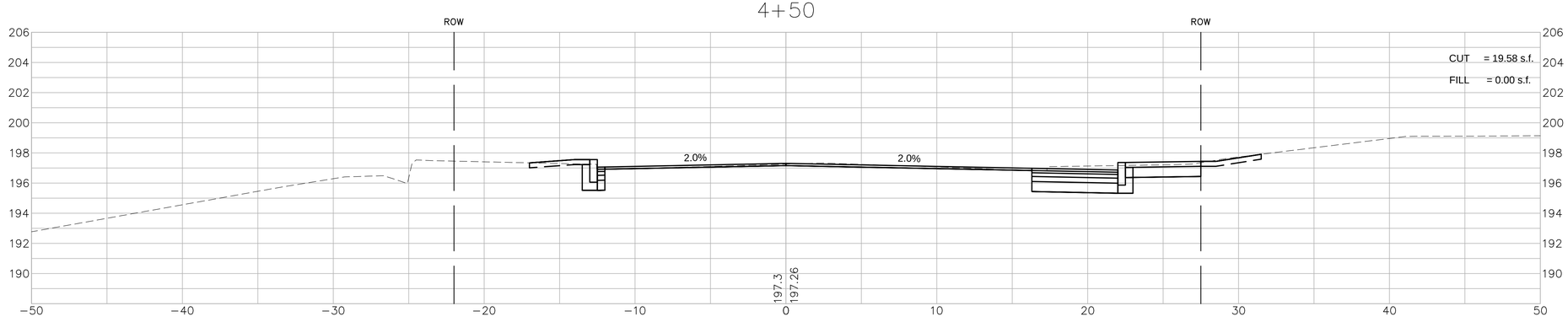

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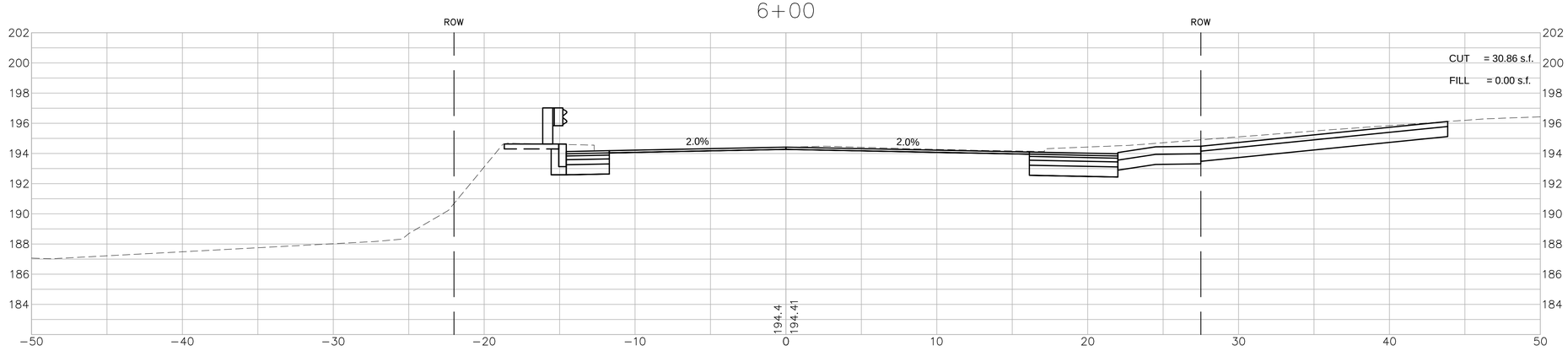
6+00



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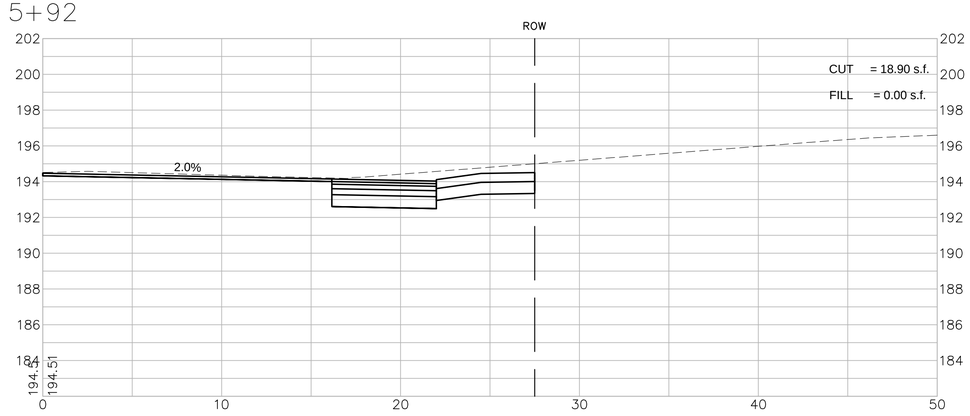

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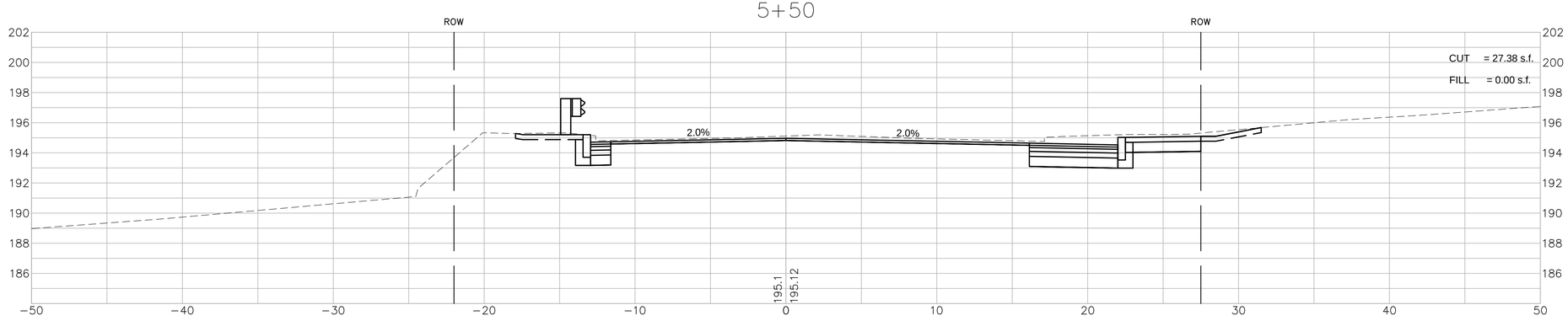

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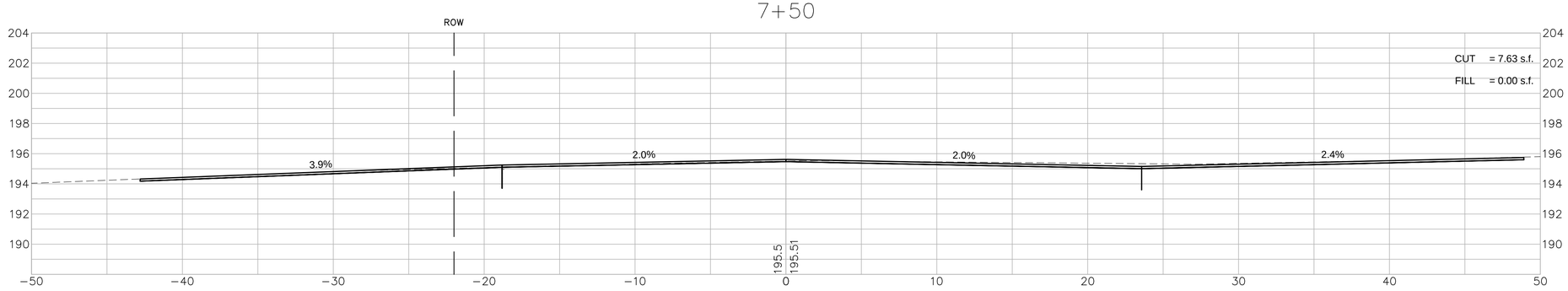

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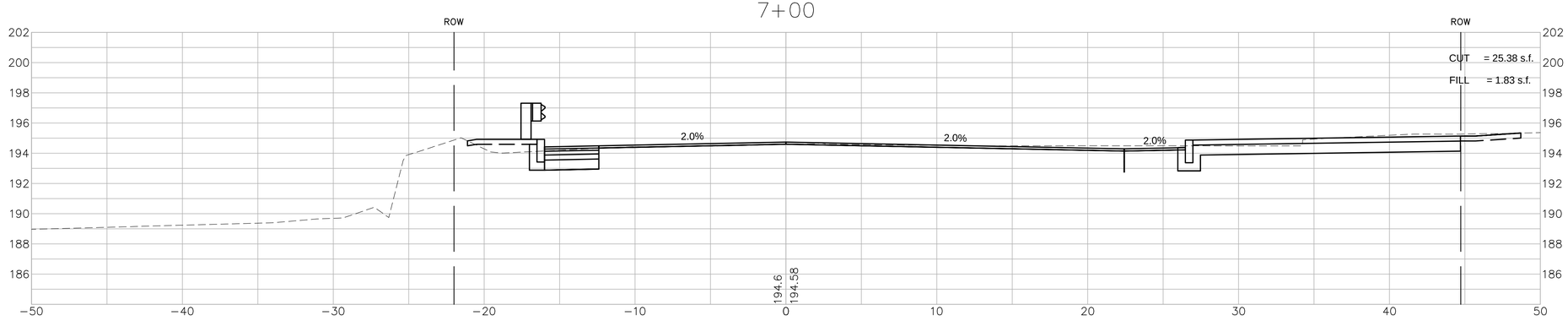

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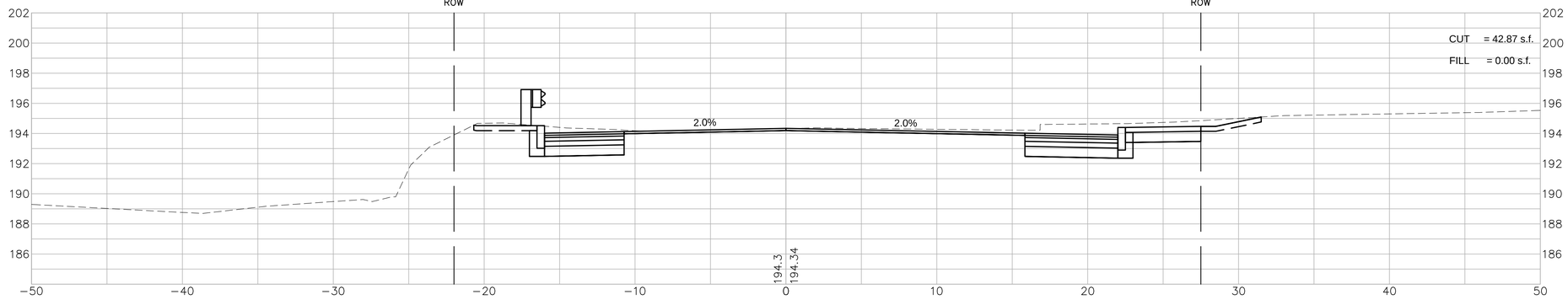

