



**CITY OF AUGUSTA, MAINE
DEPARTMENT OF CITY SERVICES
NOTICE TO CONTRACTORS**

Sealed proposals, addressed to the Purchasing Agent, City Center Plaza, 16 Cony Street, Augusta, Maine 04330, and endorsed on the outside of the envelope with the name of the Bidder, Contractor Name and Bid Number 221033; will be received by the Purchasing Agent until **2:00 o'clock p.m.** (prevailing time) on **Thursday, March 25, 2021** at which time they will be publicly opened and read. Telephone, telegraph, or facsimile Bids will not be accepted. No Bids will be accepted after the above stated time and date.

Project Name: Fuller Field Artificial Turf and Multi-Purpose Field.
Bid #: 221033

Project Location: Pierce Drive, Augusta ME

Outline of Work: The City of Augusta Maine will undertake the installation of an artificial turf field and the relocation of the Track & Field events (Shot Put, Discus and Javelin) from the area to be converted to Artificial Turf to an adjacent area to be constructed that will also serve as a multi-purpose practice field. This turnkey project will be awarded to a qualified General Contractor. The work will commence on or about June 11th, 2021 and the artificial turf component must be completed by October 1st, 2021 and the practice field area that is for the relocation of the field events is to be completed by November 15th, 2021.

The plans, specifications and proposal forms may be obtained at the Audit Department, City Center Plaza, 16 Cony Street, Augusta, Maine. Plans and Specifications are available beginning on Wednesday, February 24th, 2021 and on the City's website at <https://www.augustamaine.gov> under City Government, Purchasing. Each proposal must be made upon the blank forms provided.

The City encourages women and minority-owned businesses to submit Bids.

City of Augusta, Maine by:

William R. Bridgeo
City Manager/Purchasing Agent

PREAMBLE

The City of Augusta Maine will undertake the installation of an artificial turf field and the relocation of the Track & Field events (Shot Put, Discus and Javelin) from the area to be converted to Artificial Turf to an adjacent area to be constructed that will also serve as a practice field. This turnkey project will be awarded to a qualified General Contractor. The work will commence on or about June 11th, 2021 and the artificial turf component and the practice field area that is for the relocation of the field events is to be completed by the end of the 2021 construction season. This project will be done at a pre-existing facility that is home to the Cony Rams and city’s recreation programs. The area includes the natural grass field area to be converted to Artificial Turf as specified. This area is contained within an eight lane track that will need to be protected from heavy loads by bridging the track or utilize an acceptable means to ensure the track is not damaged. The General Contractor will be responsible for making sure NO damage occurs to the track as a result of the artificial turf project. Approximately two hundred yards away is the area where a multi-purpose practice field will be constructed that will also be the location for the shot put, discus and javelin Track and Field events. These three field events previously had been on the field area being converted to Artificial Turf. The multi-purpose practice field area will in part be built with material excavated from the Artificial Turf footprint. Thus trucking expenses will be considerably less than trucking material off-site.

INSTRUCTIONS TO BIDDERS

1. INTERPRETATION OF CONTRACT DOCUMENTS:

- A. No oral interpretation will be given to any Bidder. Every interpretation requested shall be made in writing to the Project Manager and, to be given consideration, all requests must be received at least five days prior to the date fixed for the opening of Bids.
- B. Every interpretation made to the Bidder will be in the form of an Addendum to the Specification, which, if issued, will be sent to all persons to whom Contract Documents have been issued. All such Addenda shall become a part of the Contract Documents. Failure of the Project Manager to send or of any Bidder to receive, such Addenda or interpretation shall not relieve any bidder from any obligation under his/her Bid as submitted.
- C. Last addendum request date is March 15th , 2021
- D. Project Manager: Leif Dahlin, Director of Community Services for general questions.
E-Mail: leif.dahlin@augustamaine.gov. Office Phone: (207) 626-2305.
Jimmy Coffin, Coffin Engineering. For technical questions E-Mail: jcoffin@coffineng.com
Office phone: (207) 623-9475

E. ARTIFICIAL TURF AND MULTI-PURPOSE FIELDS SPECIFICATIONS

The technical specifications and plans are provided as Appendix “A”

F. EXAMINATION OF SITE AND CONTRACT DOCUMENTS:

- A. We are happy to review the project location and answer questions and prospective bidders will be able to go to the project site on Piece Drive that is adjacent to the Cony High School and Technical Center.
- B. Before submitting a Proposal, each Bidder shall visit the site of the work and fully acquaint himself/herself with the conditions as they exist, shall also thoroughly examine conditions as they exist, the Bidding and Contract Documents, fully inform himself/herself as to all laws,

ordinances, and regulations affecting this Proposal of the Work, and shall include in his/her Proposal a sum to cover the cost of all items, implied or required, to attain the completed conditions, contemplated by the Plans and Contract Documents. Failure of any Bidder to visit the site and fully inform themselves as to all plans, Bidding documents, applicable laws, ordinances, and regulations shall in no way relieve the Bidder from any obligations with respect to his/her Bid.

C. **Bid Submission** due date is Thursday, March 25, 2021, 2:00 p.m. City Center, Audit Bureau, City of Augusta.

3. REJECTION OF PROPOSALS, WAIVER OF FORMALITIES:

- A. The City of Augusta reserves the right to reject any or all Proposals, and to waive any formalities in the Bidding procedures.
- B. This project is contingent upon available financing.

4. SUBMISSION OF BIDS:

- A. Bids shall be submitted at the place and not later than the time stipulated in the separate Notice to Bidders.
- B. Bids, on forms supplied, shall be enclosed in a sealed opaque envelope bearing the Bidder's name and address, and plainly marked with the Project identification and package number.
- C. Proposals may be mailed, at risk of Bidder, addressed as follows:

Audit Department
Att: Cheryl Gould
2nd Floor.
City Center Plaza
16 Cony Street
Augusta, Maine 04330-5298

- D. If mailed, Proposals should be enclosed in the opaque envelope as specified herein before as well as a separate outer envelope similarly identified in the lower left hand corner; plus, in large letters, the following:

BID PROPOSAL – Fuller Field Artificial Turf and Multi-Purpose Field,
Bid # 221033- DO NOT OPEN

- E. If the Contract is awarded, the City of Augusta will award it to a responsible qualified Bidder on the basis of the lowest Bid and the selected alternative Bid items, if any. The Contract will require the completion of the work according to the Contract Documents.
- F. Each Bidder shall include in his/her Bid the following information:

Principal

- Names
- Social Security Numbers
- Home Address, Including City, State and Zip Code

Firm

- Name
- Treasury Number
- Address
- City, State and Zip Code
- Telephone Number

5. BID SECURITY:

- A. The Bid must be accompanied by a Bid guaranty that will not be less than five percent (5%) of the amount of the Bid. At the option of the Bidder, the security may be a certified check, bank draft, negotiable U.S. Government Bonds (as par value), or a Bid bond. A security or a surety company listed in the latest issue of U.S. Treasury Circular 570 and authorized to do business in the State of Maine shall secure the Bid bond. The amount of such Bid bond shall be within the maximum amount specified for such Company in said Circular 570. No Bid will be considered unless it is accompanied by the required security. Certified check or bank draft must be made payable to the order of the City of Augusta. Cash deposits will not be accepted. The Bid guarantee shall insure bond or bonds by the successful Bidder, all as required by the Contract Documents.
- B. Revised Bids submitted before the opening of Bids, whether forwarded by mail or telegram, if representing an increase in excess of two percent (2%) of the original Bid, must have the Bid security adjusted accordingly; otherwise the Bid will not be considered.
- C. Bid deposits will be returned to all except the three (3) lowest Bidders within (5) days after opening of the Bids. The remaining deposits will be returned within five (5) days after the execution of the Contract.
- D. Note: Bid security shall be required for Bids in excess of \$50,000.

6. EXECUTION OF AGREEMENT; PERFORMANCE AND PAYMENT BOND:

- A. Subsequent to the award and within five (5) working days after the prescribed forms are presented for signature, the successful Bidder shall execute and deliver to the City of Augusta the forms in three (3) copies.
- B. Having satisfied all conditions of award as set forth elsewhere in these documents, the successful Bidder shall, within the period specified in paragraph "A" above, furnish a Performance Bond and also a Payment Bond each in an amount not less than the amount of the Contract as awarded, as security for the faithful performance of the Contract, and for the payment of all persons, firms or corporations to whom the Contractor may be legally indebted for labor, materials, tools, equipment, or services of any nature including utility and transportation services employed, or used by him/her in performing the work. Such bond shall be in the same form as that included in the Contract Documents and shall bear the same date as, or a date subsequent to that of the Agreement. The current power of attorney for the person who signs for any surety company shall be attached to such bond. This bond shall be signed by a guaranty or Surety Company listed in the latest issue of the U.S. Treasury Circular 570 and authorized to do business in the State of Maine and the penal sum shall be within the maximum specified for such company in said Circular 570.

- C. The Contractor will not be permitted to start any construction work under this contract until he/she has submitted certificates to prove that he/she has all the insurance coverage called for under the Contract Agreement and has obtained written approval of this insurance.
- D. The failure of this successful Bidder to execute such Agreement and to supply the required bond or bonds and insurance certificates within five (5) days after the prescribed forms are presented for signature, or within such extended period as the City of Augusta may grant based upon reasons determined sufficient by the City of Augusta, shall constitute a default, and the City of Augusta may either award the Contract to the next lowest responsible Bidder or re-advertise the Bids, and may charge against the Bidder the difference between the amount of the Bid and the amount for which a Contract for the work is subsequently executed, irrespective of whether the amount thus due exceeds the amount of the Bid bond. If a more favorable Bid is received by re-advertising, the defaulting Bidder shall have no claim against the City of Augusta for a refund.
- E. Performance and payment bonds shall be required if project exceeds \$50,000.

7. COLLUSIVE AGREEMENTS:

- A. Each Bidder submitting a Bid to the City of Augusta for any portion of the work contemplated by the documents on which Bidding is based shall execute and attach thereto, an affidavit substantially in the form herein provided, to the effect that they have not entered into a collusive agreement with any other person, firm, or corporation in regard to any Bid submitted.
- B. Before executing any subcontract, the successful Bidder shall submit the name of any proposed subcontractor(s) for prior approval and an affidavit substantially in the form provided herein.

8. STATEMENT OF BIDDER'S QUALIFICATIONS:

- A. Upon request of the City of Augusta and within 5 days of the request, each Bidder shall submit to the City, on the form furnished for that purpose, a statement of the Bidder's qualifications, his/her experience record in constructing the type of improvements embraced in this contract, his/her organization and equipment available for the work contemplated, and when specifically requested by the City of Augusta, a detailed financial statement. The City of Augusta shall have the right to take such steps as it deems necessary to determine the ability of the Bidder to perform his/her obligations under the Contract. The Bidder shall furnish the City of Augusta all such information and data for this purpose as it may request. The right is reserved to reject any Bid where an investigation of the available evidence or information does not satisfy the City of Augusta that the Bidder is qualified to carry out properly the terms of the Contract.

9. UNIT PRICES:

- A. The unit price for each of the several items in the proposal of each Bidder shall include its pro-rata share of overhead so that the sum of the products obtained by multiplying the quantity shown for each item by the unit price Bid represents the total Bid. Any Bid not conforming to this requirement may be rejected as informal. Special attention of all Bidders is called to this provision, for should conditions make it necessary to revise the quantities, no limit will be fixed for such increased or decreased quantities, nor extra compensation allowed, provided the net monetary value of all such items of work (i.e., difference in cost) shall not increase or decrease the original contract price by more than thirty-three percent (33%), except for work not covered in the Drawings and Specifications.

10. CORRECTIONS:

- A. Erasures or other changes in the Bids must be explained or noted over the signature of the Bidder.

11. TIME FOR RECEIVING BIDS:

- A. Bids received prior to the advertised hour of opening will be kept sealed in a secure manner. The officer whose duty is to open them will decide when the specified time has arrived, and no Bid received thereafter will be considered.
- B. Bidders are cautioned that, while telegraphic modifications of Bids may be received as provided above, such modifications, if not explicit and if in any sense subject to misinterpretation, shall make the Bid so modified or amended, subject to rejections.
- C. Last addendum date is March 15th, 2021

12. OPENING OF BIDS:

- A. At the time and place fixed for the opening of Bids, the City of Augusta will cause to be opened and publicly read aloud every Bid received within the time set for receiving Bids, irrespective of any irregularities therein. Bidders and other persons properly interested may be present, in person or by representative.

13. WITHDRAWAL OF BIDS:

- A. Bids may be withdrawn by the Bidder, provided that the City received notification of such withdrawal prior to the time fixed for Bid opening, either by written or telegraphic request.

Written confirmation of any telegraphic withdrawal over the signature of the Bidder must be placed in the mail and postmarked prior to the time set for opening. The Bid guaranty of any Bidder withdrawing this Bid in accordance with the foregoing conditions will be returned promptly.

14. AWARD OF CONTRACT; REJECTION OF BIDS:

- A. The Contract will be awarded to the responsible Bidder submitting the lowest Bid complying with the conditions of the Invitation for Bids. The Bidder to whom the award is made will be notified at the earliest possible date. The City of Augusta, however reserves the right to reject any and all Bids and to waive any informality in Bids received whenever such rejection or waiver is in its interest.
- B. The City of Augusta reserves the right to consider as unqualified to do the work of general construction any Bidder who does not perform with his/her own forces the major portions of the work involved in construction of the Improvements embraced in this Contract.

BID FORM
BID # 221033

BID OF: _____
Name

Address

Telephone Number(s)

The name and address shown on the above lines shall be the official name and address of the person, partnership or corporation submitting this Bid and must agree with the "Signature of Bidder" in the case of an individual; the "Name of Firm or Partnership" in the case of a firm or partnership; "Name of Bidder" in case of a corporation.

To: Cheryl Gould
Audit Department
City Center Plaza
16 Cony Street
Augusta, Maine 04330-5298

Dear City Manager/Purchasing Agent:

The undersigned having carefully examined the site of the work; the Plans; Standard Specifications, including all current amendments or revisions thereof; the Supplemental Specification, Special Provisions; Contract Agreement and Contract Bonds contained herein for the completion of the "**Fuller Field Artificial Turf and Multi-Purpose Field**" project which proposals will be received **until, 2:00 p.m. Thursday, March 25, 2021** and in case of award does hereby propose and offer to enter into a contract to supply all the materials, tools, equipment and labor required to perform the whole of the work in strict accordance with the terms and conditions of this contract at the Lump Sum price stated below.

The City of Augusta may accept this Bid at any time within sixty (60) calendar days after opening of the Bids. Low Bid will be based on lowest Bid, based on available funding for the project. (A detailed summary of results of all Bids will be sent to all Bidders.)

Summary of **BASE BID**:

The award of contract will be based on the lowest price of the Base Bid to a qualified Bidder.

The City reserves the right to reject any or all Bids received for whatever reason it deems appropriate.

BID FORM

(Fill out prices in ink, in writing and in figures; in case of a discrepancy between prices in writing and in figures, the writing shall govern. Use the pages in this document when submitting Bid and submit contract document intact.)

The undersigned also agrees to follows:

FIRST: To do any extra work, not covered by the above schedule of items, which may be ordered by the Project Manager, and to accept as full compensation therefore such prices as MAY be agreed upon in writing by the Project Manager and the Contractor; or in case no agreement is made, to accept as full compensation the price determined upon a "force account" basis as provided in the Maine Department of Transportation Specifications,

SECOND: That the official bank check, cashier's check, certified check, Surety Bond, or U.S. Postal Money Order in the amount of 5% of the total amount of the Proposal payable to the City of Augusta, Maine to accompany this BID, shall be forfeited, as liquidated damages, if in case this BID is accepted, the undersigned shall fail to execute the Contract Agreement and to furnish satisfactory Contract Bonds under the conditions stipulated in the Specifications within twelve (12) calendar days from the date of the Notice of Award of the Contract.

THIRD: To begin work on the date specified in the Project Manager's "Notice to Commence Work" to prosecute said work in such a manner as to complete it by the end of the 2021 construction season.

FOURTH: That this offer is to remain open to acceptance until the formal contract is executed by the successful Bidder of this work, and the City may, at any time without notice accept this BID whether any other BID has previously been accepted or not. Provided, however that the Project Manager shall accept, in writing, one of the BIDS made, or reject all BIDS made, within sixty (60) calendar days after the date of opening of the proposals.

BASIS OF BID

The undersigned hereby proposes:

BASE BID: To furnish all labor, materials, tools, equipment, transportation, and other facilities and to perform all work for the construction, including but not limited to earthwork, stormwater pipes, catch basins, ditching, conduit, artificial turf & pad installation, turf field markings (football, soccer and field hockey lines), gravel, paving, sodding, loam, seed, stone and erosion control as shown on the contract drawings, at the lump sum price of:

_____ \$ _____

BONDS: Furnishing Performance Bond & Payment Bond \$ _____

SYNTHETIC TURF ALTERNATES

As shown in Part 4 of the Synthetic Field Sports Surfacing specification (321823.29) provide an add-alternate cost above the base bid for the systems identified below. Base Bid includes a sand/rubber monofilament infill system.

1. Iron Turf – Green Fields \$ _____

2. Vertex Prime – Field Turf \$ _____

Contact information for pre-approved artificial turf providers:

- 1. **Field Turf: Connor Schlegel (610)-301-2462**
- 2. **Green Fields: Mark Curran (978)-761-5340**
- 3. **NET Sports Group: Harlan Michaud (207)-391-4421**
- 4. **Astroturf: Bob Lord (774)-513-0020**
- 5. **Sprint Turf: Andrew Giobbi (202)-403-4348**

The undersigned as Bidder, declares that the only persons or parties interested in this BID are those named herein: that the Bidder is not financially interested in, or otherwise affiliated in a business with any other Bidder on this contract; and that this BID is made without collusion with any other person, firm or corporation.

Respectfully submitted this _____ day of _____ 2021.

Name of Bidder _____

Authorized Signature: _____
(Name) (Title)

Business Address _____

Incorporated under the Laws of the State of _____

Names and Addresses of Officers of the Corporation:

President _____

Secretary _____

Treasurer _____

Before me appeared _____, _____
Name Title

of _____, and made oath that the above statement is true.
Company

_____, 2021
Date

Notary Public
(Signature and Seal)

My commission expires: _____
Date

CONTRACT AGREEMENT

AGREEMENT entered into this _____ day of _____ by and between the City of Augusta, a body politic and corporate, hereinafter referred to as the "City", and _____, of Augusta, in the State of Maine hereinafter referred to as the "Contractor".

WITNESSETH WHEREAS, the City did advertise by Bid Number _____ entitled " _____ " dated _____ in said Augusta;

WHEREAS, the Contractor did under date of _____ submit a Bid for such work: and

WHEREAS, after due consideration of all the Bids, the City of Augusta did award the Contract to the Contractor.

NOW THEREFORE, in consideration of the mutual promises made by each party to the other, the parties covenant and agree as follows:

-1. The Contractor will furnish all labor, materials, fixtures, supplies, equipment and transportation and will perform all work required for the construction and completion of the project in accordance with the Specifications contained in the Contract Documents entitled " _____ ", Bid Number **221033**, dated _____, **2021** (hereinafter referred to as the "Contract Documents") of which this Agreement is a part. All work shall be performed in strict conformance with the provisions of this Agreement, the Invitation for Bids, the Contractor's Proposal, General Provisions, Plans, and "Supplemental Specification", and "Special and General Provisions" of the Contract Documents which are attached hereto and made a part of this Agreement; and in Conformance with the State of Maine, State Highway Commission Standard Specifications, Revision of April 1995; including all current amendments or revisions thereof, all of which are made a part of this Contract. The restatement in this Contract of any of the terms of said Contract Documents and Standard Specifications shall not be deemed to waive any terms not so restated.

-2. It is agreed that the total of the two lump sums in the "Schedule of Items" in the Contractor's Proposal Selection of the Contract Documents will be used as the basis of determining the amount due under this Contract Agreement and for establishing the amount of the required Contract Performance Surety Bond and Contract Payment Surety Bond, and that the amount due under this Agreement so determined is _____ (_____) hereinafter referred to as the "Contract Price". The City shall have the right to increase or decrease the amount and extent of the work by giving reasonable notice in writing to the Contractor. The City will pay for the work performed and the materials furnished for any such increase and will calculate a proper reduction for any decrease in accordance with the unit prices specified in the "Schedule of Items" section of the Contractor's Proposal.

-3. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the City, its officers and employees, from and against all claims, damages, losses, and expenses, arising out of or resulting from the performance of this Contract; provided that any such claim, damage, loss, or expense (1) is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property, including the loss of use there from; and (2) is caused in whole or in part by any negligence, act, or omission of the Contractor, anyone directly or indirectly employed by it, or anyone for whose act it may be liable, except to the extent that it is caused by the City, its officers or employees.

-4. General Liability Insurance with minimum limits of liability for bodily injury in the amount of \$1,000,000 for each occurrence and \$2,000,000 aggregate and minimum limits of liability for property damage in the amount of \$1,000,000 for each occurrence. General liability coverage shall include Owners' or Contractors' Protective, Product and Completed Operations, Comprehensive, Explosion (X), Collapse (C), and Underground (U) coverage's.

5. The Contractor shall procure and furnish evidence to the City of Public Liability Insurance and Automobile Liability Insurance coverage in amounts not less than \$500,000 per person, \$1,000,000 per occurrence

for bodily injury, death, and property damage, protecting the Contractor and naming the City as an additional Insured from such claims; and also Workers' Compensation Insurance coverage.

-6. Upon receipt of executed contracts, bonds, and insurance as required, the City will promptly send a "Notice to Commence Work" to the Contractor. The Contractor agrees to perform no work under this Agreement until it receives said Notice and to complete the work by _____. The time set for such completion may be extended only by written consent of the Director of City Services of the City of Augusta, hereinafter referred to as the "Responsible City Official", or his/her authorized representative.

It is agreed that the City shall deduct, as liquidated damages, from any monies due or which may become due by the Contractor for work performed, an amount as determined by for each day that the work may remain uncompleted after the time specified for the completion of the work.

-7. The Contractor will perform the work to the satisfaction of the Responsible City Official who shall have the right of inspection at all times, and whose approval and acceptance of the work shall be a condition precedent to payments by the City under this Contract.

-8. In the event of any dispute as to the amount, nature or scope of the work required under this Contract, the decision and judgment of the Responsible City Official shall be final and binding.

-9. The Contractor shall guarantee the work for a period of one year for the faithful remedy of any defects due to faulty materials or workmanship and payment for any damage resulting there from.

-10. The City may terminate this Contract for cause by written Notice to the Contractor. In the event of such termination, Contractor shall not be entitled to any further payment under this Contract from the date of receipt of said Notice.

-11. The City shall have the right to terminate this Contract at any time for its convenience on ten (10) days prior Written Notice to Contractor. If Contract is terminated by the City for convenience, the City shall pay the Contractor for all work performed and all materials purchased pursuant to this Contract prior to the receipt of such Notice.

IN WITNESS WHEREOF, the said City of Augusta has caused this Contract to be signed and sealed in its corporate name by its City Manager being duly authorized, and has caused this Contract to be signed the day and year first written above at Augusta, Maine.

Signed, Sealed and Delivered
in Presence of:

City of Augusta (Corporate Seal)

By: _____
William R. Bridgeo
City Manager

By: _____
Contractor

Recommended by:

Project Manager

NOTICE OF AWARD

To: _____

Project Name: Artificial Turf and Multi-Purpose Field

Outline of Work:

The City of Augusta Maine will undertake the installation of an artificial turf field and the relocation of the Track & Field events (Shot Put, Discus and Javelin) from the area to be converted to Artificial Turf to an adjacent area to be constructed that will also serve as a multi-purpose practice field. This turnkey project will be awarded to a qualified General Contractor. The work will commence on or about June 11th, 2021 and the artificial turf component must be completed by the end of the 2021 construction season.

The OWNER has considered the BID submitted by you for the above-described WORK in response to its Advertisement for Bids dated _____, and information for Bidders. You are hereby notified that your BID has been accepted for items in the amount of \$_____.

You are required by the Information for Bidders to execute the Agreement and furnish the required certificates of insurance within five (5) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said certificates within five (5) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as Abandoned. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this _____ day of _____, _____.

City of Augusta

By: _____
William R. Bridgeo

Title: City Manager/Purchasing Agent

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by

_____ this _____ day of _____, **2021**.

By _____

Title _____

NOTICE TO PROCEED

To: _____

Date: _____

Project Name: Fuller Field Artificial Turf and Multi-Purpose Fields

Outline of Work:

The City of Augusta Maine will undertake the installation of an artificial turf field and the relocation of the Track & Field events (Shot Put, Discus and Javelin) from the area to be converted to Artificial Turf to an adjacent area to be constructed that will also serve as a multi-purpose practice field. This turnkey project will be awarded to a qualified General Contractor. The work will commence on or about June 11, 2021 and the artificial turf component must be completed by end of the 2021 construction season.

You are hereby notified to commence work in accordance with the Agreement dated _____, **2021**.
The date of completion of all work is therefore _____.

_____ OWNER

By: _____
William R. Bridgeo

Title: City Manager

**WAIVE OF LIEN
MATERIAL OR LABOR**

State of Maine

County of Kennebec

To whom it may concern:

Whereas _____ the undersigned _____ has been employed to furnish for the project known as “Fuller Field Artificial Turf and Multi-Purpose Field” City of Augusta County of Kennebec State of Maine.

Know then for know ye that _____ the undersigned for and in consideration of the sum of (\$ _____.) and other good and valuable consideration the receipt whereof is hereby acknowledged, do hereby waive and release any and all, or claim the right to lien on said above described project under the status of the State of Maine Relating to Mechanic's Lien on account of Labor or Material or both furnished or which may be furnished by the undersigned to or on account of said _____ for said building and premise.

Given under _____ my hand and seal this _____ day of _____, 2021.

Notarized: _____ this _____ day of _____, 2021.

My commission expires _____.

APPENDIX "A"
TECHNICAL SPECIFICATIONS AND PLANS

DIVISION 3 - CONCRETE

- 033000 Cast-In-Place Concrete
- 033546 Concrete Finishing, Curing and Repairs

DIVISION 31 - EARTHWORK

- 311000 Site Clearing
- 311413 Stripping and Stockpiling Topsoil
- 312000 Earth Work
- 312213 Rough Grading
- 312300 Excavation (Excavation and Fill)
- 312316 Rock Removal
- 312316.13 Trenching
- 312323 Structural Backfilling (Fill)
- 312333 Trench Backfilling, Compaction, Control & Testing
- 312500 Temporary Erosion Control
- 312500.13 Environmental Protection

DIVISION 32 - EXTERIOR IMPROVEMENTS

- 321116 Borrow and Bedding Material (Subbase Courses)
- 321123 Aggregate Base Course
- 321216 Asphalt Paving
- 321823.29 Synthetic Field Sport Surfacing
- 329119 Landscape Grading
- 329219 Seeding

DIVISION 33 - UTILITIES

- 330526 Buried Utility Markings (Utility Line Signs, Markers and Flags)
- 334113 Polyvinyl Chloride (PVC) Storm Drainage Piping
- 334626 Filter Fabric (Geotextile Subsurface Drainage Filtration)
- 334913 Catch Basins, Grates and Frames (Storm Drainage Structures)

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Formwork, shoring, bracing, and anchorage
- B. Concrete reinforcement and accessories
- C. Concrete

1.2 PRODUCTS INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

- A. Anchor bolts Section 05120, Structural Steel

1.3 REFERENCES

- A. ACI 211.1-91 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- B. ACI 301-96 - Standard Specifications for Structural Concrete
- C. ACI 302.1R-89 - Guide for Concrete Floor and Slab Construction
- D. ACI 304.2R-96 - Placing Concrete by Pumping Methods
- E. ACI 305R-91 - Hot Weather Concreting
- F. ACI 306R-88 - Cold Weather Concreting
- G. ACI 308-92 - Standard Practice for Curing Concrete
- H. ACI 309R-96 - Guide for Consolidation of Concrete
- I. ACI 318-95 - Building Code Requirements for Structural Concrete and Commentary
- J. ACI 347R-94 - Guide to Formwork for Concrete
- K. ACI 350R-89 - Environmental Engineering Concrete Structures
- L. ASTM A82-94 - Specification for Steel Wire, Plain, for Concrete Reinforcement
- M. ASTM A185-94- Specification for Steel Welded Wire Fabric, Plain for Concrete Reinforcement
- N. ASTM A615/A-94 - Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement
- O. ASTM A706/A-92b - Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- P. ASTM A775/A-94d - Specification For Epoxy-Coated Reinforcing Steel Bars
- Q. ASTM C33-93 - Specification for Concrete Aggregates
- R. ASTM C94-94 - Specification for Ready Mixed Concrete
- S. ASTM C150-94 - Specification for Portland Cement
- T. ASTM C260-94 - Specification for Air Entraining Admixtures for Concrete
- U. ASTM C309-93 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- V. ASTM C494-92 - Specification for Chemical Admixtures for Concrete
- W. Concrete Reinforcing Steel Institute - Manual of Standard Practice
- X. Concrete Reinforcing Steel Institute - Placing Reinforcing Bars

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, ACI 318 and ACI 350R as modified here-in.

1.5 SUBMITTALS

- A. Submit shop drawings for concrete reinforcement prior to fabrication, showing bar bends, details and placement.
- B. Submit Concrete Mix designs including past field performance test results.
- C. Submit sieve analysis and soundness tests for fine and coarse aggregates.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Plywood: APA, B-B Plyform Class I exterior.
- B. Lumber: Southern pine, No. 2 grade or equal.
- C. Steel: Minimum 16 ga. sheet, well matched, tight fitting, stiffened to resist loads without excess deflection.
- D. Form Liner: Plywood conforming to PS-1, Grade B-B exterior (concrete form) not less than 1/4 inch thick.
- E. Form Ties: Factory fabricated assembly providing at least 1.5 inch break back dimension with at least a 1 inch diameter conical wood or plastic cones to leave a uniform hole for patching. Single rod ties require a tightly fitted waterstop washer at the mid point. Multi rod ties do not require washers.
- F. Conform to ACI 301 and ACI 347

2.2 REINFORCING STEEL

- A. Bars: ASTM A615 Grade 60; deformed new materials; ASTM A706 for bars to be welded.
- B. Welded wire fabric: ASTM A185
- C. Tie wire: ASTM A82, annealed, Epoxy coated for Epoxy-coated reinforcing.
- E. Bolsters, chairs and supports: plastic coated, stainless steel, or epoxy coated.

2.3 FABRICATION OF REINFORCING STEEL

- A. Conform to CRSI Code of Standard Practice-Fabrication.
- B. Cold bend bars.
- C. Bend bars around revolving collar of recommended size.

2.4 CONCRETE MATERIALS

- A. Portland cement: ASTM C150; Type II. Tricalcium Aluminate (C₃A) content in cement less than 8%. Cement shall be furnished from one source during the project.
- B. Aggregates:
 - 1. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM Specification C-33, and the following requirements:

<u>Sieve</u>	<u>Percent Passing</u>
No. 4	95 to 100
8	80 to 100
16	50 to 85
30	24 to 60
50	5 to 30
100	0 to 10

Fineness Modulus 2.6 to 3.0

- 2. Coarse aggregate shall consist of a well graded crushed stone or a washed gravel conforming to the requirements of ASTM Specification C-33.

- C. Water: potable from municipal water supply or equal.
- D. Admixtures: All from one common manufacturer.

