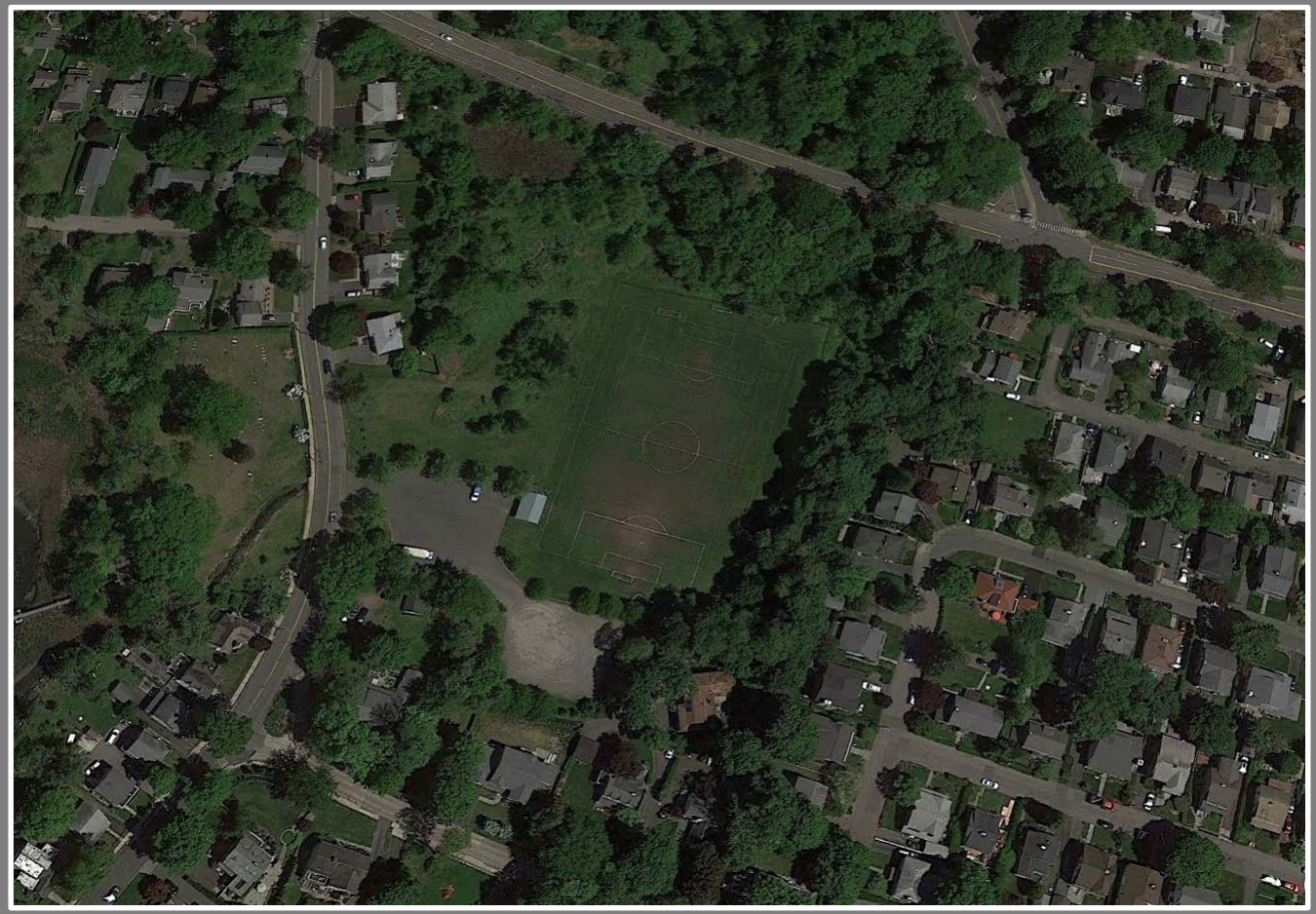


Nursery Field | Rye, New York

Stantec

February 2020

Agenda

1. Introduction
    a. Objective

2. Nursery Field
    a. Site Context
    b. Existing Conditions & Hydraulic Analysis - H&H Study Findings
    c. Programming and Hours of Use

3. Existing Field and Potential Improvements
    a. Natural Grass – Native Topsoil Rootzone
    b. Natural Grass – Sand Based Rootzone
    c. Hybrid Grass – Natural Grass and Synthetic Fibers
    c. Synthetic Turf Field