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WALTHAM, MASSACHUSETTS

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FILE NAME: 12005.00_XS
DRAWING NO.: 48 OF 68

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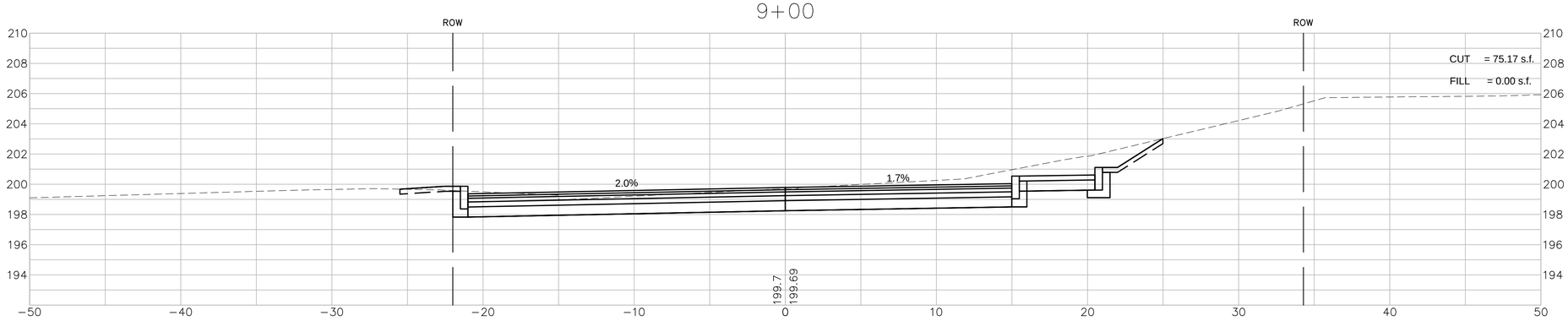

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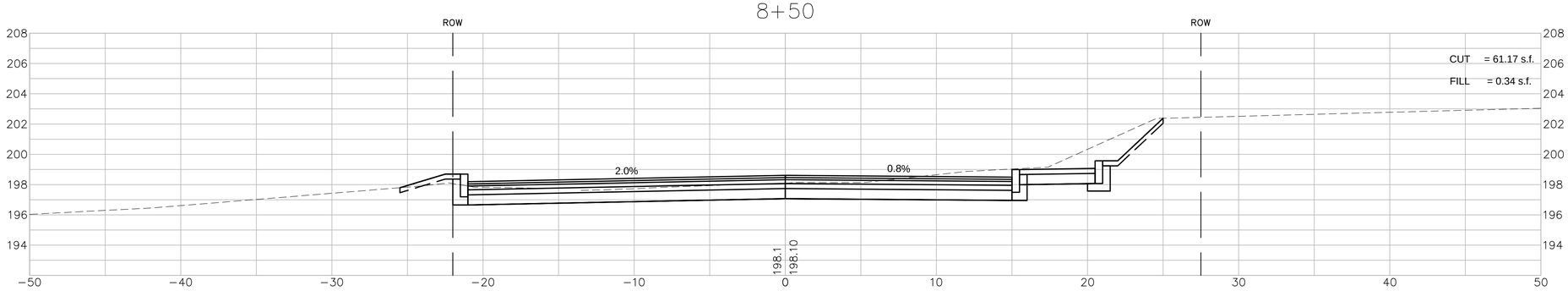

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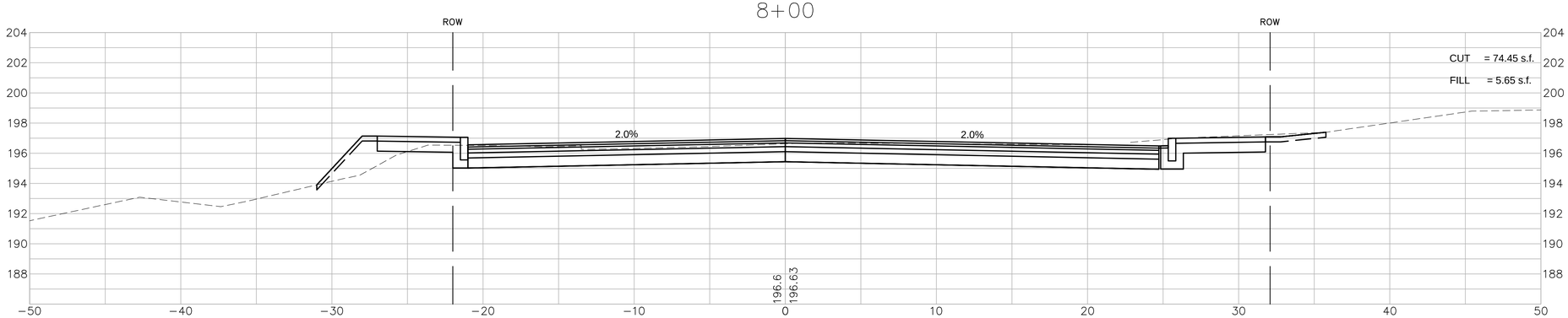

GRAPHIC SCALE
0 2 4 6 8 12 FEET

CROSS SECTIONS

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
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FILE NAME: 12005.00_XS
DRAWING NO.: 49 OF 68

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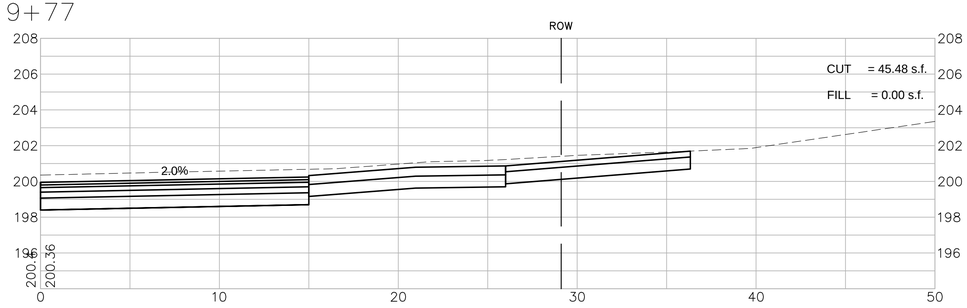

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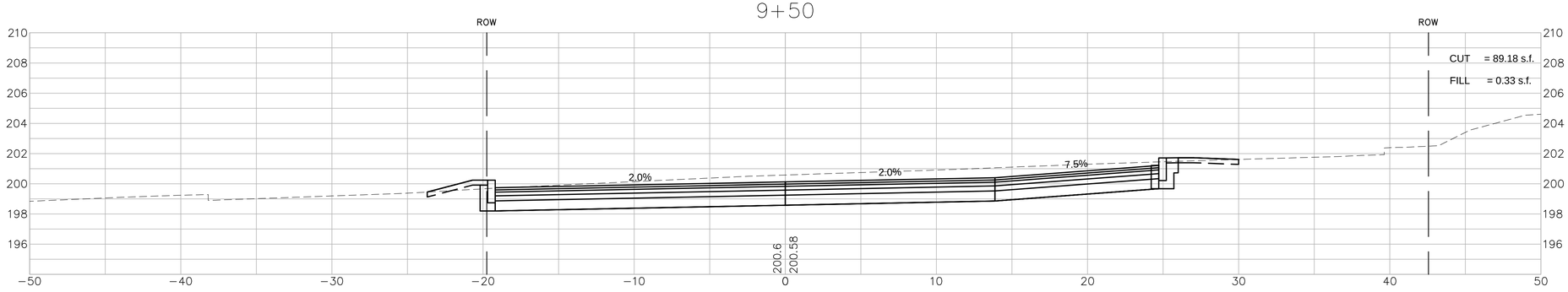

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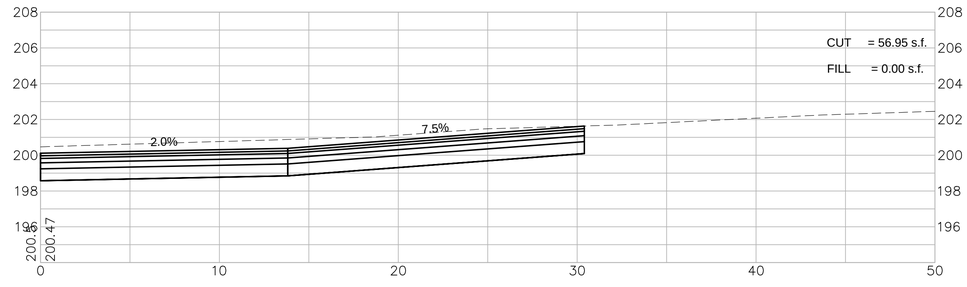

GRAPHIC SCALE
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WALTHAM, MASSACHUSETTS

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FILE NAME: 12005.00_XS
DRAWING NO.: 50 OF 68

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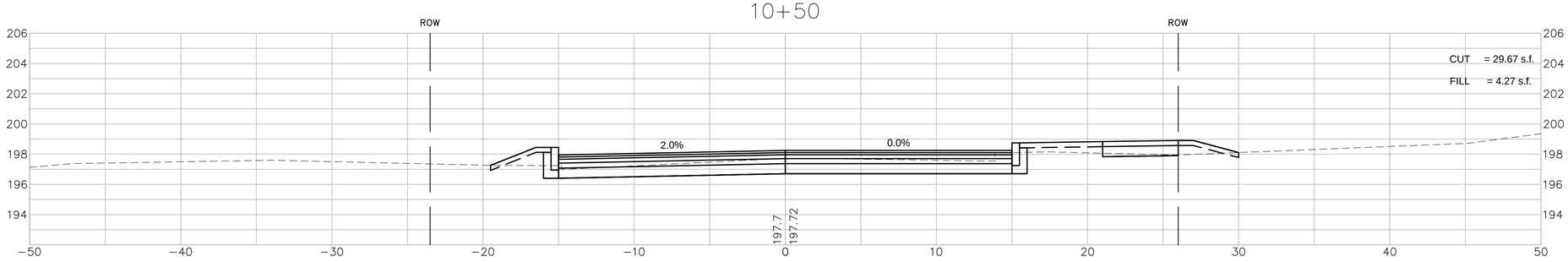