2.5 ADMIXTURES

- A. Low Range Water Reducer: Pozzolith 122-N by Master Builders; WRDA with HYCOL by Grace Construction Products Division; or equal meeting ASTM C494 Type A
- B. High Range Water Reducer (superplasticiser): Rheobuild 1000 by Master Builders; Daracem 100 by W.R. Grace; or equal meeting ASTM C494 type F.
- C. Air entraining agent: Micro-Air by Master Builders, DAREX 11 AEA by Grace Construction Products; or equal meeting ASTM C260.
- D. Non-corrosive non-chloride accelerator: Pozzutec 20 by Master Builders; or equal meeting ASTM C494 type C or E.
- E. Not permitted: Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions.

2.6 ACCESSORIES

- A. Joint filler and slab perimeters: J-Joint polyethylene foam with tear off strip for sealant or approved equal; joint filler to be slab thickness in depth less 0.5 inch for sealant.
- B. Expansion joint filler: Self expanding cork by W.R. Meadows or W.R. Grace or equal size as indicated on the Drawings.
- C. Epoxy adhesive: Water based epoxy resin/portland cement bonding agent: Arimatec 110 by Sika corporation or equal.
- D. Bond Breaker: Thompson's Water Seal or equal, or form oil.

2.7 CONCRETE CLASS

- A. Reinforced concrete sections greater than 10" thick: Class A
- B. Reinforced concrete sections equal to or less than 10" thick: Class B
- C. Concrete fill: Class C
- D. Topping for prestressed precast concrete plank: Class C
- E. Mud slab: Class D
- F. Sand/Cement Slurry: Class A without Coarse Aggregate

2.8 CONCRETE

- A. Concrete proportioning shall conform to ACI 318, Chapter 5 except as modified below:

Class	Specified Strength (f _c)	Coarse Aggregate Size	% Air +(1.5%)	Min.-Max. Slump	Min.-Max. Cem.Fac.	Max. W/C	High Range Water Reducer
A	4000 PSI	No. 57 (1")	6	1-3	564-620	0.42	Yes
B	4000 PSI	No. 67 (¾")	6	1-3	564-620	0.42	Yes
C	3000 PSI	No. 8 (3/8")	6	2-5	517-564	0.50	No
D	2500 PSI	No. 4 (1½")	4	2-5	470-517	0.55	No

- B. The maximum slump as indicated in the above table will be as measured at the batch plant.
- C. Pumped Concrete: Conform to Chapter 4 - ACI 304.2
- D. High range water reducer shall be added on site to obtain 4" - 8" slump.
- E. No water shall to be added on site.
- F. Concrete shall be furnished from one source during the project.

2.9 SELECTION OF CONCRETE PROPORTIONS

- A. The Concrete producer shall select the concrete mix proportions on the basis of past field performance or the use of trial mixes. The changes in materials, and proportions within the population of background tests shall not have been more closely restricted than they will be for the proposed work. The test record shall represent only a single record of consecutive tests that span a period of not less than 45 calendar days. The concrete mix proportions shall produce an average strength at least as great as the required average strength (f'_{cr}).
- B. Field Experience
 - 1. Concrete mix proportions shall be established on the basis of field test data with similar materials to be used for the project. Past field experience will be considered suitable if it consists of data from one group of at least 30 consecutive compressive strength tests. To be acceptable, the test data shall be based on similar mix proportions to those for the project.
 - 2. The Standard Deviation (s) shall be computed from such test data and the required average strength (f'_{cr}) to be used for the selection of the concrete proportions shall exceed the specified strength (f'_c) in accordance with the following formulae:
 - a. When the standard deviation (s) is less than 500 psi:
 $f'_{cr} = f'_c + 1.34s$
 - b. When the standard deviation (s) is greater than or equal to 500 psi:
 $f'_{cr} = f'_c + 2.33s - 500$
 - 3. When a Concrete producer does not have test data meeting the requirements listed in Section 2.11.B.1, but does have data based on a single group of 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and modification factor indicated below. To be acceptable, the test data shall be based on similar mix proportions to those for the project.

<u>No. of tests</u>	<u>Modification factor for standard deviation</u>
15	1.16
20	1.08
25	1.03
30 or more	1.00

- 4. When a Concrete producer does not have test data meeting the requirements listed in Section 2.11.B.3, but does have data based on a two groups of consecutive tests totaling at least 30. To be acceptable, none of the two groups shall consist of less than 10 tests with similar mix proportions to those for the project. The group containing 15 or more test results which have different mix proportions from those for the project shall be within 1,000 psi of the specified strength. A standard deviation shall be established as the product of the calculated standard deviation based upon the group containing 15 or more test results and modification factor indicated above.
- 5. Document that the calculated average strength for the proposed concrete proportions, using past field performance data for the proposed concrete proportions consisting of at least 10 consecutive test records, is at least greater than or equal to the required average strength (f'_{cr}). If the past field performance data consists of two groups of strength tests for two different mixes, plot the average strength versus the water cement ratio of the two mixes. Interpolate between the corresponding mixture proportions to determine the mixture proportions for the required average strength (f'_{cr}).

C. Laboratory Trial Batches

1. When an acceptable record of field test results is not available, concrete proportions established from trial mixtures meeting the following restrictions shall be permitted:
 - a. Combination of materials shall be that for proposed work.
 - b. The required average compressive strength (f'_{cr}) shall be 4,600 PSI.
 - c. Trial mixtures having proportions and consistencies required for proposed work shall be made using at least three (3) different water-cementitious materials ratios which will be less than or equal to 0.42 and will produce a range of strengths encompassing the required average strength (f'_{cr}).
 - d. The maximum cement factor as listed in Section 2.10.A shall not be exceeded.
 - e. Trial mixtures shall be designed to produce a slump within + or - 0.75 in. of maximum permitted, and for air entrained concrete, within + or - 0.5 percent of maximum air content.
 - f. For each water-cementitious materials ratio, at least three (3) test cylinders for each test age shall be made and cured in accordance with ASTM C 192. Cylinders shall be tested at 7, 21 and 28 days.
 - g. Maximum water-cementitious materials ratio for concrete to be used in proposed work shall be selected by the curve to produce the average strength required (f'_{cr}).

D. Adjustments to Required Average Strength (f'_{cr}).

1. Adjustments in the Required Average Strength (f'_{cr}) may be made during the progress of the work on the following basis:
 - a. When a minimum of fifteen 28-day tests from this project are available, the average strength and standard deviation shall be computed. Should these determinations indicate an excessive compressive strength with a low standard deviation, the Engineer may allow modification of the concrete mix to achieve a lower average strength based upon a new standard deviation. In the event such determination should indicate a lower average strength or higher Standard Deviation than anticipated, the Engineer will require corrective measures to be taken immediately which may include one or more of the following but not limited to:
 - (1) An increase in the cementitious material
 - (2) Changes in mixture proportions
 - (3) Reductions in or better control of levels of slump supplied
 - (4) A reduction in the delivery time
 - (5) Closer control of air content.
 - (6) Decrease in the water-cement ratio.
 - (7) An improvement in the quality of the testing, including strict compliance with standard test procedures.
 - (8) To test the fifth cylinder immediately or at 56 days.

2.10 STORAGE OF MATERIALS

- A. Protect materials from ground and the elements.
- B. Maintain cement in dry condition.
- C. Store reinforcement on skids.
- D. Remove defective materials from site. Do not store on site.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Conform to ACI 301 and ACI 347
- B. Verify lines, levels and measurements before proceeding.
- C. Erect plumb and straight. Maintain rigid. Brace sufficiently.
- D. Allow no concrete leakage. Provide continuous, straight, smooth exposed surfaces.
- E. Treat forms with form release agent. Protect reinforcing from contact with form release agent.
- F. Earth forms not permitted.
- G. Camber formwork as necessary.
- H. Clean out inside of forms of all foreign materials prior to concrete placement.
- I. Maintain forms and shores supporting the cast concrete for the time periods indicated:
 - 1. Walls and Vertical Surfaces
(Non-water retaining) *36 Hours
- * These periods represent cumulative number of days or hours during which the temperature of the air surrounding the concrete is above 50°F and the concrete has been damp and no loss of moisture has occurred.
- J. Reshore as required.
- K. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form release agent as specified for new formwork.
- L. All concrete formwork, including reinforcing steel and embedment items, shall have a temperature greater than or equal to 35°F at the time of concrete placement.

3.2 REINFORCEMENT

- A. Conform to the CRSI Code of Standard Practice - Field Erection for surface condition, bending, spacing and placement tolerance.
- B. Weld no reinforcement unless no exceptions are taken by Engineer in writing.
- C. Splicing reinforcement: conform to ACI 318; welded wire fabric to be lapped 1½ courses or 12 inches; tie fabric at 24 inches on center maximum spacing.
- D. Provide bar supports: on grade use concrete brick; elsewhere use manufactured wire supports.
- E. Do not bend reinforcing partially embedded in the concrete.
- F. Mechanical connections shall be installed in accordance with splice device manufacturer's recommendations.
- G. Epoxy coating damaged shall be repaired with patching material conforming to ASTM A775.
- H. All parts of mechanical connections on epoxy coated reinforcing bars, including steel splice sleeves, bolts and nuts shall be coated with the same material used for repair of epoxy coating damage.

3.3 EMBEDDED ITEMS

- A. Coordinate installation of embedded items.
- B. Place all items secure.

- C. Pipes or Conduits for embedment within a slab, wall or beam, other than those merely passing through, shall satisfy the following:
 - 1. Shall not be larger in outside diameter than one-third (1/3) the thickness of the slab, wall or beam.
 - 2. Shall not be spaced closer than 3 diameters on center.
 - 3. Shall not impair significantly the strength of the concrete.

3.4 PLACING CONCRETE

- A. Notify Independent Testing Laboratory 24 hours minimum prior to each placement.
- B. Assure placement and proper location of all embedded items.
- C. Place no concrete on frozen ground.
- D. Place concrete from mixing truck to final location quickly and without segregation.
- E. Place concrete within 90 minutes of batching.
- F. Freefall: 4 feet maximum.
- G. Place continuously and against plastic concrete only.
- H. Do not place partially hardened concrete.
- I. Consolidate concrete by vibrating. Penetrate preceding lift 4 inches to blend layers. Do not use vibrator to move fresh concrete laterally. Insert vibrator at approximately 18-inch intervals. Consolidate concrete without segregation. Conform to ACI 309.
- J. Conform to ACI 306R for cold weather concreting when environmental conditions exist as defined in Section 03346, Part 1.5.
- K. Conform to ACI 305R for Hot Weather Concreting when environmental conditions exist as defined in Section 03346 Part 1.5.
 - 1. Temperature of concrete placed shall not exceed 90°F.
- L. Provide concrete Delivery Slip prepared at batch plant with each truck load of concrete showing ticket number, date, truck number, mix strength, maximum stone size, weight of coarse aggregate, weight of fine aggregate, cement weight, volume of concrete, gallons of water added at plant, time water added at plant, quantities of all admixtures used.
- M. High Range Water Reducing admixtures shall be used for all concrete to be pumped or with a specified water/cement ratio below 0.50. Maximum slump 8 inches with admixture.
- N. Use non-corrosive, non-chloride accelerator when placing concrete in air temperatures below 50°F.
- O. Thoroughly moisten subgrade materials prior to placing slabs on grade.
- P. Horizontal wall construction joints deeper than 8' from top of placement, place one inch of sand cement slurry prior to placing concrete.
- Q. Thoroughly clean the surface of the concrete at construction and control joints and remove laitance prior to placing adjoining concrete. Do not place concrete against the hardened side of a joint for at least 48 hours.

3.5 JOINTS

- A. Saw cut control joints for slabs on grade within 24 hours of placement.
- B. Provide joints only where shown on the drawings or as otherwise approved after written request.

3.6 MODIFICATIONS OR REPAIRS TO EXISTING CONCRETE

- A. Field measurements shall be taken at the required structures to determine the quantity of concrete to be removed and/or repair and the amount of patching to be done.
- B. When removing materials or portions of existing structures and when making openings in existing structures, all precautions shall be taken and all necessary barriers and other protective devices shall be erected to prevent damage to the structures beyond the limits necessary for the new work, and to prevent damage to the structures or contents by falling or flying debris.
- C. Remove concrete to the depths shown or required. Roughen concrete surfaces by chipping, sandblasting or scarifying.
- D. Surfaces must be clean and sound. Surfaces may be dry, damp, or wet, but free of standing water. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles, and disintegrated materials by mechanical abrasion methods such as sandblasting.
- E. Exposed reinforcement shall be cleaned by wire brushing and where shown the reinforcement shall be cut or bent. Additional reinforcement shall be provided as shown on the Drawings.

3.7 DRILLING AND GROUT DOWELS

- A. Use rotary drills and cores (non-percussive) and drill holes into concrete to the depth indicated. Hole size shall be one inch (1 in.) larger in diameter than the dowel diameter unless otherwise noted.
 - 1. Drill holes may be offset 2 inches plus or minus from set locations, but shall not be drilled within six inches (6 in.) of the free edge of concrete
- B. Scour the dowel hole by thoroughly roughening the sides with a coarse, wire flue brush.
- C. Clean hole of dust and debris with a power vacuum.
- D. Fill hole with non-shrink grout; insert dowel with twisting motion; add grout as needed.
- E. Maintain dowel stationary until grout cures.

3.8 TOLERANCES

- A. Maximum allowable deviations from dimensions, elevations, slopes and positions as indicated.
 - 1. Variation from plumb:
 - a. In the lines and surfaces of columns, piers, walls, and in arises:
 - In any 10 ft. of length 1/4 in.
 - Maximum for the entire length 1 in.
 - b. For exposed corner of columns, control-joint grooves, and other conspicuous lines:
 - In any 20 ft. length 1/4 in.
 - Maximum for the entire length 1/2 in.
 - 2. Top elevation of columns, piers, walls and arises $\pm 1/4$ in.
 - 3. Top elevation of slabs $\pm 1/4$ in.
 - 4. Footings*
 - a. Variations in dimensions in plan:
 - Minus 1/2 in.
 - Plus 2 in.
 - b. Misplacement or eccentricity:
 - 2 percent of the footing width in the direction

- of misplacement but not more than 2 in.
- c. Thickness:
 - Decrease in specified thickness 5 percent
 - Increase in specified thickness No limit
- d. Elevation of top $\pm 1/4$ in.

*Tolerances apply to concrete dimensions only, not to positioning of vertical reinforcing steel, dowels, or embedded items.2

3.9 FAILURE TO MEET STRENGTH REQUIREMENTS

- A. The strength of the concrete in place will be considered substandard if any one of the following results occur:
 1. The arithmetic average of 28-day cylinder tests for any three (3) consecutive test results are less than the specified strength (f'c).
 2. More than 10 percent of the 28-day cylinder tests have strengths less than the specified strength (f'c).
 3. An individual compressive strength test result falls below the specified strength (f'c) by more than 500 psi.
- B. Concrete which fails to meet the strength requirements as outlined above will be reviewed by the Engineer. The Engineer will determine whether the substandard concrete will be accepted, rejected or additional tests performed.
- C. When Substandard concrete as defined in Section 3.11 paragraphs A.1 and A.2 occurs, the Engineer will require corrective measures to be taken immediately, as listed in Section 2.11.D, in order to increase the average of subsequent strength tests.
- D. When substandard concrete as defined in Section 3.11 paragraph A.3 occurs the Engineer may require cores drilled in the area of question in accordance with Specification 03305 paragraph 3.2.B. If the core tests are inconclusive or impractical to obtain, load tests may be required and their results evaluated in accordance with ACI 318 Chapter 20. If the average of the three cores is less than 85% of the specified 28-day strength or if one core is less than 75% of the specified 28-day strength, then that portion of the structure shall be strengthened by a method proposed by the Contractor and no exceptions taken by the Engineer or replaced by the Contractor at no additional cost to the Owner.
- E. Concrete not requiring strengthening but still falling below the strength requirements as outlined in Section 3.11 paragraph A may be accepted by the Owner in accordance with Article 13 of the General Conditions, specifically the paragraph entitled "Acceptance of Defective Work".

3.10 DEFECTIVE CONCRETE

- A. Defective concrete is defined as concrete in place, which does not conform to strength, shapes, alignments, appearances and/or elevation as shown on the drawings and/or presents faulty surface areas.
- B. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the Drawings will be considered defective.
- C. Concrete which differs from the required dimensions or locations in such a manner as to reduce the strength will be considered defective.
- D. Concrete surfaces not finished or cured in accordance with Section 03346 - Concrete Finishing, Curing, and Repairs shall be classified as defective concrete.

- E. Formed surfaces larger or smaller than dimensional tolerances specified in this Division may be rejected. If the Engineer permits the Contractor to correct the error, such correction shall be as directed and in such a manner as to maintain the strength, function and appearance of the structure.
- F. Concrete members cast in the wrong location may be rejected and shall be removed at no additional cost to the Owner if the strength, appearance or function of the structure is adversely affected.
- G. Inaccurately formed surfaces exposed to view may be rejected and shall be repaired or removed and replaced at no additional cost to the Owner.
- H. Concrete exposed to view with defects which adversely affect the appearance of the specified finish shall be repaired. If, in the opinion of the Engineer, the defects cannot be repaired, the concrete may be accepted or rejected in accordance with the decision of the Engineer.

3.11 PROTECTION FROM COLD

- A. Concrete structures shall be covered, insulated and heated as required to prevent frost penetration beneath the structures until acceptance by the Owner.

END OF SECTION

SECTION 033546 - CONCRETE FINISHING, CURING AND REPAIRS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete Curing
- B. Concrete Finishing
- C. Concrete Repairs

1.2 RELATED SECTION

- A. Section 01340 - Submittals
- B. Section 03300 - Cast-in-Place Concrete
- C. Section 03604 - Non-Shrink Grout
- D. Section 07115 - Resealable Membrane Waterproofing
- E. Section 07120 - Fluid Applied Waterproofing
- F. Section 07150 - Dampproofing
- G. Section 07900 - Joint Sealers
- H. Section 09900 - Painting
- I. Section 09965 - Abrasion Resistant Coatings

1.3 REFERENCES

- A. ACI 301-96 - Standard Specifications for Structural Concrete
- B. ACI 302.1R-89 - Guide for Concrete Floor and Slab Construction
- C. ACI 305R-91 - Hot Weather Concreting
- D. ACI 306R-88 - Cold Weather Concreting
- E. ACI 308-92 - Standard Practice for Curing Concrete
- F. ACI 350R-89 - Environmental Engineering Concrete Structures
- G. ASTM C309-93 - Specification For Liquid Membrane - Forming Compounds for Curing Concrete

1.4 SUBMITTALS

- A. None.

1.5 ENVIRONMENTAL CONDITIONS

- A. Cold Weather and Hot Weather are defined when temperatures will fall below 40°F during the week following placement or will be above 90°F, respectively.

PART 2 - PRODUCTS

2.1 FINISHING MATERIALS

- A. Patching Mortar: 1 part of a mixture of white and grey Portland cement to 2.5 parts of damp loose sand. Cement type to match substrate.

2.2 REPAIR MATERIALS

- A. Epoxy Adhesive: Armatec 110 by Sika Corporation or equivalent.
- B. Repair Mortar: polymer improved, cementitious, 2 component, trowel grade mortar equal to Concrete Coat by Euclid Chemical; Sikatop 122 by Sika Corp. or equivalent.

PART 3 - EXECUTION

3.1 FINISHES

- A. Repair all holes and defects and allow to set prior to finishing concrete.
- B. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.
- C. Finish concrete surfaces as scheduled.

3.2 FINISHING SLABS AND FLATWORK

- A. Screed to bring concrete surface to proper contour and elevation.
- B. Highway straightedge, bull float or Darby float the concrete surface immediately after screeding.
- C. Allow bleed water to evaporate or remove.
- D. (STF) Steel Troweled Finish (All Floors): Float the surface with magnesium or cast aluminum float or with a power-finishing machine. Steel trowel surface immediately after floating to produce smooth surface. Steel trowel again after concrete has hardened enough so that mortar does not adhere to trowel edge. Ringing sound should be apparent when performing second troweling due to tilted, compacting motion.
- F. (LBF) Light Broom Finish for equipment pads): wood float finish as in E above; while plastic draw a soft-bristled broom, over the concrete in long even strokes with downward pressure.
- H. Tolerances for trowel finished floors: ACI 302 class BX. 5/16 inch maximum deviation from 10 foot long straightedge placed anywhere on the surface.

3.3 FINISHING VERTICAL SURFACES

- A. (RFF) Rough Form Finish: Repair structural defects only and patch tie holes as specified in paragraph 3.5 - STRUCTURAL DEFECTS. Fins exceeding 1/4 in. in height to be removed by grinding and/or rubbing.

3.4 CURING

- A. Curing: Curing shall begin immediately following the initial set of concrete or after slab surface finishing has been completed and shall continue after form removal. All concrete shall be cured to attain strength and durability by one of the following methods for a minimum of seven days after placement regardless of the ambient air temperature:
 - 1. Ponding or continuous sprinkling. Intermittent wetting and drying is not an acceptable curing method.
 - 2. Application of absorptive mats of fabric kept continuously wet.
 - 3. Continuous application of steam or fog spray.
 - 4. Application of waterproof sheet materials.
 - B. Moisture loss from surfaces placed against wooden or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal, the concrete shall be cured by one of the methods described above, for the balance of time remaining as specified above.
- C. Cold Weather:
 - 1. Maintain concrete temperature between 50°F and 70°F for a minimum of seven days after placement, enclose and heat, insulate as required.
 - 2. Protect concrete from damage due to concentrated heat sources.
 - 3. Reapply curing compounds every two days during heating period.

4. The maximum allowable temperature drop of the concrete surfaces during the first 24 hours after the end of the curing period shall not exceed 5°F in any 1 hour.
- D. Hot Weather: Concrete temperature shall not be greater than 90°F. Protect from loss of slump, flash set, plastic cracking and rapid evaporation of water.
- E. Place concrete quickly, shade from direct sun and protect from wind. Concrete shall be cured by one of the methods described in paragraph 3.4.A for seven days after placement.

3.5 SURFACE DEFECTS

- A. As soon as the forms have been stripped and the concrete surfaces exposed, repair all surface defects. Surface defects include all form tie holes, honeycombed areas and surface blemishes including air voids and bug holes with a nominal diameter or depth greater than ¼ inch, visible construction joints, fins, burs and other defects. All concrete repair work shall result in a concrete surface of uniform color and texture, and shall be free of all irregularities. Honeycombed and/or rat holes larger than 50 cubic inches are considered a structural defect.
- B. Cut out and remove honeycombed areas and rock pockets down to solid concrete, but in no case to a depth less than 1 inch, by means of hand chisels or pneumatic chipping hammers. Saw cut the edges perpendicular to the surface. No feathered edges shall be allowed.
- C. Remove all loose aggregate paste and debris and scrub clean; thoroughly wet area to be repaired; brush and scrub grout paint into the substrate of the area to be repaired.
- D. Apply a stiff consistency of patching mortar to the area with a trowel; apply prior to the set of grout paint (but after it has cast its water sheen): leave patched surface slightly higher than surrounding surface; do not finish for 1 hour minimum. Cure in same manner as adjacent concrete.
- E. Mix patching mortar using as little water as possible; allow to stand with frequent manipulation of trowel to achieve stiffest consistency; blend white and gray Portland cement to achieve color match with surrounding concrete.
- F. Form Tie Holes: After cleaned and thoroughly dampened, apply grout paint and fill tie holes solid with patching mortar.
- G. Finished Flatwork exceeding specified tolerances:
 1. High areas shall be repaired by grinding after the concrete has cured 14 days.
 2. Low areas shall be repaired by cutting out low areas and replaced with concrete. Finish repair area to match adjacent concrete.

3.6 STRUCTURAL DEFECTS

- A. Remove and replace or repair all structural defects. Structural defects include honeycombed areas and/or rat holes greater than 50 cubic inches, areas which cracking, spalling or other signs of deterioration are present or develop during the initial curing or thereafter until accepted by the Owner. The Contractor shall propose a specific repair method, suitable for the situation, and the Engineer will review the method prior to the repair.
- B. Cut out and remove defective concrete, honeycombed areas and rock pockets to sound concrete by means of hand chisels or pneumatic chipping hammers. Saw cut 1-inch minimum the edges perpendicular to the surfaces. If honeycomb exists around reinforcement, chip to provide a clear space at least 1 inch wide all around the reinforcement. Moisten surfaces and allow to dry until damp. Apply bonding agent. Apply a polymer-modified cement with 3/8-inch coarse aggregate. Cure as required by manufacturer.

- C. Random Cracks:
 - 1. Random shrinkage or structural cracks shall be repaired utilizing a low viscosity, 100% solids, two (2) component epoxy resin system. Remove all dust, debris or disintegrated material from crack or void by use of oil-free compressed air or vacuuming.
 - 2. Crack or void must be dry at time of application. Cracks saturated with oil or grease must be chipped out to unsaturated concrete. "Vee" out cracks in horizontal surfaces slightly.
 - 3. Where cracks extend through members and are accessible, seal bottom of crack, which is to receive the epoxy. Apply epoxy in strict accordance with manufacturer's recommendations.
 - 4. Epoxy resin system shall be Sika chemical Corporation "Sikadur Hi-Mod LV", or equal.
 - 5. Patching of vertical wall or overhead cracks shall be accomplished in the same manner using a similar epoxy material of higher viscosity as recommended by the manufacturer.
- D. Excessive Cracking:
 - 1. Floor slabs containing an excessive amount of cracks as defined herein, and which will remain exposed, shall receive an epoxy mortar topping after sealing of cracks in accordance with the above paragraph.
 - 2. Excessive cracking shall be defined as areas containing cracks averaging 1/64th-inch wide or greater, and in excess of 15 linear feet of cracks per 100 square feet of slab. In the event that excessive cracking occurs in isolated areas of a given floor, topping will only be required in the area of the cracks bounded by construction, expansion, or control joints.
 - 3. Topping shall be Sika Chemical Corporation "Sikadur Lo-Mod LV Mortar" or equal.
- E. Spalls:
 - 1. All weakened, damaged or disintegrated concrete shall be removed to sound concrete. For defective areas involving only the surface and/or the finish of the concrete, reference Section 03350, Concrete Finishes, for surface defects.
 - 2. For spalled areas involving depths generally less than three (3) inches, utilize epoxy mortar for repair, Sika Chemical Corporation "Sikadur Lo-Mod LV Mortar" or equal.
 - 3. For spalled areas involving depths generally in excess of three (3) inches, utilize an epoxy bonding compound and concrete grout. Bonding compound shall be Sika Chemical Corporation "Sikadur Hi Mod" bonding agent or equal.

3.7 PROTECTION

- A. Protect concrete from high and low temperatures for seven days.
- B. Protect against vibration until concrete has attained 33% of its 28-day strength.
- C. Protect against premature loads until the 28-day strength has been attained.

END OF SECTION

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Remove surface debris.
- B. Clear site of plant life and grass.
- C. Remove trees and shrubs.
- D. Remove root system of trees and shrubs.
- E. Topsoil excavation.

1.2 RELATED SECTIONS

- A. Section 312213 - Rough Grading.
- B. Section 312300 – Excavation (Excavation and Fill)
- B. Section 312316.13 – Trenching
- D. Section 312333 – Trench Backfilling, Compaction, Control & Testing

1.3 REGULATORY REQUIREMENTS

- A. Conform to applicable code for disposal of debris.
- B. Coordinate clearing Work with existing utilities.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that existing plant life designated to remain is tagged or identified.

3.2 PROTECTION

- A. Locate, identify, and protect utilities that remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.

- C. Protect bench marks and existing structures from damage or displacement.

3.3 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs as designated on the site plan. Remove stumps and root systems and chip on-site.
- C. Clear undergrowth and deadwood, without disturbing subsoil.

3.4 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Do not burn any material to be removed unless the owner's representative grants permission and all required permits are secured.
- C. Do not bury trees, stumps, or other material otherwise indicated as to be removed.

3.5 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded.
- B. Remove from site.

END OF SECTION 311000

SECTION 311413 - STRIPPING AND STOCKPILING TOPSOIL

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Work Included: segregate topsoil approved by the Engineer prior to excavation, trenching and grading operations and stockpile it for use in the work.
- B. Related Work Specified Elsewhere (When Applicable): demolition, clearing, grading, embankment, excavation and landscaping are specified in the appropriate sections in this division.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil shall consist of friable loam of at least two percent decayed organic matter (humus), free of subsoil, and reasonably free of clay lumps, brush, roots, weeds, and other objectionable vegetation, stones and similar objects larger than one (1) inch in any dimension, litter and other materials unsuitable or harmful to plant growth. It shall contain no toxic materials.
- B. The quality of the topsoil material to be used shall be subject to approval by the Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. Remove topsoil from the areas that are likely to be disturbed as a result of construction operations to a depth based on the soil profile, as approved by the Engineer. Remove topsoil from all designated areas prior to the performance of normal excavation.

3.2 STORAGE

- A. Transport topsoil and deposit in storage piles convenient to the areas, which are subsequently to receive the application of topsoil.
- B. Stockpile topsoil separate from other excavated materials in areas approved by the Engineer.
- C. Take all necessary precautions to prevent other excavated material and objectionable material from becoming intermixed with the topsoil before, during and after stripping and stockpiling operations.
- D. Neatly trim and grade stockpiles to provide drainage from surfaces and to prevent depressions where water may become impounded.
- E. Construct temporary erosion control devices for all stockpiled material, subject to the Engineer's approval.
- F. All loam stripped and stockpiled shall be seeded with 70% Annual/30% Perennial Rye Grass.

END OF SECTION 311413

STRIPPING & STOCKPILING TOPSOIL

311413-1

SECTION 312000 - EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Perform the following items of work, as shown on the Drawings and specified herein:
1. Do all excavating and furnish all material necessary for embankment construction, as required to complete the work of this Contract, including the furnishing and compaction of additional material as needed.
 2. Completely remove from the site all excavated material which is not approved by the Engineer for use as embankment material. This provision does not apply to topsoil which will remain the property of the Owner.
 3. Establish subgrades as indicated on the Drawings and specified hereunder.
 4. Perform cutting and removal of existing pavements to the extent indicated on the Drawings and as required for the work under this Contract.
 5. Protect all trees, shrubs and plantings not designated on the Drawings to be removed, for the duration of the Contract.
 6. Protect all utilities on the site for the duration of the work.
- B. Related Work Specified Elsewhere:
1. Section 312000.13 – Earthwork – Contractor Testing

1.2 DEFINITIONS

- A. The work involved includes removal, haul and disposal of materials to prepare for construction and the placing and compaction of material to construct embankments.
- B. Excavation shall be designated as common, rock, unclassified or muck.
1. Common excavation shall consist of removal of earth, of boulders, solid mortared stone masonry and concrete masonry when each is less than two cubic yard in volume and of rock which can be removed with ordinary excavating machinery. Grubbing shall be considered as common excavation.
 2. Rock excavation shall consist of removal of solid rock which cannot be excavated without the use of explosives or ripping equipment and of boulders, solid mortared stone masonry and concrete masonry having a volume of two cubic yard or more.
 3. Unclassified excavation shall consist of removal of materials without consideration to their composition.
 4. Muck excavation shall consist of excavation of soils and organic materials which are not suitable for use in embankment.
- C. Embankment construction shall consist of constructing roadway embankments, including preparation of the areas upon which they are to be placed; site grading around buildings and structures; the construction of parking areas, lawns, berms, and dikes; the placing and compacting of approved material within areas where unsuitable material has been removed; and the placing and compacting of embankment material in holes, pits and other depressions within the roadway area or construction site limits.

D. Related Work Specified Elsewhere: (When Applicable)

1. Stripping and Stockpiling of Topsoil; Trench Excavation-Earth; Trench Excavation-Ledge; Borrow and Bedding Material; Trench Backfilling, Compaction, Control and Testing; Temporary Erosion Control and Dewatering are specified elsewhere in this division.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

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

B. Grade and Elevations:

1. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain same to properly perform the contract installation.

