City of Elko Clerk's Department
1751 College Avenue
Elko, NV 89801
(775) 777-7126
FAX (775) 777-7129

ADDENDUM NUMBER FIVE

ELKO SPORTS COMPLEX - PHASE 1

Please confirm receipt of ADDENDUM NUMBER FIVE AND FAX BACK TO (775) 777-7129 or email to cityclerk@elkocity.nv.gov.

RECEIVED:

SIGNATURE _____ COMPANY NAME _____

Dated this 26th day of January 2018.

Elko City Clerk

Shanell Owen, MMC

***** PLEASE NOTE RECEIPT OF ADDENDUM NUMBER FIVE ON APPLICABLE LINE ON SUBMITTED BID PROPOSAL*****

CITY OF ELKO
ENGINEERING DEPARTMENT
1755 COLLEGE AVENUE
ELKO, NEVADA 89801
(775)777-7210
(775)777-7219 FAX

ADDENDUM #5
ELKO SPORTS COMPLEX – PHASE 1

PWP# EL-2018-059

January 26, 2018

This addendum addresses additions, changes, and clarifications to the Contract documents and Contract Drawings for the City of Elko, Sports Complex - Phase 1.

CHANGES

1. Section 32 1801 – NATURAL GRASS PLAYING SYSTEM has been revised. Section 334100.2 is not included. See revised Section 2.2.

Thank you for your interest in bidding this project.

Sincerely,

Scott A. Wilkinson

City of Elko, Assistant City Manager

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Created by Bob Thibault

SECTION 32 1801 - NATURAL GRASS PLAYING FIELD SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide equipment and materials, and do work necessary to construct the natural turf field playing system, as indicated on the Drawings and as specified. Work shall include but shall not be limited to:

1. Earthwork Requirements:

   a. Demolition
   b. Excavation, trenching, grading, backfilling, compaction to achieve subgrade.
   c. Laser grading
   d. Disposal of spoil materials.
   e. Acceptance and certification of Sub-grade elevations and compaction
   f. Grade elevation certification of Finish sub-grade

2. Field Drainage System Requirements:

   a. Filter Fabric
   b. Gravel drainage trench material
   c. Lateral drains and fittings
   d. Clean outs and inline structures

3. Drain Pipe (Per Section 334100.20 High Density Polyethylene Storm Utility Drainage Piping):

   a. Drain pipe, collector pipe and fittings
   b. Clean outs and inline structures/manholes

4. Sports Irrigation System Requirements (Per Section 328425 Irrigation).

5. Playing Field Requirements:

   a. Soil materials and amendments
   b. Blended rootzone materials and amendments
   c. Laser grading
   d. Finish Grade survey certification of rootzone mix

6. Grass Installation (Per Section 329619.13 Playing Field Seeding).

1.2 RELATED WORK

A. Examine the Contract Documents for requirements that affect and or are related to the work of this section.
   1. 323113 - Chain Link Fencing and Gates
   2. 328425.10 – Sports Field Irrigation
   3. 329619.13 - Playing Field Seeding
   4. 334100.20 - High Density Polyethylene Storm Utility Drainage Piping
   5. Earthwork

1.3 REFERENCES STANDARDS

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Association of State Highway and Transportation Officials (AASHTO):

a. T 89 - Determining the Liquid Limit of Soils
b. T 90 - Determining the Plastic Limit and Plasticity Index of Soils

2. Occupational Safety and Health Administration (OSHA)

3. Department of Transportation Standard Specifications

4. American Society for Testing and Materials (ASTM):

a. D 3776 - Mass Per Unit Area (Weight) of Woven Fabric

b. D 3786 - Hydraulic Bursting Strength of Knitted Goods and Non-Woven Fabrics: Diaphragm Bursting Strength Tester Method,

c. D 4491 - Water Permeability of Geotextiles by Permitivity

d. D 4533 - Trapezoid Tearing Strength of Geotextiles

e. D 4632 - Breaking Load and Elongation of Geotextiles (Grab Method)

f. D 4833 - Index Puncture Resistance of Geotextiles, Geomembranes, & Related Products

g. F 405 - Corrugated Polyethylene (PE) Tubing and Fittings

h. F 449 - Subsurface Installation for Agricultural Drainage or Water Table Control

i. F 667 - 8, 10, 12 and 15-inch Corrugated Polyethylene Tubing and Fittings

j. C 136 Sieve Analysis of Fine and Course Aggregates

k. D 422 Particle-Size Analysis of Soils

l. E 11 Wire-Cloth Sieve for Testing Purpose

m. D 5268 Standard Specification for Topsoil Used for Landscaping Purposes

1.4 DEFINITIONS

A. Excavation: Removal of material encountered to subgrade elevations indicated and subsequent disposal or placement of materials removed.

B. Unauthorized Excavation: Inadvertent or purposely removing materials beyond indicated subgrade elevations or dimensions without specific direction of the Architect. Unauthorized excavation, as well as remedial work resulting from unauthorized excavation directed by Architect shall be at Contractor's expense.

1. Unauthorized excavation, including disposition of additional excavated materials and other work resulting from slides, cave-ins or remedial work shall be at Contractor's expense.

C. Additional Excavation: When excavation has reached required subgrade elevations, the Architect the Architect will be notified and will make an observation of conditions. If Architect determines that bearing materials at required subgrade elevations are unsuitable, excavation shall be continued until suitable bearing materials are encountered and excavated material shall be replaced as directed by the Architect.

1. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.

D. Subgrade: The undisturbed earth or the compacted soil layer immediately below proposed playing field drainage or soil materials.

E. Finish sub-grade: Final elevations and grading modifications to be performed in this Contract on the sub-grade elevations. Playing field system to be installed above finish sub-grade.

F. Gravel Drainage material: Approved stone material used in drainage trenches surrounding perforated underdrain piping and on top of perimeter/collector drainage pipe trenches. This material should bridge with the rootzone mix as described herein.