4. Advantages and Disadvantages of the Systems

5. Health & Human Safety

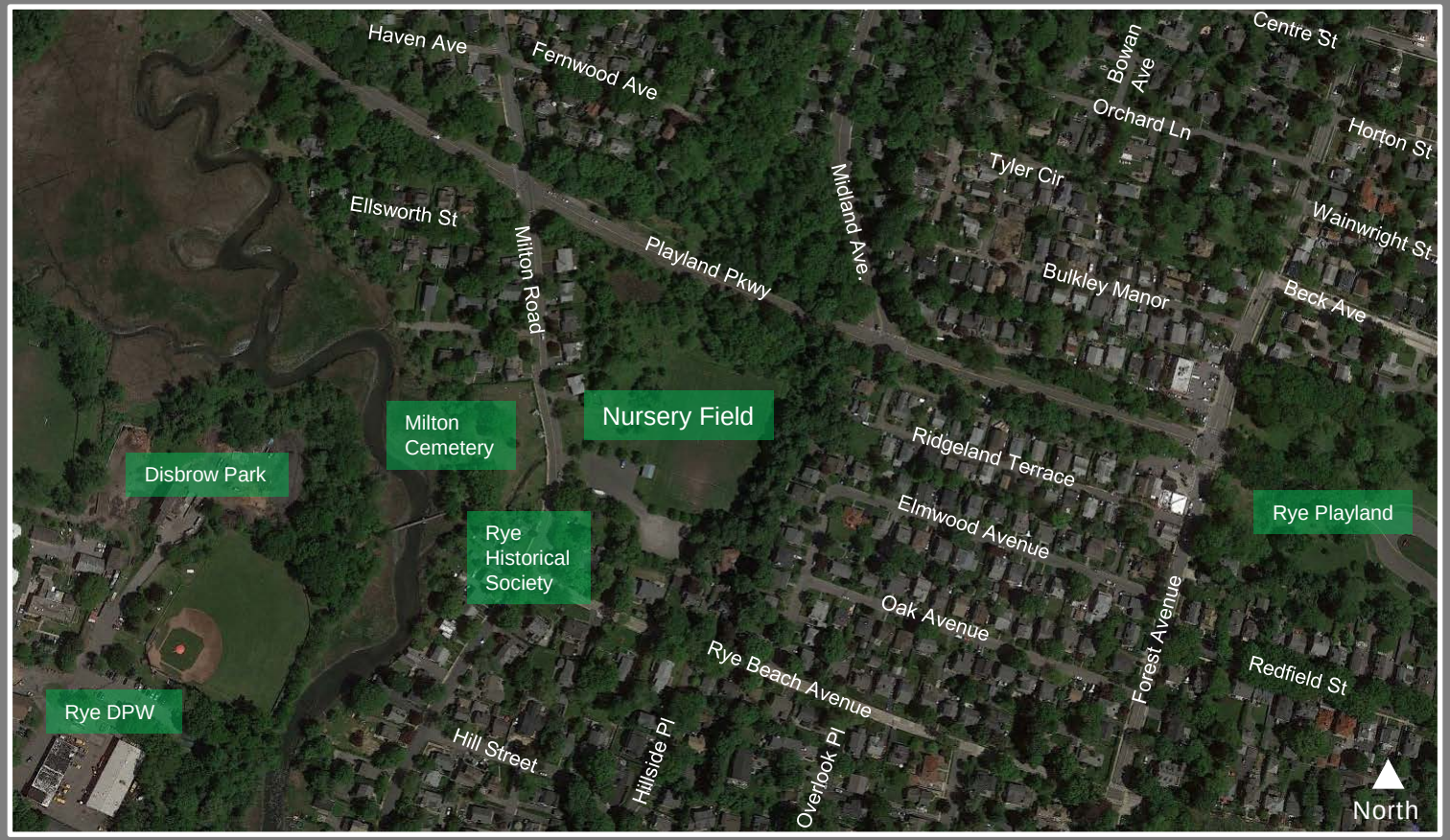
6. Infill and Temperature

7. Field Maintenance and Turf Recycling

8. Cost Comparison

9. Summary

Site Context

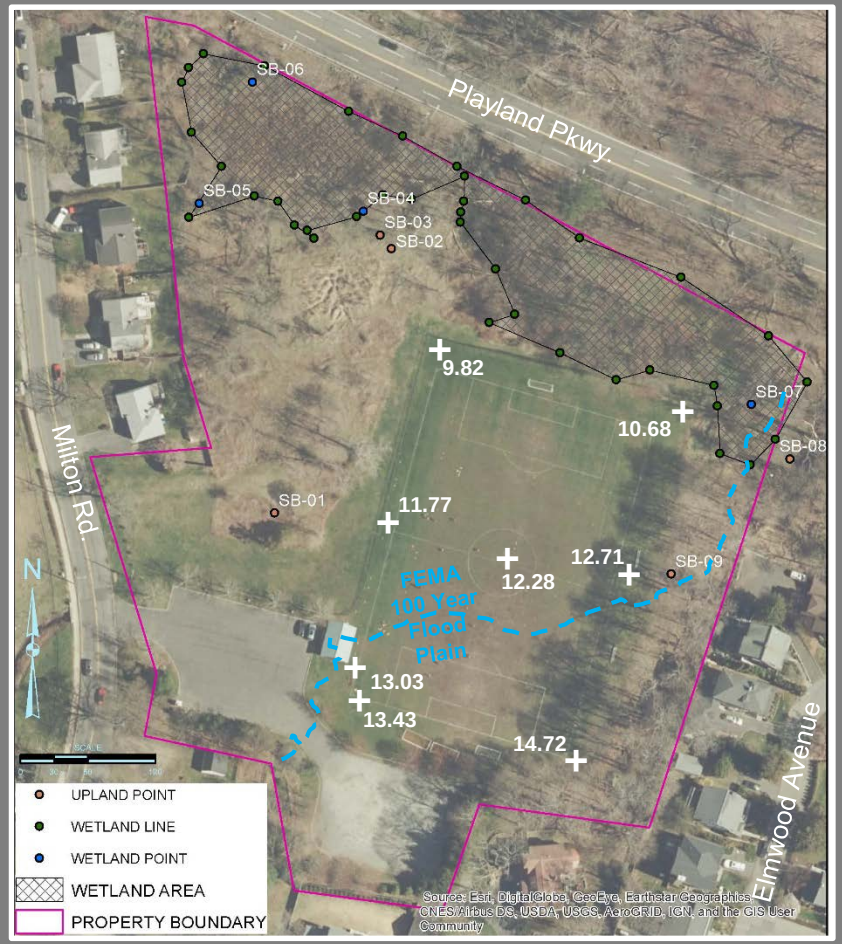