C. Compaction:

1. The Contractor shall compact all embankment materials in accordance with this specification.
2. Density testing shall be performed by an Independent Testing Laboratory retained by the Owner and acceptable to the Engineer and Contractor.
3. Independent Testing Laboratory shall determine in place densities in accordance with ASTM D1556 or other methods approved by the Engineer.
4. Independent Testing Laboratory shall submit one (1) copy of the following reports to each of the following: Engineer, Resident Project Representative, Contractor;
 - a. Test reports on material
 - b. Field density test reports
 - c. One moisture density curve for each type of soil encountered
5. Location of Tests:
 - a. One test per 300 feet of completed roadway subgrade just prior to placement of subbase gravels and additional tests at depths as required by the Engineer.
 - b. Two tests on finished subgrade in parking area just prior to placing the subbase gravels and additional tests at depths as required by the Engineer.
 - c. One test per 300 feet of completed railroad subgrade after fine grading and just prior to placement of the loam and additional tests at depths as required by the Engineer.
 - d. Tests on lagoon embankments shall be taken on every 1,000 c.y. of dike material. Also in order to determine optimum water content, maximum allowable lift and number of equipment passes required, one test section shall be constructed, and thoroughly tested. To avoid conflicts the Contractor shall allow a minimum of one working day for testing to be conducted on the test section. The test section may be part of the lagoon embankment.

6. If the test results fail to meet the requirements of these specifications, the Contractor shall correct the situation and obtain a passing test. The cost of reworking the material to obtain a passing test shall be borne by the Contractor and no allowance will be made for delays in the performance of the work. All testing and retesting shall be conducted by the Independent Testing laboratory. Costs of retesting will be paid by Owner. The cost of retesting will be determined by Engineer and Owner will invoice Contractor for this cost. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price.

1.4 JOB CONDITIONS

A. Disposition of Utilities:

1. The locations of utilities shown on the plans are approximate as determined from physical evidence on or above the surface of the ground and from information supplied by the utilities. The Engineer in no way warrants that these locations are correct. It shall be the responsibility of the Contractor to determine the actual locations of any utilities within the project area.
2. Rules and regulations governing the respective utilities shall be observed in executing all work in this section. Active utilities shall be adequately protected from damage, and removed or relocated only as indicated or specified. Inactive and abandoned utilities encountered in excavation and grading operations shall be removed, plugged or capped. Report in writing to the Engineer, the locations of such abandoned utilities. Extreme care shall be taken when performing work in the vicinity of existing utility lines, utilizing hand excavation in such areas, as far as practicable. If, in the progress of excavation, any utility should become damaged and result in any damage to public or private property, the General Contractor shall restore to the original condition, at no additional cost to the Owner, anything which has been damaged or disturbed.

PART 2 - PRODUCTS

2.1 DEFINITIONS OF GRAVEL, SAND AND SILT CLAY

- A. The terms "gravel", "coarse sand," "fine sand" and "silt-clay," as determinable from the minimum test data required in this classification arrangement and as used in subsequent word descriptions, are defined as follows:
 1. Gravel - Material passing sieve with 75 mm (3-inch) square openings and retained on the 2.00 mm (No. 10) sieve.
 2. Coarse Sand - Material passing the 2.00 mm (No. 10) sieve and retained on the 0.425 mm (No. 40) sieve.
 3. Fine Sand - Material passing the 0.425 mm (No. 40) sieve and retained on the 0.075 mm (No. 200) sieve.
 4. Silt-Clay (Combined silt and clay) - Material passing the 0.075 mm (No. 200) sieve.
 5. Boulders (retained on 77 mm (3-inch) sieve) should be excluded from the portion of the sample to which the classification is applied, but the percentage of such material, if any, in the sample should be recorded.
 6. The term "silty" is applied to fine material having plasticity index of 10 or less and the term "clayey" is applied to fine material having plasticity index of 11 or greater.

2.2 SOIL MATERIALS

- A. Use of Excavated Material:
1. To the extent they are needed, all suitable materials from the specified excavation may be used in the construction of required embankment and slope protective devices (riprap).
 2. Surplus excavated materials suitable for filling operations shall not be wasted, but will be stockpiled for future use as directed by the Engineer within the Town's property. This specific location will be determined at the start of construction.
 3. Unsuitable material shall consist of grubbings or other materials which contain rock of size exceeding specifications, organic materials, or other materials of a deleterious nature as deemed by the Engineer. Silts, clays and granular materials with more than 8% passing the number 200 sieve shall be considered unsuitable for embankment in the Frost Penetration Zone under paved areas when sufficient water supply is available to cause heaving.
- B. Common borrow shall consist of approved material required for the construction of embankments or for other portions of the work as designated and shall be obtained from a source off-site, except as otherwise noted. Common borrow shall be free from frozen material, clay, perishable rubbish, peat, organic and other deleterious materials.
- C. Gravel borrow shall be free of rocks with a maximum dimension over six inches, frozen material and other unsuitable material. That portion passing a three-inch square mesh sieve shall contain not more than 70% passing a 1/4 inch mesh sieve and not more than 10% passing a number 200 mesh sieve.
- D. Rock fill shall consist of rock for use in embankments which consists of hard durable particles broken to various sizes that will form a compact embankment with a minimum of voids. It shall contain no particles or fragments with a maximum dimension in excess of the compacted thickness of the layer being placed.
- E. Embankment material shall consist of suitable approved common excavation and/or common, or gravel borrow. Rock excavation may be used as embankment material if it is thoroughly mixed with common excavation and/or common borrow to eliminate voids.

PART 3 - EXECUTION

3.1 CUTTING AND REMOVAL OF EXISTING PAVEMENT

- A. Refer to the Drawings for extent of cutting and removal required of existing pavements.
- B. Perform all cutting in a straight and neat manner, using mechanical equipment for such purpose. Pavement cuts shall be vertical. Completely remove all cut surfacing materials from the site.
- C. In addition to areas specifically designated on the Drawings, perform cutting wherever existing surfacing will be disturbed by the work of this Contract.

3.2 SAFETY

- A. Comply with applicable local, state or federal safety regulations or in the absence thereof, with the provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc.
- B. Provide shoring, sheeting and/or bracing at excavations as required to prevent cave-ins of excavation, and to assure complete safety of existing structures, utilities and pavements that are to remain in place.
- C. Remove sheeting and shoring and bracing, as backfilling operations progress, taking all necessary precautions to prevent failure of excavation sides. Where sheeting is to be left in place, it shall not be within 2 feet of subgrade.

3.3 COMMON EXCAVATION

- A. The Contractor shall excavate material encountered to establish required grade elevations.
 - 1. Unauthorized Excavation:
 - a. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at the Contractor's expense.
 - b. The Contractor shall backfill and compact unauthorized excavations as specified for authorized excavations of the same classification, unless otherwise directed by the Engineer.
 - 2. Additional Excavation:
 - a. When excavation has reached required subgrade elevations, notify the Engineer who will make an inspection of conditions.
 - b. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace the excavated material as directed by the Engineer.
 - c. Removal of unsuitable material and its replacement as directed will be paid on the basis of contract conditions relative to changes in work.
- B. Common excavation areas shall be maintained in such condition that the excavation will be well drained.
- C. Roadway excavation, in general, shall proceed in a direction upgrade. Subgrades shall be promptly rolled to prevent absorption of water.

3.4 EXCAVATION FOR UTILITY SERVICES

- A. Water, telephone, fire alarm, storm drainage, electric services, utility structures, sanitary sewer piping, manholes, and catch basins will be installed under the work of the respective Sections.

3.5 MINIMUM LIMITS FOR EARTH EXCAVATION

- A. Earth excavation must be carried to the following limits, unless otherwise indicated herein or on the drawings or authorized by the Engineer:
1. Subgrades for site work shall be as follows:
 - a. Areas to receive topsoil - Four (4) inches below finish grades.
 - b. Utility structures - Bottom of structure or as shown on the site details and eighteen (18) inches outside wall extremities.
 - c. On-site bituminous concrete paved surfaces, as noted on the Drawings.
 - d. Off-site paved areas, as noted on the Drawings.
 - e. Unspecified site improvements - To bottom elevation of item plus ample working space on all sides.
 2. In non-specified areas - To the lines indicated on the Drawings plus proper side clearance for construction.

3.6 ROCK EXCAVATION

- A. In open excavations material will be classified as rock only when the following conditions prevail:
1. When the natural compound, natural mixture, and/or chemical element cannot be broken and removed from its existing position and state by a 3/4-yard backhoe or D8 dozer and requires the use of drills, or the use of explosives.
 2. Boulders or old concrete foundations in excess of 2 cubic yards.
 3. Anything other is "earth" insofar as removal of the material to be excavated is concerned.
 4. NOTE: When during the process of excavation, rock is encountered such material shall be uncovered and exposed, and the Engineer shall be notified by the Contractor, before proceeding further. The areas in question shall then be measured as stipulated in paragraph B, following. The Contractor shall not proceed with excavation of material claimed as rock until the material has been classified by the Engineer. Should the Contractor proceed with the excavation without notifying the Engineer, or prior to the survey, he shall forfeit his right to extra payment in the subject area.
- B. The Contractor will provide qualified personnel, acceptable to both the Owner and the Engineer, to take cross-sections of rock before removal of same, and to provide computations of cross-sections within the pay limits.
- C. Excavate rock, encountered in grading areas within the contract, to depths as follows:
1. Under pavements and surfaced areas - To six inches below the required subgrade for such areas.
 2. Under lawn areas - To two feet below finished grade, unless approved otherwise by the Engineer.
- D. Blasting - Obtain written permission and approval of method from the local authorities before proceeding with rock excavation. Explosives shall be stored, handled, and employed in accordance with the provisions of the "Manual of Accident Prevention in Construction: of the Associated General Contractors of America, Inc.

3.7 COLD WEATHER PROTECTION

- A. Protect excavations against freezing when atmospheric temperature is less than 35°F.

3.8 COMPACTION

- A. General: Control soil compaction during construction to the satisfaction of the Engineer and/or Resident Project Representative by providing compaction to at least the minimum percentage of maximum density as specified for each area classification.
- B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship (determined in accordance with ASTM D1557) and to not less than the following percentages of relative dry density (determined in accordance with ASTM D2049) for soils which do not exhibit a well-defined moisture density relationship.
 - 1. Lawn or Unpaved Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum dry density as determined by AASHTO T-180, Method C or D.
 - 2. Pavements: Compact top 12 inches of excavation subgrade and each layer of fill material to 95 percent maximum dry density as determined by AASHTO T-180, Method C or D.
- C. Moisture Control: Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material at a rate such that free water does not appear on surface during or subsequent to compaction operations.
- D. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
- E. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry.

3.9 EMBANKMENT

- A. Compaction Equipment:
 - 1. Provide sufficient equipment units of suitable types to spread, level and compact fills promptly upon delivery of materials.
 - 2. The Contractor may use any compaction equipment or device which he finds convenient or economical, but the Engineer retains the right to disapprove equipment which, in his opinion, is of inadequate capacity or unsuited to character of material being compacted.
 - 3. The Contractor shall be responsible for the proper placement and compaction of backfill material. Any settlement that occurs shall be repaired by the Contractor at his own cost and expense. If pipeline and/or structures are damaged or displaced, they shall be repaired at the Contractor's expense.
- B. Areas to be filled or backfilled shall be free of construction debris, refuse, compressible or decayable materials and standing water.

- C. Notify the Engineer when excavations are ready for inspection. Filling and backfilling shall not be started until conditions have been approved by the Engineer.
- D. Place acceptable soil materials in layers to required subgrade elevations, for each area classification listed below.
 - 1. In excavations; use satisfactory excavated or borrow material.
 - 2. Under grassed areas; use satisfactory excavated or borrow material.
 - 3. Under pavements; use satisfactory excavated or borrow material or combination of both.
- E. Grub areas a depth of 12" where fills are to be less than five feet in depth as shown on the Drawings.
- F. When existing ground surface has a density less than that specified under "Compaction" for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.
- G. Placement and Compaction: Place fill materials in layers no thicker than 10 inches.
- H. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification.
- I. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- J. Place backfill and fill materials evenly to required elevations adjacent to structures. Take care to prevent wedging action of fill against structures by carrying the material uniformly around structure to approximately the same elevation in each lift.
- K. When water and sewer piping is laid in filled areas, place the fill before any pipe is placed, and compact as specified to a depth or not more than two feet above the proposed top of the pipe. A trench shall then be excavated to the required grade, and of sufficient width to permit thorough tamping of the fill under the bells and around the pipe.
- L. At the end of each day's work the embankment shall be shaped and rolled to minimize infiltration of water.

3.10 GRADING

- A. General: Uniformly grade areas within limits of construction. Smooth finished surface within specified tolerances.
 - 1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 feet above or below the required subgrade elevations.
 - 2. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2 inch above or below the required subgrade elevation.

3.11 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances in settled, eroded or rutted areas.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, reshape, and compact to required density prior to further construction.

3.12 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, debris and dispose of it off the Owner's property. This provision does not apply to stockpiled topsoil which shall remain on site unless written authorization for its removal is provided by the Engineer.

END OF SECTION 312000

SECTION 312213 - ROUGH GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Removal of topsoil and subsoil.
- B. Cutting, grading, filling and rough contouring the site.

1.2 RELATED SECTIONS

- A. Section 312300 – Excavation (Excavation and Fill)
- B. Section 312316.13 – Trenching
- C. Section 312333 – Trench Backfilling, Compaction, Control & Testing

1.3 REFERENCES

- A. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
- B. ASTM D922 - Test Method for Density of Soil and Soil Aggregate in Place by the Nuclear Methods. (Shallow Depth)
- C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: Excavated material, graded, free of roots, rocks larger than 1 inch, subsoil, debris, and large weeds.
- B. Subsoil: Excavated material, graded, free of lumps larger than 6 inches, rocks larger than 3, and debris.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify site conditions.
- B. Verify that survey benchmark and intended elevations for the Work are as indicated.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- C. Protect above and below grade utilities which are to remain.
- D. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- E. Protect bench marks and existing structures from excavation equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded.
- B. Remove from site.

3.4 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded.
- B. Remove from site or use in approved locations.
- C. When excavation through roots is necessary, perform work by hand and cut roots with sharp axe.

3.5 FILLING

- A. Fill areas to contours and elevations with unfrozen materials.
- B. Common Borrow MDOT 703.18: Place and compact materials in continuous layers not exceeding 8 inches of compacted depth, compacted to 95 percent.
- C. Maintain optimum moisture content of fill materials to attain required compaction density.
- D. Make grade changes gradual. Blend slope into level areas.

3.6 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1/10 foot.

END OF SECTION 312213

SECTION 312300 - EXCAVATION (EXCAVATION AND FILL)

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Excavation for building foundations.
- B. Excavation for slabs-on-grade.
- C. Excavation for site structures.

1.2 RELATED SECTIONS

- A. Section 312213 - Rough Grading
- B. Section 312333 – Trench Backfilling, Compaction, Control & Testing
- C. Section 312316.13 - Trenching

1.3 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- C. Protect above and below grade utilities which are to remain.
- D. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- E. Protect benchmarks, existing structures, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.2 EXCAVATION

- A. Excavate subsoil required to accommodate building foundations and slabs-on-grade.
- B. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- C. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- D. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- E. Correct unauthorized excavation at no extra cost to Owner.
- F. Remove excess material not being reused from site.

3.3 FIELD QUALITY CONTROL

- A. Provide for visual inspection of bearing surfaces.

3.4 PROTECTION

- A. Protect excavations by methods required preventing cave-in or loose soil from falling into excavation.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

END OF SECTION 312300

SECTION 312316 - ROCK REMOVAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

Furnish the labor, materials and equipment necessary to identify and remove bedrock within the proposed excavation limits in accordance with the requirements of this Section, including the following:

- A. Rock Removal - All rock blasting and rock removal using drill and blast techniques, including blasting for roadways, parking areas, building foundations, and trench blasting for utilities. The blasting shall be performed in accordance with the requirements of this Section. The Contractor shall employ controlled blasting procedures in order to maintain ground vibrations and airblast overpressures below the maximum levels specified in this Section and to minimize stressing and fracturing of the rock beyond the limits of the excavations, footing elevation subgrades, and utility trenches shown on the Drawings. The Contractor's proposed blasting methods, procedures, sequence and data to show compliance with these specifications shall be described in a blasting plan submitted prior to blasting operations and meeting the requirements of subsection 3.02.
 - 1. Condition Surveys - The Contractor shall perform pre-blast condition surveys of all structures and improvements of adjoining properties within at least 600 feet of any blast as described in subsection 3.01.A. If a complaint of alleged blasting related damage is made by a nearby property owner during construction, the Contractor shall perform additional condition surveys as described in subsection 3.01.B.
 - 2. Test Blasts - Prior to commencement of production blasting, the Contractor shall, using small charges and the required monitoring instruments, establish a site specific relationship between charge weight, distance and response in accordance with the requirements of subsection 3.04.F.2.
 - 3. Blast Monitoring - A monitoring program of blasting vibrations shall be performed by the Contractor during construction in accordance with the requirements of subsections 1.06.C.3 and 3.07.
 - 4. Blasting Records - A blasting log summarizing the details of the round as shot, weather conditions, blast proximity to nearby structures, location of monitoring instruments and measured vibration data shall be maintained and reported in accordance with the requirements of subsections 1.06.C.2 and 3.06.
- B. Disposal of blasted rock and cleaning of exposed bedrock surfaces.

1.2 RELATED SECTIONS AND INFORMATION

- A. Section 312213 - Rough Grading
- B. Section 312000 - Earthwork
- C. Section 312333 – Trench Backfilling, Compaction, Control & Testing: Backfill materials.
- D. Section 312316.13 - Trenching: Trenching and backfilling for utilities.

1.3 PRICES

- A. Rock Quantity: Rock removal, including open ledge and trench ledge will be priced on a unit price basis.

1.4 COMPLIANCE WITH STANDARDS

- A. Comply with the provisions of all applicable safety codes including without limitation the following Codes and Standards:
- B. National Fire Protection Association (NFPA): 495 Code for the Manufacture, Transportation, Storage and Use of Explosive Materials.
- C. "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc.
- D. "Construction Safety Rules and Regulations" as adopted by the State Board of Construction Safety, Augusta, Maine.
- E. Section 107.12 (Use of Explosives) of the "Standard Specifications" prepared by the Maine Department of Transportation.
- F. Occupational Safety and Health Act of 1970 (Public Law 91-596 of the United States, 29 USC Section 651 et. seq.)
- G. Applicable provisions of laws, rules, ordinances, and regulations of Federal, State and the Town of Farmingdale governing the transportation, storage, handling and use of explosives.
- I. In case of conflict between regulations or between regulations and the requirements of this Specification, the Contractor shall comply with the strictest applicable codes, regulations or Specifications.

1.5 DEFINITIONS

- A. Site Rock: Solid mineral material with a volume in excess of 1/3 cu yd. loose rock removable by hammer or over excavation shall not be designated as site rock.
- B. Trench Rock: Solid mineral material with a volume in excess of 1/4 cu yd or solid material that cannot be removed with a backhoe without drilling or blasting. Rock removable by hammer shall not be designated as trench rock.
- C. Peak Particle Velocity: Peak Particle Velocity shall mean the greatest of three peak velocity components (inches per second units) measured at any point, with the three components being measured in the vertical and mutually perpendicular horizontal directions.

1.6 SUBMITTALS AND NOTIFICATIONS

A. Submit under provisions of Section 01300.

B. Advance Submittals and Notifications

1. Qualifications: Qualifications in accordance with the provisions of Section 1.07 shall be submitted for the blasting contractor conducting blasting operations and for the independent seismologist or blasting consultant performing pre-blast surveys and vibration monitoring.
 - a. Blasting Contractor - At least two weeks prior to commencing drilling and blasting operations written evidence of the licensing, experience, and qualifications of the blaster who shall be responsible for the loading and firing of each shot shall be submitted to the Engineer. If different, the name and qualifications of the person responsible for designing and directing the blasting operation shall also be submitted to the Engineer.
 - b. Seismologist or Blasting Consultant - At least two weeks prior to the performance of pre-blast surveys the name and resume of qualifications of the independent seismologist or blasting consultant proposed for use in conducting pre-blast condition surveys and monitoring blast vibrations shall be submitted to the Engineer. In the event a different seismologist or blasting consultant is proposed for use in monitoring blast vibrations only, the name and resume of qualifications of this individual shall be submitted to the Engineer at least two weeks prior to commencing any drilling and blasting operations. A sample of a previous vibration analysis or report shall be included with the qualifications.
2. Notification of Pre-Blast Surveys and Blasting Schedule: Prior to commencement of any pre-blast surveys, the Contractor shall provide documentation to the Engineer and the Town listing building owners within 600 ft. of the anticipated blasting areas (from Tax Map records), that the subject building owners were notified of the pre-blast survey work and the blasting schedule, and the offer to conduct a pre-blast survey was either accepted or rejected by each building owner.
3. Pre-Blast Condition Surveys: Written verification that all pre-blast condition surveys and related reports were completed in accordance with the requirements of Section 3.01 shall be submitted to the Engineer at least two weeks prior to commencing any drilling and blasting operations.
4. Blasting Plan: At least two weeks prior to commencing drilling and blasting operations the Contractor shall submit to the Engineer for review a blasting plan providing complete details of his proposed blasting and construction operations in accordance with the blasting plan requirements described in Section 3.02.
5. Blasting Schedule: The blasting contractor shall prepare and submit a blasting schedule in accordance with the requirements of Section 3.03 to the Engineer and the Town (fire, police, emergency agencies and Codes Enforcement personnel) at least one week prior to commencing blasting operations.

6. Certificate of Insurance: Prior to commencing any drilling and blasting operations, the Contractor shall submit a Certificate of Insurance in accordance with the requirements of Section 1.10.

C. Submittals and Notifications During Blasting Operations

1. Notification of Individual Blasts: During construction the blasting contractor shall coordinate the blasting schedule with the Engineer and the Town (fire, police, emergency agencies and Code Enforcement personnel) when requested. A minimum of 24 hours in advance, the blasting contractor will notify the Engineer and the Town by telephone of the start of blasting in any new area. At least 24 hours prior to any blast, the blasting contractor shall inform by telephone all property owners who have requested to be so informed, of the impending blast.
2. Blasting Log: A blasting log summarizing details of the round as shot, weather conditions, proximity of the blast location to nearest structures, exact locations of monitoring instruments, and the results of blast monitoring at each instrument location shall be maintained daily for every blast. Specific information to be included on the log are described in Section 3.06. The blasting log shall be available for inspection on-site, shall be submitted in writing to the Engineer within 24 hours following each blast, and shall be submitted to the Town on a weekly basis.
3. Blast Monitoring Reports: Blast monitoring data obtained by the independent seismologist or blasting consultant shall be available for inspection on-site, shall be submitted in writing to the Engineer (as part of the blasting log) within 24 hours following each blast, and shall be submitted to the Town on a weekly basis. In the event a ground vibration or airblast limit is exceeded, the blasting contractor shall notify the Engineer by telephone immediately following the blast.
4. Condition Surveys: If a nearby property owner submits a complaint regarding alleged blasting related damages during construction, the independent seismologist or blasting consultant shall conduct a second survey of the property within 48 hours of receiving the complaint to identify any changes in the property conditions. A condition report summary shall be submitted to the Engineer within two weeks after the second survey is conducted.
5. Noise Minimization: The contractor shall take precautions, such as the use of water, vacuums, and mufflers, to minimize noise and dust from air track operations, and shall keep noise and airborne dust levels at off site residences below regulatory limits.

1.7 QUALIFICATIONS

- A. The Blasting Contractor shall be a company specializing in explosives for disintegration of rock, with at least five years documented experience in controlled blasting techniques.
- B. Seismologist or Blasting Consultant: The Contractor will be required to retain an independent seismologist or blasting consultant to perform condition surveys prior to and during blasting operations, and to monitor, record, analyze, and report the seismic vibrations and airblast pressures being caused by blasting activities.

The seismologist or blasting consultant shall have at least five years of documented experience conducting condition surveys for blasting operations, and shall be experienced in the subject of vibrations emanating from construction activities. The seismologist or blasting consultant shall not be an employee of the Contractor, subcontractor, explosives manufacturer, or explosives distributor.

- C. The seismologist or blasting consultant shall be present at the site of the blasting during all blasts. The seismologist or blasting consultant shall provide and use all necessary equipment to observe and record vibrations to ascertain that acceptable levels of vibrations are not exceeded. The seismologist or blasting consultant shall monitor, report findings, and submit recommendations to the Engineer in accordance with the requirements of this Specification.

1.8 REGULATORY REQUIREMENTS

- A. Conform to applicable code for explosive disintegration of rock and to NFPA 495 for handling explosive materials.
- B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

1.9 SAFETY PRECAUTIONS AND WARNING SIGNALS

- A. During the blasting operation the blasting contractor shall be responsible for control of access in and around the general blast area.
- B. All persons within 600 ft. of the blasting area will be notified of “warning” and “all-clear” signals through notices left in mailboxes and signs posted in the area.
- C. Equipment and traffic shall be stopped far enough away to ensure work area safety and shall not be released until the blasting foreman issues the “all-clear” signal.
- D. A series of air horn warnings shall be issued to warn of an imminent blast as follows: 3 horn signals at 5 minutes prior to blast; 2 horn signals at 1 minute prior to blast; 1 horn signal after the blast to signal “all-clear” conditions once the shot has been checked for any misfires.
- E. Explosives shall be stored, handled and employed in accordance with federal, state and local regulations and in accordance with NFPA 495, except where stricter requirements are contained elsewhere herein such requirements shall govern.
- F. No explosives, caps, detonators, and fuses shall be stored on the site during non-working hours. The Contractor shall notify each public utility company having structures in the proximity to the work site, of the impending use of explosives and give sufficient advance notice to enable the companies to take such steps as they deem necessary to protect their property from injury.

1.10 RESPONSIBILITY FOR BLASTING OPERATIONS

- A. A review of the Contractor’s blasting submittals by the Engineer or the Town will not relieve the Contractor of its responsibility for the accuracy, adequacy, and safety of the blasting; for exercising proper supervision and field judgment; for preventing damage to structures; and for producing

results in accordance with this Specification and the regulations and ordinances of the Town of Farmingdale. The Contractor shall be solely and completely responsible for the safety of all persons and property during the performance of its work. The Contractor shall take whatever measures it deems necessary, in addition to the requirements herein, to protect the safety of persons and property, both at the construction site and away from the site. The Contractor shall have full and complete responsibility for the handling, discharging, or settling of any and all damage or annoyance claims resulting from the blasting activities on the project. Any monitoring and/or review of the Contractor's procedures and performance conducted by the Engineer or the Town shall not relieve the Contractor of its responsibility for safety at and away from the site, or for preventing damage to adjacent structures or property. The Blasting Contractor shall carry liability insurance coverage (XCU) in an amount no less than \$2,000,000. A certificate of insurance documenting the coverage and naming the owner, owner's representative, Engineer, and their consultants as additional insured shall be submitted prior to commencing any drilling and blasting operations.

1.11 INDEMNITY

- A. The Contractor shall hold harmless the Owner, Owner's representative, Engineer and their consultants from any costs, liens, charges, claims or suits, including the costs of defense arising from any direct or indirect damage, real or alleged, from blasting.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Explosives: Type recommended by explosive firm following seismic survey and required by authorities having jurisdiction.
- B. Delay Device: Type recommended by explosive firm.
- C. Blast Mat Materials: Type recommended by explosives firm.

PART 3 - EXECUTION

3.1 CONDITION SURVEYS

- A. Pre-Blast Condition Surveys: The pre-blast survey shall document the conditions of existing buildings within at least 600 ft. of the limit of blasting work. The pre-blast survey shall be completed by the independent seismologist or blasting consultant. The survey shall include documentation of interior subgrade and above grade accessible walls, ceilings, floors, roof, and visible exterior as viewed from the grade level. It shall detail the existing structural, cosmetic, plumbing, and electrical condition, and shall include all walls, and not be limited to areas in buildings showing existing damage. Where significant cracks or damage exist, or for defects too complicated to describe in words, photographs shall be taken.

A good quality videotape survey with appropriate audio description of locations, conditions, and defects can be used. Notes and sketches may be made to highlight or enhance the photographic documentation. The condition report shall present engineering notes and photographs or video records. The report shall also summarize the condition of each building and define areas of concern, including deteriorated structures or utilities, structures housing sensitive equipment, and/or manufacturing processes that are sensitive to vibrations.

- B. Condition Surveys During Construction: If a nearby property owner submits a complaint regarding alleged blasting related damages during construction, the independent seismologist or blasting consultant shall conduct a second condition survey of the property within 48 hours of receiving the complaint to identify any changes in the property conditions. This survey shall be conducted with same level of detail, care and diligence as the pre-blast condition survey.
- C. The contractor shall report to the Town in writing all blasting complaints received by the contractor within 24 hours of receipt. Each blast complaint report shall include the name and address of the complainant, time received, date and time of blast complained about, and a written description of the circumstances, which led to the complaint. Upon receiving a written complaint from a resident alleging damage from blasting, the contractor's independent seismologist or blasting consultant and/or a representative of the Blaster's Insurance Company shall investigate the claim and a written report shall be issued to the homeowner, with a copy to the Town, of the results of the investigation and the response of the contractor. This written report shall be received by the resident and the Town within 15 working days of receipt of the written complaint.

3.02 BLASTING PLAN

- A. The blasting contractor shall be required to submit a drilling pattern and loading plan, referred herein as a blasting plan, in accordance with the schedule described in Section 1.06.B.4. The blasting plan shall be submitted to the Engineer for review, and shall contain details of the proposed rock excavation and blasting operations. No drilling or blasting shall take place until approval is received from the Engineer. The blasting plan shall include the following:
 - 1. The sequence and schedule of blasting rounds, including the general approach for developing each bedrock excavation area.
 - 2. A diagrammatic description of the typical blast pattern to be used, including presplitting pattern if pre-splitting is required.
 - 3. Diameter, spacing, burden, depth and orientation of each drill hole relative to the "free face", along with details of the delay pattern.
 - 4. A diagrammatic description of the loading plan for a typical production hole and, if presplitting is required on the project, for a typical presplit hole. This description shall include:
 - a. Diameter, spacing, burden depth and orientation of each drill hole.
 - b. Type and nomenclature of detonators and delay pattern.
 - c. Type, nomenclature and weight per cartridge of explosives to be used, and weight and distribution of charge to be used within each hole, as well as total weight of explosive charge on each delay, and the total weight for the blast round.
 - d. Type and distribution of stemming to be used in each hole
 - 5. Estimation of ground vibration levels at nearest adjacent structures.
 - 6. Methods of matting the blast area to prevent fly rock and excessive air blast pressure.

7. Written evidence of the licensing, experience, and qualifications of the blaster who will be directly responsible for the loading and firing of each shot.
8. A listing of instrumentation which the Contractor and/or the independent seismologist or blasting consultant proposes to use to monitor vibrations and, together with performance specifications and users manual supplied by the manufactures, and a recent calibration (within the previous six months).
9. A description of the criteria to be used for locating vibration-monitoring instrumentation for each blast.
10. A copy of the blasting permit obtained to conduct blasting on the site.

- B. The blasting plan shall form the basis for all blasting operations on the project. If, in the judgment of either the Engineer or the Contractor, changes in the plan appear to be necessary, drilling or blasting operations shall be suspended and a revised plan shall be submitted to the Engineer reflecting the proposed changes.