G. Rootzone mix: Blended mix containing processed sand, organics and or other amendments as described in the Contract Documents. Final mix as approved through a submittal and laboratory testing process.

H. Baseline Specifications – This refers to materials and blends approved by the Testing Agent for gravels and rootzone mix that will be used as a benchmark or baseline during the remainder of quality control testing during construction.

I. Certified grade elevations: As performed by a State Licensed land surveyor. Document to be signed, sealed and submitted for review and approval prior to next layer of work.

J. Sports Irrigation System: Refers exclusively to the irrigation system designed and to be installed in the playing field area. When noted, this may also include the mainline piping from the site water source to the playing field.

1.5 SUBMITTALS

A. Manufacturer's Product Data: Submit manufacturer's specifications and installation instructions for all products in the playing field system, including certifications and other data as may be required to show compliance with the Contract Documents. Included but not limited to the following; drainage pipe materials, geotextile fabric, irrigation system heads, valves, boxes, fittings, wire connectors, pipe and appurtenances.

B. Test reports: Field reports as indicated in PART 3 of this specification.

C. Supplier List: Submit list of procured and contracted suppliers of all materials required for the Playing Field System.

D. Material Certifications: Manufacturer's or vendor's certified analysis for:

1. Soil amendments

E. Product Data: Submit manufacturer's product data and samples as noted for the following:

1. Geotextile fabric – 3 samples approximately 7" x 11".

F. Gravel Drainage Materials

1. Gravel Drainage material: Minimum one gallon sample of each source material for testing
2. Submitted and tested simultaneously with rootzone materials

G. Rootzone Material Samples:

1. Submit samples of each of the following materials to establish baseline specifications regarding ratios performed and recommendations made by Contractors testing agent prior to bid and included in the Contract Documents. Contractor's agent shall perform these tests after the bid throughout construction.

a. Processed Sand Material: One-gallon sample of each potential sand source for testing.

b. Organic Amendment: One – gallon sample of each amendment proposed for blending

H. Schedule: Work schedule for all work described in these documents. This schedule shall be regularly updated and submitted as progress continues throughout ultimate completion.

I. Playing Field Contractor Reference List

1. Up to date contact information
2. Responsibility/scope of work for project
3. Similar projects – full fields

J. Playing Field Contractor Job Superintendent Resume

1. Similar projects and references if different that Contractor reference list

K. Subcontractor List: Submit list of key subcontractors for the project. Briefly describe the role of each as well as their experience with similar types of facilities such as being constructed in these Documents. This list should include but is not limited to:

1. Seed Installer
2. Rootzone Blender
3. Irrigation installer

L. Photographic Documentation – Contractor to frequently provide Owner and its representative's digital pictures of in progress work documenting all layers and levels of work described in this Specification section.

1.6 QUALITY ASSURANCE

A. The complete Field System shall be installed by a firm meeting the following criteria:

1. A minimum of one (1) successful project containing at least three (3) fields in the last five (5) years on projects comparable to this Scope of Work which includes but is not limited to:

a. Laser grading (not GPS) experience for subgrade, gravel and finished surface meeting the requirements for finish grade required in this Contract

b. Sports Field irrigation system installation

c. Blended rootzone material installation

d. Experience with testing protocols for gravels and rootzone mixes.

e. Experience with grow-in and care of complete playing field system thru turnover to Owner

2. Firms must have been in business under the same Ownership for at least three years, and shall have been installing similar sports fields for that entire period.

B. The resume of the natural grass field installation superintendent who will be on-site during the installation shall be provided showing a list of the (5) successful projects for which he/she was responsible.

C. All playing field system installation shall be directed by one (1) Contractor with proven experience in this type of work.

D. The Playing Field Contractor shall be responsible for the protection of the field surface after it's installation through Project Completion.

E. Grade Certification: Certified surveys by a State licensed land surveyor shall be made at the top of the in-place finished sub-grade and the top of the finished rootzone mix installation for conformance to specified final elevations. GPS survey laser equipment shall not be used for finish elevation determination unless approved in writing by the Owner and its representatives. Equipment mounted laser and hub or similar are required for playing field grading operations.

1.7 QUALITY CONTROL

A. Testing Agents:

1. Sitework and Materials Testing Agents:

a. The Contractor shall hire testing agents for items required by the Work including but not limited to compaction, concrete, geotechnical. The Playing Field Contractor shall notify the Owner regarding timing, scheduling and use of these agents.

b. The Engineer shall recommend for Owner approval or rejection based on results and recommendations of the tests.

2. Playing Field Testing Agent:

a. The Contractor shall hire an independent, A2LA accredited and insured Testing Agent to perform testing of the gravel and rootzone material components

b. The Playing Field Testing Agent is to report/submit test results as they are known and simultaneously to the Playing Field Contractor, the Owner and its representatives.

c. Testing Agent shall make recommendations and approve final rootzone and gravel materials for the baseline specification as well as final materials to be installed

d. Potential Agents for Contractor Consideration

1) Turf Diagnostic and Design, Sam Ferro, (913) 723-3700

2) Tifton Physical Soil Testing Laboratory, Powell Gaines, (229) 382-7292

3. Playing Field Fertility Testing Agent:

a. The Contractor shall hire an independent Agent to test for fertility of the following to substantial completion;

1) Rootzone mix prior to seeding

b. This agent may be the same as the Playing Field Testing Agent noted above or potentially one of the following;

1) CLC Labs (614) 888-1663

2) Tournament Turf Laboratories (724) 898-2329

c. The Agent will simultaneously submit results and recommendations to the Playing Field Contractor, Owner and its representatives.

B. Gravel and Rootzone Mix Materials Sampling, Testing and Approval Procedures

1. Pre-bid Optional Testing and Sampling:

a. Bidders are encouraged to:

1) Pre-test gravel and processed sand materials with the Contractors Testing Agent listed in this specification prior to submitting a bid. This does not guarantee that the materials or source will be approved for final construction.

2) Pre-qualify any material deviating from that specified.

3) All costs associated with pre-bid testing shall be borne by the bidder.