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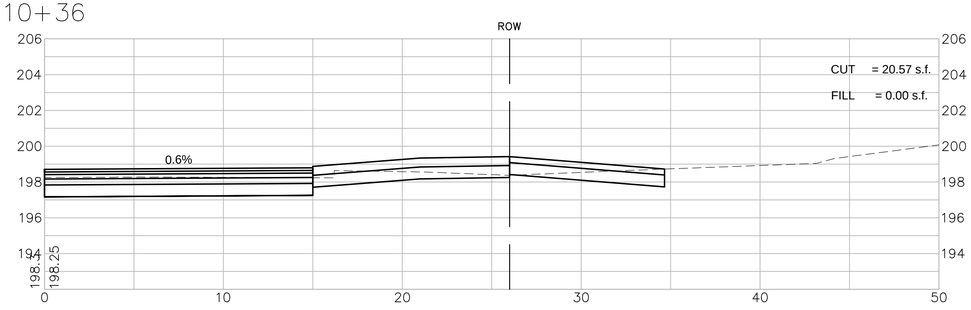

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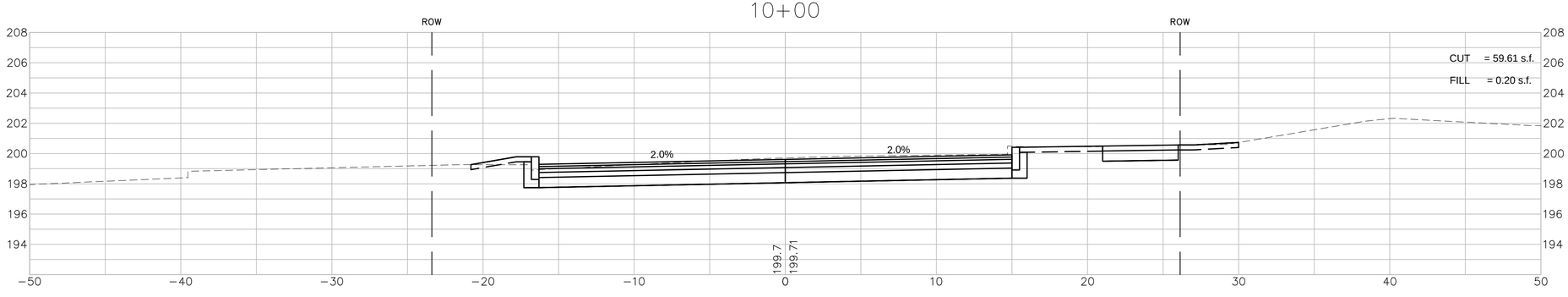

GRAPHIC SCALE
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CROSS SECTIONS

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FILE NAME: 12005.00_XS
DRAWING NO.: 51 OF 68

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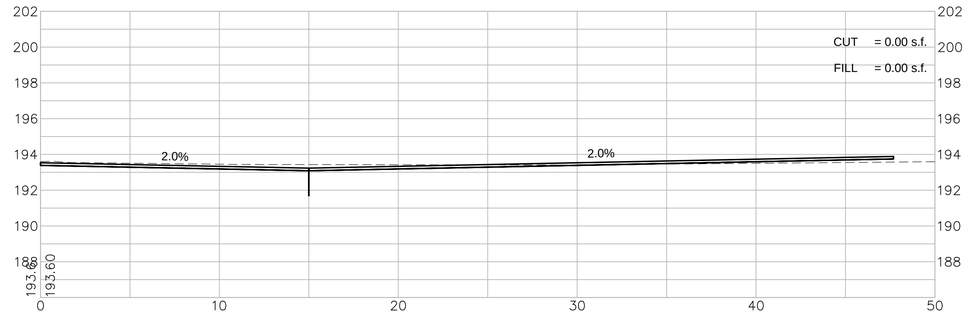

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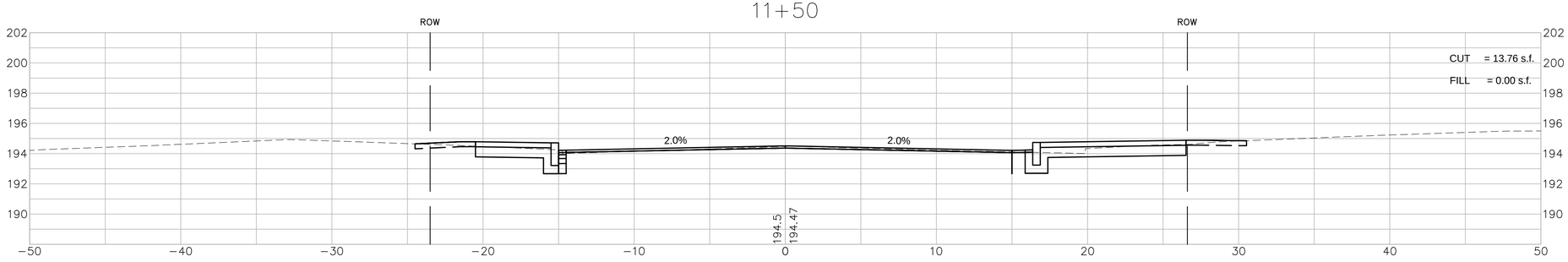

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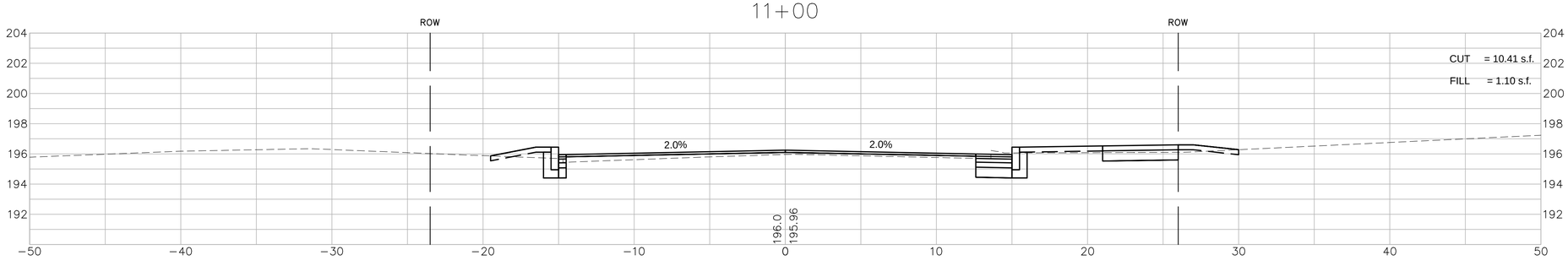

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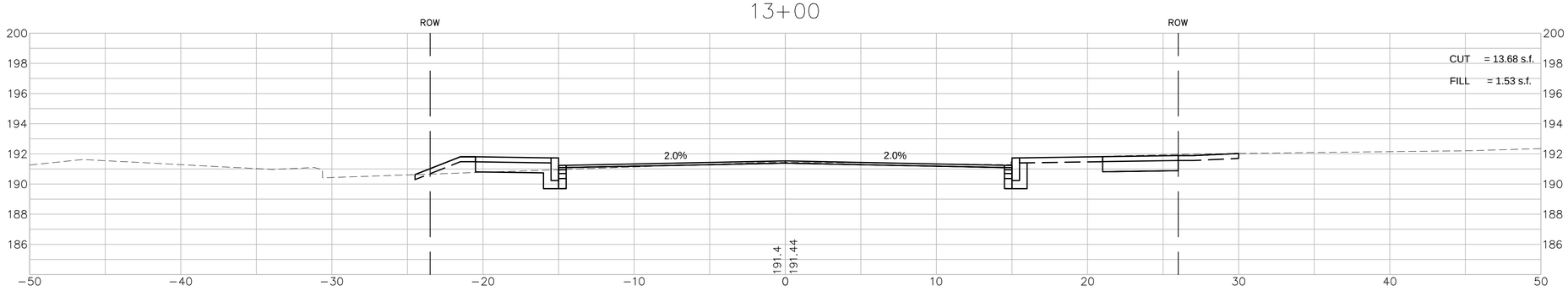

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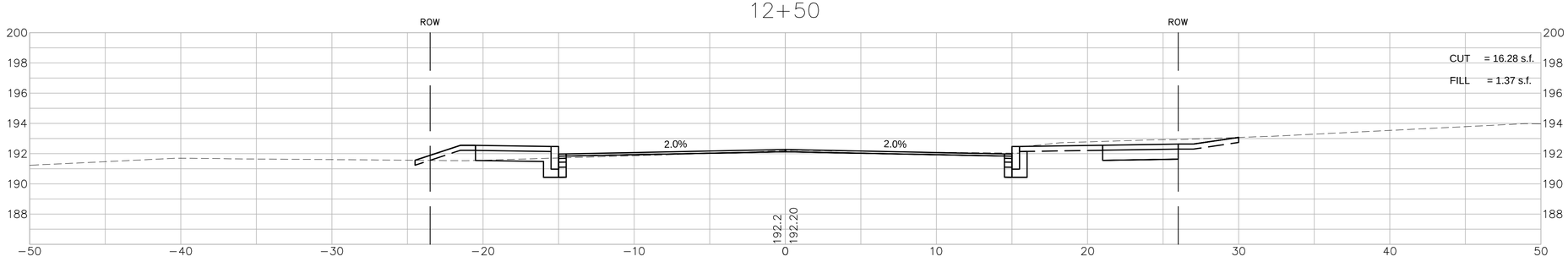

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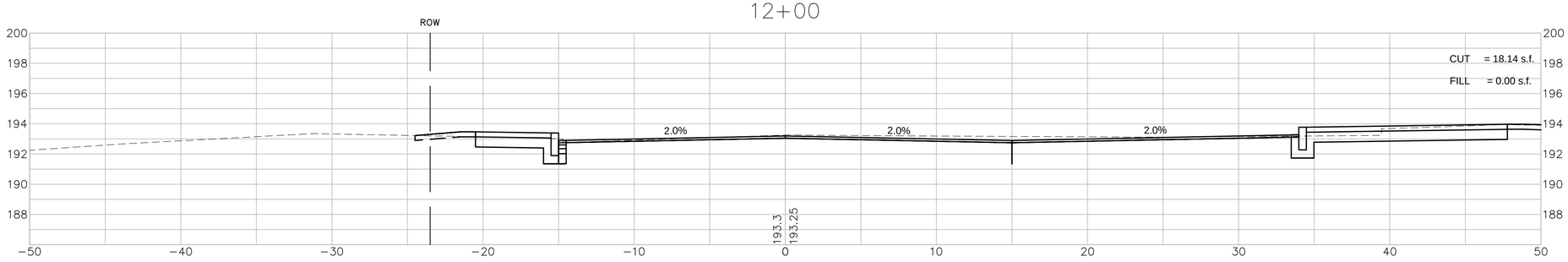