3.3 BLASTING SCHEDULE

- A. The blasting contractor shall prepare and submit a projected project-blasting schedule to the Engineer and the Town (fire, police, emergency agencies and Codes Enforcement personnel) at least one week prior to commencing blasting operations. The schedule shall, at a minimum, include the following:
1. Name, address and phone number of blaster.
 2. Identification of specific blasting areas.
 3. Projected dates and times of blasts.
 4. Methods to restrict access in the blast area and warning whistle announcements.
- B. During construction the blasting contractor shall coordinate the actual blasting schedule with the Engineer and the Town (fire, police, emergency agencies and Codes Enforcement personnel) when requested. A minimum of 24 hours in advance, the blasting contractor shall notify by telephone the Engineer and, if requested, the Town, of the estimated time of blast. At least 24 hours prior to any blast, the blasting contractor shall inform by telephone all property owners who have requested to be so informed, of the impending blast.

3.4 EXCAVATION METHODS

- A. General: Rock excavation shall be accomplished by blasting, cutting, wedging, barring, hammering, mechanical ripping, or a combination thereof. The Contractor shall select and be responsible for methods and procedures to be used, except as hereinafter provided.
- B. Scaling and Final Rock Slope Stability: Rock scaling may be required on all or part of the exposed face following rock excavation. All loose and unstable material, all breakage, and all potentially unstable rock slides, even if located beyond the payment lines, shall be removed or stabilized to the Engineer's satisfaction during or upon completion of the excavation. Permanent rock cut slopes deviating from the design grades or exhibiting unexpected conditions shall be inspected by the Engineer, or their qualified geotechnical engineering sub-consultant, concerning the long-term stability of the slopes. The Engineer, or their sub-consultant shall prepare written documentation, and copied to the Town, regarding the long-term stability of the rock cut slopes, including, if appropriate, any remedial actions considered necessary to provide slopes with a suitable factor of

safety against post-construction movements.

- C. Rock Excavation Limits and Overblast Mitigation: All necessary precautions shall be taken in blasting operations to preserve the rock outside the lines of excavation in the soundest possible condition. Blasting shall be done only to the lines and grades shown on the Drawings or approved by the Engineer. Where overblasting occurs at footing locations or other project structures, the overblasted rock shall be completely removed to the satisfaction of the Engineer, and the over-excavated area backfilled with 2500 psi concrete, crushed stone, or in accordance with backfilling and compaction requirements of Section 02223 as determined by the Engineer.
- D. Excavations for Buried Utilities: In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.
- E. Cleaning of Rock Surfaces: The Contractor shall, in areas designated by the Engineer, clean rock surfaces exposed during excavation to permit a thorough inspection and assessment of the rock by the Engineer. Cleaning of rock surfaces shall consist of the removal of all organic materials, soil, and loose rock. Cleaning may be done with high-pressure air jets, water jets, brooms or by any other method acceptable to the Engineer.
- F. Blasting Procedures:
 - 1. Hours of Blasting: Blasting shall be limited to the hours of 9:00 AM and 4:00 PM, Monday through Friday.
 - 2. Test Blast(s): Prior to the commencement of production blasting, the Contractor shall, using small charges and the required monitoring instruments, establish a site specific relationship between charge weight, distance and response. The Contractor shall develop site specific scaled distance relationships from the test blast rounds to determine the allowable charge weight of explosives to be detonated per delay which will result in a minimum of overbreak, a minimum of shattering or loosening of rock beyond the excavation limits, and which will produce sound and reasonably uniform surfaces in the completed excavations.. The scaled distance (D_s) shall be the distance from the charge to the recording seismograph (D), divide by the square root of the explosive charge ($W^{0.5}$).
 - 3. Controlled Perimeter Blasting: When blasting near existing structures, production blasting shall start as far as possible from the existing structures so that blast vibrations and bedrock conditions can be evaluated as blasting approaches the structures. For blasting located within 65 ft. of existing structures, controlled perimeter blasting techniques may be required along the excavation perimeter to assist in obtaining a stable, undisturbed rock face and mitigate offsite impacts. Controlled blasting refers to the controlled use of explosives and blasting accessories in carefully spaced and aligned drill holes, to produce a smooth, free surface, or shear plane, in the rock along the specified backslope. Acceptable controlled blasting techniques include presplitting, cushion blasting, line drilling, and smooth-wall blasting. Smaller blast rounds may also be desirable as blasting approaches nearby structures to minimize explosive charge weights and mitigate impacts in the event normally sized charges do not produce expected results.

4. Fly Rock Control: Before the firing of any blast, the rock to be blasted shall be covered with blasting mats, as approved by the Engineer. Mats shall be placed for every blast over the entire loaded area and shall restrict all fly rock from leaving the site. If blasted rock is permitted to escape the blasting mats, all blast-related activities shall be stopped. The Contractor shall prepare a report describing why rock was allowed to be ejected, and how such events will be prevented in the future. This report shall be submitted to the Engineer and, if requested, the Town. In order to proceed with any further blast related activity, written permission shall be obtained from the engineer. These provisions do not relieve the Contractor from all responsibility for the safety of his own personnel, the safety of the general public, as well as damage to structures.
5. Overbreak Control at Perimeter Areas: When blasting at the perimeter of the excavations, care shall be taken at the excavation limits to minimize overbreak and fracturing of remaining rock. If necessary, presplitting or cushion blasting shall be utilized at such locations.
6. No free-flowing, pourable, or pumpable explosives shall be used. All explosives shall be in cartridges or other semi-rigid containers.

3.5 VIBRATION AND AIRBLAST LIMITS

- A. Ground Vibration: Ground vibration from all blasting operations shall be measured in terms peak particle velocity (inches per second), I any of the three mutually perpendicular components of particle velocity, and frequency (Hertz).
 1. Residential Structures: The permissible maximum ground vibration at existing nearby aboveground residential structures shall not exceed the following limits:

Ground Vibration Limits for Residential Structures

<i>Type of Structure</i>	<i>Maximum PPV (in/s)</i>	
	<i>Frequencies Below 40 HZ</i>	<i>Frequencies 40Hz or Greater</i>
Modern Homes – Drywall Interiors	0.75	2.0
Older Homes – Plaster on Wood Lath for Interior Walls	0.50	2.0

2. Non-residential Structures: The maximum peak particle velocity (PPV) of ground vibrations for non-residential structures shall not exceed 2.0 in/s.
3. Underground Utilities: The maximum PPV of ground vibrations for underground utilities shall not exceed 2.0 in/s. Buried pipelines and other utilities owned by private utility companies are sometimes subject to lower limiting values imposed by the owner. The Contractor shall verify the maximum allowable PPV of ground vibrations allowed by the individual utilities.
4. Deteriorated structures or utilities, structures housing sensitive equipment, and/or manufacturing processes that are sensitive to vibrations may require lower PPV limits than those indicated above. If information obtained from the pre-blast surveys indicates lower limits are required at certain structures, the independent seismologist or blasting consultant

will identify the lower limits applicable to a specific structure, and the blasting contractor shall incorporate such provisions in the features of the blasting plan applicable to this site area.

- B. Airblast Overpressure: The peak airblast overpressure at any inhabited building not owned or controlled by the developer will not be allowed to exceed 133 decibels (linear) when measured by an instrument with a high pass system and a lower frequency limit of 2 Hz. The equivalent maximum allowable airblast overpressure is 0.013 pounds per square inch (psi).
- C. Vibration Reduction: In the event the blasting contractor's blasting round results in ground vibrations or airblast overpressures approaching the stated limits, the Engineer may require the blasting contractor to modify the blasting operations to reduce ground vibrations/overpressures. In the event the blasting contractor's blasting round results in ground vibrations or airblast overpressures exceeding the stated limits at structures, the blasting contractor shall cease all blasting activities and submit a written report to the Engineer, and copied to the Town. This report shall discuss the corrective action to be taken on the next shot, and the next shot shall not be loaded until the Engineer acknowledges, in writing, that a design change is being attempted

3.6 BLASTING RECORDS

- A. A blasting log summarizing details of every blast round as shot shall be maintained daily. The blasting log shall include detailed information concerning the specific drilling and loading for each blast as well as the results of blast monitoring by the independent seismologist or blasting consultant. Blast monitoring requirements are described in Section 3.07. The blasting log must be available for inspection on-site, shall be submitted in writing to the Engineer within 24 hours following each blast, and shall be submitted to the Town on a weekly basis. Specific information to be included on the log include:
 - 1. Name of blasting company and blaster responsible for the blast.
 - 2. Location, date and time of the blast.
 - 3. Weather conditions including such factors as wind direction and cloud cover.
 - 4. Number and spacing of drill holes and depth of burden or stemming.
 - 5. Diameter and depth of drill holes.
 - 6. Type of explosives used.
 - 7. Total amount of explosives used.
 - 8. Maximum amount of explosives used per delay period of 8 milliseconds or greater.
 - 9. Maximum number of holes per delay period of 8 milliseconds or greater.
 - 10. Method of firing and type of circuit.
 - 11. Type of detonators used and delay periods used.
 - 12. Height or length of stemming.
 - 13. Distance and direction to nearest structure.
 - 14. Scale distance to nearest structure.
 - 15. The exact location and approximate elevation of each seismograph and the distance from each seismograph to the blast.
 - 16. Vibration and airblast overpressure data from each seismograph, including a strip chart (or other permanent record of velocity/time waveform) with the calibration and monitoring record marked with the date, time and location of the blast, including: resultant PPV (in/s);

longitudinal, vertical and transverse PPV (in/s); frequency (Hz); and peak airblast overpressure (dBL).

17. The name and signature of the person operating each seismograph.

18. The name of the person and firm analyzing the seismograph record.

3.7 BLAST MONITORING

- A. Blast monitoring and analysis shall be conducted by the independent seismologist or blasting consultant. A minimum of three (3) seismograph instruments shall be used to monitor vibrations and airblast overpressures for each blast. Seismograph locations for each blast shall comply with the criteria described in the blasting plan.
- B. All vibration-monitoring instruments used on the project shall comply with the following requirements:
 - 1. Measure, display, and provide a permanent record on a strip chart of particle velocity components.
 - 2. Measure the three mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to the vibration source.
 - 3. Have a velocity (seismic) frequency response of 2 Hz to 150 Hz, a sound frequency range of 1 Hz to 500 Hz, and be capable of measuring PPV's up to 10 in/s.
 - 4. All seismographs used on the project shall display the date of the most recent calibration.
 - 5. Calibration must have been performed within the last six (6) months and must be performed to a standard traceable to the National Institute of Standards and Technology.
- C. Blast monitoring data obtained by the independent seismologist or blasting consultant shall be available for inspection on-site, shall be submitted in writing to the Engineer as part of the blasting log (Section 3.06) within 24 hours following each blast, and shall be submitted to the Town on a weekly basis. In the event a ground vibration or airblast limit is exceeded, the blasting contractor shall notify the Engineer by telephone immediately following the blast.

END OF SECTION 312316

SECTION 312316.13 - TRENCHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Excavate trenches for piping.
- B. Backfilling and compaction.

1.2 RELATED SECTIONS

- A. Section 312333 – Trench Backfilling, Compaction, Control & Testing

1.3 REFERENCES

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 kg) Rammer and 12 inch (304.8 mm) Drop.
- C. ASTM D922 - Test Method for Density of Soil and Soil Aggregate in Place by the Nuclear Methods. (Shallow Depth)
- D. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

1.4 FIELD MEASUREMENTS

- A. Verify that intended elevations for the Work are as shown on Drawings.

PART 2 - PRODUCTS

2.1 BED MATERIALS

- A. Type 1 - 3/4 inch screened stone; free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136.
- B. Dead Sand.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify fill materials to be reused, is acceptable.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Maintain and protect existing utilities remaining, which pass through work area.
- C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- D. Protect benchmarks and existing structures from excavation equipment and vehicular traffic.
- E. Protect above and below grade utilities which are to remain.
- F. Cut out soft areas of subgrade not capable of insitu compaction.

3.3 EXCAVATION

- A. Cut trenches sufficiently wide to enable installation of drainage structures and allow inspection.
- B. Hand trim excavation. Remove loose matter.
- C. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume.
- D. Correct unauthorized excavation at no cost to Owner.
- E. Remove excavated material from site.

3.4 BEDDING

- A. Support drainage structures during placement and compaction of bedding fill.

3.5 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Employ a placement method that does not disturb or damage the pipe in trench.
- D. Maintain optimum moisture content of backfill materials to attain required compaction density.
- E. Remove surplus backfill materials from site.

3.6 TOLERANCES

- A. Top Surface of Backfilling: Plus or minus 1/2 inch from required elevations.

3.7 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ANSI/ASTM D1556, ANSI/ASTM D1557, and ANSI/ASTM D698.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.8 PROTECTION OF FINISHED WORK

- A. Re-compact fills subjected to vehicular traffic.

END OF SECTION 312316.13

SECTION 312323 - STRUCTURE BACKFILLING (FILL)

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Building perimeter construction, backfilling and site structure backfilling.
- B. Fill under slabs-on-grade.
- C. Consolidation and compaction.

1.2 RELATED SECTIONS

- A. Section 312000 - Earthwork.
- B. Section 03300 - Cast-in-Place Concrete: Concrete materials.

1.3 REFERENCES

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 kg) Rammer and 12 inch (304.8 mm) Drop.
- C. ASTM D922 - Test Method for Density of Soil and Soil Aggregate in Place by the Nuclear Methods. (Shallow Depth)
- D. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

PART 2 - PRODUCTS

2.1 FILL MATERIAL

- A. Granular Borrow: MDOT 703.19: Place and compact materials in continuous layers not exceeding 8 inches of compacted depth, compacted to 95 percent of modified proctor density.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify fill materials to be reused are acceptable.
- B. Verify foundation perimeter drainage installation has been inspected.

3.2 PREPARATION

- A. Generally, compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of insitu compaction. Fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.3 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Employ a placement method that does not disturb or damage foundation perimeter drainage, foundation damp proofing, and utilities in trenches.

3.4 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ANSI/ASTM D1556, ANSI/ASTM D1557, and ANSI/ASTM D698.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.5 PROTECTION OF FINISHED WORK

- A. Recompect fills subjected to disturbance.

END OF SECTION 312323

SECTION 312333 - TRENCH BACKFILLING, COMPACTION, CONTROL & TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Backfilling work includes backfilling trenches below subgrade and/or backfilling around structures with suitable material removed in the course of excavating and other suitable material as shown on the Drawings and/or as specified herein.

B. Related Work Specified Elsewhere: (When Applicable)

1. Traffic regulation is specified in Division I.
2. Clearing, removal and replacement of paving, trench excavation-earth, trench excavation - ledge, structure excavation, dewatering, borrow and bedding material are specified in the appropriate sections in this division.
3. Quality Control as specified in Division 1.

1.2 QUALITY ASSURANCE

- A. When other than excavated backfill is required, and/or where shown on the Drawings, compact backfill material to an in-place density not less than 90 percent of the maximum density of the material in accordance with ASTM D1557 Method "B".
- B. Where backfilling with excavated material, compact to native field density.
- C. Density testing shall be performed by an Independent Testing Laboratory retained by the Owner.
- D. Determine in-place density in accordance with ASTM D1556 or by other methods as approved by the Engineer.
- E. Locations of Tests (when applicable):
 1. Average of one test between each manhole for sewers.
 2. Average of two tests around each pump station structure.
 3. Average of one test for each 300 linear feet of water line and of force main.
 4. Additional testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the contractor's compaction operation.
 - a. If the additional test results fail to meet the requirements of these Specifications, the Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required compaction. Owner will pay the cost of retesting. The Engineer will determine the cost of retesting and the Owner will invoice the Contractor for this cost. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price. No allowance will be considered for delays in the performance of the work. The Independent Testing Laboratory shall conduct all testing and retesting.
 - b. If the test results pass and meet the requirements of these Specifications, the cost of the testing service will be borne by the Owner, but no allowance will be considered for delays in the performance of the work.

- F. Requirements for compaction and the testing thereof establish guidelines for proper backfilling, but in no way relieve Contractor of correcting any settlement, which occurs thereafter.

PART 2 - PRODUCTS

2.1 FINAL BACKFILL MATERIALS

- A. Suitable Excavated Material:
1. Free from large clods, silt lumps or balls of clay.
 2. Free from stones and rock fragments over 50 pounds.
 3. Free from organics, peat, etc.
- B. Frozen Materials:
1. Do not backfill with, or on, frozen materials.
 2. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
- C. Wet Material:
1. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet.
 2. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. General:
1. Provide and place all necessary backfill material.
 2. Do not allow large masses of backfill material to be dropped into the excavation, as from a grab bucket, in such a manner that may endanger pipes and structures.
 3. Place material in a manner that will prevent stones and lumps from becoming nested.
 4. Completely fill all voids between stones with fine material.
 5. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
 6. Deposit backfill material evenly on all sides of structures to avoid unequal soil pressures.
 7. Keep stones or rock fragments with a dimension greater than two inches at least 6 inches away from the pipe or 18 inches from the structure during backfilling.
- B. Sheeting:
1. Leave sheeting in place when, in the opinion of the Engineer, damage is likely to result from its withdrawal.
 2. Completely fill with suitable material and thoroughly compact all voids left by the removal of sheeting.
- C. Backfilling in Paved Areas:

1. Backfill in such a manner as to permit the rolling and compaction of the backfilled trench with the adjoining material to provide the required subgrade bearing value for placing aggregate base and subbase materials and paving immediately after backfilling is completed.
 2. Where required, place excavated material that is acceptable to the Engineer for surfacing or pavement subbase, at the top of the backfill to the depths as directed by the Engineer. Bring the surface to the required grade and rake out and remove stones.
- D. Backfilling Trenches in Nonpaved Areas:
1. Grade the ground to a reasonable uniformity.
 2. Leave the mounding over the trenches in a uniform and neat condition, satisfactory to the Engineer.
- E. Bedding and Backfilling Pipelines:
1. Install pipe bedding and initial backfill in accordance with the Borrow and Bedding Section in this division.
 2. Deposit and thoroughly compact the remainder of the backfill in twelve inch layers.
- F. Placing and Compacting Backfill:
1. The nature of the backfill materials will govern the methods best suited for their placement and compaction.
 2. No stone or rock fragment larger than twelve inches in dimension shall be placed in the backfill.
 3. No material shall be dropped from a height greater than five feet, unless a timber chute is used to break the fall.
 4. Rolling and tamping by mechanical or hand means shall be employed for compacting material in twelve-inch lifts.
 5. Other types of placing and compacting methods may be employed only when approved by the owner's representative.
- G. Placing and Compacting Impervious Dam Material:
1. The impervious dam material will be rolled and tamped by mechanical or hand means.
 2. Material shall be placed in lifts not greater than six inches.
- H. Improper Backfill:
1. When excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required, as directed by the Engineer.
 2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.
 3. Excavation, backfilling and compacting work performed to correct improper backfilling shall be performed at no additional cost to the Owner.
 4. Retesting shall be performed by the Contractor at his expense.

END OF SECTION 312333

SECTION 312500 - TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The work under this section shall include provision of all labor, equipment, materials and maintenance of temporary erosion control devices as specified herein, as shown on the Drawings and as directed by the Engineer.
2. Erosion control measures shall be provided as necessary to correct conditions that develop prior to the completion of permanent erosion control devices or as required to control erosion that occurs during normal construction operations.
3. Construction operations shall comply with all federal, state and local regulations pertaining to erosion control.
4. After awarded the Contract, prior to commencement of construction activities, meet with the Engineer to discuss erosion control requirements and develop a mutual understanding relative to details of erosion control.

B. Related Work Specified Elsewhere:

1. Site work is specified in appropriate sections of this Division.
2. Provisions stipulated in Environmental Protection.

C. Design Criteria:

1. Conduct all construction in a manner and sequence that causes the least practical disturbance of the physical environment.
2. Stabilize disturbed earth surfaces in the shortest time and employ such temporary erosion control devices as may be necessary until such time as adequate soil stabilization has been achieved.

1.2 SUBMITTALS

- A. The Contractor shall furnish the Engineer, in writing, his work plan giving proposed locations for storage of topsoil and excavated material before beginning construction. A schedule of work shall accompany the work plan. Acceptance of this plan will not relieve the Contractor of the responsibility of completion of the work as specified.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Baled Hay: At least 14" by 18" by 30" securely tied to form a firm bale, staked as necessary to hold the bale in place.
- B. Sand Bags: Heavy cloth bags of approximately one cubic foot capacity filled with sand or gravel.

- C. Mulches:
 1. Loose hay, straw, peat moss, wood chips, bark mulch, crushed stone, wood excelsior, or wood fiber cellulose.
 2. Type and use shall be as specified by the "Maine Erosion and Sedimentation Control Handbook for Construction - Best Management Practices" prepared by the Maine DEP and the Soil and Water Conservation Commission herein after referred to as the BMP.
- D. Mats and Nettings:
 1. Twisted Craft paper, yarn, jute, excelsior wood fiber mats, glass fiber and plastic film.
 2. Type and use shall be as specified in the BMP.
- E. Permanent Seed: Conservation mix appropriate to the predominant soil conditions as specified in the BMP and subject to approval by the Engineer.
- F. Temporary Seeding: Use species appropriate for soil conditions and season as specified in the BMP and subject to approval by the Engineer.
- G. Water: The Contractor shall provide water and equipment to control dust, as directed by the Engineer.
- H. Filter Fabrics: Filter fabric shall be of one of the commercially available brands such as Mirafi, Typar or equivalent. The Engineer prior to installation shall approve fabric types for particular applications.

2.2 CONSTRUCTION REQUIREMENTS

- A. Temporary Erosion Checks:
 1. Temporary erosion checks shall be constructed in ditches and other locations as necessary. Stones shall be used for check dams as specified.
 2. Baled hay, sand bags or siltation fence may be used in an arrangement to fit local conditions.
- B. Temporary Berms: Temporary barriers shall be constructed along the toe of embankments when necessary to prevent erosion and sedimentation.
- C. Temporary Seeding: Areas to remain exposed for a time exceeding 3 weeks shall receive temporary seeding as indicated below:

<u>Season</u>	<u>Seed</u>	<u>Rate</u>
Summer (5/15 - 8/15)	Sudangrass	40 lbs/acre
Late Summer/Early Fall (8/15 - 9/15)	Oats	80 lbs/acre
Fall (9/15 - 10/1)	Annual Ryegrass	40 lbs/acre
Winter (10/1 - 4/1)	Winter Rye	112 lbs/acre
Spring (4/1 - 7/1)	Mulch w/Dormant Seed	80 lbs/acre*
	Oats	80 lbs/acre
	Annual Ryegrass	40 lbs/acre

* Seed rate only

- D. Siltation fences shall consist of porous filter fabric with a wire mesh backing and shall be supported by posts as per manufacturer's recommendations. The Engineer shall approve fabric.
- E. Mulch All Areas Receiving Seeding: use either wood cellulose fiber mulch (750 lbs/acre); or straw mulch with chemical tack (as per manufacturers specifications). Wetting for small areas may be permitted. Biodegradable netting is recommended in areas to be exposed to drainage flow.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Temporary Erosion Checks:

1. Temporary erosion checks shall be constructed in ditches and at other locations designated by the Engineer. The Engineer may modify the Contractor's arrangement of silt fences, bales and bags to fit local conditions.
2. Baled hay, silt fences, or sandbags, or some combination, may be used in other areas as necessary to inhibit soil erosion.
3. Siltation fence, if called for in the plans, shall be located and installed as shown.

B. Maintenance:

Erosion control features shall be installed prior to excavation wherever appropriate. Temporary erosion control features shall remain in place and shall be maintained until a satisfactory growth of grass is established. The Contractor shall be responsible for maintaining erosion control features throughout the life of the construction contract. Maintenance will include periodic inspections by the Owner or Engineer for effectiveness of location, installation and condition with corrective action taken by the Contractor as appropriate.

C. Removing and Disposing of Materials:

1. When no longer needed, material and devices for temporary erosion control shall be removed and disposed of as approved by the Engineer.
2. When removed, such devices may be reused in other locations provided they are in good condition and suitable to perform the erosion control for which they are intended.
3. When dispersed over adjacent areas, the material shall be scattered to the extent that it causes no unsightly conditions nor creates future maintenance problems.

END OF SECTION 312500

SECTION 312500.13 - ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 DEFINITIONS OF CONTAMINANTS:

- A. Sediment: Soil and other debris that has been eroded and transported by runoff water.
- B. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from construction activity.
- C. Chemical Wastes: Includes salts, acids, alkalis, herbicides, pesticides, and organic chemicals.
- D. Sanitary Wastes: Wastes characterized as domestic sanitary sewage.

1.2 ENVIRONMENTAL PROTECTION REQUIREMENTS:

- A. Provide and maintain during the life of the Contract, environmental protection as defined herein. Provide environmental protective measures as required to prevent or control pollution that develops during normal construction practice. Provide environmental protection measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with all federal, state, and local regulations pertaining to water, air, and noise pollution.

PART 2 - PRODUCTS

- A. Temporary Erosion Control Blanket-Adhere to specifications in 717.061 in the MDOT Standard Specifications Highways and Bridges. Silt Fence-Terratex pre-assembled or equal.

PART 3 - EXECUTION

A. PROTECTION OF NATURAL RESOURCES:

The natural resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their existing condition or restored to an equivalent or improved condition upon completion of the work. Confine construction activities to areas defined by the work schedule, drawings, and specifications.

- B. Land Resources: except in areas indicated to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without special approval of the owner's representative. Do not fasten or attach ropes, cables, or guys to any existing nearby trees for anchorages unless specifically authorized. Where such special emergency use is authorized, the Contractor shall be responsible for any resultant damage.
- C. Protection: protect existing trees that are to remain and which may be injured, bruised, defaced, or otherwise damaged by construction operators. Remove displaced rocks from uncleared areas. Protect monuments and markers.

- D. Repair and Restoration: repair or restore to their original condition all trees or other landscape features scarred or damaged by the equipment operations. Obtain approval of the repair or restoration from the Engineer prior to its initiation.
- E. Temporary Construction: remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, and all other vestiges of construction. Temporary roads, parking areas, and similar temporary use areas shall be graded in conformance with surrounding areas and revegetated, seeded, or sodded as required by the plans.
- F. Water Resources: perform all work in such a manner that any adverse environmental impact on water resources is avoided. Storage of hydraulic fluid is not permitted on-site. Quantities of bulk materials shall be reduced to a level acceptable to the owner's representative.

3.2 EROSION AND SEDIMENT CONTROL MEASURES:

- A. Burn-off: Burn-off of ground cover is not permitted.
- B. Protection of Erodible Soils: All earthwork brought to final grade shall be immediately finished as indicated or specified. Protect immediately side slopes and backslopes upon completion of rough grading. Plan and conduct all earthwork in such a manner as to minimize the duration of exposure of unprotected soils, and in no case shall exposure exceed 7 days. Consult weather forecasts prior to exposing large areas of soil. Check erosion control measures before forecasted major storm events.
- C. Temporary Protection to Erodible Soils: Utilize the following methods to prevent erosion and control sedimentation.
 - 1. Vegetation and Mulch: Provide temporary protection on all side and back slopes as soon as rough grading is completed or sufficient soil is exposed to require protection to prevent erosion. Such protection shall be by accelerated growth of permanent vegetation, temporary vegetation, mulching, or netting. Stabilize slopes by hydroseeding, anchoring mulch in place, covering with anchored netting, sodding, or such combination of these and other methods necessary for effective erosion control.

3.3 CONTROL AND DISPOSAL OF SOLID, CHEMICAL AND SANITARY WASTES:

- A. Pick up solid wastes and place in containers that are emptied on a regular schedule. The preparation, cooking and disposing of food is strictly prohibited on the project site. Conduct handling and disposal of wastes to prevent contamination of the site and other areas. On completion, leave areas clean and natural looking. Remove signs of temporary construction and activities incidental to construction of permanent work in place
- B. Disposal of Rubbish, Garbage, and Debris: dispose of rubbish, garbage and debris in accordance with the requirements specified herein.

- C. Sewage, Odor, and Pest Control: dispose of sewage through chemical toilets or comparable effective units and periodically empty wastes. Include provisions for pest control and elimination of odors.
- C. Petroleum Products: conduct fueling and lubricating of equipment and motor vehicles in a manner that affords the maximum protection against spills and evaporation. Dispose of lubricants to be discarded and excess oil in accordance with approved procedures meeting federal, state and local regulations.

3.4 DUST CONTROL:

- A. Keep dust down at all times, including nonworking hours, weekends, and holidays. Sprinkle or treat the soil at the site, haul roads, and other areas disturbed by operations with dust suppressers. Petroleum products will not be used as suppressers. No dry power brooming is permitted. Instead use vacuuming, wet mopping, wet sweeping, or wet power brooming.

END OF SECTION 312500.13

SECTION 321116 - BORROW AND BEDDING MATERIAL (SUBBASE COURSES)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide, place and compact borrow and bedding material in authorized excavation(s) below normal depth and in other location(s) as shown on the Drawings and/or as specified herein.

B. Related Work Specified Elsewhere:

1. Trench Excavation - Earth, Trench Excavation - Ledge, Trench Backfilling, Compaction, Control and Testing are specified in the appropriate sections in this division.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Gravel Borrow:

1. Well graded granular material having no rocks with a maximum dimension over 6-inches, except where it is used for pipe bedding in which case the maximum size shall be 2-inches.
2. Free from frozen material and other unsuitable material.
3. That portion passing a three inch square mesh sieve shall contain not more than 70 percent passing a 1/4 inch mesh sieve and not more than 10 percent passing a number 200 mesh sieve when used as pipe bedding material and not more than 5 percent passing a number 200 mesh sieve when used as backfill around structures.

B. Screened Stone (Bedding Material):

1. Shall be either screened stone or crushed stone and shall be well graded in size from 1/4 inch to 3/4 inch.
2. Clean, hard, and durable particles or fragments.
3. Free from dirt, vegetable, or other objectionable matter, and excess of soft, thin elongated, laminated or disintegrated pieces.

4. Sieve Analysis:

<u>Sieve Designation</u>	<u>% Passing by Weight Square Opening</u>
1"	100
3/4"	90-100
3/8"	20-50
No. 4	0-10
No. 8	0-5

C. Sand:

1. Clean, hard and durable particles or fragments.
2. Sieve Analysis:

<u>Sieve Designation</u>	<u>% Passing by Weight Square Opening</u>
3/8"	100
No.4	95-100
No. 16	50-85
No. 50	10-30
No. 100	2-10

D. Underdrain Backfill Material:

1. Free from organic matter.
2. Gradations:

Type "B" Underdrain	
<u>Sieve Designation</u>	<u>% by Weight Passing Square Mesh Sieves</u>
1 inch	95-100
½ inch	75-100
No. 4	50-100
No. 20	15-80
No. 50	0-15
No. 100	0-10

Type "C" Underdrain	
<u>Sieve Designation</u>	<u>% by Weight Passing Square Mesh Sieves</u>
1 inch	100
¾ inch	90-100
⅜ inch	0-75
No. 4	0-25
No. 10	0-5

3. Filter Fabric Lined Trench with 3"-6" coarse aggregate.
Shall conform to AASHTO T 27

E. French Drain Stone

1. Hard, durable rock.
2. Gradations:

<u>Sieve Designation</u>	<u>% by Weight Passing Square Mesh Sieves</u>
6 inch	90-100
1½ inch	0-40
No. 4	0-5

3. Shall conform to AASHTO T 27 except that the total material sampled shall be sieved and the minimum weight of the sample will be 120 pounds.