4) Refer to sampling procedure in following sections.

2. After Bid Award and Prior to construction:

a. General:

1) Contractor to submit gravel and rootzone materials simultaneously to Contractor's Testing Agent.

2) All shipping and testing costs are borne by the Contractor.

3) Submit one gallon samples, clearly marked and labeled to the Testing Agent for each material to be tested.

4) Rootzone Materials and gravel materials shall be tested and analyzed simultaneously.

5) Test results and recommendations shall be made by the Testing Agent and distributed simultaneously to the Contractor, Owner and its representatives.

b. Gravel Drainage Material: Simultaneously submit one-gallon samples of each gravel to be used for testing. Refer to "2.3 Gravel Drainage Materials and Protocol Reporting" later in this Specification for the following gravels and Reporting Protocols:

1) Gravel trench drainage material

c. Establishing the Gravel Baseline Specification:

1) Approval by the Testing Agent of the submitted gravel materials shall serve as the Baseline gravel materials specification for the remainder of the project.

d. Rootzone Materials: Provide one-gallon samples of each of the following materials to be used for testing and approval by the Testing Agent. Refer to "2.3 Rootzone Material Components and Protocol Reporting" later in this Specification for the requirements of the following materials and Reporting Protocols:

1) Processed Sand
2) Organic amendment(s)

e. Verifying and establishing the Rootzone Baseline Specification:

1) Approval by the Testing Agent of the submitted rootzone materials and blend shall serve as the Baseline rootzone mix specification for the remainder of the project.

f. Suggested Sampling Collection Procedures from material stockpiles:

1) Make a sample collection tube sized so that the material can be gained 4-5 feet deep into the pile.

2) Push this pipe into the stockpile at 6-8 random locations depending on the size of the stockpile. The material collected at each location shall be placed into a clean bucket. Do this for each stockpile or batch.

3) Thoroughly mix the samples in the bucket and fill a one gallon labeled zip lock freezer bag with material from the bucket. Repeat the procedure for each stockpile or batch.

4) Clearly note locations of composite samples and what stockpile it corresponds to. Include a transmittal letter to identify the source of samples and sample location. Do not use labels to identify samples. Use a waterproof marker and double bag the sample(s). Send the sample(s) to the Playing Field Testing Agent. Contractor to coordinate all sample deliveries, especially those on the weekend with Testing Agent.

3. During Construction Testing and Sampling Procedures (Quality Control Batch Testing):

a. Gravel trench Material Testing:

1) Submit a one-gallon sample for every 500 cubic yards of each material used for testing by the Playing Field Testing Agent and general compliance with the established Baseline specifications.

2) Collect samples in similar fashion as described in the following Rootzone Sampling section.

3) All quality control gravel tests shall be performed by the Testing Agent. The first sample shall be tested for sizing characteristics and infiltration rates. The remainder of the samples shall be tested for sizing characteristics only unless the Testing Agent, at his/her discretion and for the best interests of the Owner decides to also perform infiltration.

4) Gravel test results shall meet general conformance to the Baseline Gravel Specification.

5) Additional testing costs due to deviations and out of general conformance shall be borne by the Contractor.

6) Each batch to be sampled and tested will be released for field placement immediately after approved and only upon approval.

7) Contractor shall only install approved gravel materials

b. Rootzone Materials Testing and Sampling Procedures:

1) Submit a one gallon blended sample for every 500 cubic yards of material using all materials at the ratios used in the approved Baseline Rootzone Specification

2) Contractor shall use an experienced blender to provide a uniform and consistent mix for sampling and batch processing.

3) Suggested Sampling Collection Procedures from the blended rootzone material stockpile:

4) Make a sample collection tube from a 2.5 inch PVC pipe, approximately 4 - 5 foot long with a 45 degree angle on one end of the pipe. It is also useful to have a rubber mallet to tap samples out of the pipe.

5) Push this pipe into the stockpile at 6-8 random locations depending on the size of the stockpile. The material collected at each location shall be placed into a clean bucket. Do this for each stockpile or batch.

6) Thoroughly mix the samples in the bucket and fill a one gallon labeled zip lock freezer bag with material from the bucket. Repeat the procedure for each stockpile or batch.

7) Note locations of composite samples and what stockpile it corresponds to. Include a transmittal letter to identify the source of samples and sample location. Do not use labels to identify samples. Use a waterproof marker and double bag the sample(s). Send the sample(s) to the Playing Field Testing Agent. Contractor to coordinate all weekend sample deliveries with Testing Agent.

c. All quality control rootzone mix tests shall be performed by the Testing Agent.

d. The first batch sample shall be tested using full protocol as follows; (Refer to "2.4 Rootzone Material Components" later in this Specification):

1) Particle Size Characteristics (ASTM F1632)
2) Particle Shape/Particle Size Parameters/pH
3) Physical Properties (ASTM F-1815)

e. The remainder of the batch samples shall be tested for particle sizing and infiltration rate characteristics only unless the Testing Agent, at his/her discretion and for the best interests of the Owner decides to also perform the full protocol.

f. Each batch to be sampled and tested will be released for field placement immediately after approved and only upon approval.

g. Rootzone mix test results shall meet general conformance to the Baseline Rootzone Specification. A reasonable variation in the batch blend results to meet general conformance would be described as a homogeneous mixture not deviating more than 15% in the sand content between tests.

h. Additional testing costs due to deviations and out of general conformance shall be borne by the Contractor.

C. Earthwork Material Qualification and Testing:

1. If found necessary, submit the following test data for each potential borrow source.

a. Particle Size Analysis:

1) Method: AASHTO D422.
2) Number of Tests: Three (3) per potential source.
3) Acceptance Criteria: Gradation within specified limits.

b. Maximum Density Determination:

1) Method: Modified Proctor Test - ASTM D 1557.
2) Number of Tests: Three (3) per potential source.