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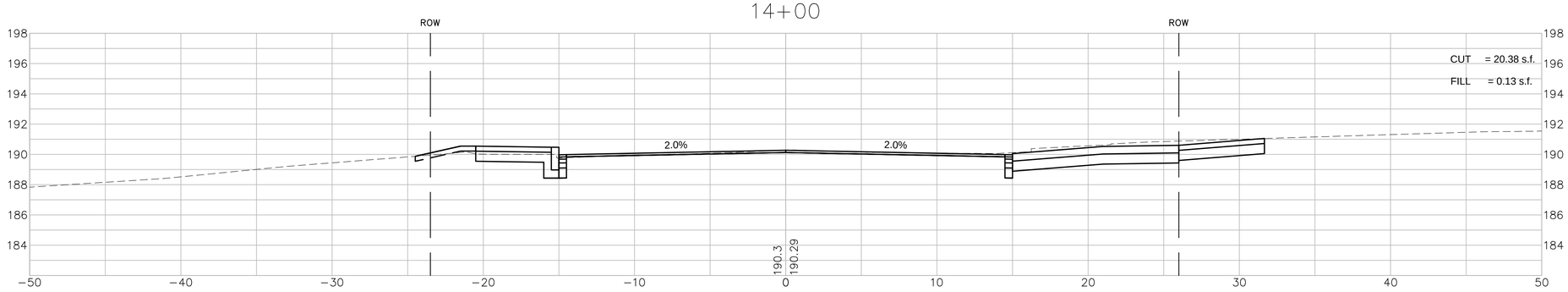
14+00



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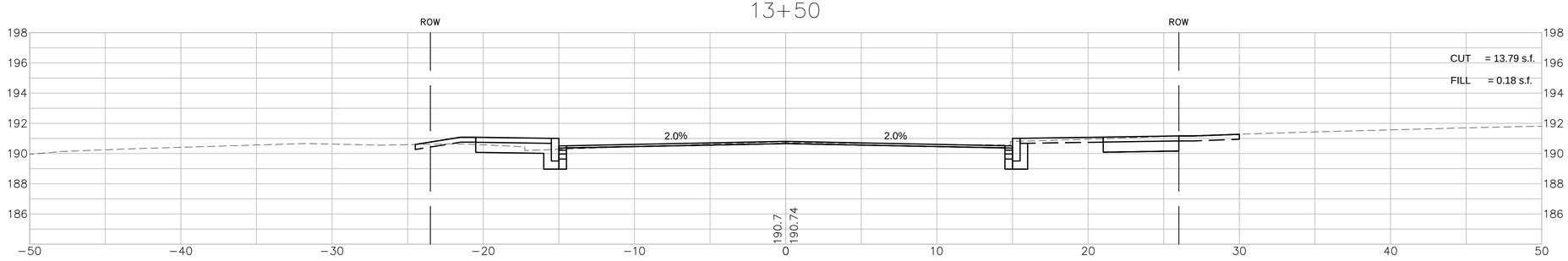

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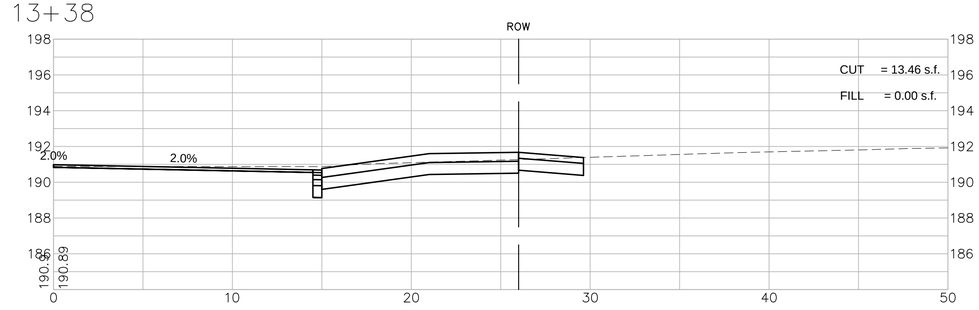

GRAPHIC SCALE
0 2 4 6 8 12 FEET

CROSS SECTIONS

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

GPI Greenman-Pedersen, Inc.
Engineers, Architects, Planners, Construction Engineers & Inspectors
181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

NO.	REVISION	DATE

DESIGN/DRAWN BY: RJD/RJD
CHECK BY: JWD/GJH
DATE: 7/13/2012
SCALE: AS NOTED
JOB NO.: MAX-2012005.00
FILE NAME: 12005.00_XS
DRAWING NO.: 54 OF 68

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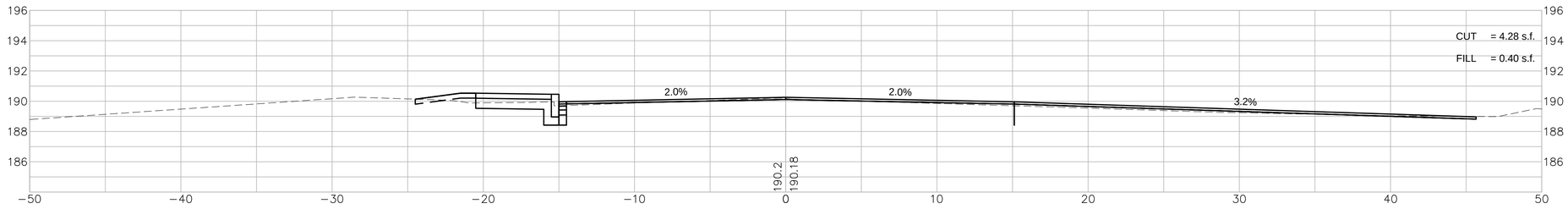

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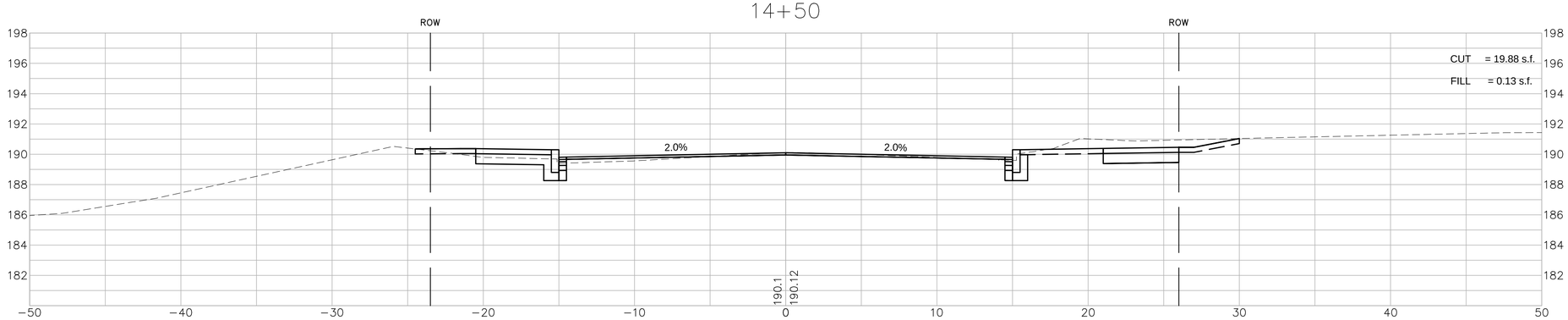

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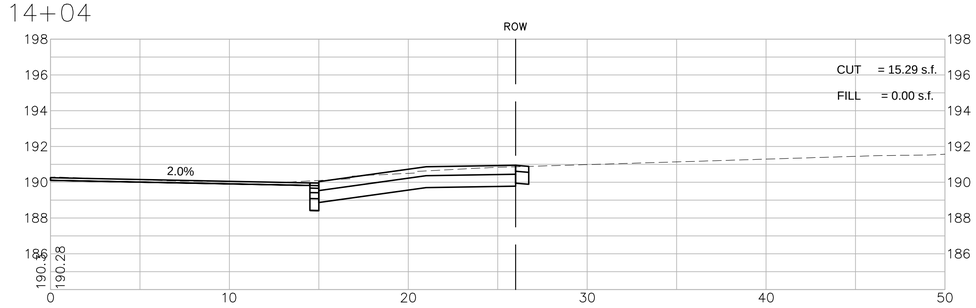

GRAPHIC SCALE
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FILE NAME: 12005.00_XS
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GRAPHIC SCALE
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DRAWING NO.: 56 OF 68

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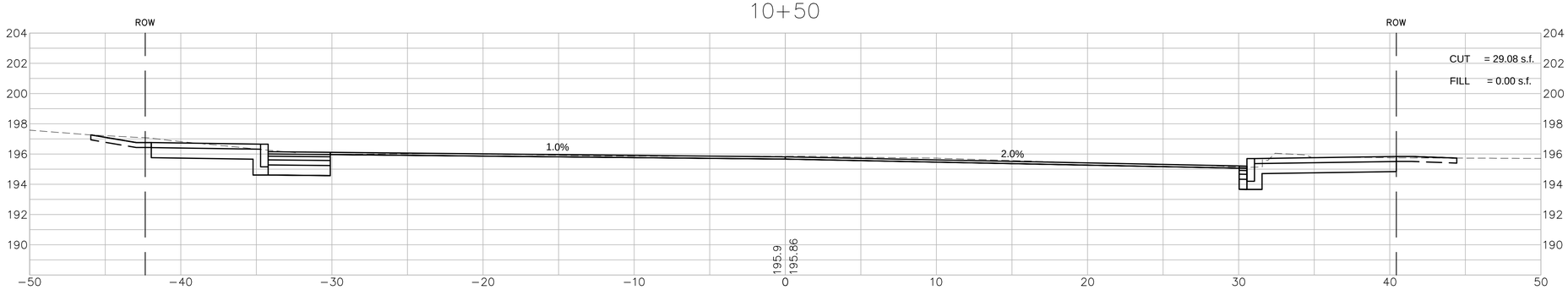

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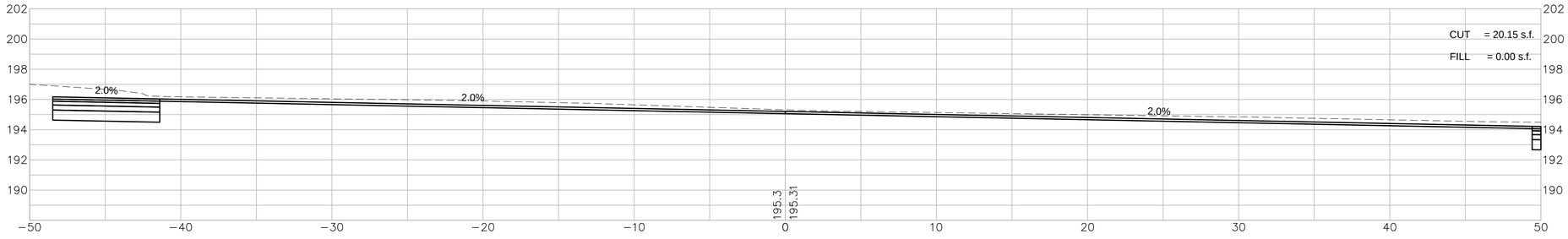