- F. 3/4"-Crushed Stone: Crushed Stone shall be a uniform material, containing angular pieces, as are those which come from a mechanical crusher. Gradation requirements shall be as follows:

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
1"	98-100
3/4"	0-30
No. 200	0-3

- G. Impervious Dam Material: The impervious dam material shall be uniform natural or selected cohesive soil with minimum of 30 percent of the material passing a No. 200 sieve. It shall not contain vegetation, masses of roots, individual roots larger than 12 in. long or 1/2 in. in diameter or other porous or organic matter.
- H. Unsuitable Soil Materials: Shall be those defined in AASHTO M145, soil classification Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7; also, peat and other highly organic soils.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Place bedding material, initial backfill, impervious dam material and fill below pipe bedding in layers of uniform thickness not greater than six inches or as shown on the Drawings.
- B. Thoroughly compact each layer by means of a suitable vibrator or mechanical tamper.
- C. In excavations below normal depth or where unsuitable materials are excavated, gravel borrow shall be used unless ground water makes such usage not practical; if such is the case, then screened gravel shall be used.
- D. No stone 2" in diameter or larger shall be allowed within 6" of the pipe.
- E. Where soft silt and clay soils are encountered the trench shall be excavated 6 inches below the normal bedding and backfilled with 6-inches of compacted sand.
- F. No stone or rock greater than 12 inches measured at any point shall be placed in the trench backfill.
- G. The following schedule gives the minimum bedding requirements for various types of pipe.
Dimensions refer to distance below bottom of pipe.
- | | |
|----------------------------|---------------|
| 1. PVC or ADS Pipe | 6 inches min. |
| 2. P.E. Pipe | 6 inches min. |
| 3. Culverts and Underdrain | 6 inches min. |
| 4. Storm Drain Pipe | 6 inches min. |
- H. The following schedule gives the minimum initial backfill requirements for various types of pipes.
- | | |
|----------------------------|---|
| 1. PVC or ADS Pipe | 6 inches min. over the top of the pipe |
| 2. P.E. Pipe | 6 inches min. over the top of the pipe |
| 3. Culverts and Underdrain | 6 inches min. over the top of the pipe |
| 4. Storm Drain Pipe | 6 inches min. over the top of the pipe. |

END OF SECTION 321116

BORROW AND BEDDING MATERIAL (SUBBASE COURSES)

321116-3

SECTION 321123 - AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Aggregate base course.

1.2 RELATED SECTIONS

- A. Section 312333 – Trench Backfilling, Compaction, Control & Testing: Compacted fill under base course.

1.3 REFERENCES

- A. AASHTO M147-65 - Materials for Aggregate and Soil-Aggregate.
- B. ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate for gravel base shall be screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the part that passes a 3-inch sieve shall meet the grading requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	“MDOT” Type A Aggregate	“MDOT” Type D Aggregate
1/2 inch	45 - 70	35 - 80
1/4 inch	30 - 55	25 - 65
No. 40	0 - 20	0 - 30
No. 200	0 - 6.0	0 - 7

Type "A" aggregate for base shall not contain particles of rock, which will not pass the 2-inch square mesh sieve.

Type "D" aggregate for base shall not contain particles of rock, which will not pass the 6-inch square mesh sieve.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify subbase has been inspected, gradients and elevations are correct, and are dry.

3.2 AGGREGATE BASE PLACEMENT

- A. Spread Type D base course aggregate over the prepared backfill. Place Type D base course aggregate in 8-inch layers and compact.
- B. Spread Type A base course aggregate over prepared Type D base course. Place Type A base course aggregate in a 3-inch layer and compact.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Compact placed aggregate materials to achieve compaction to 95 percent of its maximum dry density in accordance with ANSI/ASTM D698 and ANSI/ASTM D1557.
- F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- G. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.

3.3 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation from True Elevation: Within 1/2 inch.

3.4 FIELD QUALITY CONTROL

- A. Gradation of Aggregate: In accordance with ASTM C136.
- B. Compaction testing will be performed in accordance with ANSI/ASTM D698 and ANSI/ASTM D1557.

- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- D. Frequency of Tests: Owners and Engineers discretion.

END OF SECTION 321123

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Asphaltic concrete paving and surface sealer; wearing binder or base course.

1.2 RELATED SECTIONS

- A. Section 312213 – Rough Grading: Preparation of site for paving and base.
- B. Section 312333 – Trench Backfilling, Compaction, Control & Testing: Compacted subbase for paving.
- C. 321123 - Aggregate Base Course

1.3 REFERENCES

- A. MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot Mix Types; The Asphalt Institute.
- B. MS-3 - Asphalt Plant Manual - The Asphalt Institute (AI).
- C. MS-8 - Asphalt Paving Manual - The Asphalt Institute (AI).
- D. MS-19 - Basic Asphalt Emulsion Manual, The Asphalt Institute (AI).

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with AI Manual MS-8.
- B. Mixing Plant: Conform to AI Manual MS-3.
- C. Obtain materials from same source throughout.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate for Binder Course Mix: MDOT 403.207
- B. Aggregate for Wearing Course Mix: MDOT 403.208

- C. Fine Aggregate: In accordance with MDOT standards.

2.2 ACCESSORIES

- A. Tack Coat (if required): Homogeneous, medium curing, liquid asphalt in accordance with MDOT standards.

2.3 ASPHALT PAVING MIX

- A. Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2 standards.
- B. Wearing Course: 5 to 7 percent of asphalt cement by weight in mixture in accordance with AI MS-2 standards.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that compacted aggregate base course is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.2 BASE

- A. Section 321123 - Aggregate Base Course forms the base construction for work of this Section.

3.3 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

- A. Thickness of binder course shall be in accordance with construction drawings.
- B. Thickness of surface course shall be in accordance with construction drawings.
- C. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas accessible to rolling equipment.
- D. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.4 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation from True Elevation: Within 1/2 inch.

3.5 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 2 days.

END OF SECTION 321216

321823.29 - SYNTHETIC FIELD SPORTS SURFACING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include GENERAL CONDITIONS and all other Division 1 - General Requirements as part of this section.
- B. It is the intent of this Section to specify an Infilled Synthetic Turf System that provides a high quality playing surface for multi-purpose MIAA athletic use that is similar to well-maintained natural grass. The finished surface shall be immediately firm, consistent and stable while providing long term durability, safety and shock attenuation. The Infilled Synthetic Turf System Vendor's attention is called to the testing requirements related to G-Max rating per ASTM F355-A. A G-Max rating of less than 90 or in excess of 165 at any time from acceptance through the end of the Warranty Period is unacceptable.
- C. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- D. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

- A. Provide an inspection and certification of subsurface drainage system and free draining subbase prior to commencement of subsequent work.
- B. Inspect existing edging for structural integrity to accept new synthetic turf. Perform replacement or repair if needed.
- C. Fine grade subgrade surface to meet subgrade elevations within the area to receive the synthetic turf system.
- D. Furnish and install a new Infilled Synthetic Turf System on the free draining base. Synthetic Turf system to include parallel long-slit film polyethylene fibers and spinneret or extruded monofilament fibers woven into a high quality polyurethane backing, resilient infill mix, and cast-in-place concrete nailer as shown on the plans and otherwise specified herein.
- E. Provide tufted, inlaid and/or painted lines and markings or other such graphics as shown on the Drawings and approved Shop Drawings.
- F. Provide all attachments and penetrations as required to complete the work as shown on the Drawings and approved Shop Drawings.
- G. Provide GMax and HIC testing upon completion. Testing and certifying of installed system shall be at the Contractor's expense.
- H. Provide warranty and field maintenance training.
- I. Provide Field Groomer and Sweeper attachments for field maintenance.

1.03 RELATED WORK

- A. 033000 Cast-In-Place Concrete
- B. 312000 Earthwork
- C. 321216 Asphalt Paving
- D. 334113 PVC Storm Drainage Piping
- E. 334626 Filter Fabric
- F. 334913 Catch Basins

1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM).
- B. Consumer Products Safety Commission (CPSC).
- C. US Lacrosse (USL).
- D. United States Soccer Federation (USSF).
- E. Federation Internationale de Football Association (FIFA).

1.05 QUALITY CONTROL

A. Experience:

1. Infilled Synthetic Turf System shall be provided by an experienced specialty vendor which shall have supplied at least 25 outdoor athletic field systems of 75,000 s.f. or greater of the type and installation process herein specified within the last three (3) year period.
2. Infilled Synthetic Turf System installation shall be performed by an experienced specialty contractor which shall have lain at least 25 outdoor athletic field systems of 70,000 sf. or greater of the type and installation process herein specified within the last three (3) year period.
3. All installation operations shall be performed by personnel fully familiar with the materials and their application under the full-time direction and supervision of a qualified technical supervisor directly employed by the Infilled Synthetic Turf System Vendor. Installation supervisors shall have a minimum of 3 years' experience in the installation of Infilled Synthetic Turf Systems.

B. Source Limitations: Obtain Infilled Synthetic Turf System including tufted synthetic turf yarn and carpet backings from a single Tufted Synthetic Turf Manufacturer. Provide additional system components including anchoring materials, seaming products, binders and adhesives, and infill materials meeting the criteria of this Specification Section from single sources.

C. Inspection and Acceptance: The Infilled Synthetic Turf System Vendor and Contractor shall inspect the subgrade and drainage system to verify their acceptance of installation and condition. Commencement of subsequent installation in a given work area indicates acceptance of underlying substrates and systems.

D. Planarity and Grade: Deviation in planarity within the finished surface shall not exceed 1/8" beneath a 10' straightedge. Deviation from a straight grade between levels on drawings shall not exceed 1/4".

- E. Protection: Heavy equipment or vehicles of any kind should not be allowed on the field area subsequent to the completion of the drainage system.
- F. Restoration of Damage: Infilled Synthetic Turf System Vendor shall exercise care in the execution of his work and avoid damage or defacement of adjacent or surrounding areas by using suitable protective means. Damage or defacement which occurs shall be remedied at Infilled Synthetic Turf System Vendor's cost to the satisfaction of the Awarding Authority.

1.06 SUBMITTALS

- A. Submit the following in accordance with the Conditions of the Contract and Division 1 Specifications:

- 1. Manufacturer's Literature:

- a. Submit a signed statement from the Infilled Synthetic Turf System Vendor that the Drawings and Specifications have been reviewed by a qualified representative of the Infilled Synthetic Turf System Vendor and major materials suppliers, and that they are in agreement that the materials and installation method to be used for the Infilled Synthetic Turf System are proper and adequate for use a multi-purpose athletic field in the State of Maine.
- b. A recent reference list of at least 25 fields supplied by the Infilled Synthetic Turf Vendor of the type and installation process specified herein with contract name, address and telephone number to enable such data to be validated prior to the commencement of work.
- c. A recent reference list of at least 25 fields installed by the Infilled Synthetic Turf Installer of the type and installation process specified herein with contract name, address and telephone number to enable such data to be validated prior to the commencement of work.
- d. Job Resumes of Infilled Synthetic Turf System Vendor's Installation Supervisor and Infilled Synthetic Turf System Installers.
- e. Cut Sheets for all materials required under this Section including third party ASTM certified lab reports.
- f. Manufacturer's written warranties for all individual components of the Infilled Synthetic Turf System.
- g. Provide a sample written 8-year labor and materials warranty from the Infilled Synthetic Turf System Vendor.
- h. Infilled Synthetic Turf System Vendor's written eight (8) year Infilled Synthetic Turf System warranty.
- i. Manufacturer's written warranties for the Field Groomer and Sweeper.
- j. Material Safety Data Sheets for all products listed in this Section.

2. Shop Drawings:
 - a. Provide details which illustrate the scope of work, including but not limited to materials, cross sections, subsurface and penetration details
 - b. Provide a seaming plan at 1"=20'-0".
 - c. Provide a striping plan at 1"=20'-0" which includes layout for all sports identified in Para 3.05 FIELD LAYOUT, showing field lines, center markings, boundaries, and other field markings in compliance with MIAA requirements and as otherwise shown on the drawings.
 - d. Supply shop drawings (including details) at an approved scale for location, installation and erection of the cast-in-place concrete nailer.
3. Product Samples and Information:
 - a. Provide color samples of manufacturer's standard parallel long-slit film polyethylene and spinneret or extruded monofilament fiber.
 - b. Provide a minimum 12-inch by 12-inch sample of slit film polyethylene and monofilament carpet. One edge of the sample shall contain a 4-inch tufted white line and a 4-inch yellow line inlaid through the middle to depict materials, colors and workmanship. Provide additional carpet samples for other colors required under this section.
 - c. Provide 12" long sample of 15" wide seaming tape.
 - d. Provide sieve analysis of infill materials for approval.
 - e. Provide a 1-quart sample of the infill mix at the Landscape Architect's approved mix ratio.
 - f. Provide information regarding future requirements for painting of field surface.
4. Provide delivery slips for all Infilled Synthetic Turf System materials delivered to the site.
5. Provide Field Maintenance Training and written Operations and Maintenance Manual to the Awarding Authority.
6. Provide As-Built Field Layout Drawing upon completion of Work.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle products in exact accordance with the Manufacturer's requirements and specifications.
- B. Products delivered to the site which are not in compliance with the requirements of this Section shall be removed from the site immediately at no cost to the Awarding Authority.

1.08 PROJECT CONDITIONS

- A. Weather Limitations: No part of the construction shall be conducted during a rainfall or when rainfall is imminent. No part of the construction shall be conducted unless both ambient and materials temperatures are at least 40 degrees F and rising.
- B. After a rainfall, sufficient time shall be given to allow surfaces and infill materials to dry before resuming work. Surfaces and materials shall be dry, as well as clean. Adhesives should not be applied within 12 hours after rainfall, or when rainfall is forecast.
- C. Do not apply Infilled Synthetic Turf System materials or components over wet, frozen, or muddy base.

1.09 WARRANTY

- A. Warranty: The Infilled Synthetic Turf System Vendor shall provide a third party insured warranty guaranteeing all manufactured and procured Infilled Synthetic Turf System materials and workmanship against damage by climatic conditions or proper and normal use (including the use of cleats) for a minimum period of eight (8) years from the official date of Substantial Completion. In addition, the Infilled Synthetic Turf Warranty shall guarantee all manufactured and procured materials and/or workmanship including such defects as premature decrease in infill height, premature decrease in pile height or weight (stipulated as more than 10% decrease), UV degradation, fading, seam rupture, dislodgement, inadequate drainage or inadequate air transmission. The guarantee shall be in writing, stating the any defects, including the need to remove and replace manufactured and/or procured materials will be repaired at no cost to the Awarding Authority within 7 days written notice of the Awarding Authority. The warranty coverage shall not be prorated nor limited to the amount of the usage. Warranty coverage shall provide for \$15 million per year in the aggregate and \$5 million per claim minimum.
- B. Performance Testing:
 - 1. The Infilled Synthetic Turf System Vendor shall, at their own expense, have G-Max testing performed by an approved and certified independent testing laboratory prior to requesting Substantial Completion. Testing shall consist of shock attenuation per ASTM F-355-A. The Awarding Authority and Landscape Architect shall be provided with copies of all testing.
 - 2. Testing shall be performed at the field's center, the goal locations for all sports and at 10 yards inside each corner of the field. Tests shall also be taken at 4 random spots as chosen by the Landscape Architect or Awarding Authority.
 - 3. At no time shall the G-Max be less than 90 nor exceed 165 at any one point of the field.
 - 4. In cases where the result of a test falls outside the specified values, additional tests shall be taken in 10-foot increments in 4 opposite directions (north, south, east and west) from the failing test point and each subsequent failing test point until all tests fall within the specified values. The failing area shall be marked off, repaired and retested by the Infilled Synthetic Turf System Vendor until all tests fall within the specified values.

5. G-Max testing during the remainder of the warranty period will be performed by and at the discretion of the Awarding Authority. Results of these tests will be provided to the Contractor and Infilled Synthetic Turf Vendor.

1.10 PATENT RIGHTS AND INFRINGEMENT

- A. There are various established performance criteria throughout this request for products and services. There may exist patent coverage for some means and methods of achieving those performance criteria. Bidders are responsible for ascertaining that means and methods of the products and services which they are providing are not being provided in violation of any such patent rights. Bidder's responsibilities are as follows:
 1. To hold harmless, the Awarding Authority, Landscape Architect and the Awarding Authority's other consultants, as to any violation to include dollar amounts that could be owed as a result of damages for infringement including potential treble damages as provided for under U.S. Patent Law.
 2. Any and all costs that the Awarding Authority, Landscape Architect and/or the Awarding Authority's other consultants, would incur in replacing materials and services which are determined to infringe patent rights.
 3. All administrative, legal and other costs that would be incurred as a result of an infringement.
- B. If any product or services proposed to be provided by the bidder are known by the bidder to be subject to any existing claims of infringement, bidder shall notify Awarding Authority and Landscape Architect of such claim and provide evidence of financial ability to perform on the above hold harmless requirements.

PART 2- PRODUCTS

2.01 INFILL SYNTHETIC TURF SYSTEM

- A. The turf fiber shall consist of a dual yarn system. The grass yarn shall be a combination of parallel long-slit film polyethylene and spinneret/extruded monofilament fibers. The fibers shall be tufted in a grass-like fabric to a finished pile height of approximately 2.00" and coated with a secondary backing of high-grade polyurethane. The synthetic turf fabric shall be filled with an infill product as identified in Para 2.03.
- B. All components and their installation method shall be designed and manufactured for use on outdoor athletic fields. The materials as hereinafter specified should be able to withstand full climatic exposure in all climates, be resistant to insect infestation, rot, fungus, mildew, ultraviolet light and heat degradation, and shall have the basic characteristics of flow-through drainage, allowing free movement of surface runoff through the synthetic turf fabric where such water may flow to the existing base and into the field drainage system.
- C. The finished playing surface shall appear as mowed grass with no irregularities and shall afford excellent traction for conventional athletic shoes of all types. The finished surface shall resist abrasion and cutting from normal use. The system shall be suitable for football, soccer, lacrosse, baseball, softball, PE classes, intramurals, and recreational use.

- D. The polyethylene parallel long-slit-film pile fiber and the spinneret/extruded monofilament fiber shall be a proven athletic caliber fiber designed specifically for outdoor use and stabilized to resist the effect of ultraviolet degradation, heat, foot traffic, water, and airborne pollutants. The pile fiber shall possess the following physical characteristics:

Linear Density (Denier) Monofilament Fibers	10,000 (min)	ASTM D 1577
Slit Film Fibers	8,000 (min)	ASTM D 1577
PE Yarn Thickness / Width Monofilament Fibers	240 +/- 10 microns	ASTM D 3218
Slit Film Fibers	110 +/- 10 microns	ASTM D 3218
Break Strength Monofilament Fibers	25 lb-F	ASTM D 2256
Slit Film Fibers	8 lb-F	ASTM D 2256
Pile Weight	50 oz/yd ²	ASTM D 5848

- E. The Pile fabric shall possess the following physical characteristics:

Finished Pile Height	2.00"	ASTM D 5823
Product Weight (total)	82 oz/yd ²	ASTM D 5848
Primary Backing Weight	8 oz/yd ²	ASTM D 5848
Secondary Backing Weight	24 oz/yd ²	ASTM D 5848
Fabric Width	15'	ASTM D 5793
Tuft Gauge	3/8	ASTM D 5793
Grab Tear Strength	200 lb-F	ASTM D 5034
Tuft Bind (Avg)	8 lb-F min.	ASTM D 1335

- F. Pre-Installation Submittal: Prior to the completed synthetic turf product being shipped to the project site, the synthetic turf manufacturer shall provide the in-house Production Report to the Landscape Architect. The Production Report shall be specific to the material being shipped, and include results of in-house testing completed on the turf manufactured for this project. The Production report must indicate that the synthetic turf being shipped is in compliance with all performance criteria identified in Paragraph D and E, above. The Production Report must be signed by the plant's Production Manager and/or Quality Control Manager who oversaw the manufacturing of this synthetic turf product. The Production Report must be submitted to and acknowledged by the project Landscape Architect prior to shipping material to the job site. The Landscape Architect hereby reserves the right to require that the General Contractor provide independent third party laboratory testing of the manufactured synthetic turf product to insure compliance with the identified performance criteria noted in paragraph D and E, above.
- G. Rolls shall be a minimum of 15 feet wide. Rolls shall be of sufficient length to cover from sideline to sideline without head seams.
- H. Adhesives for bonding tufted synthetic turf shall be two-component, solvent and water-free polyurethane adhesive for bonding jointing strips between panels of synthetic grass sheets. All products shall be obtained from a single manufacturer. Adhesive shall be equal to Ultrabond Turf PU 2K as manufactured by MAPEI, or approved equal.

- I. Tape for securing inlaid lines and logos shall be high quality coated cordura tape made specifically for Infilled Synthetic Turf applications with a minimum roll width of 15 inches. Products shall be equal to Ultrabond Turf Tape 100 as manufactured by MAPEI, or approved equal.
- J. The Infilled Synthetic Turf System Vendor shall provide double stitched locked seams to secure the synthetic turf panels. The Infilled Synthetic Turf System Vendor is informed that all seams shall be flat and indiscernible upon installation. Shearing of the slit film pile will not be permitted as a means of achieving a flat seam.
- K. If the Infilled Synthetic Turf Vendor intends to modify any of the above criteria, it shall first be approved in writing by the Awarding Authority prior to submitting a bid.
- L. Perimeter edge details, underground storm sewer piping and connections, and goal post foundations required for the system shall be as detailed and recommended by the manufacturer, and as approved by the Awarding Authority.
- M. Acceptable Infilled Synthetic Turf Systems include:
 - 1. Allsport Ultra by Greenfields USA, Dayton, TN, represented locally by Mark Curran tel. 978-761-5340
 - 2. Vertex Prime by Field Turf represented locally by Connor Schlegal tel. 610-301-2462
 - 3. Ultrablade DFE Extreme by Sprint Turf, Atlanta, GA represented locally by Andrew Giobbi tel 202-403-4348
 - 4. Rhino Blend by Astroturf, Dalton, GA, represented locally by Bob Lord tel. 774-513-0020
- N. Infill Materials shall be uniformly filled to a depth which leaves no more than 1/2" of exposed pile after settlement. Acceptable infill materials are outlined below.

2.02 INFILL MATERIAL

The synthetic turf infill material shall be specifically designed and manufactured for athletic use. Infill materials shall be uniformly filled to a depth which leaves no more than 1/2" of exposed fiber height after settlement and consist of a non-compacting mixture of silica sand and/or alternative infill as recommended by the manufacturer. Pre-approved infill systems include the following products and manufacturers:

- 1. Envirofill ® manufactured by USGreentech, L.L.C. A rounded silica sand with an acrylic coating, as recommended by manufacturer.
- 2. Geofill, as manufactured by ItalGreen S.P.A. Blend of organic material and rounded silica sand, as recommended by manufacturer.
- 3. PureGeo, as manufactured by Field Turf. Blend of organic material and rounded silica sand, as recommended by manufacturer
- 4. GreenPlay, as manufactured by GreenPlay Organics, L.L.C. Blend of organic material and rounded silica sand, as recommended by manufacturer
- 5. BrockFill, as manufactured by Brock USA. Blend of organic material and rounded silica sand, as recommended by manufacturer

2.03 RESILIENT UNDERLAYMENT (SHOCK PAD)

- 1. Submittals:
 - a. Product Data: Submit 8" x 8" product sample and technical data sheet.
 - b. Shop Drawings: Submit cross-sectional view showing product installation in relation to sub-base and synthetic turf (including edge attachment).

- c. Test Data: Submit listing of all applicable test data for compliance to specifications. All testing to be performed by independent sources following applicable ASTM or other internationally recognized standards and procedures.
- d. Installation: Submit copy of product installation instructions. Submit copy turf installation recommendations.
- e. Warranty: Submit copy of product 16 -Year warranty coverage.
2. Shall be SP-17™ by Brock® and as supplied by Brock International, Boulder CO 80301, or approved equal, locally represented by Eric Hughes tel 781-883-9663 Additional acceptable expanded polypropylene shock pad products include these sources:
 - a. ShockWave Ecobase, www.nottssport.co.uk
 - b. UltraBaseMAX, www.ultrabasesystems.com
3. Underlayment shall be 17 mm thick expanded polypropylene designed for athletic fields. Material thickness shall be based upon product thickness needed in order to meet the system performance requirements.
4. Gmax shall be between 75-120 throughout warranty period and must not exceed 120 for the life of the turf/infill/pad system.
5. HIC not to exceed 1000 for full turf system from a 1.4m drop height.
6. System must meet minimum critical fall height of 1.4m at installation per IRB Reg 22 and One Turf Concept with specified turf system.
7. Product shall drain at greater than 300 inches per hour.
8. Warranty shall be 16 years or more and cover the cost to replace or repair the turf in affected area in the event of product failure. Warranty must guarantee the turf/pad system not to exceed 120 Gmax for the life of the turf with no less than 1” of infill.
9. Product shall be 100% closed loop recycled. Recycling for energy not acceptable - Downcycling product is not acceptable.
10. When tested with the Deltec field tester, vertical deformation must remain between 7-11 mm.
11. Supplier must provide documentation that product meets human health screening levels and total threshold limit concentration using EPA Method 3052 and Title 22 (CAM 17) metals using EPA Method 6020/7471A and for hexavalent chromium using EPA Method 7196A.
12. Manufacturer must prove absence of heavy metals in production material, and a controlled chain of custody for all materials used.
13. All material used in the artificial system must meet environmental and human health standards established in this specification. Documentation of chain of custody for materials may be required.

14. Product must be of a homogeneous material composition. Variable material content will not be accepted
15. Product must be made in the USA.

2.04 CONCRETE SYNTHETIC TURF ANCHOR

- A. The concrete synthetic turf anchor for attaching the synthetic turf carpet shall be an extruded or cast-in-place concrete curb and shall be provided and installed as specified in Section 033000, Cast-In-Place Concrete Curb.

2.05 FIELD MAINTENANCE EQUIPMENT

- A. Field Groomer for routinely brushing the field shall be a drag broom unit equivalent to "Synthetic Sports Turf Groomer" with "Spring Tine Rake" attachment as manufactured by GreensGroomer Worldwide, Inc. PO Box 34151 Indianapolis IN 46234 (888) 298-8852 ext. 500, www.greensgroomer.com, or approved equivalent.
- B. Field Sweeper for routinely removing debris from the field shall be drag behind unit equivalent to "LitterKat" with magnetic bar attachment as manufactured by Greens Groomer Worldwide, Inc. PO Box 34151 Indianapolis IN 46234 (888) 298-8852 ext. 500, www.greensgroomer.com or approved equivalent.

PART 3- EXECUTION

3.01 GENERAL

- A. The installation shall be performed in full compliance with approved Shop Drawings.
- B. All installation operations shall be performed by personnel fully familiar with the materials and their application, under the full time direction and supervision of a qualified technical supervisor employed by the Vendor of the Infilled Synthetic Turf System. Installation supervisors shall have a minimum of 3 years of experience.
- C. The surface to receive the Infilled Synthetic Turf System shall be inspected and certified by the Contractor and Infilled Synthetic Turf System Vendor as ready for the installation of the Infilled Synthetic Turf System and must be perfectly clean as installation commences and shall be maintained in that condition throughout the process.

3.02 BASE VERIFICATION

- A. The Free Draining Base shall be inspected by the Contractor or Infilled Synthetic Turf System Vendor by means of a laser level on a 25-foot grid pattern. Based on the inspection of the topological survey, the Contractor or Infilled Synthetic Turf System Vendor shall fine grade the Free Draining Base suitably, including proper rolling and compaction. The Free Draining Base shall not be approved for tolerance to grade without obtaining a topographic survey. Submit electronic topographic survey to Landscape Architect for review and approval.
- B. The Free Draining Base shall be tested to insure a 95% maximum dry density per a standard proctor test at the contractor's expense.

- C. Upon written certification from the Contractor and Infilled Synthetic Turf Vendor that the Free Draining Base and drainage system have been properly installed, the Infilled Synthetic Turf System installation shall commence.

3.03 SHOCK PAD

- A. Install the shock pad in strict accordance with the manufacturer's recommendations. Shock pad installation shall be completed by the Synthetic Turf Installer and/or by a contractor certified by the approved shock pad manufacturer. An official representative from the shock pad manufacturer shall be present on the site at the commencement of the installation.
- B. The synthetic turf and shock pad shall be installed simultaneously. In order to reduce movement or damage, the shock pad shall only be installed as far ahead as 2 turf rolls and shall be completely covered at the end of each work day.
- C. As the infill is placed in on top of the turf, secure the shock pad to avoid shifting movement of line markings. Replace or reposition any panels that are shifted or damaged.

3.03 INFILLED SYNTHETIC TURF SYSTEM INSTALLATION

- A. Tufted Synthetic Turf shall be installed with no wrinkles, ripples or bubbles. Shearing of fibers, slits in the fabric or driven spikes or staples to relieve such defects will not be permitted.
- B. Tufted Synthetic Turf rolls with shall be installed perpendicularly across the field. Turf rolls shall be of sufficient length to permit full cross-field (sideline - sideline) installation. No head or cross seams will be allowed. Once all playing surface rolls have been installed, install sideline rolls perpendicularly to playing surface rolls and attached by stainless steel screws or ramset at a maximum of 18-inch intervals directly to the concrete nailer shelf. Rolls shall be installed so that tufted lines are placed as shown on the approved Shop Drawings. Care shall be taken to insure that seams are not located in close proximity to the sliding areas associated with the baseball infield.
- E. All Tufted Synthetic Turf seams shall be adhered with high strength tape and glued as stated above. The Infilled Synthetic Turf Vendor shall provide sewn seams. All seams shall run perpendicularly across the field. Seams shall be flat, tight, and permanent with no separation or fraying. Tufted Synthetic Turf Yarn pile that is trapped or glued between seems shall be freed from the seams by hand or other approved method to an upright position prior to brushing and infilling.
- F. All Tufted Synthetic Turf inlays, logos and other field markings shall be adhered with high strength tape and glued as stated above. Inlay seams shall be flat, tight, and permanent with no separation or fraying. Tufted Synthetic Turf Yarn pile that is trapped or glued between inlay seams shall be freed from the seams by hand or other approved method to an upright position prior to brushing and infilling.
- G. Upon completion of seaming and inlaying and prior to infilling, the entire field shall be brushed with a motorized rotary nylon broom to free trapped or tangled fibers. The blended infill materials shall be spread evenly by using a drop spreader in uniform rate multiple applications until the specified infill depth (after settlement) is achieved. Between each application of the blended infill materials the field shall be brushed in multiple directions with the motorized nylon broom to stand the pile upright and fully distribute the blended infill materials within the pile.
- H. Upon completion the Infilled Synthetic Turf System Vendor shall provide the Awarding Authority with independent testing data stating that the finished field falls within the required minimum and maximum G-Max ratings. The cost of this test shall be the responsibility of the contractor.

3.04 FIELD LAYOUT

A. Soccer Field:

1. Soccer Field shall be marked in accordance with NFHS Rules and Interpretations, latest edition.
2. Field shall have 4" wide inlaid yellow center, halfway, goal line and touchlines. All other field markings shall be installed per the approved Shop Drawings.
3. Perimeter dimensions taken to the outside of the line.

B. Men's Lacrosse Field:

1. Lacrosse Field shall be marked in accordance with NFHS Rules and Interpretations, latest edition.
2. The center, side and end shall all be 4" wide, the goal lines shall be 2" wide. The restraining line shall be 2" width on both side of the common football yard line. All lines to be inlaid, color to be selected by owner from manufacturer's standard range of colors.
3. Perimeter dimensions taken to the outside of the line.

C. Women's Lacrosse Field:

1. Lacrosse Field shall be marked in accordance with NFHS Rules and Interpretations, latest edition.
2. The center, side, end and restraining lines shall all be 4" wide, and common with soccer. The goal lines shall be 2" wide. All lines to be inlaid, color to be selected by owner from manufacturer's standard range of colors.
3. Perimeter dimensions taken to the outside of the line.