2. Re-establish gradation and maximum density of fill material if source is changed during construction

D. Earthwork Material Qualification and Testing:

1. If found necessary, submit the following test data for each potential borrow source.

a. Particle Size Analysis:

1) Method: AASHTO D422.
2) Number of Tests: Three (3) per potential source.
3) Acceptance Criteria: Gradation within specified limits.

b. Maximum Density Determination:

1) Method: Modified Proctor Test - ASTM D 1557.
2) Number of Tests: Three (3) per potential source.

2. Re-establish gradation and maximum density of fill material if source is changed during construction

1.8 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered and stored within the Contractor's work limits or in an area approved by the Owner.

B. All material shall be stored in strict accordance with the manufacturer's recommendations.

C. Special care shall be exercised during delivery and storage to avoid damage to the products.

D. Products that are damaged will be removed and replaced, unless the product can be repaired in an acceptable manner by the Contractor, at his expense.

E. Packaged Materials:

1. Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site. Store out of low lying or drainage areas.

F. Drainage Gravels and Rootzone Mix:

1. Deliver tested and approved lots in clean, washed and covered trucks to eliminate contamination during transportation. Place directly on playing field. Do not stockpile on site.

G. Rootzone Mix: May be blended directly on site in a stockpile area that is clean and well-draining. Move to playing field area only after Testing Agent approval from Construction Quality Control Batch test results

1.9 COMPLETION AND ACCEPTANCE

A. General: Field completion shall be separated into 2 phases, "Punch List" and "Substantial Completion."

B. Punch List/Preliminary Completion: Scheduled date for Punch List shall be at least 15 calendar days before Substantial Completion. Notify the Playing Field Designer/Engineer and Owner in writing, 3 days prior to scheduled date for the Punch List. To be considered ready for this Punch List the following items shall be installed:

1. Drainage system installed.
2. Drainage gravels placed and to grade.
3. Rootzone mix in place, compacted and to grade
4. Irrigation system tested, installed and adjusted.
5. Seeding Performed, no bare spots and mowing is underway.
6. Top-dressing as needed to remove surface deflection.

C. Substantial Completion: Contractor shall notify the Playing Field Designer/Engineer and Owner in writing, 5 days prior to a requested date for a site observation to meet "Substantial Completion." To be considered "Substantially Complete" or "Playable" the following items shall be provided:

1. All Punch List items are complete.

2. Submit five (5) copies of written operating and maintenance instructions. Provide format and contents as directed by the Engineer.

3. Maintenance Log compiled in a loose-leaf 3-ring binder detailing all work done on fields from installation through Substantial Completion. Log shall include product information sheets and manufacturers' representatives contacted with phone numbers

4. Submit (5) copies of all certified surveys performed during construction for Quality Control.

5. Instruct the Owner's personnel in the operation of the irrigation and other systems.

6. Grass roots shall be visually displayed and active.

7. All grass edges to be cut in crisp, straight lines as depicted on the drawings.

8. Grass Maintained at a height of 3/4 inch

9. Seed established areas to appear dense, green, consistent grass void of any bare or patchy areas

10. Smooth, level playing surface compacted and level to grading tolerances.

11. Stockpiling or storing of "attic stock" materials.

12. Written warranties/guarantees.

13. Upon completion, Contractor shall provide Owner with project as-built/record drawings.

1.10 WARRANTY/GUARANTEE

A. General: Warranties / Guarantees specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties/guarantees made by the Contractor under requirements of the Contract Documents.

B. The following are inclusive of the term "Playing Field System" for provisions of the guarantee:

1. Final grade tolerances to one-quarter inch in the length of 25' of finish grade in any direction.

2. All materials and products specified.

3. Working functions of the drainage system.

4. Rootzone mix shall be guaranteed to have a percolation rate of 6 inches per hour

5. Working functions of the irrigation system.

6. Grass shall be true of species and type and free from objectionable weeds and/or grasses

C. Installer Guarantee: Provide a "Full System Guarantee" agreement. The President of the Playing Field Contractor shall sign the guarantee. Provide a guarantee for repair or replacement of the Playing Field System including both materials and workmanship for the following period of time:

1. One year after date of Substantial Completion.

D. The Warranty does not cover any defect, failure, damage caused by or connected with abuse, neglect, deliberate acts, acts of God, casualty or loads exceeding the Contractor's recommendations.

1.11 SPARE PARTS/ATTIC STOCK

A. Stockpile Materials (Attic Stock): Provide the following additional materials stored as directed by the Owner. [Use only those that apply and size according to project size]

1. Rootzone Mix – 50 Tons

PART 2 - PRODUCTS

2.1 EARTHWORK MATERIALS

A. General: All fill material, regardless of intended use category, shall be clean and free from organic matter, roots, brush or other vegetation, trash, debris or other detrimental substances, and rocks or unbroken lumps larger than 3 inch, and shall be tested and approved by the soil testing and observation agency prior to placement

B. Suitable Material: Soils classified by ASTM as GW, GP, GM, GC, SW or SP, free from organic, frozen, or other deleterious materials. When approved by the Playing Field Designer/Engineer on a case-by-case basis, Select Fill is an acceptable alternate.

C. Structural Fill: non-plastic, sound, durable, granular particles consisting of sand, gravel, stone or blends with these materials, free from organic, frozen, or other deleterious materials, conforming to the following gradation requirements:

Sieve	Percent Passing
4"	100
No. 40	0-70
No. 200	0-10

D. Trench Backfill: Existing soils obtained from Playing Field System excavations, excluding broken and pulverized weathered bedrock

E. All stone shall be angular. Rounded or river stone is not allowed.

2.2 DRAINAGE SYSTEM MATERIALS

A. Collector Pipe, Drainage Pipe, and Fittings:

1. Per Section 334100.20 High Density Polyethylene Storm Utility Drainage Piping

B. Collector Pipe Inline Drainage Structures / Clean Outs:

1. General:
   a. Inline structures only are to be used. Risers with fittings are not allowed.
   b. Size per drawings

2. Products:
   a. Cleanouts
      1) Nyloplast Drain Basin
      2) Nyloplast Inline Drain
   b. Grate
      1) Solid, Ductile Iron
      2) Open Grate

3. Suppliers:
   a. Nyloplast-ADS

Section is not included. refer to addendum 01/26/2018 for revised section 2.2

1) www.ads-pipe.com/us
b. National Diversified Sales
1) www.ndspro.com
c. Approved equal

Section not included cont.