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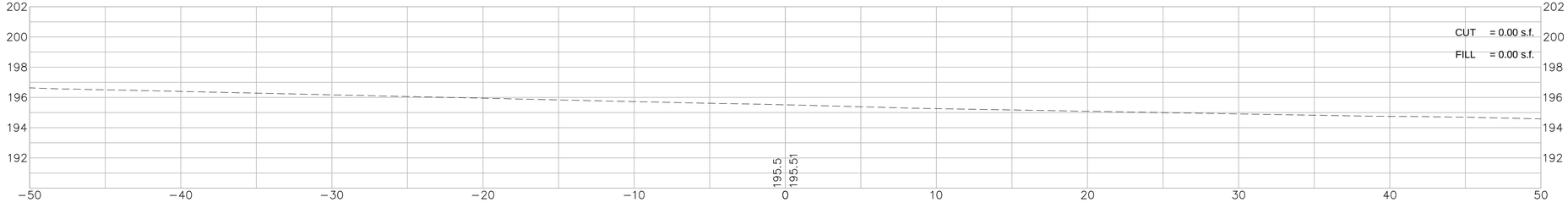

GRAPHIC SCALE
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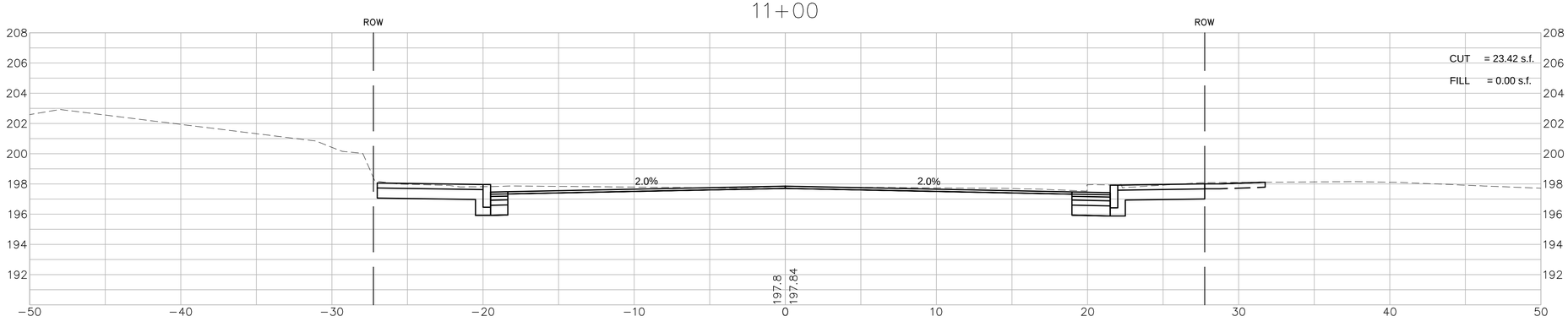
11+00



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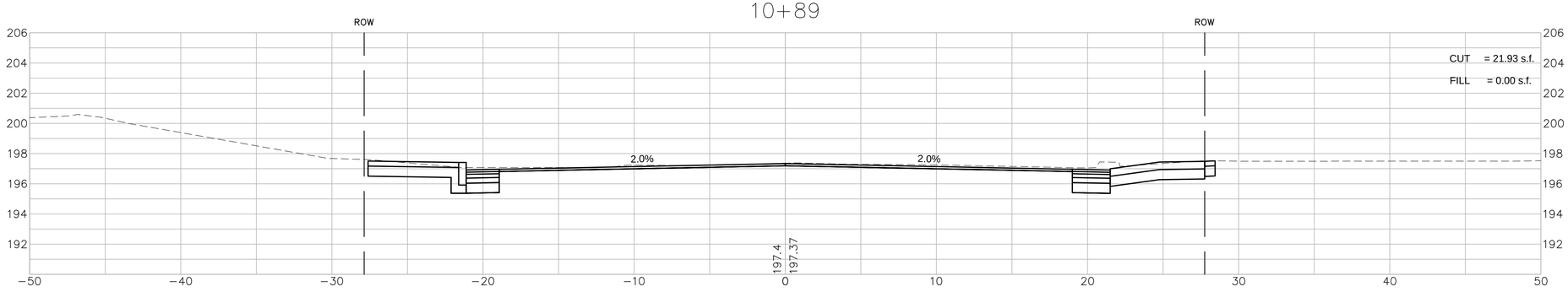

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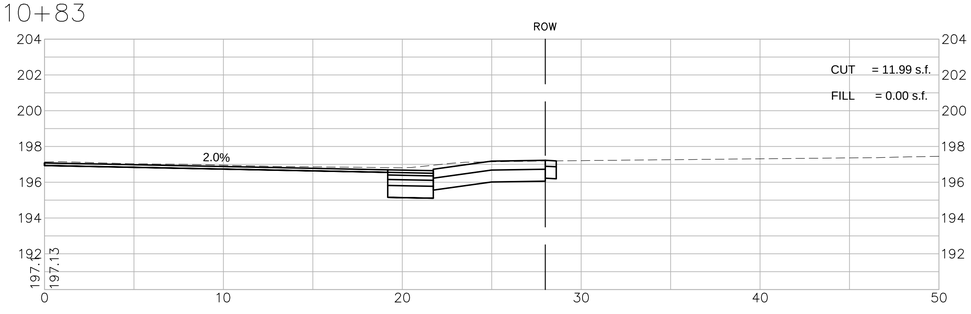

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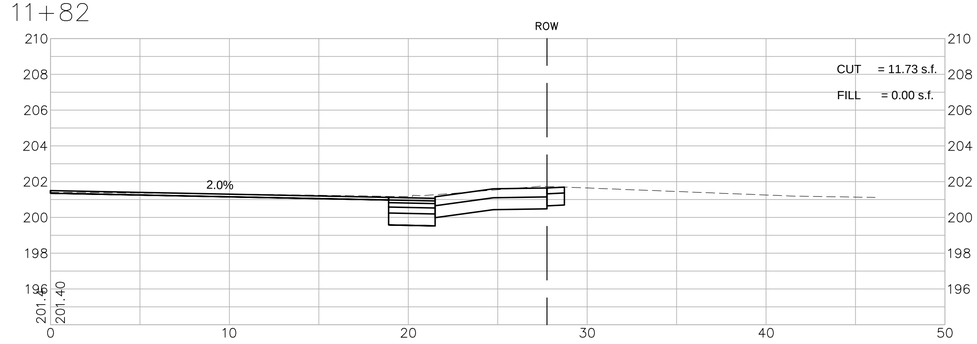
11+82



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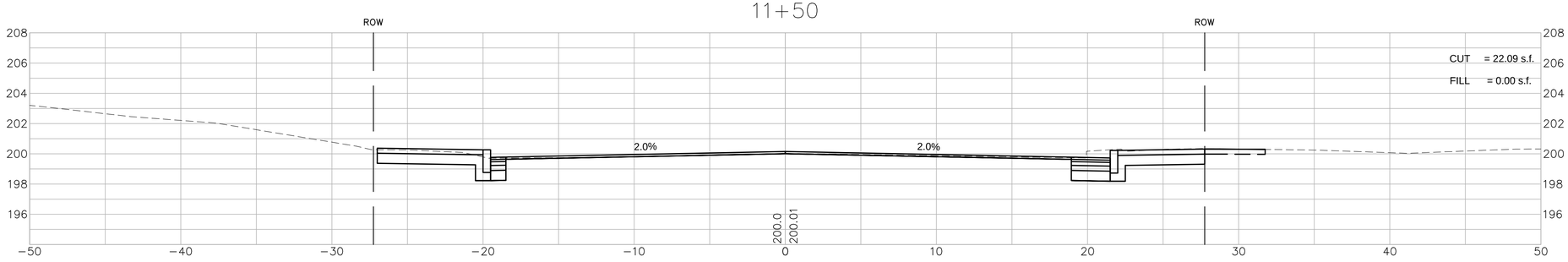

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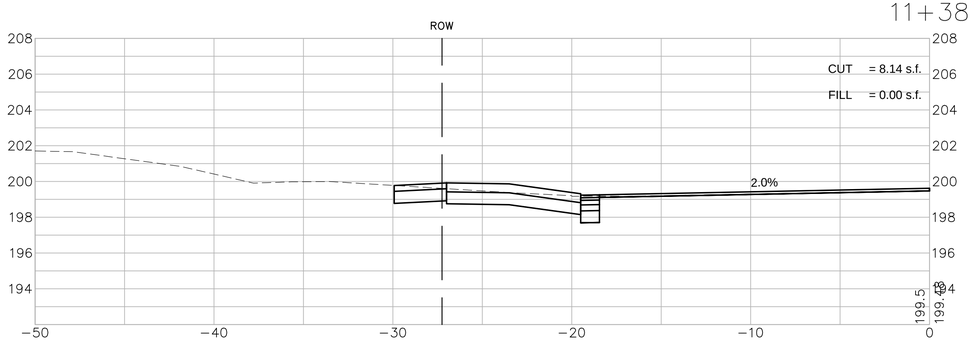

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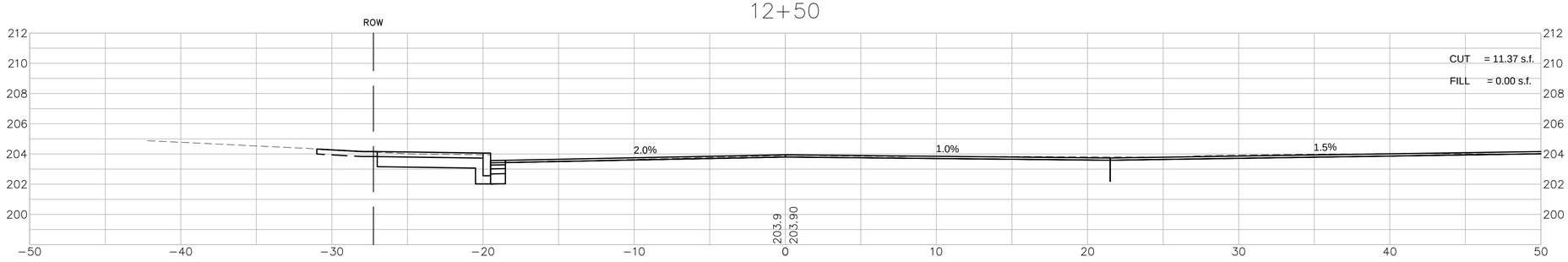
12+50



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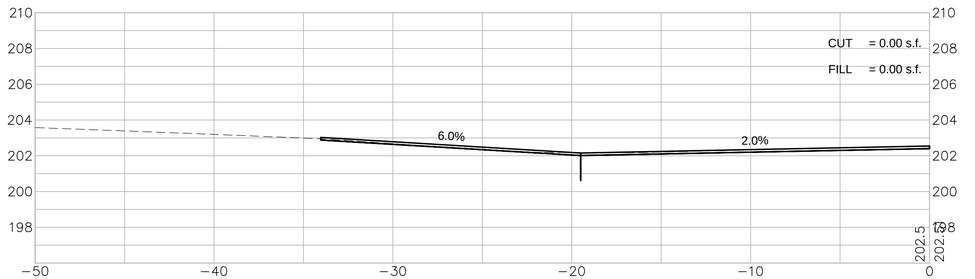