D. Field Hockey Field:

1. Field Hockey Field shall be marked in accordance with NFHS Rules and Interpretations, latest edition.
2. All lines to be inlaid, color to be selected by owner.
3. Perimeter dimensions taken to the outside of the line.

E. Football Field:

1. Football Field shall be marked in accordance with NFHS Field Diagram Guide Rules and Interpretations, latest edition.
2. Field shall have white inlaid lines, numbers, hashmarks and field markings, installed per the contract documents.
3. Perimeter dimensions taken to the outside of the line.

3.05 LOGOS AND GRAPHICS

- A. Electronic files for all logos and graphics will be provided to the Infilled Synthetic Turf Vendor by the Landscape Architect. Do not scan images from the Project Documents or Approved Shop Drawings or download images from websites for use in fabricating logos or graphics. Logos and graphics as indicated on the Drawings shall be inlaid per the Approved Shop Drawing. Logos and graphics shall be cut via laser and assembled offsite for one piece installation. Infilled Synthetic Turf System Vendor to provide mechanical perforations in the assembled logos and graphics as required to meet the specified drainage and air transmission requirements of the Infilled Synthetic Turf System.

3.06 AS BUILT FIELD LAYOUT DRAWING

- A. Provide As-Built Field Layout Drawing including verification of field layout dimensions to the Landscape Architect.

3.07 FIELD GROOMER AND SWEEPER

- A. Deliver Field Groomer and Sweeper to Awarding Authority and provide operational and field maintenance training.

3.08 CLEAN UP

- A. Provide the labor, supplies and equipment as necessary for final cleaning of surfaces and installed items. Surfaces, recesses, enclosures, etc. shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate use by the Awarding Authority.

3.09 ACCEPTANCE

- A. Should any imperfections develop in the surface areas prior to the final acceptance of the work, they shall be removed and replaced with new materials.
- B. All such repair work shall be done at no additional cost to the Awarding Authority.

PART 4 – ALTERNATE SYNTHETIC TURF SYSTEMS

4.01 ADD ALTERNATE #1 – IRON TURF BY GREENFIELDS

- A. Furnish and install a high performance synthetic turf and shock pad system, in lieu of the synthetic turf and shockpad system specified under Part 2 Products. All physical properties, system performance, testing and quality requirements specified under Parts 1, 2 and 3 of this Section apply to Part 4 except as noted in Part 4.
- B. Alternate synthetic turf product shall include:
 - 1. Total turf system shall consist of the Polyolefin Family of thermoplastics. Mixing of different polymer families and/or variable material content will not be accepted. Turf system shall be of a homogeneous material composition. Urethane coatings are not acceptable.
 - 2. Total turf carpet system shall be fully, 100% closed-loop (cradle-to-cradle) recyclable. Recycling for energy will not be accepted. Down-cycling to lower-grade products is not acceptable.
 - 3. Turf system shall be fabricated as a woven system consisting of a blend of monofilament and slit-film fibers.
 - 4. Denier of fiber bundle shall be 80,000

5. Turf break strength shall be greater than 18.0lbs
 6. Total weight of turf shall be a minimum of 85oz/yd²
 7. Face weight of turf shall be a minimum of 59oz/yd²
 8. Secondary backing shall be 13.0oz/yd² and of a compatible composition as the fibers to maintain the fully 100% recyclability
 9. Tuft bind shall be greater than 18lbs (80N)
 10. Turf shall provide a warranty of TEN (10) YEARS, see item 1.6 for all other warranty requirements.
 11. Turf shall surpass 300,000 Lisport Cycles as certified by a 3rd party independent testing agency.
- C. The synthetic turf system submitted to and approved by the engineer and Owner shall be the following specified system No other systems will be considered without comprehensive demonstration submitted by the Contractor that an alternative clearly meets all specified material, performance and qualification requirements.
1. IronTurf UltraGreen by Greenfields USA, Dayton, TN, represented locally by Mark Curran tel. 978-761-5340
- D. RESILIENT UNDERLAYMENT (SHOCK PAD)
1. Shall be PowerBase YSR™ by Brock® and as supplied by Brock International, Boulder CO 80301, approved equal, locally represented by Eric Hughes tel 781-883-9663

4.02 ADD ALTERNATE #2 – VERTEX PRIME BY FIELD TURF

- A. Artificial grass FieldTurf system materials shall consist of the following:
1. Carpet made of slit-film/monofilament polyethylene fibers tufted into a fibrous, non-perforated, porous backing. Alternating row monofilament and slit-film carpet constructions are not permitted.
 2. Infill: graded sand and cryogenic rubber crumb that partially covers the carpet.
 3. Glue, thread, paint, seaming fabric and other materials used to install and mark the artificial grass slit-film/monofilament FieldTurf.
- B. The installed artificial grass slit-film/monofilament FieldTurf shall have the following properties:

<u>Standard</u>	<u>Property</u>	<u>Specification</u>
	Yarn Structure – A	Slit-Film
ASTM D1577	Yarn Denier - A	5,000
	Yarn Structure – B	Ridged Monofilament
	Yarn Denier – B	14,000+
ASTM D5823	Min. Pile Height	2.5”
ASTM D1577	Fiber Thickness A/B	130/360 Microns
ASTM D5793	Stitch Gauge	3/4”
ASTM D5848	Pile Weight	47oz/square yard
ASTM D5848	Primary Backing	7+oz/square yard
ASTM D5848	Secondary Backing	14+oz/square yard
ASTM D5848	Total Weight	68+oz/square yard
ASTM D1335	Tuft Bind (Without Infill)	8+lbs
ASTM D5034	Grab Tear (Width)	200 lbs/force
ASTM D5034	Grab Tear (Length)	200 lbs/force
ASTM D4491	Carpet Permeability	>40 inches/hour
ASTM F1936	Impact Attenuation (Gmax)	<200
	Min. Infill Material Depth	1.75 inches
	Min. Sand Infill Component	6.2lbs/square foot
	Min. Cryogenic Rubber Infill	3lbs/square foot
	Total Product Weight	1393oz/square yard

Variation of +/- 5% on above listed properties is within normal manufacturing tolerances

- C. Carpet shall consist of slit-film/monofilament fibers tufted into a primary backing with a secondary backing.
- D. Carpet Rolls shall be 15’ wide rolls.
1. Rolls shall be long enough to go from field sideline to sideline.
 2. Where the playing field is for football, the perimeter white line shall be tufted into the individual sideline rolls.
- E. Backing:
1. Primary backing shall be a minimum double-layered polypropylene fabric
 2. Secondary backing shall permanently lock the fiber tufts in place.
 3. Perforated (with punched holes), backed carpet is unacceptable.

- F. Fiber shall be measuring no less than 2 ½ inches high.
1. Systems with less than a 2 ½ inch fibers are unacceptable.
- G. Infill materials shall be approved by the manufacturer.
1. Infill shall consist of a resilient granular system, comprising selected and graded sand and cryogenically hammer-milled SBR rubber crumb.
 2. Artificial Grass products without cryogenically processed rubber shall not be accepted.
- H. The sand infill will comply within the following characteristics:
- Average Particle size between 20 and 30 mesh [calculated based on summing the midpoint of sieve pan fractions times the % retained on given screen fractions]
 - Average Particle shape > 0.4 on the Krumbein scale
 - Particle structure predominantly single grain
 - Produce < 0.4%, -50M in API crush test at 80psig
- I. Non-tufted or inlaid lines and markings shall be painted with paint approved by the synthetic turf manufacturer.
- J. Thread for sewing seams of turf shall be as recommended by the synthetic turf manufacturer.
- K. Glue and seaming fabric for inlaying lines and markings shall be as recommended by the synthetic turf manufacturer.

END OF SECTION 321823.29

SECTION 329119 - LANDSCAPE GRADING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Finish grade subsoil and proof roll.
- B. Place, level, and compact topsoil.

1.02 RELATED WORK

- A. Section 312213 - Rough Grading: Subsoil contouring.
- B. Section 312333 – Trench Backfilling: Backfilling and compacting fill.
- C. Section 312316.13 - Trenching: Excavation, backfill, and compacting fill in trenches.
- D. Section 311216 – Bituminous Concrete Paving (Asphalt Paving)
- E. Section 329300 - Trees, Plants, and Ground Cover: Topsoil fill for trees, plants, and ground cover.

1.03 SAMPLES

- A. Submit samples under provisions of this contract.
- B. Submit 10 lb sample of topsoil to testing laboratory, in airtight container.

1.04 PROTECTION

- A. Protect landscaping and other features remaining as final work.
- B. Protect existing structures, fences, roads, sidewalks, paving, and curbs.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Topsoil: Reused, free of subsoil, roots, grass, excessive amount of weeds, stone, and foreign matter
- B. Topsoil: Imported, friable loam; free of subsoil, roots, grass, excessive amount of weeds, stone, and foreign matter; acidity range ph of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify site conditions and note irregularities affecting work of this Section.
- B. Beginning work of this Section means acceptance of existing conditions.

3.02 SUBSOIL PREPARATION

- A. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones in excess of 1/2 inch in size, and subsoil contaminated with petroleum products.
- B. Scarify subgrade to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.03 PLACING TOPSOIL

- A. Place topsoil in areas where sodding and planting is scheduled.
- B. Use topsoil in relatively dry state. Place during dry weather.
- C. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade.
- D. Remove stone, roots, grass, weeds, debris, and foreign material while spreading.
- E. Manually spread topsoil around trees, plants and buildings to prevent damage.
- F. Lightly compact or roll placed topsoil.
- G. Remove surplus subsoil and topsoil from site.
- H. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.04 TOLERANCES

- A. Top of Topsoil: Plus or minus 1/2 inch.

3.05 SCHEDULE OF LOCATIONS

- A. The following paragraphs identify compacted topsoil thicknesses for various locations.
- B. Sod or loam and seed: 4 inches.
- C. Shrub Beds: 18 inches.

SECTION 329219 - SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish, place, and test topsoil, seed, lime, and fertilizer where shown on the drawings and protect and maintain seeded areas disturbed by construction work, as directed by the Engineer.
- B. Related Work Specified Elsewhere (When Applicable): Earthwork, excavation, backfill, compaction, site grading and temporary erosion control are specified in the appropriate Sections of this Division.

1.2 SUBMITTALS AND TESTING

A. Seed:

- 1. Furnish the Engineer with duplicate signed copies of a statement from the vendor, certifying that each container of seed delivered to the project site is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements.
- 2. This certification shall appear in, or with, all copies of invoices for the seed.
- 3. The certification shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates and certificates have been approved.
- 4. Each lot of seed shall be subject to sampling and testing, at the discretion of the Engineer, in accordance with the latest rules and regulations under the Federal Seed Act.

B. Topsoil:

- 1. Inform the Engineer, within 30 days after the award of the Contract, of the sources from which the topsoil is to be furnished.
- 2. Obtain representative soil samples, taken from several locations in the area under consideration for topsoil removal, to the full stripping depth.
- 3. Have soil samples tested by an independent soils testing laboratory, approved by the Engineer, at the Contractor's expense.
- 4. Have soil samples tested for physical properties and pH (or lime requirement), for organic matter, available phosphoric acid, and available potash, in accordance with standard practices of soil testing.
- 5. Approval, by the Engineer, to use topsoil for the work will be dependent upon the results of the soils tests.

C. Lime & Fertilizer:

- 1. Furnish the Engineer with duplicate copies of invoices for all lime and fertilizer used on the project showing the total minimum carbonates and minimum percentages of the material furnished that pass the 90 and 20 mesh sieves and the grade furnished.
- 2. Each lot of lime and fertilizer shall be subject to sampling and testing at the discretion of the Engineer.
- 3. Sampling and testing shall be in accordance with the official methods of the Association of Official Agricultural Chemists.

4. Upon completion of the project, a final check may be made comparing the total quantities of fertilizer and lime used to the total area seeded. If the minimum rates of application have not been met, the Engineer may require the Contractor to distribute additional quantities of these materials to meet the minimum rates.

1.3 DELIVERY, STORAGE & HANDLING

A. Seed:

1. Furnish all seed in sealed standard containers, unless the Engineer grants exception in writing.
2. Containers shall be labeled in accordance with the United States Department of Agriculture's rules and regulations under the Federal Seed Act in effect at the time of purchase.

B. Fertilizer:

1. Furnish all fertilizer in unopened original containers.
2. Containers shall be labeled with the manufacturer's statement of analysis.

1.4 JOB CONDITIONS

- #### A. Topsoil:
- Do not place or spread topsoil when the subgrade is frozen, excessively wet or dry, or in any condition otherwise detrimental, in the opinion of the Engineer, to the proposed planting or to proper grading.

B. Seeding:

1. Planting Seasons: The recommended seeding time is from April 1 to September 15. The Contractor may seed at other times except as indicated in the erosion and sedimentation control report. Regardless of the time of seeding, the Contractor shall be responsible for each seeded area until it is accepted.
2. Weather Conditions:
 - a. Do not perform seeding work when weather conditions are such that beneficial results are not likely to be obtained, such as drought, excessive moisture, or high winds.
 - b. Stop the seeding work when, in the opinion of the Engineer, weather conditions are not favorable.
 - c. Resume the work only when, in the opinion of the Engineer, conditions become favorable, or when approved alternate or corrective measures and procedures are placed into effect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed:

1. Provide the grass seed mixture approved by the Engineer, having the following composition:
 - a. Park Mixture:
 - 50 percent Creeping Red Fescue
 - 30 percent Kentucky Bluegrass
 - 20 percent Perennial Rye

2. Do not use seed, which has become wet, moldy, or otherwise damaged in transit or during storage.

B. Topsoil:

1. Provide the quantity of topsoil necessary, in the opinion of the Engineer, to complete the work.
2. Resuse topsoil from stockpiled material or provide topsoil that is natural, friable clay-loam soil possessing the characteristics of representative soils which produce heavy growths of crops, grass, or other vegetation.
3. Provide topsoil which is reasonably free from subsoil, brush, objectionable weeds, other litter, clay lumps, stones, stumps, roots, objects larger than 2 inches in diameter, and toxic substances which might be harmful to plant growth or be a hindrance to grading, planting, and maintenance operations.
4. Obtain topsoil from naturally well-drained areas.

C. Lime:

1. Provide lime, which is ground limestone containing not less than 85% of total carbonate and of such fineness that 90% will pass a No. 20 sieve and 50% will pass a No. #100 sieve.
2. Coarser materials will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing a No. #100 sieve. No additional payment will be made to the Contractor for the increased quantity.

D. Fertilizer:

1. Provide a phosphorous-free fertilizer approved by the Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Equipment:

1. Provide all equipment necessary for the proper preparation of the ground surface and for the handling and placing of all required materials.
2. Demonstrate to the Engineer that the equipment will apply materials at the specified rates.

B. Soil: Perform the following work prior to the application of lime, fertilizer or seed.

1. Scarify the subgrade to a depth of 2 inches to allow the bonding of the topsoil with the subsoil.
2. Apply topsoil to a depth of 4 inches or as directed on areas to be seeded.
3. Trim and rake the topsoil to true grades free from unsightly variations, humps, ridges or depressions.
4. Remove all objectionable material and form a finely pulverized seedbed.

3.2 PERFORMANCE

A. Grading:

1. Grade the areas to be seeded as shown on the Drawings or as directed by the Engineer.
2. Leave all surfaces in even and properly compacted condition.
3. Maintain grades on the areas to be seeded in true and even conditions, including any necessary repairs to previously graded areas.

B. Placing Topsoil:

1. Uniformly distribute and evenly spread topsoil on the designated areas.
2. Spread the topsoil in such a manner that planting work can be performed with little additional soil preparation or tillage.
3. Correct any irregularities in the surface resulting from top soiling or other operations to prevent the formation of depressions where water may stand.
4. Thoroughly till the topsoil to a depth of at least 3 inches by plowing, discing, harrowing, or other approved method until the condition of the soil is acceptable to the Engineer.

C. Placing Fertilizer:

1. Distribute fertilizer uniformly at a rate determined by the soils test over the areas to be seeded.
2. Incorporate fertilizer into the soil to a depth of at least 3 inches by discing, harrowing, or other methods acceptable to the Engineer.
3. The incorporation of fertilizer may be a part of the tillage operation specified above.
4. Distribution by means of an approved seed drill equipped to sow seed and distribute fertilizer at the same time will be acceptable.

D. Placing Lime:

1. Uniformly distribute lime immediately following or simultaneously with the incorporation of fertilizer.
2. Distribute lime at a rate determined from the pH test, to a depth of at least 3 inches by discing, harrowing, or other methods acceptable to the Engineer.

E. Seeding:

1. Level out any undulations or irregularities in the surface resulting from tillage, fertilizing, liming or other operations before starting seeding operations.
2. Hydro seeding:
 - a. Hydro seeding may be performed where approved and with equipment approved by the Engineer.
 - b. Sow the seed over designated areas at a minimum rate of 5 pounds per 1000 square feet.
 - c. Seed and fertilizing materials shall be kept thoroughly agitated in order to maintain a uniform suspension within the tank of the hydro seeder.
 - d. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates.
3. Drill Seeding: N/A
4. Broadcast Seeding:
 - a. Broadcast seeding may be performed by equipment approved by the Engineer.
 - b. Sow the seed uniformly over the designated areas at a rate of 5 pounds per 1,000 square feet.
 - c. Sow half the seed with the equipment moving in one direction and the remainder of the seed with the equipment moving at right angles to the first sowing.
 - d. Cover the seed to an average depth of 1/2 inch by means of hand raking, brush harrow, spike-tooth harrow, chain harrow, cultipacker, or other approved devices.

e. Do not perform broadcast seeding work during windy weather.

F. Compacting:

1. Seeded areas must be raked lightly after sowing unless seeding is to be directly followed by application of an approved mulch.
2. Compact the entire area immediately after the seeding operations have been completed.
3. Compact by means of a cultipacker, roller, or other equipment approved by the Engineer weighing 60 to 90 pounds per linear foot of roller.
4. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, use a pneumatic roller (not wobbly wheel) that has tires of sufficient size to obtain complete coverage of the soil.
5. When using a cultipacker or similar equipment, perform the final rolling at right angles to the prevailing slopes to prevent water erosion or at right angles to the prevailing wind to prevent dust.

3.3 PROTECTION & MAINTENANCE

A. Protection:

1. Protect the seeded area against traffic or other use.
2. Erect barricades and place warning signs as needed.

B. Maintenance:

1. Properly care for the seeded areas during the period when the grass is becoming established.
2. The protection period shall extend for 12 months after the completion of the entire project, unless the desired cover, in the opinion of the Engineer, is established in a shorter period of time.

3.4 ACCEPTANCE

- A. At final acceptance of the project all areas shall have a close stand of grass with no weeds present and no bare spots greater than three inches (3") in diameter over greater than five percent (5%) of the overall seeded area.

END OF SECTION 329219

SECTION 330526 - BURIED UTILITY MARKINGS (UTILITY LINE SIGNS, MARKERS & FLAGS)

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. This work shall consist of providing utility line markings installed above all buried lines installed as part of this contract as indicated on the Drawings and replacing existing markings disturbed as part of this contract.

B. Related Work Specified Elsewhere:

1. Pipe, excavation, backfill, insulation are specified in the appropriate Sections in this Division.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials and color shall be in accordance with latest AASHTO specifications for pipe and utility marking.
- B. For ferrous pipe material use 0.004" minimum polyethylene film; 6" wide clearly marking type of buried utility
- C. For non-ferrous pipe material (e.g. Concrete, PVC, PE, etc.) use detection tape composite of polyethylene and metallic core 6" wide clearly marking type of buried utility.
- D. Seton Identification Products, New Haven, CT, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Marking tape shall be installed over utility lines centerline and buried 24" below grade.
- B. Markings damaged during opening of trench shall be reinstalled with 2' overlap at broken sections.

END OF SECTION 330526

SECTION 334113 - POLYVINYL CHLORIDE (PVC) STORM DRAINAGE PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide and install PVC non-pressure pipe and fittings of the size(s) and type(s) and in the location(s) shown on the Drawings and as specified herein.

B. Related Work Specified Elsewhere: (When Applicable)

1. Excavation and backfill, dewatering, pavement, borrow and bedding material, and cleaning and testing requirements are specified in the appropriate sections of this division.
2. Pipe & Pipe Fittings.

1.2 QUALITY ASSURANCE

A. Manufacturers:

1. Certain-Teed.
2. J-M Manufacturing.
3. Or equivalent.

1.3 SUBMITTALS

- A. Submit shop drawings in accordance with the General Conditions of the Construction Contract.
- B. Submit manufacturer's "Certification of Conformance" that pipe and fittings meet or exceed the requirements of these Specifications.
- C. Submit other documents as specified in the appropriate Sections of this Division.

1.4 DELIVERY STORAGE AND HANDLING

- A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets and other materials.
- B. Carefully inspect all materials at the time of delivery and just prior to installation.
- C. Carefully inspect all pipe and fittings for:
 1. Defects and damage
 2. Deviations beyond allowable tolerances for joint dimensions.
 3. Removal of debris and foreign matter.
- D. Examine area and structures to receive piping for:
 1. Defects, such as weak structural components that adversely affect the execution and quality of work.
 2. Deviations beyond allowable tolerance for pipe clearances.

- E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.
- F. Immediately remove all rejected materials from the project site.

PART 2 - MATERIALS

2.1 MATERIALS

- A. Pipe and Fittings:
 - 1. The polyvinyl chloride pipe and fittings, including those required for stubs, shall conform to ASTM standard specification for PVC Sewer Pipe and Fittings, Designation D 3034 (SDR 35) (4" to 15"), F679 (18" to 27").
 - 2. Straight pipe shall be furnished in lengths of not more than 20 feet.
 - 3. Saddles will not be allowed.
- B. Joints:
 - 1. Joints for the polyvinyl chloride pipe shall be push-on joints using factory installed elastomeric ring gaskets.
 - 2. The gaskets shall be securely fixed in place by the manufacturer, so that they cannot be dislodged during joint assembly.
 - 3. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oils and ground water, and which will endure permanently under the conditions of the proposed use.
 - 4. The joints shall conform to ASTM Specifications for Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals, Designation D3212-76.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Inspection:
 - 1. Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight.
 - 2. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16 inch per foot of length.
 - 3. If a piece of pipe fails to meet this requirement for straightness it shall be rejected and removed from the site.
 - 4. Any pipe unit or fitting discovered to be defective, either before or after installation, shall be removed and replaced with a sound unit.
- B. Jointing:
 - 1. All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.
 - 2. Pipe and fittings shall be installed to the lines and grades indicated on the drawings or as required by the Engineer. Care shall be taken to insure true alignments and gradients.
 - 3. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation.

4. Each pipe unit shall than be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.
5. Joints shall not be "pulled" or "cramped" unless permitted by the Engineer.

C. Pipe Deflection:

1. Pipe provided under this specification shall be installed so there is no more than a maximum deflection of 5.0 percent. Such deflection shall be computed by multiplying the amount of deflection (normal diameter less minimum diameter when measured) by 100 and dividing by the nominal diameter of the pipe.
2. The Contractor shall wait a minimum of 30 days after completion of a section of sewer, including placement and compaction of backfill, before measuring the amount of deflection by pulling a specially designed gage assembly through the completed section. The gage assembly shall be in accordance with the recommendations of the pipe manufacturer and be acceptable to the Engineer.
3. Should the installed pipe fail to meet this requirement, the Contractor shall do all work to correct the problem as the Engineer may require without additional compensation.

D. Testing:

1. Clean and test pipe in accordance with appropriate sections of this division.

END OF SECTION 334113

SECTION 334626 - FILTER FABRIC

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

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

B. Related Work Specified Elsewhere:

1. Temporary Erosion Control, Riprap and Stone Ditch Protection, and Gabions and Revet Mattresses are specified in the appropriate sections of this Division.

1.2 QUALITY ASSURANCE

- A. A competent laboratory must be maintained by the manufacturer of the fabric at the point of manufacture to insure quality control.
- B. During all periods of shipment and storage, the fabric shall be wrapped in a heavy duty protective covering to protect the fabric from direct sunlight, ultraviolet rays, temperatures greater than 140°F, mud, dirt, dust and debris.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Filter fabric for use in stabilization, drainage, underdrains, erosion control, landscaping and beneath structures shall be formed in widths of not less than six (6) feet and shall meet the requirements of Table 1. Both woven and non-woven geotextiles are acceptable; however no "slit-tape" woven fabrics will be permitted for drainage, underdrain, and erosion control applications.

Table 1

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

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

- B. Filter fabric for use in reinforcement and under riprap shall meet the requirements of Table 2. Woven and non-woven geotextiles are acceptable.

Table 2

<u>Geotextile Mechanical Property</u>	<u>Test Method</u>	<u>Minimum Permissible Value</u>
Grab Tensile Strength (both directions)	ASTM 4595-86	195 pounds
Grab Elongation	ASTM D4632-86	20 percent
Mullen Burst Strength	ASTM D3786-87	340 psi
Puncture Strength	ASTM D3787	85 pounds
Trapezoid Tear Strength	ASTM D4533-85	85 pounds
Equivalent Opening Size (EOS)	ASTM D4751	U.S. Std. Sieve number(s) between #20 and #100

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

- C. Filter Fabric for use in siltation fencing shall be the following:
1. Environfence 100X (Mirafi)
 2. Supac 4NP (Phillip 66)
 3. Exxon 180 Siltfence
 4. Amoco 1380 Silt Stop
 5. Harris Siltfence
 6. Or equivalent

PART 3 - EXECUTION

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

END OF SECTION 334626

SECTION 334913 - CATCH BASINS, GRATES AND FRAMES (STORM DRAINAGE STRUCTURES)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Construct catch basins, grates, frames and brick masonry in conformance with the dimensions and locations shown on the Drawings.
- B. Related Work Specified Elsewhere: (Where applicable)
 - 1. Pipe, trench excavation and backfill, paving and dewatering are specified in the appropriate Sections in this Division.

1.2 QUALITY ASSURANCE

- A. Precast Catch Basin Field Inlet, and/or Base, Barrel and Top Sections:
 - 1. Conform to ASTM C478-72 (AASHTO M199-795) except as modified herein, on the Drawings, or as directed by the Engineer.
 - 2. Average strength of 4,000 psi at 28 days
 - 3. Testing:
 - a. Determine concrete strength by tests on 6 inch by 12 inch vibrated test cylinders cured in the same manner as the bases, barrels and tops.
 - b. Have tests conducted at manufacturer's plant or at an approved testing laboratory.
 - c. Have not less than 2 tests made for each 100 vertical feet of precast catch basin sections.
- B. Frames and Covers:
 - 1. Acceptable Manufacturers:
 - a. Etheridge Foundry Company
 - b. Neenah Foundry Company
 - c. E.L.LeBaron Foundry Company
 - d. Or equivalent.
- C. Masonry:
 - 1. Brick shall comply with the ASTM Standard Specifications for Sewer Brick (made from clay or shale), Designation C32, for Grade SS, hard brick (AASHTO M91-78).
 - 2. Cement: ASTM C-150 (AASHTO M85-79I).
 - 3. Hydrated Lime: ASTM C-207.
 - 4. Sand: ASTM C33 (AASHTO M6-65 C197A).

1.3 SUBMITTALS TO THE ENGINEER

- A. Submit shop Drawings and manufacturer's literature in conformance with the Standard General Conditions of the Construction Contract.
- B. Field Inlets, Bases, Barrel Sections and Tops: Submit test results and receive approval from the Engineer prior to delivery to the site.

PART 2 - PRODUCTS

2.1 PRECAST CATCH BASIN SECTIONS

- A. Dimensions, as shown on the Drawings.
- B. Use flat tops or eccentric cones as appropriate. Exterior face of cone sections shall not flare out beyond the vertical.
- C. Joints: Bell-and-spigot or tongue-and-groove formed on machine rings to insure accurate joint surfaces.
- D. Constructed to support an HS-20 wheel loading.
- E. Openings:
 - 1. Provide openings in the risers to receive pipes entering the catch basin of the types and materials approved by the Engineer.
 - 2. Make openings at the manufacturing plant or cut openings in the field.
 - 3. Size: To provide a uniform annular space between the outside wall of pipe and the riser.
 - 4. Location: To permit setting of the entering pipes at the correct elevations.
- F. Joints:
 - 1. Joint gaskets to be flexible self-seating butyl rubber joint sealant installed according to manufacturer's recommendations. For cold weather applications, use adhesive with joint sealant as recommended by manufacturer.
Acceptable Materials:
 - a. Kent-Seal No. 2
 - b. Ram-Nek
 - c. Or equivalent.
 - 2. Joints between precast sections shall conform to related standards and manufacturer's instructions.

2.2 FRAMES AND GRATES

- A. All essential details of design shall conform to the Drawings. The Engineer may approve standard castings differing in non-essential details.
- B. All frames and grates shall be made of cast iron and shall have machined bearing surfaces to prevent rocking under traffic.
- C. Grate castings will be smooth with no sharp edges.
- D. Constructed to support an HS-20 wheel loading.

2.3 MASONRY

A. Brick:

1. Sound, hard, uniformly burned, regular and uniform in shape and size, compact texture, and satisfactory to the Engineer.
2. Immediately remove rejected brick from the work.

B. Mortar:

1. Composition (by volume):
 - a. 1 part portland cement.
 - b. 1/2 part hydrated lime.
 - c. 4-1/2 parts sand.
2. The proportion of cement to lime may vary from 1:1/4 for hard brick to 1:3/4 for softer brick, but in no case shall the volume of sand exceed 3 times the sum of the volume of cement and lime.

C. Cement:

1. Shall be Type II portland cement.

D. Hydrated Lime:

1. Shall be Type S.

E. Sand:

1. Shall consist of inert natural sand.
2. Grading:

Sieve	Percent Passing
3/8	100
4	95-100
8	80-100
16	50-85
50	10-30
100	2-10
Fineness Modulus	2.3 - 3.1

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Precast Catch Basin Sections:

1. Perform jointing in accordance with manufacturer's recommendations and as approved by the Engineer.
2. Install barrels and tops level and plumb.
3. Make all joints water tight.
4. Solidly fill annular spaces around pipes entering the catch basin with non-shrink grout or other material approved by the Engineer.

5. Cut openings (as required) carefully to prevent damage to barrel sections and tops. Damaged barrel sections and tops shall be replaced by the Contractor at no additional expense to the Owner.
- B. Pipe Connections to Catch Basins: Connect pipes to catch basins with joint design and materials approved by the Engineer.
- C. Masonry:
1. Laying Brick:
 - a. Use only clean bricks in brickwork for catch basins.
 2. Moisten the brick by suitable means until they are neither so dry as to absorb water from the mortar or so wet as to be slippery when laid.
 3. Lay each brick in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and thoroughly bond as directed.
 4. Construct all joints in a neat workmanlike manner; construct the brick surfaces inside the manholes so they are smooth with no mortar extending beyond the bricks and no voids in the joints. Maximum mortar joints shall be 1/2 inch.
 5. Curing:
 - a. Protect brick masonry from drying too rapidly by using burlaps, which are kept moist, or by other approved means.
 - b. Protect brick masonry from the weather and frost as required.
- D. Frames and Grates:
1. Set all frames in a full bed of mortar, true to grade and concentric with the catch basin opening.
 2. Completely fill all voids beneath the bottom flange to make a watertight fit.
 3. Place a ring of mortar at least one inch thick around the outside of the bottom flange, extending to the outer edge of the catch basin all around its circumference.
 4. Clean the frame seats before setting the covers in place.
- E. Bedding and Backfilling:
1. Bedding material of catch basin shall be 6 inches of screened stone (see Section 02200).
 2. Backfill 18 inches all around catch basin with gravel borrow.