C. Geotextile Fabric:

1. General:

a. Provide on playing field subgrade and playing field drainage trenches.

b. The geotextile shall be a nonwoven sheet of plastic yarn as defined by ASTM D123 and conform to the criteria presented in the following table. These requirements shall be based on the Minimum Average Roll Value (MARV) which is defined as the value that can be expected, with 95% confidence, to be the minimum test average obtained on a roll sampled and tested in accordance with ASTM D4759.

c. Geotextile shall meet the requirements of AASHTO M288 except as modified herein.

Geotextile Class 1			
Physical Property	ASTM Procedure	Minimum Acceptance Criteria	
		English	Metric
Grab Tensile Strength	D 4632	200 lbs	890 N
Grab Elongation at Break	D 4632	50%	50%
Puncture Strength	D 4833	80 lbs	355 N
Mullen Burst Strength	D 3786	260 psi	1790 Kpa
Trapezoidal Tear	D 4533	80 lbs	355 N
Apparent Size Opening (AOS)	D 4551	70-100 US Std Sieve	150 – 212 um

2. Product:

a. Mirafi 180 N:
1) www.mirafi.com

b. Propex Geotex 801:
1) www.geotextile.com

c. Approved equal

2.3 GRAVEL DRAINAGE MATERIALS AND PROTOCOL REPORTING

A. Gravel Drainage Trench Material: A washed and graded pea stone shall be used as trench fill for collectors and laterals and drainage layer over the entire playing field finished subgrade. The stone shall be placed directly below the rootzone mix. The size of the stone shall fit the following size criteria and shall "bridge" with the processed sand material. The processed sand / rootzone mix shall be tested, reported and compared with the following gravel drainage material meeting the following size requirements:

1. Particle Size Distribution: (#78M Gravel):

a. 100% passing a 1/2 inch (12.5 mm) sieve

b. No more than 10% passing a 10 mesh (2.0 mm) sieve
c. No more than 5% passing a 18 mesh (1.0 mm) sieve

2. Bridging:

a. D15 Gravel less than or equal to 8 x D85 Rootzone Mix
b. D15(gravel) = 4.00mm
c. 4.00mm greater than or equal to 1.00mm
d. D15(rootzone) = 0.20mm

3. Permeability:

a. D15 (Gravel) greater than or equal to 5 x D15(Rootzone Mix)
b. D15(gravel) = 4.00mm
c. 4.00mm greater than or equal to 1.00mm
d. D15(rootzone) = 0.20mm

4. Uniformity of Coefficient of Gravel (Cu):

a. D90(gravel) / D15(gravel) less than or equal to 3.0
b. D90 (gravel) = 8.30mm
c. 2.08 less than or equal to 3.0
d. D15(gravel) = 4.00mm

5. Stability - The gravel should meet one or both of the following requirements:

a. Sulfate Soundness (C-88)

1) Not to exceed 12% loss

b. LA Abrasion (ASTM C131)

1) Not to exceed 40

6. Infiltration Rate shall be greater than 50"/hr.

B. The Testing Agent shall test the gravel material and report results using Full or Partial Protocol as follows:

1. Full Protocol Reporting: This full reporting shall be performed to establish the Baseline gravel material specification after the bid and prior to construction. Items to be reported are as follows:

a. Particle Size Distribution
b. Bridging
c. Permeability
d. Coefficient of Uniformity (Cu)
e. Stability (Sulfate Soundness and LA Abrasion)
f. Infiltration Rate

2. Partial Protocol Reporting: Partial reporting shall be performed after the Full Protocol batch test has verified conformance to the baseline approvals. The intent of the partial protocol is to speed up the results process during Construction Quality Control batch testing. If it is found that the Particle Size Distribution results are not in general conformance with earlier approved results, then a Full Protocol test shall be performed to determine the discrepancy. Results shall be published and approved prior to placement on field and items to be reported for Partial Protocol are as follows:

a. Particle Size Distribution.

2.4 ROOTZONE MIX COMPONENTS AND PROTOCOL REPORTING

A. Components: For bidding purposes, the blend shall generally possess the ratios of 80% processed sand: 20% organic materials. The Testing Agent will have latitude during the mix design process to reasonably modify these ratios and to ultimately approve a final baseline specification mix as described earlier in this specification section. The materials used are as follows:

1. Processed Sand:

a. The sand shall be uniform coarse sand screened and washed meeting the following Particle Size Distribution (ASTM C136 and F1632 sand fractions % retained):

Fraction Size/Name	U.S. Standard Sieve	Diameter of Sieve (mm)	Allowable Range % Retained on Sieve
Gravel	10	2.00	3% maximum
Very Coarse Sand	18	1.00	less than, equal to 3 – 20%
Coarse Sand	35	0.50	At least 60% Particles in this range
Medium Sand	60	0.25	
Fine Sand	100	0.15	10% maximum
Very Fine Sand	270	0.05	5% maximum
Silt		0.002	5% maximum
Clay		<0.002	3% maximum

1) No more than 30% combined for No. 10 and No. 18 sieve.

2) 100% passing the No. 5 (4 mm) sieve, and no more than 15% combined very fine sand, silt, and clay.

2. Organic Amendments:

a. General

1) The following components may be blended with the approved processed sand to make the final approved rootzone mixture.

b. Processed Peat:

1) Performance Criteria: If selected shall have a minimum organic matter content of 85% by weight as determined by loss on ignition (ASTM D 2974-87 Method D) and shall be free of sticks, stones, hay, or any other deleterious matter.