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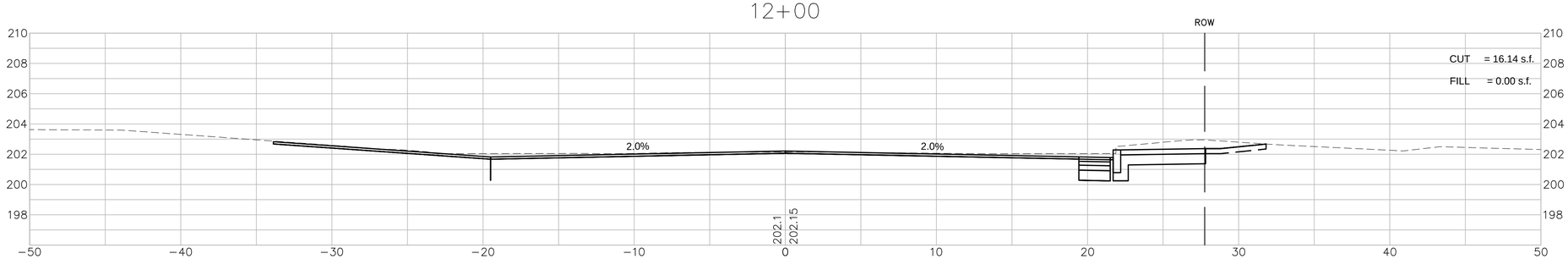

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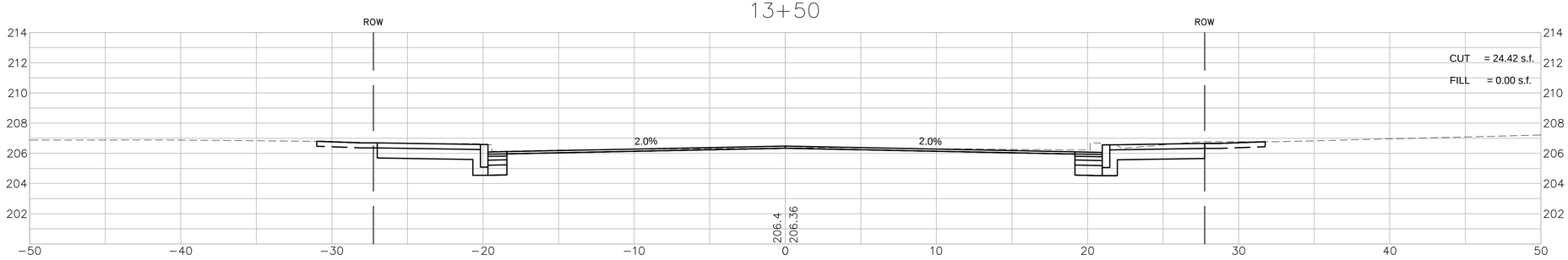
13+50



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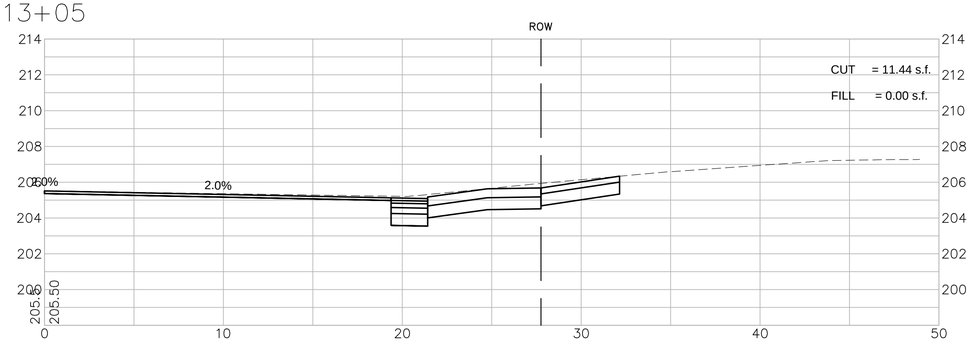

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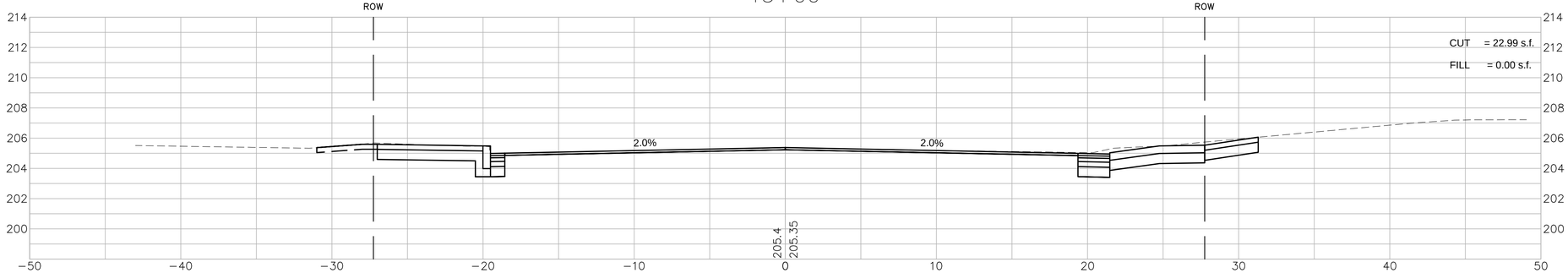

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WALTHAM, MASSACHUSETTS

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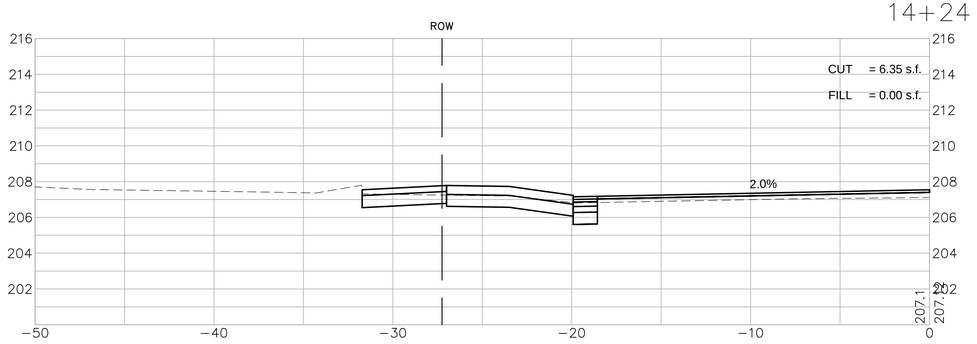
DRAWING NO.: 61 OF 68

14+24



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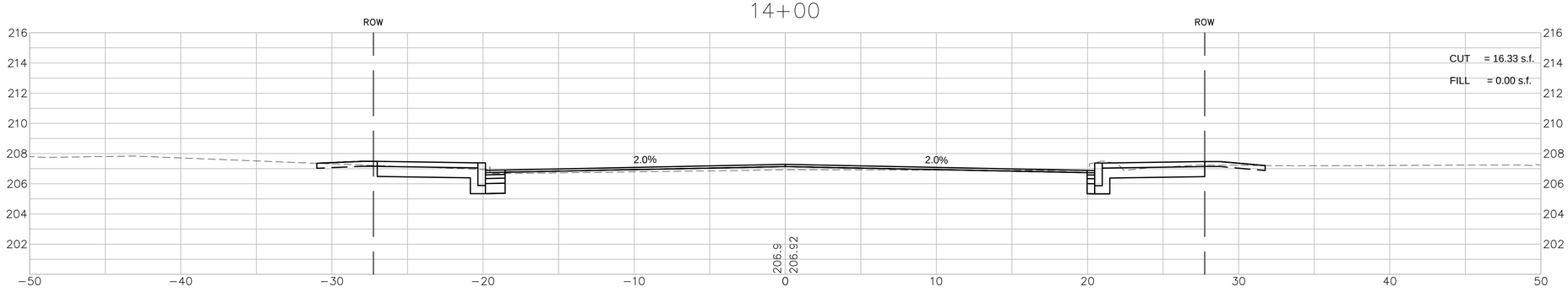

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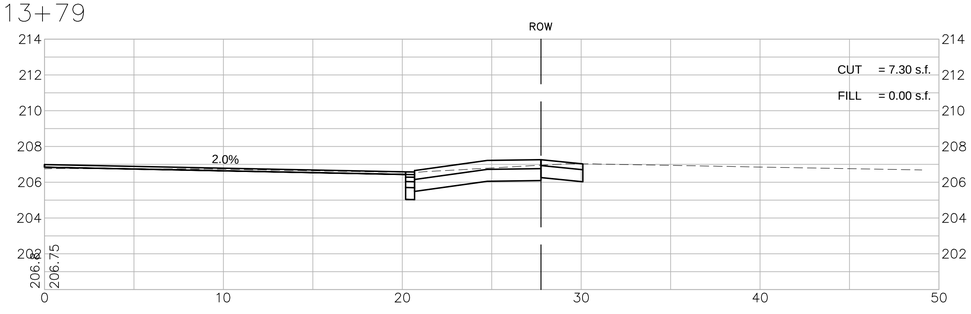

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DRAWING NO.: 62 OF 68

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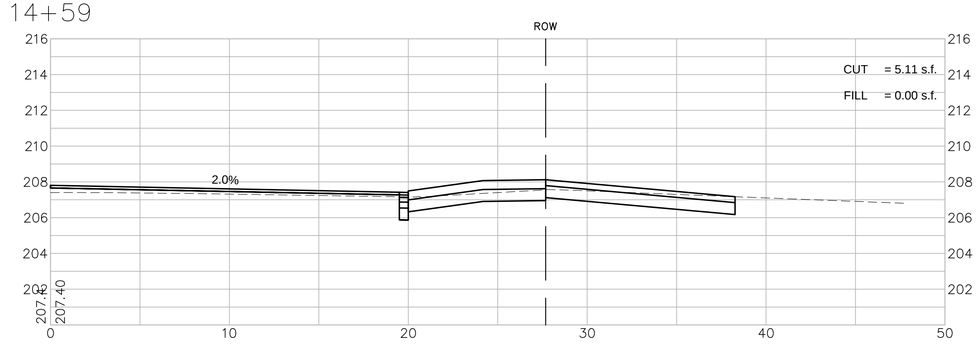