END OF SECTION 334913

**ALUMNI ARTIFICIAL TURF FIELD
SCHEDULE OF VALUES**

00310-3
Bid Form

ITEM	QUANTITY	UNIT	UNIT COST	TOT. COST
3/4" CRUSHED STONE	4,200	CY		
4" DIA. PERF. PVC PIPE	4,180	LF		
4" DIA. PVC PIPE		LF		
10" DIA. PERF. HDPE PIPE	1,480	LF		
GEOTEXTILES	45,000	SY		
SAND FILTER	75	CY		
CAST IN PLACE CONCRETE	120	CY		
ASPHALT	345	TON		
TYPE A GRAVEL	150	CY		
TYPE D GRAVEL	3,330	CY		
CATCH BASINS	2	EA		
FINISHING STONE	520	CY		
STONE DUST	65	CY		
GRANULAR BORROW		CY		
SCREENED TOPSOIL	150	CY		
TOTAL=				

MULTI-PURPOSE FIELD
SCHEDULE OF VALUES

00310-4
 Bid Form

ITEM	QUANTITY	UNIT	UNIT COST	TOT. COST
3/4" CRUSHED STONE	500	CY		
4" DIA. PERF. PVC PIPE	2,410	LF		
4" DIA. PVC PIPE	1,180	LF		
10" DIA. PERF. HDPE PIPE	1,000	LF		
GEOTEXTILES	10,500	SY		
SAND FILTER		CY		
CAST IN PLACE CONCRETE		CY		
ASPHALT		TON		
TYPE A GRAVEL		CY		
TYPE D GRAVEL		CY		
CATCH BASINS		EA		
FINISHING STONE		CY		
STONE DUST	65	CY		
GRANULAR BORROW	3000*	CY		
SCREENED TOPSOIL	2,000	CY		
TOTAL=				

* Fill to subgrade not included in granualr borrow quantity

FULLER FIELD ARTIFICIAL TURF &
MULTI-PURPOSE FIELD
BID #221033

BASIS OF BID

Dated: _____

The undersigned hereby proposes:

BASE BID: To furnish all labor, materials, tools, equipment, transportation, and other facilities and to perform all work for the construction, including but not limited to earthwork, stormwater pipes, catch basins, ditching, conduit, artificial turf & pad installation, turf field markings (football, soccer and field hockey lines), gravel, paving, sodding, loam, seed, stone and erosion control as shown on the contract drawings, at the lump sum price of:

_____ \$ _____

BONDS: Furnishing Performance Bond & Payment Bond \$ _____

SYNTHETIC TURF ADD ALTERNATES

As shown in Part 4 of the Synthetic Field Sports Surfacing specification (321823.29) provide an add-alternate cost above the base bid for the systems identified below. Base Bid includes a sand/rubber monofilament infill system.

1. Iron Turf – Green Fields \$ _____

2. Vertex Prime – Field Turf \$ _____

Contact information for pre-approved artificial turf providers:

1. Field Turf: Connor Schlegel (610)-301-2462
2. Green Fields: Mark Curran (978)-761-5340
3. NET Sports Group: Harlan Michaud (207)-391-4421
4. Sprint Turf: Andrew Giobbi (202)-403-4348
5. AstroTurf: Bob Lord (774)-513-0020



Preliminary Geotechnical Report

Synthetic Turf Alumni Field Cony High School Augusta, Maine

Prepared for:

City of Augusta

Prepared by:

Summit Geoengineering Services

Project #12131

July 2012



July 17, 2012
Summit #12131

City of Augusta
Attn: Jim Goulet
City Center Plaza
16 Cony Street
Augusta, ME 04330

Reference: Preliminary Geotechnical Investigation
Synthetic Turf for Alumni Field - Cony High School Augusta, Maine

Dear Jim,

We have completed a preliminary geotechnical investigation for a proposed synthetic turf surface for alumni field (football field) at Cony high school in Augusta, Maine. Our scope of services included performing 5 test pits at the site and preparing this preliminary report summarizing our findings and geotechnical considerations.

1.0 Project Description

We understand the project may consist of constructing a new synthetic turf surface for the existing alumni field (football field) at Cony high school. Currently the field consists of a natural grass surface surrounded by a 400-meter running track. The ground surface within the existing field is relatively flat with a slight center crown. Existing grades slope upward sharply at the northwest corner of the field towards an existing parking lot. We anticipate the new synthetic turf surface would be constructed at or near existing grade.

2.0 Explorations & Laboratory Testing

Summit Geoengineering Services (SGS) observed the subsurface conditions with the excavation of five test pits on July 12, 2012. The test pits were located by pacing from existing site features. The City of Augusta dug the test pits to a depth of 6 feet using a JD 310 SE Backhoe. Samples of the subgrade were obtained in test pits TP-2 at a depth of 4 to 6 feet and TP-3 at a depth of 0 to 1.5 feet. SGS was onsite to coordinate and observe the subsurface explorations. The location of the test pits is shown on the Test Pit Location Plan in Appendix A. Logs of the explorations are included in Appendix B.

A sample of marine clay from TP-2 was tested for Atterberg Limits in accordance with ASTM D4318 and for moisture content in accordance with ASTM D2216. A sample of existing fill from TP-3 was tested for grain size analyses in accordance with ASTM D422. Copies of the laboratory results are included in Appendix C.

3.0 Subsurface Conditions

The subsurface conditions generally consist of *topsoil* overlying *fill* overlying *glacial marine deposits* explored to a depth of 6 feet. *Bedrock* was not encountered in the test pits performed to a depth of 6 feet. The soil stratigraphy is further described as follows:

The *topsoil* ranged from 3 to 6 inches in thickness consisting of brown silty sand and is visually classified as SM in accordance with the Unified Soil Classification System (USCS). The topsoil was generally loose and damp.

The *fill* consisted of dark brown to brown gravelly sand with little silt. The fill is classified as SW-SM in accordance with the Unified Soil Classification System (USCS). The fill was generally compact and humid to damp.

The *glacial marine deposit* consist of olive brown to gray silty clay with occasional lenses of sand and gravel and is classified as CL in accordance with the USCS. The glacial marine clay was generally firm to stiff and damp to moist.

Bedrock was not encountered in the test pits to a depth of 6 feet. We understand relatively shallow bedrock was encountered within the northwest corner of the field during construction of Cony high school. Bedrock mapping by the Maine Geological Survey indicates the bedrock is Devonian quartz monzonite consisting of muscovite-biotite quartz monzonite.

Groundwater seepage was not observed in the explorations. Slight mottling within the glacial marine clay indicates seasonal groundwater may be present during wet periods. In general, we anticipate seasonal groundwater to become perched along the surface of the glacial marine clay layer during wet periods, flowing toward adjacent wet areas where positive drainage is present.

4.0 Evaluation

In general, the following preliminary geotechnical considerations should be incorporated in the design and construction of the synthetic field at this site.

- Presence of glacial marine clay and its moderate to high frost susceptibility.
- Potential for subgrade softening of glacial marine clay, especially when wet, resulting in potential need for subgrade reinforcement in the form of geotextile fabric or similar.
- Poor drainage characteristics of the glacial marine clay subgrade.

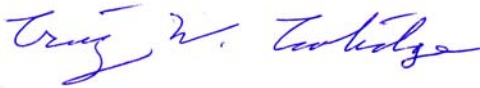
Consideration for clay subgrade conditions, groundwater control, and frost heave protection should all be considered for design of a synthetic turf field at Cony high school. Control of groundwater and surface water for the subgrade will be important to satisfactory performance of the synthetic turf field. Summit would welcome the opportunity to assist with further geotechnical consulting during the design phase and selection of the synthetic turf system.

5.0 Closure

Our recommendations are based on professional judgment and generally accepted principles of geotechnical engineering. Some changes in subsurface conditions from those presented in this report may occur. Should these conditions differ materially from those described in this report, Summit should be notified so that we can re-evaluate our recommendations.

We appreciate the opportunity to serve you during this preliminary phase of your project. If there are any questions or additional information is required, please do not hesitate to call.

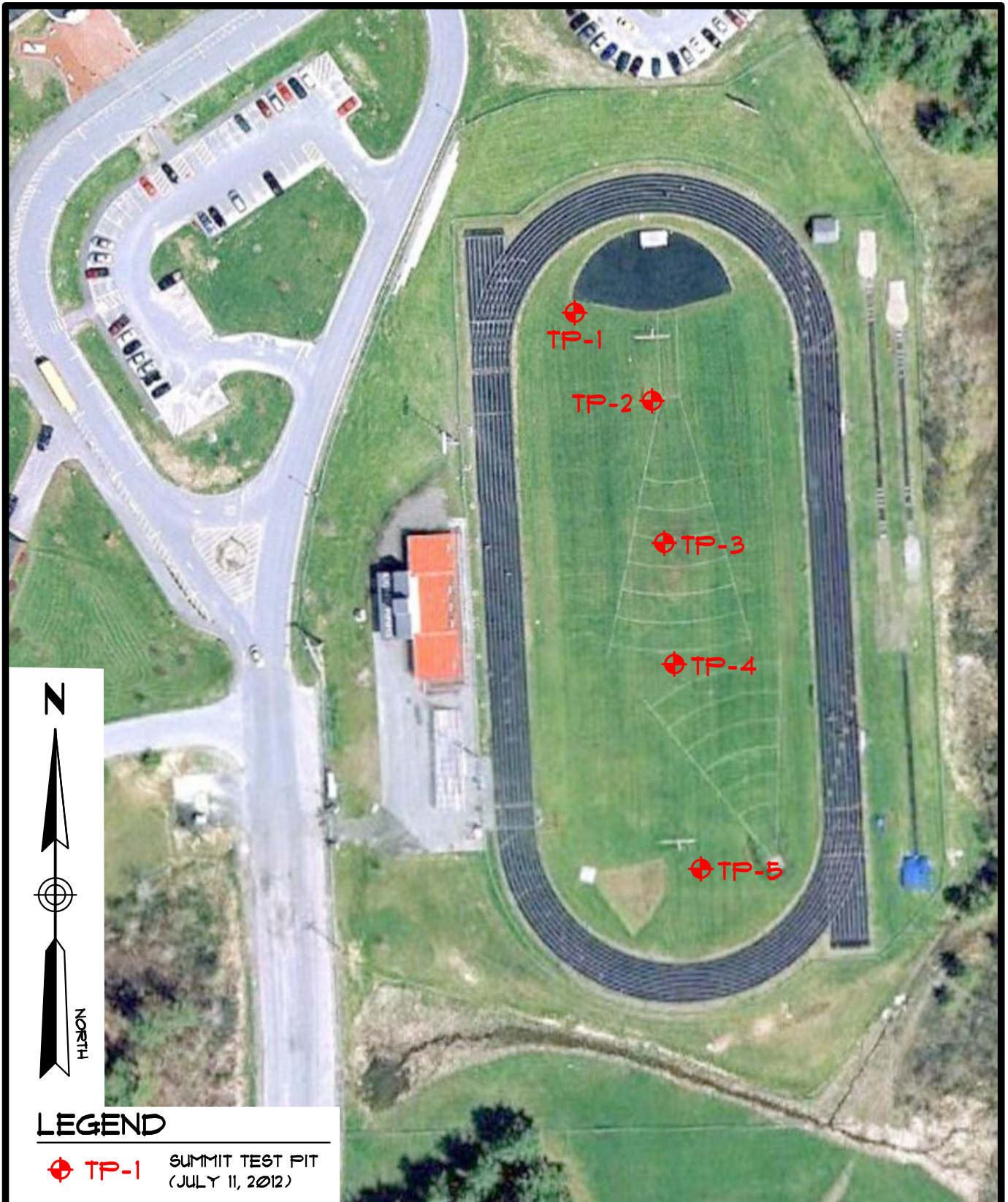
Sincerely yours,
Summit Geoenvironmental Services,



Craig W. Coolidge, P.E.
Vice President
Senior Geotechnical Engineer



APPENDIX A
SITE PLANS & MAPPING



LEGEND

 **TP-1** SUMMIT TEST PIT
(JULY 11, 2012)

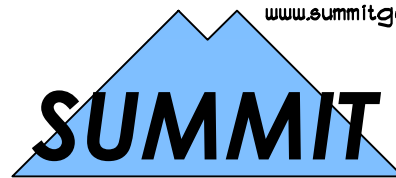
**TEST PIT LOCATION PLAN
NEW SYNTHETIC ATHLETIC FIELD**

CONY HIGH SCHOOL - AUGUSTA, MAINE
PREPARED FOR

CITY OF AUGUSTA

434 CONY ROAD
AUGUSTA, MAINE 04330

Tel.: (207) 318-7761
Fax: (207) 629-9094
www.summitgeoeng.com



GEOENGINEERING SERVICES

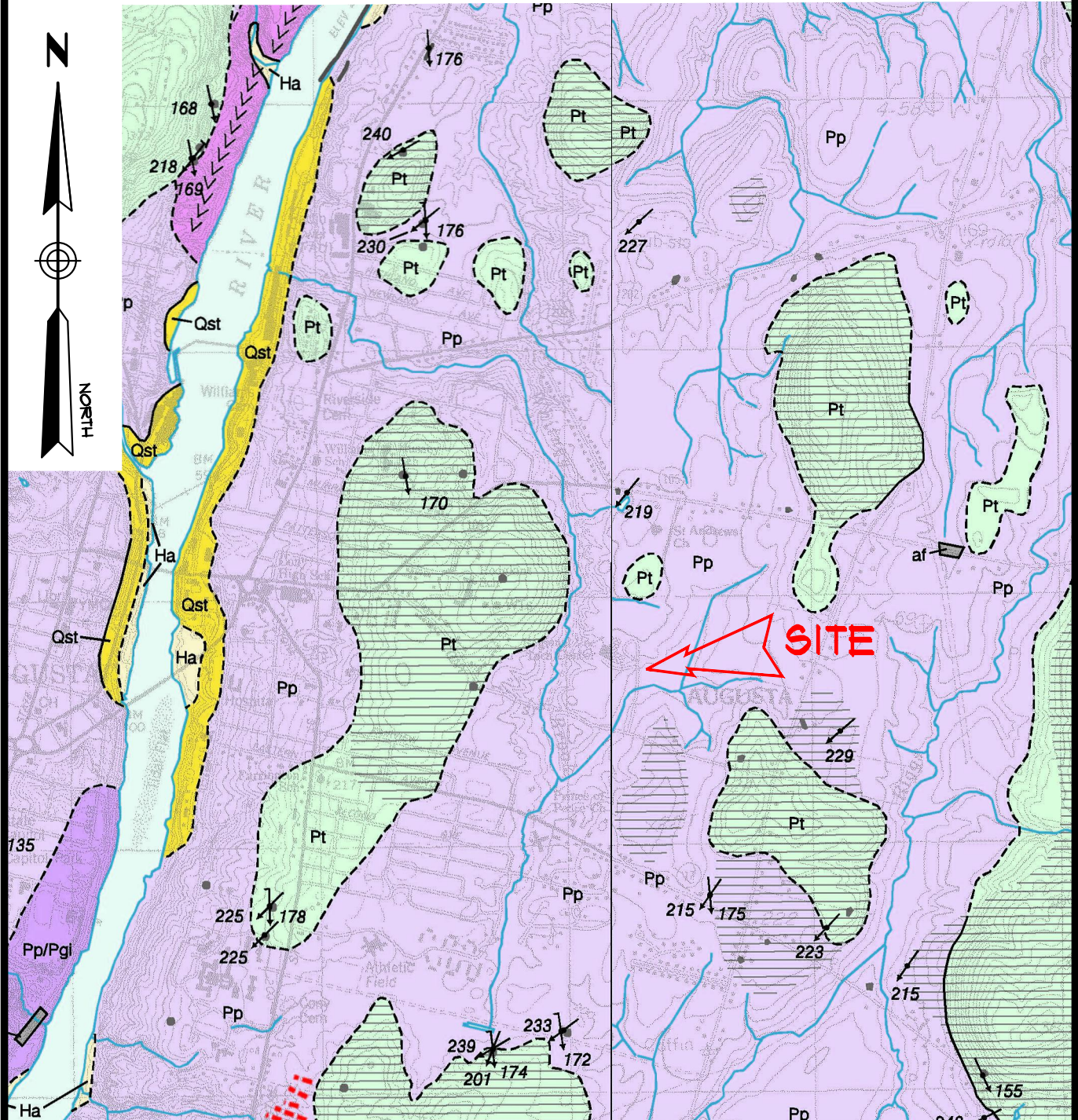
DATE: JULY 2012	DRAWN BY: KRF	CHECKED BY: CC
JOB: 12131	SCALE: 1" = 100'	FILE: 12131 MAPS

LEGEND

- Pt ESKER (SAND & GRAVEL)
- Pp PRESUMPCOT FORMATION
-  BEDROCK OUTCROPS / THIN DRIFT AREAS

MAP REFERENCE

MAINE GEOLOGICAL SURVEY, SURFICIAL GEOLOGY MAP, AUGUSTA & TOGUS POND QUADRANGLES, DATED 2007.



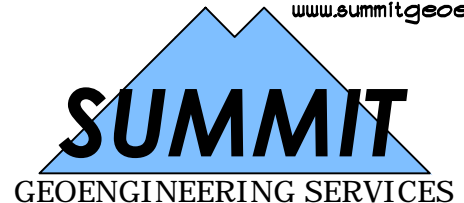
SURFICIAL GEOLOGY MAP NEW SYNTHETIC ATHLETIC FIELD

CONY HIGH SCHOOL - AUGUSTA, MAINE
PREPARED FOR
CITY OF AUGUSTA

434 CONY ROAD
AUGUSTA, MAINE 04330

Tel.: (207) 318-7761
Fax: (207) 629-9094
www.summitgeoeng.com

DATE: JULY 2012	DRAWN BY: KRF	CHECKED BY: CC
JOB: 12131	SCALE: 1" = 2000'	FILE: 12131 MAPS



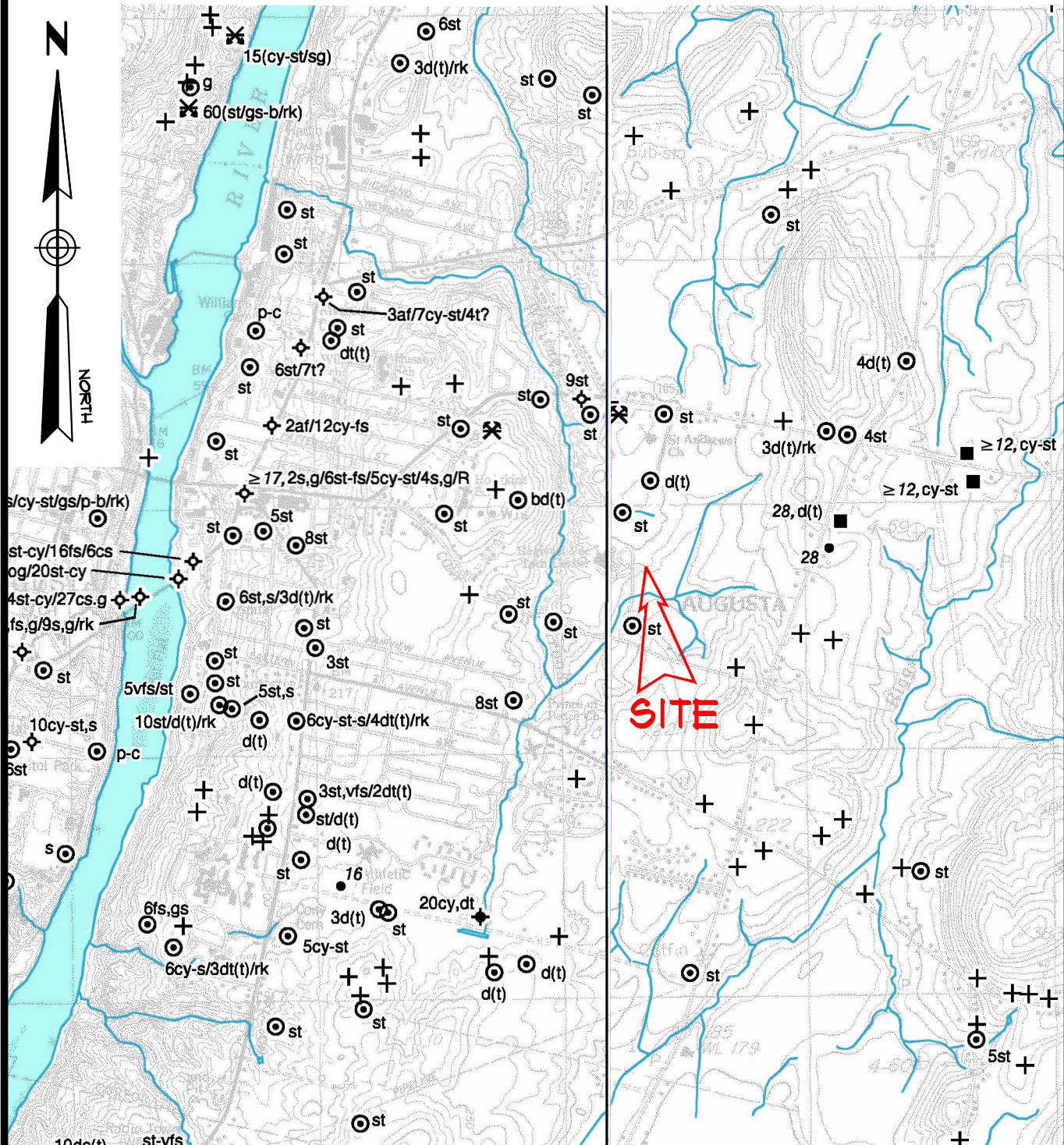
LEGEND

- MATERIALS DATA POINT
- + BEDROCK OUTCROP
- 19 ● BEDROCK WELL WITH DEPTH TO BEDROCK



MAP REFERENCE

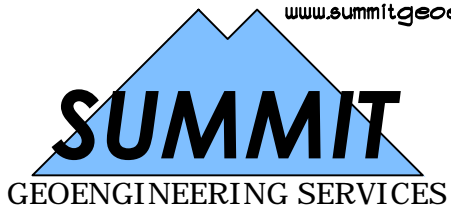
MAINE GEOLOGICAL SURVEY, SURFICIAL MATERIALS MAP, AUGUSTA & TOGUS POND QUADRANGLE, DATED 2005.



SURFICIAL MATERIALS MAP
NEW SYNTHETIC ATHLETIC FIELD
 CONY HIGH SCHOOL - AUGUSTA, MAINE
 PREPARED FOR
CITY OF AUGUSTA

434 CONY ROAD
 AUGUSTA, MAINE 04330

Tel.: (207) 318-7761
 Fax: (207) 629-9094
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DATE: JULY 2012	DRAWN BY: KRF	CHECKED BY: CC
JOB: 12131	SCALE: 1" = 2000'	FILE: 12131 MAPS

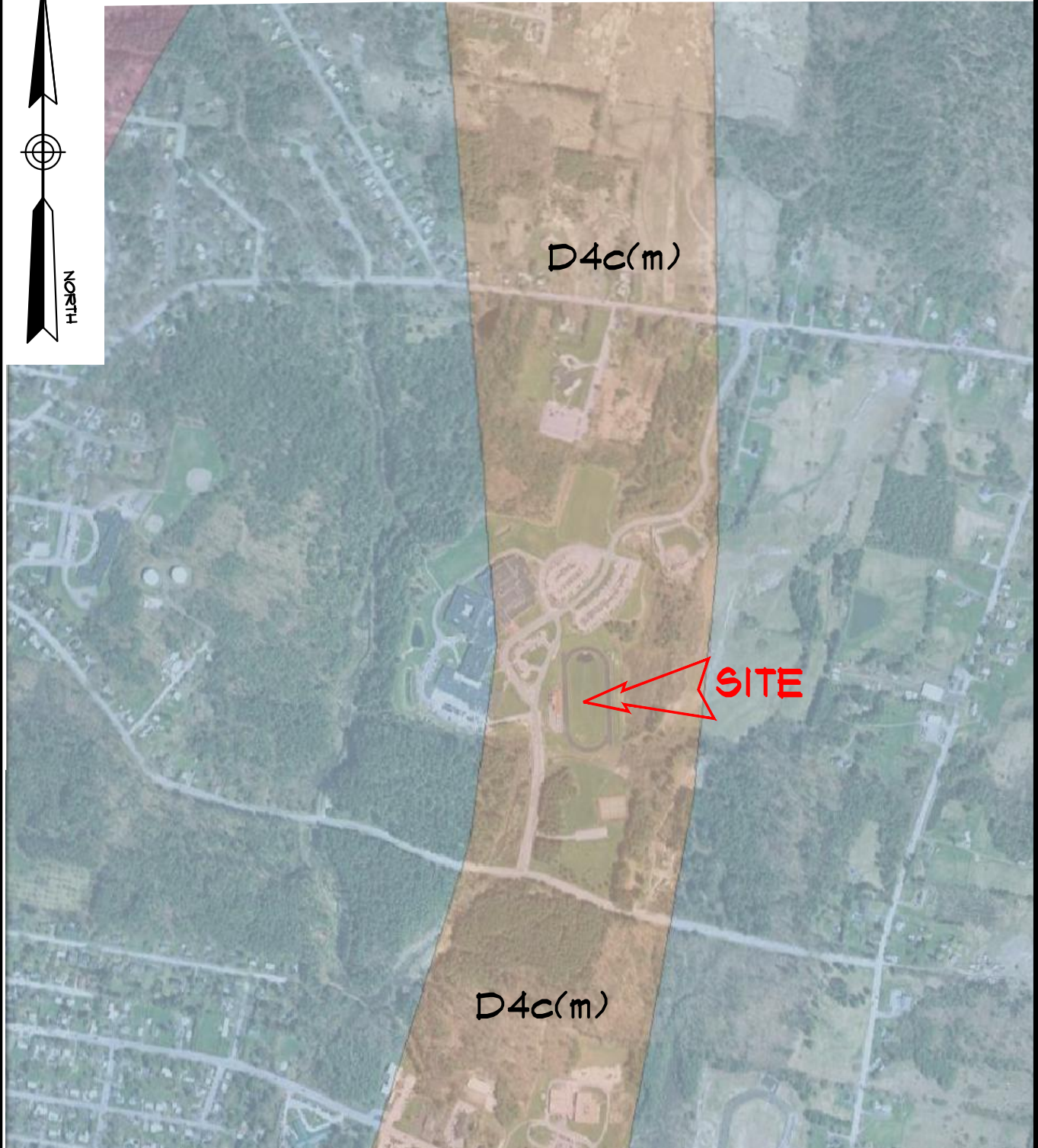


LEGEND

D4c(m) DEVONIAN QUARTZ MONZONITE

MAP REFERENCE

1985 BEDROCK GEOLOGIC MAP OF MAINE



BEDROCK GEOLOGY MAP NEW SYNTHETIC ATHLETIC FIELD

CONY HIGH SCHOOL - AUGUSTA, MAINE
PREPARED FOR

CITY OF AUGUSTA

434 CONY ROAD
AUGUSTA, MAINE 04330

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Fax: (207) 629-9094
www.summitgeoeng.com

DATE: JULY 2012	DRAWN BY: KRF	CHECKED BY: CC
JOB: 12131	SCALE: 1" = 1000'	FILE: 12131 MAPS

SUMMIT
GEOENGINEERING SERVICES

APPENDIX B
EXPLORATION LOGS
PHOTOGRAPH LOGS



TEST PIT LOG

Test Pit # **TP-1**

Project: Synthetic Field
 Cony High School
 Augusta, Maine

Project #: 12131

Groundwater:
 None Encountered

Contractor: City of Augusta

Ground Surface Elevation: N/A

Equipment: JD 310 SE Backhoe

Reference: N/A

Summit Staff: Craig Coolidge, P.E.

Date: 7/11/2012

Weather: Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
	Brown Silty SAND, loose, damp, SM	TOPSOIL = 6 inches (Grassy)
1	Dark brown SAND, little Silt and Gravel, trace Clay, compact, humid to damp, SW-SM	0.5' FILL
2	Olive brown to gray and mottled Silty CLAY, firm to stiff, damp to moist with depth, CL	1.5' GLAICAL MARINE DEPOSIT PP = 5,000 psf
3		
4		
5		
6	Slight moisture on clay	
7	End of Exploration at 6', No Refusal	6'
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-2**

Project: Synthetic Field
 Cony High School
 Augusta, Maine

Project #: 12131

Groundwater:
 None Encountered

Contractor: City of Augusta

Ground Surface Elevation: N/A

Equipment: JD 310 SE Backhoe

Reference: N/A

Summit Staff: Craig Coolidge, P.E.

Date: 7/11/2012

Weather: Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
1	Brown Silty SAND, loose, damp, SM	TOPSOIL = 3 to 4 inches (Grassy)
2	Dark brown SAND, little Silt and Gravel, trace Clay, compact, humid to damp, SW-SM	FILL
3	Gray and mottled Silty CLAY, trace Sand and organics, stiff, damp to moist with depth, CL	2' GLAICAL MARINE DEPOSIT PP = 4,000 psf LL = 38 PI = 15 w = 25.7% PP = 3,000 psf
4		
5		
6	Becoming gray Silty CLAY, firm, and moist with depth	
7	End of Exploration at 6', No Refusal	6'
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-3**

Project: Synthetic Field
 Cony High School
 Augusta, Maine

Project #: 12131

Groundwater:
 None Encountered

Contractor: City of Augusta

Ground Surface Elevation: N/A

Equipment: JD 310 SE Backhoe

Reference: N/A

Summit Staff: Craig Coolidge, P.E.

Date: 7/11/2012

Weather: Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
	Brown Silty SAND, loose, damp, SM	TOPSOIL = 5 inches (Grassy, Portions Bare)
1	Brown to dark brown Gravelly SAND, little Silt, compact, humid to damp, SW-SM	0.4' FILL Gravel = 44.1%, Sand = 49.8%, Silt = 6.1%, w = 5.7%
2	Olive gray to gray and mottled Silty CLAY, firm to stiff, damp to moist with depth, CL	1.5' GLAICAL MARINE DEPOSIT PP = 8,000 psf to 4,000 psf with depth
3		
4		
5		
6		
7	End of Exploration at 6', No Refusal	6'
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-4**

Project: Synthetic Field
 Cony High School
 Augusta, Maine

Project #: 12131

Groundwater:
 None Encountered

Contractor: City of Augusta

Ground Surface Elevation: N/A

Equipment: JD 310 SE Backhoe

Reference: N/A

Summit Staff: Craig Coolidge, P.E.

Date: 7/11/2012

Weather: Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
	Brown Silty SAND, loose, damp, SM	TOPSOIL = 5 inches (Grassy)
1	Brown to dark brown Gravelly SAND, little Silt, compact, humid to damp, SW-SM	0.4' FILL
2	Gray Silty CLAY mixed with some olive brown Silty CLAY, some Gravel (rocks 6" or smaller), compact to stiff, damp, CL	1.5' REWORKED FILL PP = 6,000 psf
3		
4		
5	Gray Silty CLAY, trace Sand and Gravel, organics (occasional 1" diameter root), slight odor, moist, CL	4.5'+/- GLACIAL MARINE DEPOSIT PP = 5,000 psf
6		
7	End of Exploration at 6', No Refusal	6'
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		



TEST PIT LOG

Test Pit # **TP-5**

Project: Synthetic Field
Cony High School
Augusta, Maine

Project #: 12131

Groundwater:
None Encountered

Contractor: City of Augusta

Ground Surface Elevation: N/A

Equipment: JD 310 SE Backhoe

Reference: N/A

Summit Staff: Craig Coolidge, P.E.