2) Peat Analysis:

Parameter	Specification
Total Ash	15% or less
pH	6.5 to 7.5
% Moisture	40% to 70%

Sieve Criteria	
2.0 mm sieve	0 to 5% retained
1.0 mm sieve	Less than 20% retained

3) Peat Suppliers:

a) Fafard Peat, www.fafard.com
b) Peat Inc., Steve Young, (763)-441-8387
c) Oglebay Norton Industrial Sands, Inc. (619) 277-1670
d) Pioneer Peat, Inc. (701) 746-4300

B. Rootzone Mix Requirements: The processed sand shall be uniform coarse sand screened and washed and when blended with the organic material by the Testing Agent shall be reported and meet the following requirements:

1. Particle Size Analysis meeting previous distribution chart.

2. Physical Analysis (determined at 25 cm tension – 10 inches by USGA testing protocol ASTM F1815) – multiple mixes may be shown to determine the final selection

a. Saturated Hydraulic Conductivity – 10 to 12 in/hr

b. Total Porosity – 35 to 55% (Non capillary and Capillary)

c. Bulk Density - 1.2 to 1.6 (ASTM F2396)

d. Report Water Retention Percent at Field Capacity

e. pH range of 6.0 to 6.5 (ASTM D4972 Method A water only)

f. Organic Matter Percent by weight for the mix shall be 0.4 to 0.6% (ASTM F1647 Method 1)

g. Uniformity Coefficient (Cu): 2.0 – 5.0

h. Gradation Index (D90/D10): Less than 10

C. Protocol and Reporting: The Testing Agent shall test the individual rootzone components and the blended mix(es) and report results using Full or Partial Protocol as follows:

1. Full Protocol Reporting: This full reporting shall be performed to verify/establish Baseline spec after the bid and prior to construction and for the first 3 batches of the mix during Construction Quality Control batch testing. Items to be reported are as follows:

a. Particle Size Analysis / Distribution.

b. Physical Analysis:

1) Saturated Hydraulic Conductivity
2) Total Porosity (Non capillary and Capillary)
3) Bulk Density
4) Report Water Retention Percent at Field Capacity
5) pH range
6) Organic Matter Percent by weight for the mix
7) Uniformity Coefficient (Cu):

8) Gradation Index (D90/D10)

2. Partial Protocol Reporting: The remaining batches after the initial three during Construction Quality Control batch testing shall be tested and reported for the following unless it is determined at the sole discretion of the Owner or the Testing Agent to use the full protocol:

   a. Particle Size Distribution / Analysis
   b. Uniformity Coefficient
   c. Infiltration Rate

3. Mix Adjustments and Recommendations: The Testing Agent shall make recommendations from the material reporting if necessary.

4. PH Recommendations:

   a. Testing Agent shall make appropriate recommendations to modify the pH rating of the rootzone mx to establish an optimum range of 6.0 to 6.5 for sports turfgrass.

PART 3 - EXECUTION

3.1 EXAMINATION AND PROTECTION

A. Verification of Conditions: Examine areas and conditions under which all work of this Section is being performed. Commencement of work implies acceptance of all areas and conditions.

B. Protection of Work: Protect all on-going work, so as not to delay work due to weather or project related construction. This includes but is not limited to the use of tarps, geotextile, plywood and other protective measures.

C. Protection of Persons and Property: Provide all necessary measures to protect workmen and passersby. Barricade open excavations occurring as part of the work, as required by municipal or other authorities having jurisdiction.

   1. Protect adjacent construction throughout the entire operation. Protect newly graded areas from destruction by weather or runoff. Protect structures, utilities, pavements, and other improvements from damage caused by settlement, lateral movement, undermining and washout.

D. Unanticipated Conditions: Notify the Engineer immediately upon finding evidence of previous structures, filled materials that penetrate below designated excavation levels, or other conditions which are not shown or which cannot be reasonably assumed from existing surveys and geotechnical reports. Secure the Engineer's instruction before proceeding with further work in such areas.

3.2 EARTHWORK EXECUTION / PLAYING FIELD SUBGRADE & FINISH SUBGRADE

A. Layout and Control:

   1. The Contractor shall be responsible for furnishing, setting and marking of all line, grade and location stakes, including offsets and general construction staking.

   2. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no additional cost to the Owner.

3. Establish location and extent of existing utilities before commencement of grading or installation operations.

   a. Below grade utilities exist surrounding the field edge within and immediately outside the limits of the playing field. Contractor to use caution. Some operations may include hand digging, potholing, or other methods to establish the locations of these utilities both vertically and horizontally.

4. Surface Water Control:

   a. All earthwork operations shall be conducted in a manner to prevent surface water from infiltrating into the subgrade and base. Drainage is to be maintained in all parts of the site to drain surface water without ponding at all times. The Contractor, at his own expense, shall undercut soils saturated by ponding and backfill per this Section at the direction of the Engineer.

5. Quality Control:

   a. Subgrade Ground Surface Requirements:

      1) Perform density tests in accordance with ASTM A1556, ASTM D2167, or ASTM D2022

      2) Perform moisture tests in accordance with ASTM D3017.

      3) Where field-testing is performed using nuclear test methods, verify calibration of both density and moisture gages at the beginning of work, on each different type of material encountered, and additionally as directed by the Owner

   b. Fill and Backfill Materials: Test existing on-site soils and borrow materials proposed for use in filling and backfilling operations as follows. Allow testing services to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

Moisture Content:	ASTM D2216
Maximum Index Density:	ASTM D4253
Moisture Density Relations:	ASTM D698
Plasticity Index:	ASTM D4318

   c. Subgrade Material: One test for every 2500 square foot of compacted subgrade material, or major fraction thereof, but in no case less than two tests for each day's work

B. Excavation:

   1. Refer to Site Earthwork Specifications and Civil Drawings for additional Earthwork requirements

C. Moisture Control:

   1. Where subgrade soil material, fill or backfill must be moisture conditioned before compaction, uniformly apply water to the surface and to each layer of fill or backfill as

necessary to provide optimum moisture content. Prevent ponding or other free water on surface subsequent to, or during, compaction operations.

2. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to specified density. Soil that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a value which will permit compaction to the percentage of maximum density specified.

D. Compaction Equipment:

1. Compaction equipment used for the Work is subject to approval by the Engineer. Any equipment not originally manufactured for compaction purposes and equipment which is not in proper working order will not be approved. Furnish manufacturer's specifications covering data not obvious from a visual inspection of the equipment and necessary to determine its classification and performance characteristics

E. Playing Field Subgrade:

1. All cutting, filling, backfilling and grading necessary shall be done to bring the playing field areas to the following subgrade tolerances:

2. The final elevation of the finish playing field subgrade shall be plus or minus one inch at any point on the field and on a 25 foot by 25 foot grid of the finished grades indicated on the Contract Drawings. Laser controlled or indicated equipment shall be used for this part of the work.

a. Playing Field Subgrade Elevation Certification: A certified survey by a State licensed land surveyor shall be performed at 25-foot centers to verify grade and elevation of the subgrade. The digital survey document shall indicate spot elevations and tenth of foot contours and shall be submitted to the Engineer for review and approval prior to moving to next part of work

b. Playing Field Finish Subgrade.

3. General:

a. After verification and approval of the subgrade, the Playing Field Contractor shall then proceed with the fine grading of the subgrade. All fine grade cutting, filling, and backfilling necessary to be performed on the subgrade to bring the playing field areas finish subgrade to the required tolerances.

b. Finish subgrade shall mirror the final finish elevation of the field surface in regards to slope except where noted on the drawings.

c. Compaction for the finish subgrade shall meet 95% Standard Proctor as described in section 3.2 of this Specification.

d. Proofrolling of the finish subgrade is required.

e. Sufficient grading must be done during the progress of the work so that the entire site shall be well drained and free from water pockets.

4. Playing Field Finish Subgrade Tolerance Requirements: The final elevation of the finish subgrade shall be plus or minus one half inch at any point on the field and on a 25 foot by 25 foot grid grade as indicated on the Contract Drawings.

5. Playing Field Finish Subgrade Elevation Certification: A certified survey by a State licensed land surveyor shall be performed at 25-foot centers to verify required grade and elevation tolerances of the finish subgrade. The digital survey document shall indicate spot elevations and tenth of foot contours and shall be submitted to the Engineer for review and approval prior to moving to next part of work.

3.3 DRAINAGE SYSTEM INSTALLATION

A. Collector and Lateral Pipe Trenching:

1. Only perform trenching, drainage pipe installation and backfilling operations that can be completed in one day. Exposed trenches that collapse due to rain or other occurrences shall be widened and filled as specified or refilled with subgrade materials, compacted, and retrenched.

2. Contractor to connect playing field drainage system to site storm drainage.

3. Excavate trenches for all piping to a uniform depth and width, sufficiently wide enough to provide ample working room.

   a. Minimum width of trench to be twice the pipe diameter.

   b. Abnormal conditions such as large cobbles or unstable conditions that may cause trench to lose integrity shall be reported to the Engineer immediately.

4. Excavate trenches and conduit to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil.

5. Contractor to remove or manipulate spoils from trenching excavation so that integrity of finished grade requirements is maintained prior to placing filter fabric.

B. Installation of Geotextile Filter Fabric:

1. Install filter fabric onto full extent of field bottom and sides of trenches.

2. Extend fabric a minimum of 12 inches past each side of top of trench on top of the subgrade.

3. The fabric shall be placed as smooth and wrinkle-free as possible.

4. All laps shall be at least thirty-six inches in width without tension, stress, folds, or creases.

5. At time of installation, fabric will be rejected if it has defects, ribs, holes, flaws, deterioration, or damage incurred during manufacture, transportation, handling, or storage. Damaged materials shall be removed and replaced at no additional cost to the Owner.

6. Install fabric to coordinate with trenching operation and other parts of the Work.

7. Sandbags or other devices may be used as required to hold the fabric in position during installation. Materials, equipment or other items shall not be dragged across the fabric or be allowed to slide down slopes on the fabric

8. Fabric shall be covered as soon as possible after placement to minimize exposure to sunlight and to other types of contamination such as surface run-off.

a. Fabric shall not be exposed for more than 10 days.

b. Fabric which becomes overly contaminated shall be removed and replaced with new fabric.

9. Contractor to temporarily fold fabric over at the tops of the trenches during construction to eliminate migration of soil materials into the gravel trench. Just prior to installation of gravel drainage blanket, this fold shall be undone and fabric shall be laid over the finished subgrade. Should contamination of the gravel trench occur, Contractor shall remove contaminated material and replace with clean approved materials at no cost to the Owner

C. Installation of Collector and Lateral piping:

1. Lay perforated pipe directly on geotextile fabric at trench bottom in accordance with pipe manufacturer's recommendations.

2. Provide collars and couplings as required for installation of these lines as well as for connections to drainage structures and trench drains.

3. Install collector as indicated on drawings so that it connects to site structures or extends to limits indicated.

a. Protect any exposed ends of pipe until connected to detention or storm sewer system by playing field Contractor or others

4. Pipe laying work shall commence at the main collector line and shall proceed from low point of system to high point.

a. Pipe shall be laid true to line and grade in such a manner as to assure a close concentric joint with the adjoining pipe.

b. Protect any exposed ends of the pipe until final connections are made.

c. After pipe installation has been observed by the Engineer, drainage material shall be placed around and over the pipe.

5. Install inline structures, drain inlets, catch basins per manufacturer's instructions

6. After pipe installation has been observed by the Playing Field Designer/Engineer, approved drainage material shall be placed around and over the pipe to the top of the trench.

a. If observation indicates poor alignment, debris, displaced pipe, infiltration or other defects, Contractor to take whatever steps are necessary to correct such defects prior to proceeding

7. Installation of drain lines from ground boxes:

   a. Install drain lines from in ground boxes installed in the field area. Connect directly to field drainage system.