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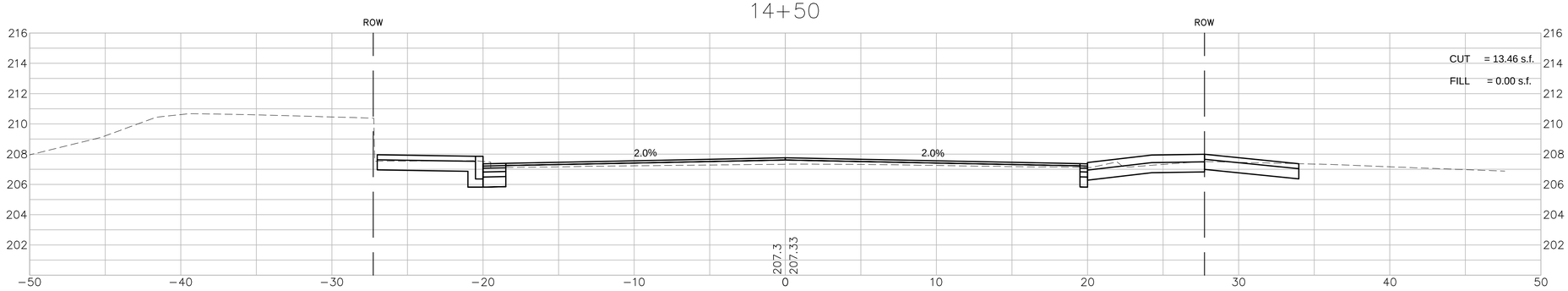

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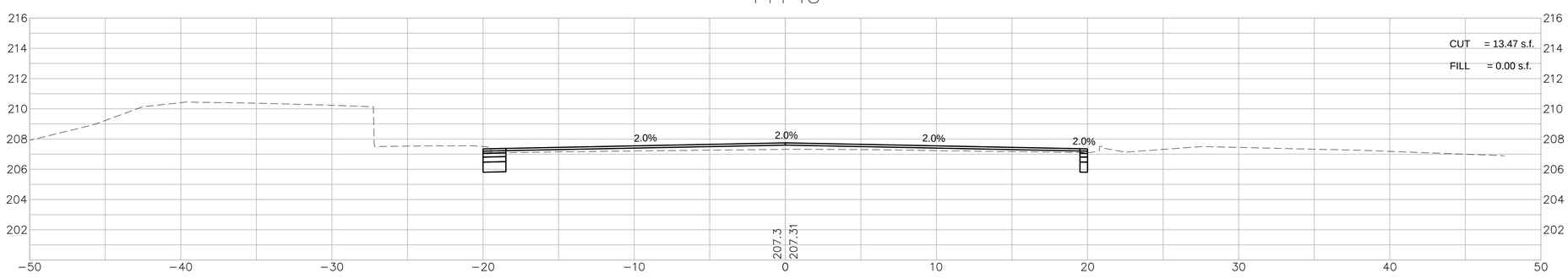

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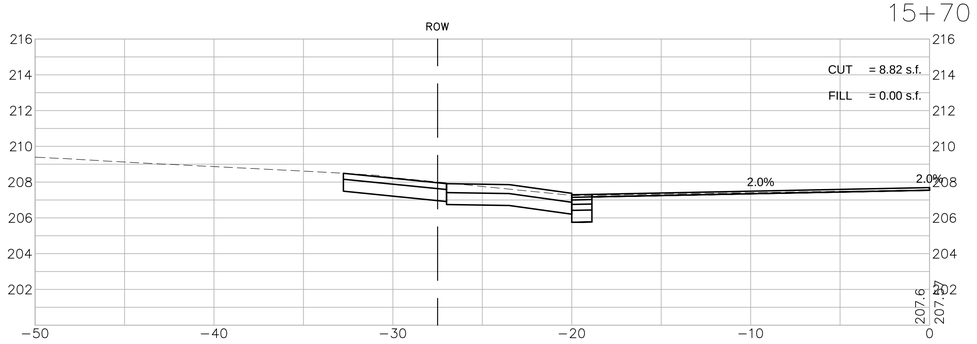

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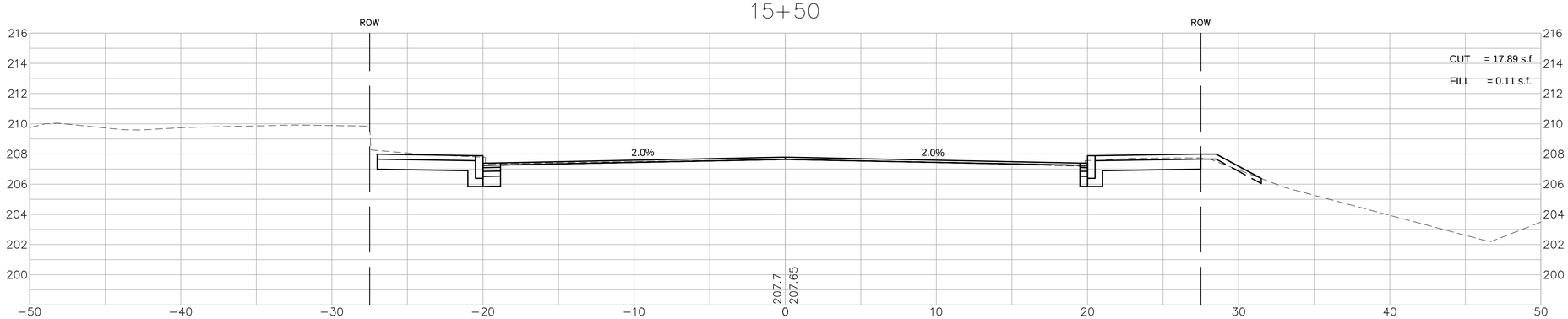

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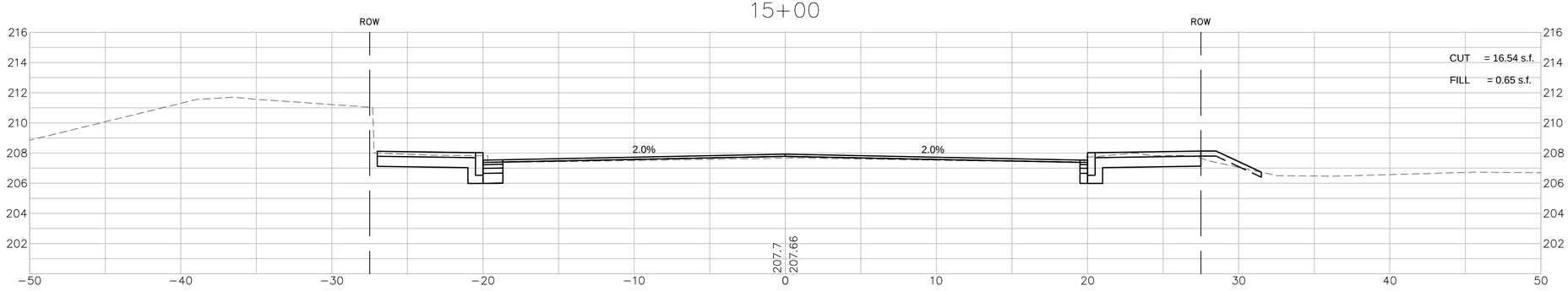

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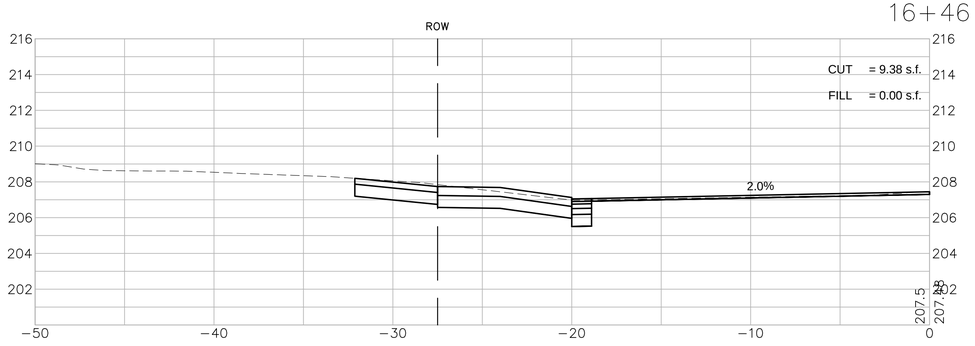

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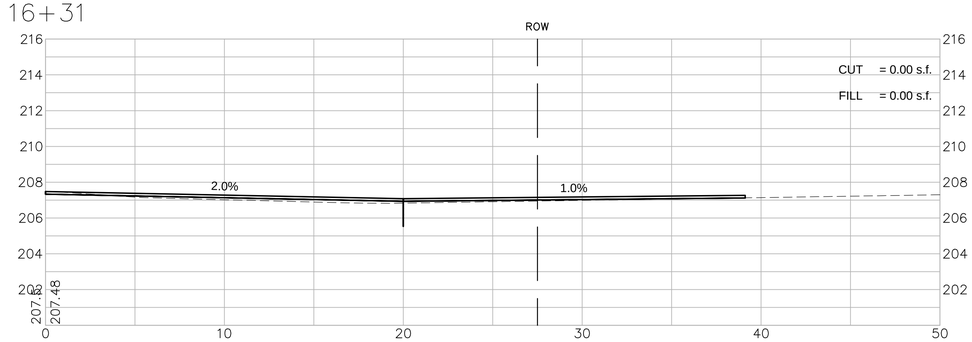

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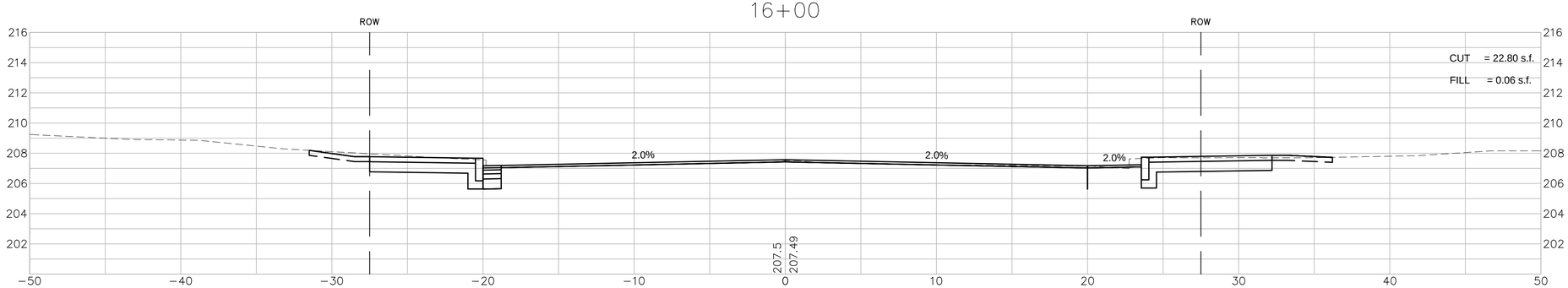