Date: 7/11/2012

Weather: Clear

Depth (ft)	DESCRIPTION	
	ENGINEERING	GEOLOGIC/GENERAL
	Brown Silty SAND, loose, damp, SM	TOPSOIL = 4 inches (Grassy)
1	Brown to dark brown Gravelly SAND, little Silt, compact, humid to damp, SW-SM	0.3' FILL
2	Gray Silty CLAY mixed with some olive brown Silty CLAY, some Gravel (rocks 6" or smaller), compact to stiff, damp, CL	1.5' REWORKED FILL PP = 6,000 psf
3		
4		
5		
6	Gray Silty CLAY, trace Sand and Gravel, organics (occasional 1" diameter root), slight odor, moist, CL	5'+/- GLACIAL MARINE DEPOSIT PP = 6,000 psf
7	End of Exploration at 6', No Refusal	6'
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		

Client Name: City of Augusta		Project No. 12131
Photo No. 1		
Date: 7-11-2012		
Site Location: Cony High School Augusta, Maine		
Description: Photograph of site and test pit TP-1, facing northeast.		

Photo No. 2	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of site, facing south.	

Client Name: City of Augusta	Project No. 12131
Photo No. 3	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of test pit TP-1 with transition to clay subgrade visible.	

Photo No. 4	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of glacial marine clay from test pit TP-1.	


Client Name: City of Augusta	Project No. 12131
Photo No. 5	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of test pit TP-2, facing southeast.	

Photo No. 6	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of test pit TP-2.	

Client Name: City of Augusta	Project No. 12131
Photo No. 7	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of test pit TP-3, facing southeast.	

Photo No. 8	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of test pit TP-3.	

Client Name: City of Augusta	Project No. 12131
Photo No. 9	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of test pit TP-4, facing south.	

Photo No. 10	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of test pit TP-4.	

Client Name: City of Augusta		Project No. 12131
Photo No. 11		
Date: 7-11-2012		
Site Location: Cony High School Augusta, Maine		
Description: Photograph of test pit TP-5, facing east.		

Photo No. 12	
Date: 7-11-2012	
Site Location: Cony High School Augusta, Maine	
Description: Photograph of test pit TP-5.	

APPENDIX C
LABORATORY RESULTS



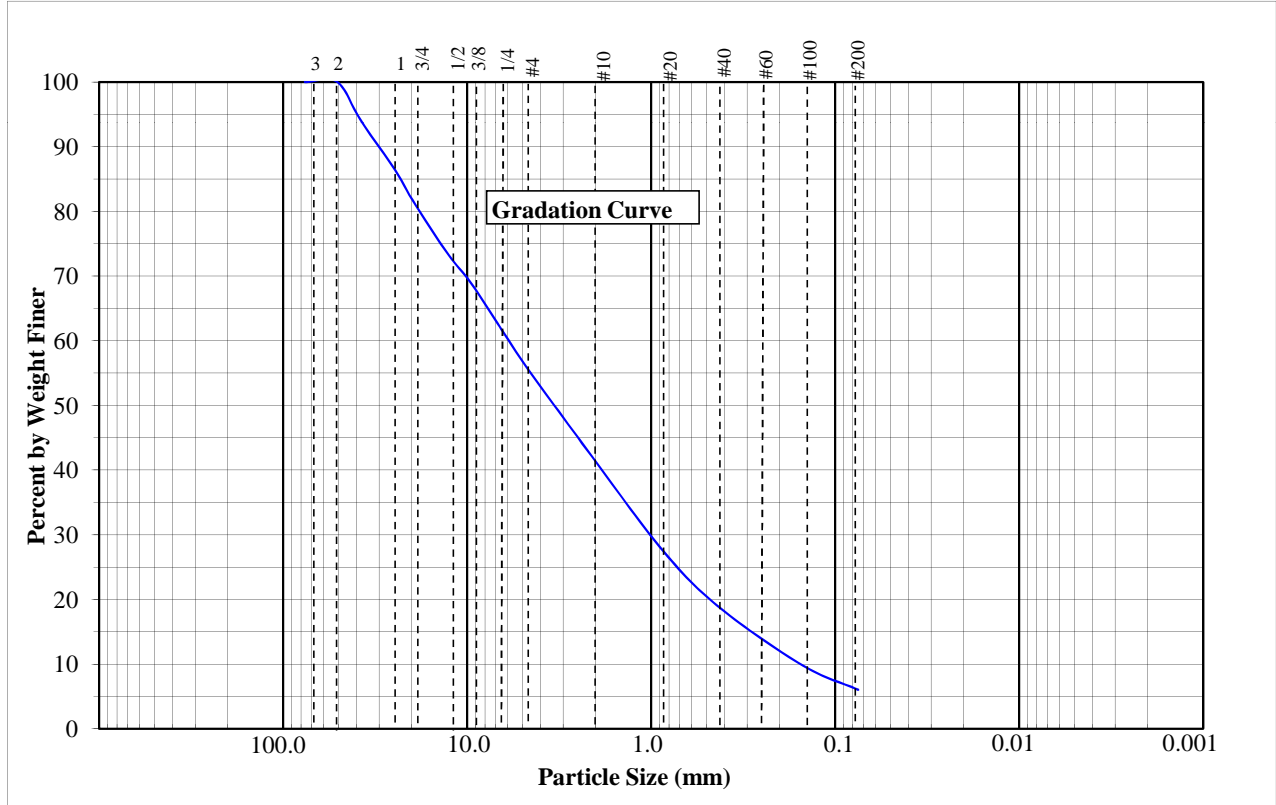
GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME: Synthetic Fields Cony High School
 CLIENT: Summit Geoengeering
 CLIENT SOIL DES: TP-3; 0-1.5'
 SOURCE: TP-3; 0-1.5'
 DATE: July 11, 2012

PROJECT #: 14381 / 12131
 SUMMIT SAMPLE: S1
 INTENDED USE: Existing Fill
 SPECIFICATION:
 TECHNICIAN: S. Luettich

DATA

<u>PARTICLE SIZE mm</u>	<u>% BY WT FINER</u>
76.20 (3 in)	100.0
50.80 (2 in)	100.0
38.10 (1-1/2 in)	94.1
25.40 (1 in)	87.0
19.05 (3/4 in)	80.9
12.70 (1/2 in)	73.4
9.53 (3/8 in)	68.9
6.35 (1/4 in)	61.3
4.75 (No. 4)	55.9
2.00 (No. 10)	41.3
0.85 (No. 20)	27.3
0.43 (No. 40)	18.8
0.15 (No. 100)	9.8
0.08 (No. 200)	6.1



REMARKS: Moisture Content: 5.7%

Reviewed: Darrell A. Gilman, CMT Manager
 Date: 7/12/12



SUMMIT ENVIRONMENTAL CONSULTANTS, INC.

434 Cony Road, Augusta, Maine 04330
 Phone: (207) 621-8334 Fax: (207) 626-9094

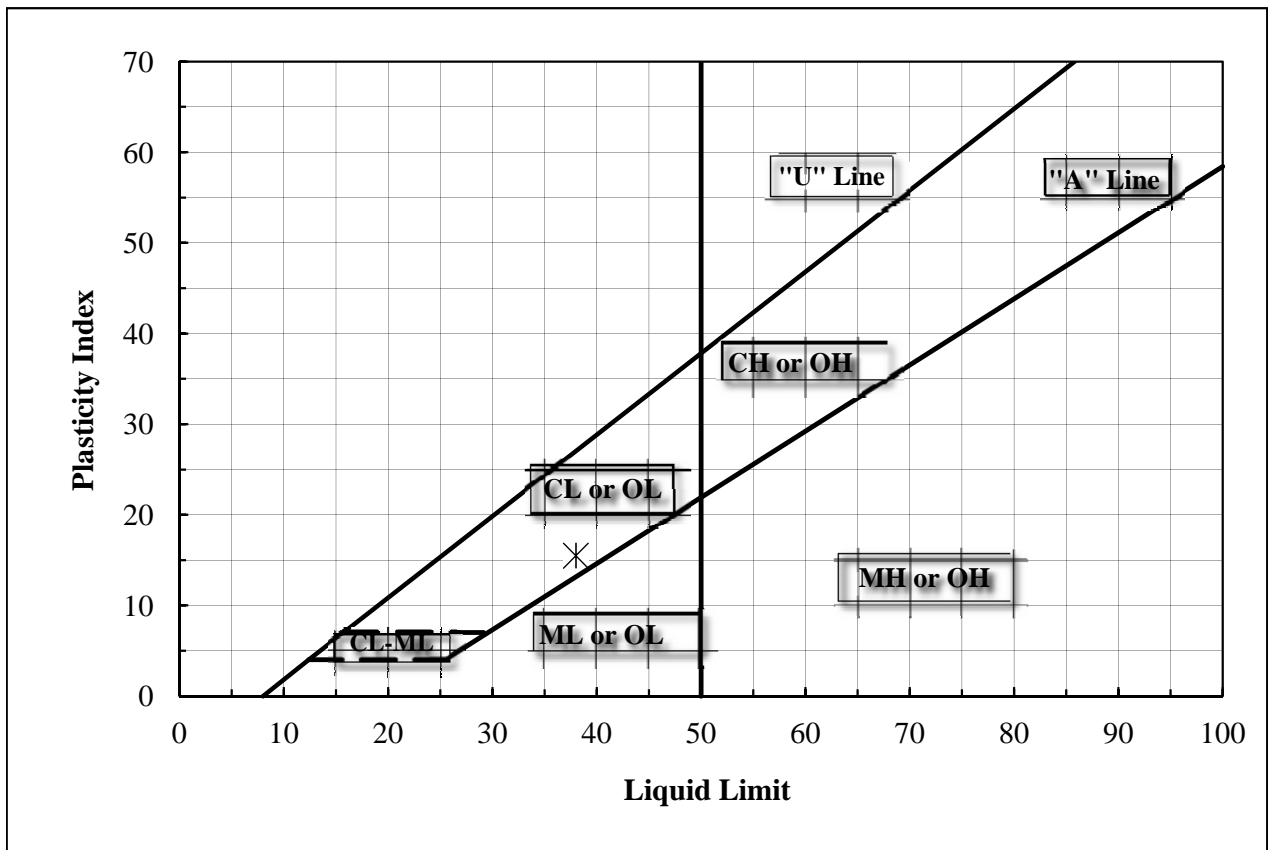
ATTERBERG LIMIT TEST - ASTM D4318

Method "A" (Multi-point)

PROJECT NAME:	Synthetic Field Cony High School	PROJECT #:	14381 / 12131
CLIENT:	Summit Geoenvironmental Services	SAMPLE #:	S2
PROCEDURE:	A	DEPTH:	4' to 6'
INTENDED USE:	Subgrade Investigation	DATE:	7/11/12
SAMPLE SOURCE:	TP-2	TECHNICIAN:	A. Higgins

DATA

Source	Depth	LL	PL	PI	Classification
TP-2	4' to 6'	38	23	15	Lean Clay (CL)



Notes:

Reviewed: Darrell A. Gilman, CMT Manager
 Date: 7/16/2012



SUMMIT ENVIRONMENTALCONSULTANTS, INC.
434 Cony Road, Augusta, Maine04330
Phone: (207) 621-8334 Fax: (207) 626-9094

Laboratory Determination of Water (Moisture) Content of SoilASTMD2216 / D4643

PROJECT NAME:	Synthetic Field Cony High School	PROJECT #:	14381 / 12131
CLIENT:	Summit Geoenvironmental Services	DRYING METHOD:	Oven
SAMPLE SOURCE:	TP-2; 4'-6'	DATE:	July 11, 2012
SAMPLING METHOD:		TECH:	S. Luettich

<u>Location</u>	<u>Sample No.</u>	<u>Depth</u>	<u>Moisture Content</u>	<u>Remarks</u>
TP-2	S-2	4'-6'	25.7%	

REMARKS:

Reviewed: Darrell A. Gilman - CMT Manager

Date: July 12, 2012

REPORT

19-0858

October 26, 2019

Explorations and Geotechnical Engineering Services

Proposed Multi-Purpose Field
Cony High School Campus
Augusta, Maine

Prepared For:

E. S. Coffin Engineering & Surveying, Inc.
Attention: James Coffin, P.E.
P.O. Box 4687
Augusta, ME 04330

Prepared By:

S. W. Cole Engineering, Inc.
26 Coles Crossing Drive
Sidney, ME 04330
T: (207) 626-0600



- *Geotechnical Engineering*
- *Construction Materials Testing and Special Inspections*
- *GeoEnvironmental Services*
- *Test Boring Explorations*

www.swcole.com

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19-0858

October 26, 2019

E. S. Coffin Engineering & Surveying, Inc.
Attention: James Coffin, P.E.
P.O. Box 4687
Augusta, ME 04330

Subject: Explorations and Geotechnical Engineering Services
Proposed Multi-Purpose Field
Cony High School Campus
Augusta, Maine

Dear Jim:

In accordance with our Proposal, dated June 25, 2019, we have performed subsurface explorations for the subject project. This report summarizes our findings and geotechnical recommendations and its contents are subject to the limitations set forth in Appendix A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of our services was to obtain subsurface information at the site in order to develop geotechnical recommendations relative to earthwork associated with the proposed construction. Our scope of services included observations of test pit explorations, a geotechnical analysis of the subsurface findings and preparation of this report.

1.2 Site and Proposed Construction

The site is located east of Pierce Drive and approximately 200 feet north of the intersection with Cony Street on the Cony High School Campus to the in Augusta, Maine. The site has been previously developed with an existing tennis court in the western portion of the site that is to be removed in favor of the proposed construction. The remaining site is generally open and grass covered with an existing drainage feature located on the north and east boundary of the site. Based on the plan received

October 9, 2019, we understand the site slopes downward from south to north from about Elevation 190 feet (project datum) at the existing paved parking area to Elevation 174 feet at the existing low lying wet area.

We understand development plans call for construction of a new natural turf, multi-purpose field with associated drainage ditches on the west and south sides of the field. We understand the proposed competition area will have a finished grade of 186 to 187 feet and measure 160 feet by 300 feet in plan area. We understand tapered fills of up to 9 feet will be required to achieve proposed grades. We understand proposed soil slopes will be constructed at 3H:1V.

Proposed and existing site features are shown on the "Exploration Location Plan" attached in Appendix B.

2.0 EXPLORATIONS

Eight test pits (TP-1 through TP-8) were made at the site on July 19, 2019 by the City of Augusta using a John Deere 310 SE excavator. The exploration locations were selected and established in the field by E. S. Coffin Engineering & Surveying, Inc. The approximate exploration locations are shown on the "Exploration Location Plan" attached in Appendix B. Logs of the explorations and a key to the notes and symbols used on the logs are attached in Appendix C. The elevations shown on the logs were estimated based on topographic information shown on the "Exploration Location Plan".

The subsurface soils were observed and logged at the time of excavation by a representative from S. W. Cole Engineering, Inc. (S.W.COLE).

3.0 SUBSURFACE CONDITIONS

3.1 Soil and Bedrock

Test pits TP-1 through TP-8 were made in the area of the proposed field and encountered a soils profile generally consisting of topsoil overlying stiff silty clay overlying areas of shallow refusal (probable bedrock). Test pits TP-1, TP-2 and TP-4 were terminated on probable bedrock at depths of about 5.8, 5.4 to 9.6 feet, respectively. The remaining test pits were terminated in the stiff silty clay at a depth of about 10 feet.

Not all the strata were encountered at each exploration; refer to the attached logs for more detailed subsurface information.

3.2 Groundwater

The soils encountered were moist from the ground surface. Saturated soils were generally encountered below a depth of about 8 feet. Groundwater seepage was observed in TP-4 at a depth of about 9.6 feet. Groundwater likely becomes perched on the relatively impervious silty clay encountered in the explorations. Long term groundwater information is not available. It should be anticipated that groundwater levels will fluctuate, particularly in response to periods of snowmelt and precipitation, as well as changes in site use.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General Findings

Based on the subsurface findings, the proposed construction appears feasible from a geotechnical standpoint. The principle geotechnical considerations include:

- Topsoil, organics, remnant structures, foundations and pavement must be completely removed from beneath the proposed development area and backfilled with properly compacted Gravel Borrow overlying geotextile fabric, as needed, in soft or yielding areas.
- Subgrades across the site will consist of sensitive silts and clays. Earthwork and grading activities should occur during drier, non-freezing weather of Spring, Summer and Fall. Construction equipment should not operate directly on the native silt and clays when wet. Excavations to subgrade should be completed with a smooth-edged bucket to lessen subgrade disturbance.
- Imported Structural Fill and Gravel Borrow will be needed for construction. The existing fill and native soils may be suitable for reuse as Common Borrow outside the playfield and proposed fill slope areas provided they are at a compactable moisture content at the time of reuse.
- We recommend lateral subsurface drainage piping placed approximately 30 feet on-center at a depth of about 3 feet below the finish surface and sloped to promote drainage to the periphery of the field.

4.2 Site and Subgrade Preparation

We recommend site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits. Surficial organics, roots and topsoil should be completely removed from areas of proposed fill and construction. As much vegetation as possible should remain outside the construction areas to lessen the potential for erosion and site disturbance. We recommend the silty clay subgrade be shaped/sloped to promote surface and groundwater drainage to the periphery of the field. Perimeter swales should be designed to allow drainage of the new granular fills and subgrades and divert water away from the field.

Additionally, based on the presence of the silty clay subgrade soils, we recommend the use of lateral subsurface drainage piping placed at a depth of about 3 feet below the surface and sloped to promote drainage to the periphery of the field. Subsurface drainage piping if used should be bedded in Crushed Stone and wrapped in non-woven geotextile fabric, such as Mirafi 160N. We recommend a 30 foot spacing for the subsurface drainage piping.

Following removal of organics, pavements, structures and foundations, we recommend the field area and fill embankments be built using Structural Fill or Gravel Borrow. We recommend the maximum aggregate size of the Gravel Borrow be limited to 3 inches within 2 feet of the field area surface.

4.3 Fill, Backfill and Compaction

We recommend the following fill and backfill materials.

Common Borrow: Fill to raise grades below grassed areas not below playfield or fill embankments should be non-organic compactable earth meeting the requirements of 2014 MaineDOT Standard Specification 703.18 Common Borrow. Common Borrow fills with a Plasticity Index greater than 10 should be capped with at least 12 inches of Granular Borrow.

Granular Borrow: Fill to raise grades in playfield and fill embankment areas as well as to repair soft areas, should be sand or silty sand meeting the requirements of 2014 MaineDOT Standard Specification 703.19 Granular Borrow.

Structural Fill: Backfill for over excavations and an initial layer over wet subgrades should be clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below:

Structural Fill	
Sieve Size	Percent Finer by Weight
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
No. 40	0 to 30
No. 200	0 to 6

Reuse of Site Soils: The non-organic on-site soils may be suitable for reuse as Common Borrow below grassed areas outside the proposed playfield and fill slope areas, provided they are at a compactable moisture content at the time of reuse.

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in building and paved areas be compacted to at least 93 percent of its maximum dry density as determined by ASTM D-1557.

4.4 Weather Considerations

Construction activity should be limited during wet and freezing weather and the site soils may require drying or thawing before construction activities may continue. The contractor should anticipate the need for water to temper fills in order to facilitate compaction during dry weather. If construction takes place during cold weather, subgrades must be protected during freezing conditions. Fill must not be placed on frozen soil; and once placed, the soil must be protected from freezing.

4.5 Design Review and Construction Testing

S.W.COLE should be retained to review the construction documents prior to bidding to determine that our earthwork, foundation and pavement recommendations have been properly interpreted and implemented.

A soils testing program should be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE is available to observe earthwork activities and the preparation of subgrades,

5.0 CLOSURE

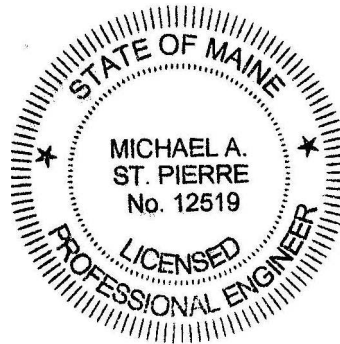
It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you during the construction phase of the project.

Sincerely,

S. W. Cole Engineering, Inc.

Michael A. St. Pierre, P.E.
Senior Geotechnical Engineer

MAS:pfk



APPENDIX A

Limitations

This report has been prepared for the exclusive use of E. S. Coffin Engineering & Surveying, Inc. for specific application to the proposed Multi-Purpose Field off Pierce Drive on the Cony High School campus in Augusta, Maine. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct our services in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

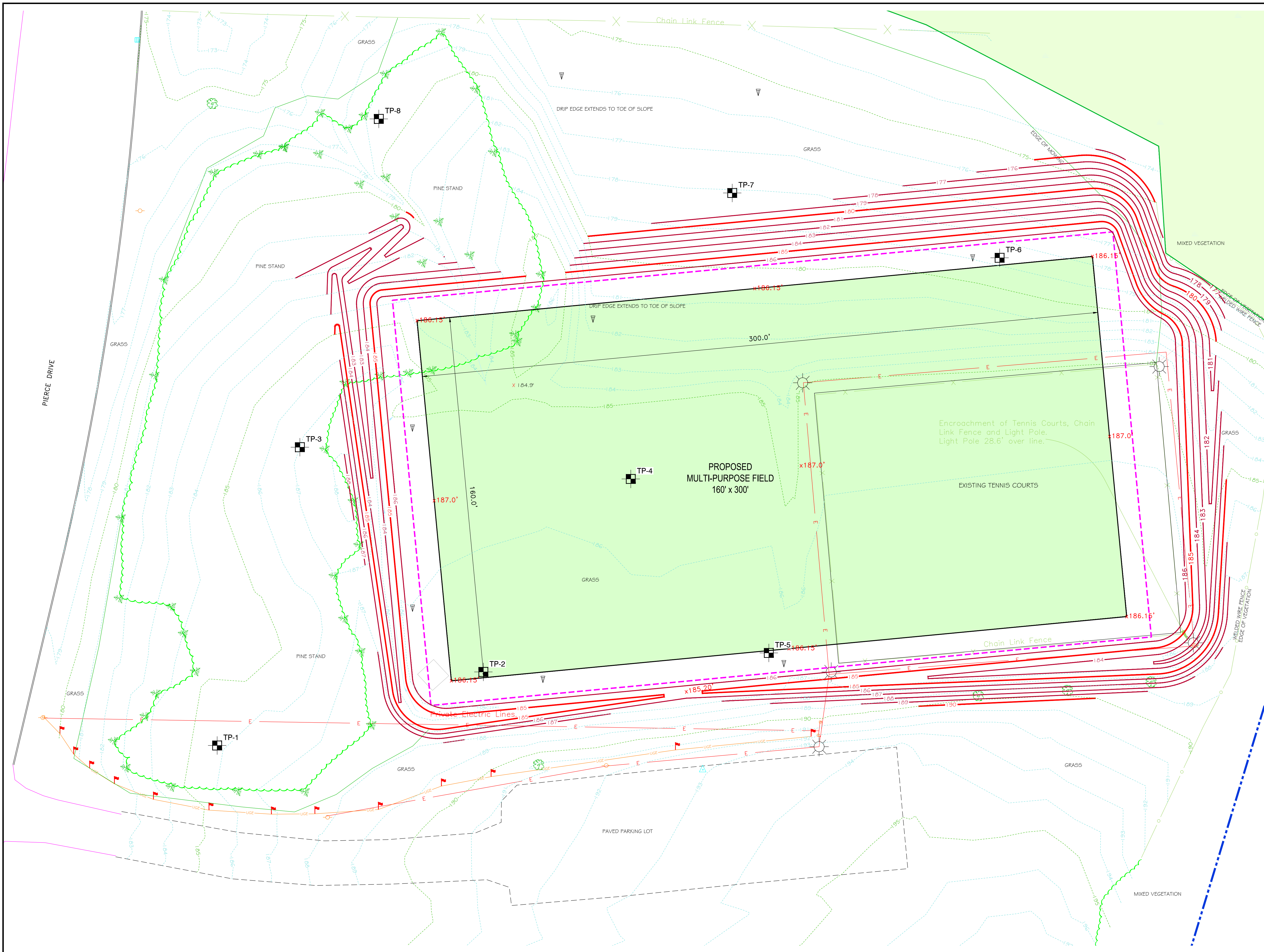
Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE's scope of services has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.

APPENDIX B

Figures

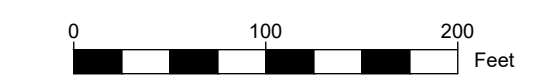



LEGEND:

 APPROXIMATE TEST PIT LOCATION

NOTES:

1. EXPLORATION LOCATION PLAN WAS PREPARED FROM A 1"=20' SCALE PLAN OF THE SITE ENTITLED "TOPOGRAPHIC SURVEY," PREPARED BY E. S. COFFIN ENGINEERING & SURVEYING, INC. (COFFIN), DATED OCTOBER 2019.
2. THE TEST PIT LOCATIONS WERE ESTABLISHED IN THE FIELD BY SURVEY BY COFFIN.
3. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S. W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
4. THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE EXPLORATIONS IN RELATION TO THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.



	
E. S. COFFIN ENGINEERING & SURVEYING, INC. EXPLORATION LOCATION PLAN PROPOSED MULTI-PURPOSE FIELD CONY HIGH SCHOOL CAMPUS AUGUSTA, MAINE	
Job No.: 19-0858 Date: 10/24/2019	Scale: 1" = 20' Sheet: 1

R:\2019\19-0858\CAD\Drawings\19-0858-EP.dwg 10/24/2019 4:42:31 PM 1:1 CDM, S.W. Cole Engineering, Inc.

APPENDIX C

Exploration Logs and Key



TEST PIT LOGS

PROJECT NO.: 19-0858
 LOGGED BY: Nate Strout
 CONTRACTOR: City of Augusta
 EQUIPMENT: John Deere 310 SE

CLIENT: E. S. Coffin Engineering & Surveying, Inc.
 PROJECT: Proposed Multi-Purpose Field
 LOCATION: Cony High School Campus, Augusta, Maine

TEST PIT TP-1

DATE: 7/19/2019 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 184' +/- COMPLETION DEPTH (FT): 5.8
 WATER LEVEL DEPTHS (FT): No free water observed REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
5	0.5	Topsoil					
		Brown Silty CLAY					
		mottled from 0.5 to 3' +/-					
	5.6	Brown Silty SAND					
Refusal at 5.8 feet (Probable Bedrock)							

TEST PIT TP-2

DATE: 7/19/2019 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 186' +/- COMPLETION DEPTH (FT): 5.4
 WATER LEVEL DEPTHS (FT): No free water observed REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
5	0.6	Topsoil					
		Brown Silty CLAY					
		mottled from 0.6 to 3.5' +/-					
Refusal at 5.4 feet (Probable Bedrock)							

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:
 Water Level
 ▽ At time of Digging
 ▼ At Completion of Digging
 ▾ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.



TEST PIT LOGS

PROJECT NO.: 19-0858
 LOGGED BY: Nate Strout
 CONTRACTOR: City of Augusta
 EQUIPMENT: John Deere 310 SE

CLIENT: E. S. Coffin Engineering & Surveying, Inc.
 PROJECT: Proposed Multi-Purpose Field
 LOCATION: Cony High School Campus, Augusta, Maine

TEST PIT TP-3

DATE: 7/19/2019 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 187' +/- COMPLETION DEPTH (FT): 9.9
 WATER LEVEL DEPTHS (FT): Soils moist below 8' +/- REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
5	0.4	Topsoil					
		Brown Silty CLAY					
		mottled from 0.4 to 3.3' +/-					

Bottom of Exploration at 9.9 feet

TEST PIT TP-4

DATE: 7/19/2019 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 185.5' +/- COMPLETION DEPTH (FT): 9.6
 WATER LEVEL DEPTHS (FT): 9.6 ft Moderate seepage at 9.6' REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
5	0.5	Topsoil					
		Brown Silty CLAY					
		mottled from 0.5 to 2.9' +/-					
		... becoming gray					

Refusal at 9.6 feet
 (Probable Bedrock)

9.6

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:
 Water Level
 ▽ At time of Digging
 ▼ At Completion of Digging
 ▾ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.



TEST PIT LOGS

PROJECT NO.: 19-0858
 LOGGED BY: Nate Strout
 CONTRACTOR:
 City of Augusta
 EQUIPMENT:
 John Deere 310 SE

CLIENT: E. S. Coffin Engineering & Surveying, Inc.
 PROJECT: Proposed Multi-Purpose Field
 LOCATION: Cony High School Campus, Augusta, Maine

TEST PIT TP-5

DATE: 7/19/2019 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 186.5' +/- COMPLETION DEPTH (FT): 10.0
 WATER LEVEL DEPTHS (FT): No free water observed REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
0.5		Topsoil					
		Brown Silty CLAY					
5		mottled from 0.5 to 2.8' +/-					
		... becoming gray					
10							

Bottom of Exploration at 10.0 feet

TEST PIT TP-6

DATE: 7/19/2019 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 179' +/- COMPLETION DEPTH (FT): 10.2
 WATER LEVEL DEPTHS (FT): Soils wet below 8' +/- REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
0.5		Topsoil					
		Brown and gray Silty CLAY					
5		mottled from 0.5 to 3' +/-					
10							

Bottom of Exploration at 10.2 feet

TEST PIT 19-0858.GPJ SWCE TEMPLATE.GDT 10/25/19

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:
 Water Level
 ▽ At time of Digging
 ▼ At Completion of Digging
 ▾ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.



TEST PIT LOGS

PROJECT NO.: 19-0858
 LOGGED BY: Nate Strout
 CONTRACTOR:
 City of Augusta
 EQUIPMENT:
 John Deere 310 SE

CLIENT: E. S. Coffin Engineering & Surveying, Inc.
 PROJECT: Proposed Multi-Purpose Field
 LOCATION: Cony High School Campus, Augusta, Maine

TEST PIT TP-7

DATE: 7/19/2019 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 178' +/- COMPLETION DEPTH (FT): 10.2
 WATER LEVEL DEPTHS (FT): Soils wet below 8' +/- REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
0.4		Topsoil					
		Brown and gray Silty CLAY					
5		mottled from 0.4 to 3' +/-					
10							

Bottom of Exploration at 10.2 feet

TEST PIT TP-8

DATE: 7/19/2019 LOCATION: See Exploration Location Plan SURFACE ELEVATION (FT): 179.5' +/- COMPLETION DEPTH (FT): 10.1
 WATER LEVEL DEPTHS (FT): Soils wet below 8' +/- REMARKS:

Depth (feet)	Graphic Log	Stratum Description	H ₂ O Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
0.4		Topsoil					
		Brown and gray Silty CLAY					
5		mottled from 0.4 to 3' +/-					
10		... becoming gray					

Bottom of Exploration at 10.1 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:
 Water Level
 ▽ At time of Digging
 ▼ At Completion of Digging
 ▾ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

KEY TO NOTES & SYMBOLS

Test Boring and Test Pit Explorations

Stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q _u	-	unconfined compressive strength, kips/sq. ft. - laboratory test
S _v	-	field vane shear strength, kips/sq. ft.
L _v	-	lab vane shear strength, kips/sq. ft.
q _p	-	unconfined compressive strength, kips/sq. ft. – pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W _L	-	liquid limit - Atterberg test
W _P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass.
γ _T	-	total soil weight
γ _B	-	buoyant soil weight

Description of Proportions:

Trace:	0 to 5%
Some:	5 to 12%
“Y”	12 to 35%
And	35+%
With	Undifferentiated

Description of Stratified Soils

Parting:	0 to 1/16” thickness
Seam:	1/16” to 1/2” thickness
Layer:	½” to 12” thickness
Varved:	Alternating seams or layers
Occasional:	one or less per foot of thickness
Frequent:	more than one per foot of thickness

REFUSAL: Test Boring Explorations - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: Test Pit Explorations - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.