8. Collector pipe Clean Out: A nyloplast or equal structure is to be used for the cleanout. Cap shall be placed flush with finish subgrade as shown on the drawings. Install bolt, washer and nut on cap for metal detection purposes

D. Gravel Drainage Fill:

1. Trenches:

   a. Place approved drainage gravel fill material in the drainage trench in a single layer. Place material around drainage pipe until it is level with the surrounding subgrade.

   b. Contractor to temporarily cover top of open gravel trench with the geotextile material overlapping the top of the trench to reduce contamination of the gravel material prior to placement of Rootzone Layer.

E. Clean Out/End Cap: Cap shall be recessed below the rootzone mix and flush with finish subgrade elevation. Install bolt, washer and nut on cap for metal detection purposes

F. Testing Drain Lines: The Contractor shall ensure that lines are in proper alignment and free flowing prior to placing the drainage gravel fill material. The Playing Field Designer/Engineer will observe portions of this process for general conformance of the specifications

3.4 SPORTS FIELD IRRIGATION INSTALLATION

A. General: Install system per Section 328425 – Irrigation Installation.

B. Rootzone mix batches must be approved by Testing Agent prior to any shipping or installation of the mix on to the playing field area.

C. Begin placement of rootzone mix only after irrigation system layout and installation have been approved.

D. The tested and approved rootzone material shall be dumped at the edge of the field and systematically worked outward onto the field. Under no circumstances will loaded rubber tired vehicles in excess of 1 ton be allowed over the drainage trenches prior to or during the spreading of the root zone mix. Equipment used on the rootzone mix/field shall be of a size and weight and shall utilize low pressure turf type tires, tracks or tires, which will not damage or overly compact the field installation.

E. The material shall be spread onto the field in an even depth/layer as indicated. The finish grade slope shall conform exactly to the subgrade slope, (unless indicated otherwise on drawings) when the root zone mix has been spread uniformly over the field and compacted to 85% of the maximum dry density as determined by the standard proctor test. The field shall be compacted, settled and firmed uniformly. Operate the irrigation system as necessary to settle and compact the mix to a final uniform depth.

F. Finish grades shall be achieved by using a combination of laser-operated equipment, string lines, drag screens, rollers, and hand raking with a tolerance of 1/4 inch in 25 feet.

G. Finish Grade Verification: A certified survey by a land surveyor licensed in the State shall be performed at 25-foot centers for each field to verify grade and elevation of the finish field

elevation which is 1/4 inch in 25 feet in any direction. The digital survey document shall indicate spot elevations and tenth of foot contours and shall be submitted to the Engineer for review and approval prior to moving to next part of work.

3.5 GRASSING

A. Grass Installation: Per Playing Field Seeding Section. Playing Field Grow in Maintenance: Per Playing Field Seeding Section.

3.6 PLAYING FIELD GROW IN MAINTENANCE

A. To be performed as previously described within this document.

B. Contractor to perform grow in maintenance thru acceptance. This shall minimally be for a period of 30 days or 2 mowings.

C. Maintenance Log: Contractor to record a daily log of all maintenance activities performed on the field through Substantial Completion. These daily records shall be submitted to the Owner and Playing Field Designer/Engineer with submittals to meet Substantial Completion

3.7 FIELD LAYOUT

A. General: Layout of the field regarding all chalk lines and markings shall be by the Owner following Substantial Completion.

3.8 CLEAN UP

A. At the end of each day, remove all scraps and other debris created by the rootzone installation from the playing field area.

B. Remove all surplus excavated material not required for filling and backfilling, trash, and debris and dispose of it properly off of the Owner's property at Contractor's expense.

C. Leave the premises and work in clean, satisfactory condition.

3.9 PROTECTION

A. Protection of materials and work shall be the responsibility of the Contractor during installation and thru acceptance/substantial completion. All material damaged prior to acceptance shall be replaced at no cost to the Owner.

END OF SECTION

2.2 DRAINAGE SYSTEM MATERIALS

A. Collector Pipe, Drainage Pipe, and Fittings:

1. General

   a. All specific pipes are noted on the Contract Drawings.

   b. Review drawings for locations of perforated and non-perforated piping.

   c. Solid wall pipe shall be high-density polyethylene pipe (HDPE) and shall conform to the requirements of AASHTO M252 Type S for 4 to 10 inch diameters and AASHTO M294 or ASTM F2306 Type S for 12 to 60 inch diameters.

   d. Perforated pipe shall be double wall high-density polyethylene pipe (HDPE) and shall conform to the requirements of AASHTO M252 Type SP for 4 inch to 10 inch diameters and AASHTO M294, Type SP or ASTM F2306 for 12 inch to 60 inch diameters.

   e. HDPE Perforated pipe shall have Class 2 slotted perforations in accordance with AASHTO M252 and M294.

   f. Virgin material for pipe and fitting production shall be high-density polyethylene conforming to the minimum requirements of cell classification 424420C for 4-inch to 10-inch diameters, and 435400C for 12-inch to 60-inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 5%.

   g. Provide drainage pipe complete with bends, reducers, adapters, couplings, collars, and joint materials.

   h. Solid wall pipe joints and fittings shall meet the watertight joint performance requirements of AASHTO M252, AASHTO M294, or ASTM F2306. 4-inch through 60-inch shall be watertight according to the requirements of ASTM D3212. Gaskets shall be made of polyisoprene meeting the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

   i. Solid wall HDPE 12-inch through 60-inch diameters shall have a reinforced bell with a bell tolerance device. The bell tolerance device shall be installed by the manufacturer.

   j. Provided drainage pipe complete with all fittings such as bends, reducers, adapters, couplings, collars, and joint materials. Fittings and couplers for perforated HDPE pipe shall be split couplings or snap couplings manufactured by the same manufacturer as the corrugated HDPE.

   k. Manufacturer's certification according to AASHTO M252 and M294 shall be submitted to the Owner prior to installation of the pipe.

2. Products

   a. Advanced Drainage Systems (ADS)

      1) www.ads-pipe.com

   b. Hancor, Inc.

      1) www.hancor.com

   c. Approved Equal