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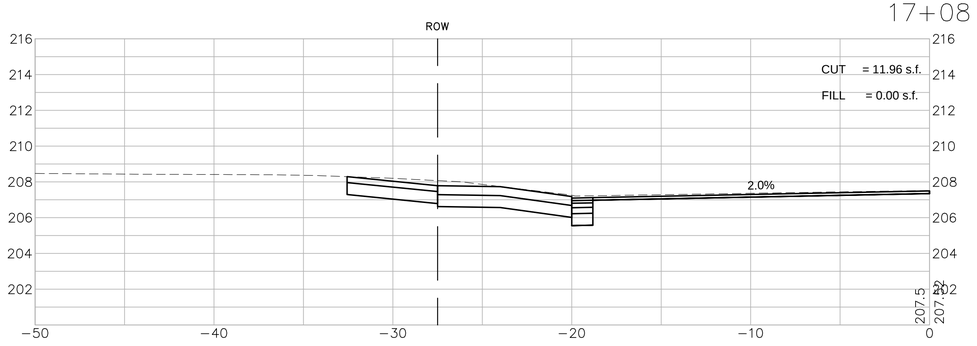
17+08



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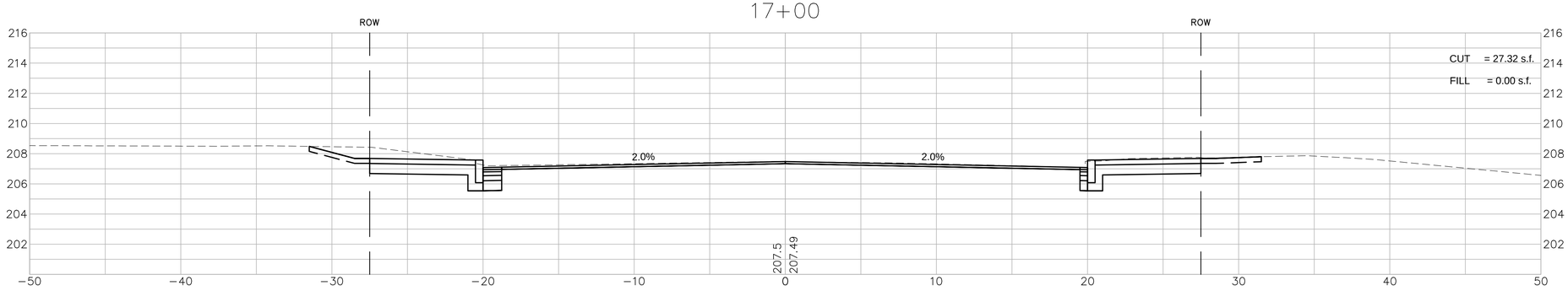

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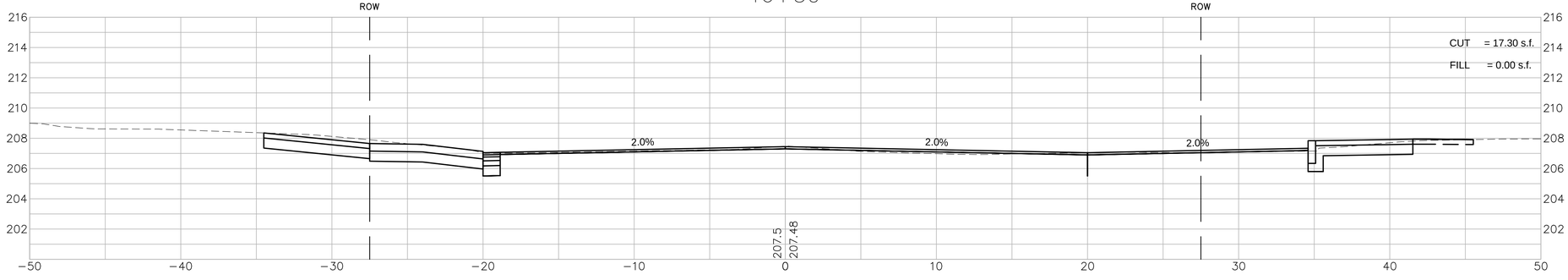

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181 BALLARDVALE STREET, SUITE 202, WILMINGTON, MA 01887
Tel: (978) 570-2999 Fax: (978) 658-3044
http://www.gpinet.com

NO.	REVISION	DATE

DESIGN/DRAWN BY:	RJD/RJD
CHECK BY:	JWD/GJH
DATE:	7/13/2012
SCALE:	AS NOTED
JOB NO.:	MAX-2012005.00
FILE NAME:	12005.00_XS
DRAWING NO.:	66 OF 68

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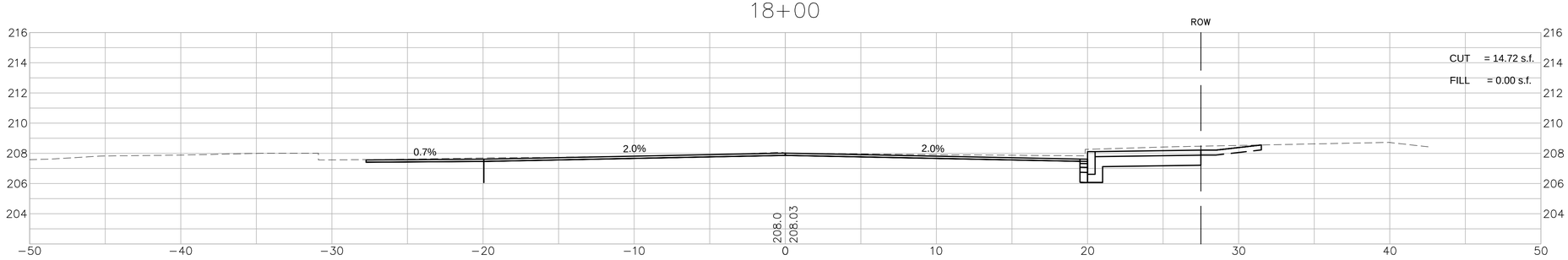

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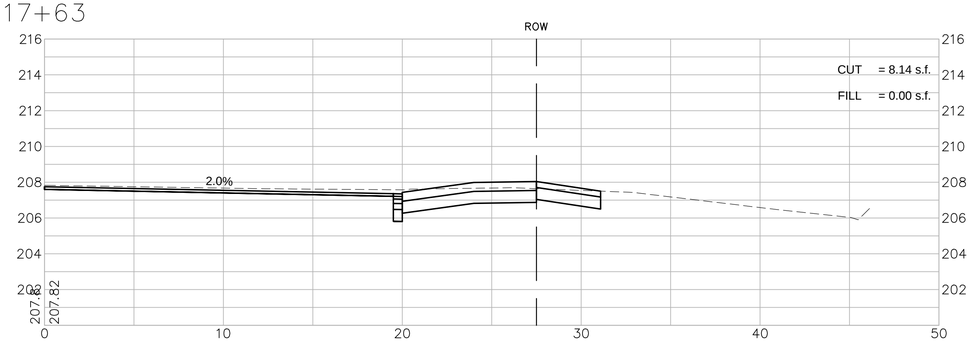

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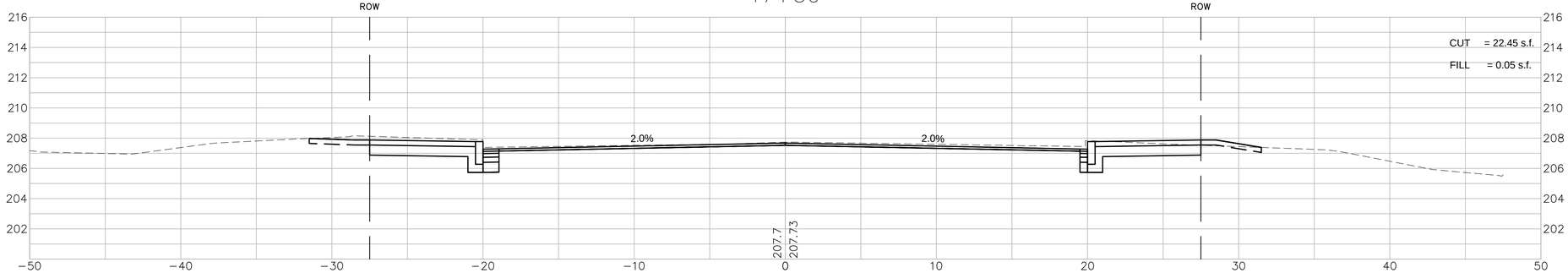

GRAPHIC SCALE
0 2 4 6 8 12 FEET

CROSS SECTIONS

TRAPELO ROAD & FOREST STREET
WALTHAM, MASSACHUSETTS

PROJECT: **Roadway & Traffic Signal Improvement Project**
Trapelo Road & Forest Street
Waltham, Massachusetts

PREPARED FOR: Waltham Transportation & Parking Department
119 School Street
Waltham, Massachusetts

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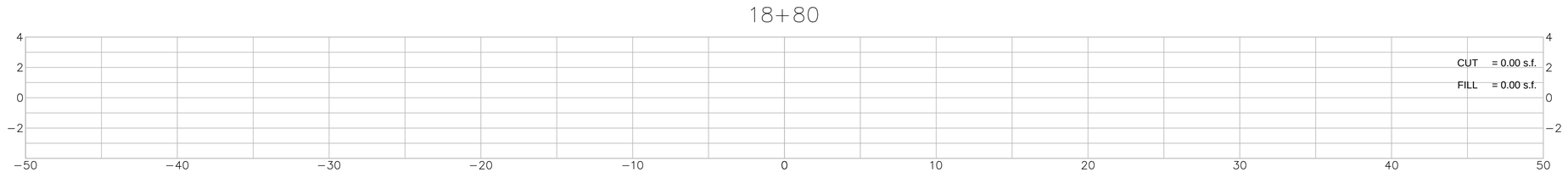

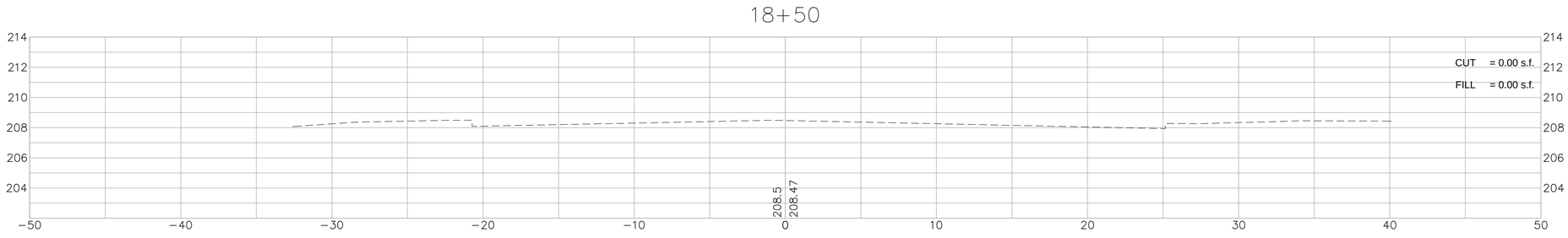

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