Existing Site Conditions

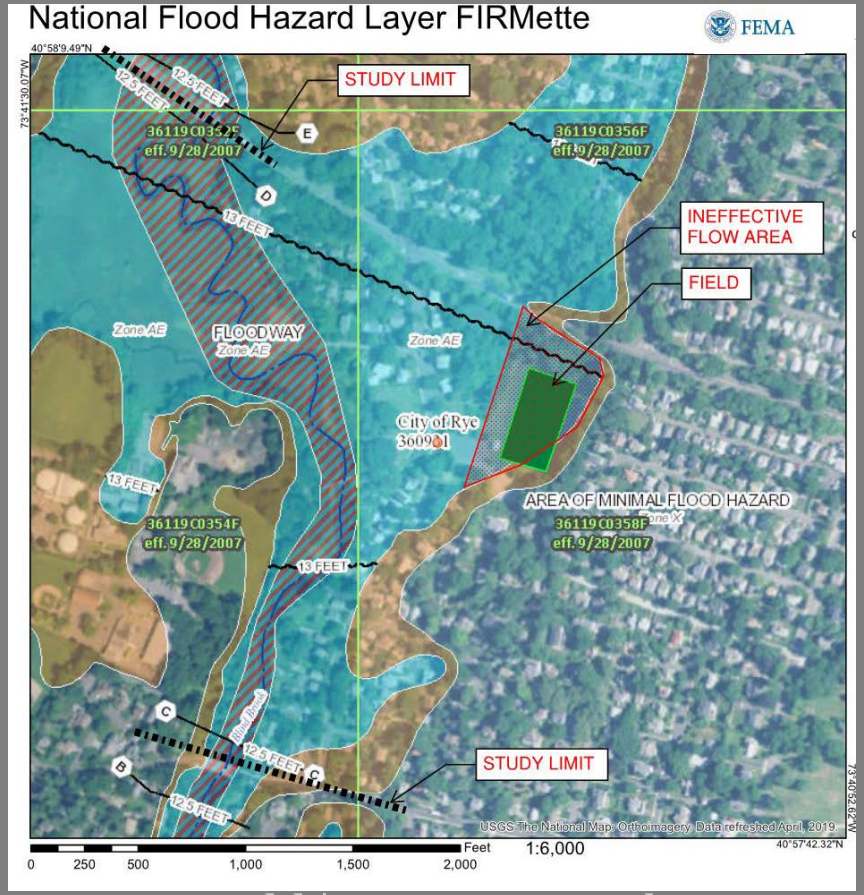
Wetland delineation
Aug. 29th 2019
By GZA accordance federal manual and they are considered hydrologically isolated

Also according to GZA:

‘Wetland is unlikely to support endangered species’

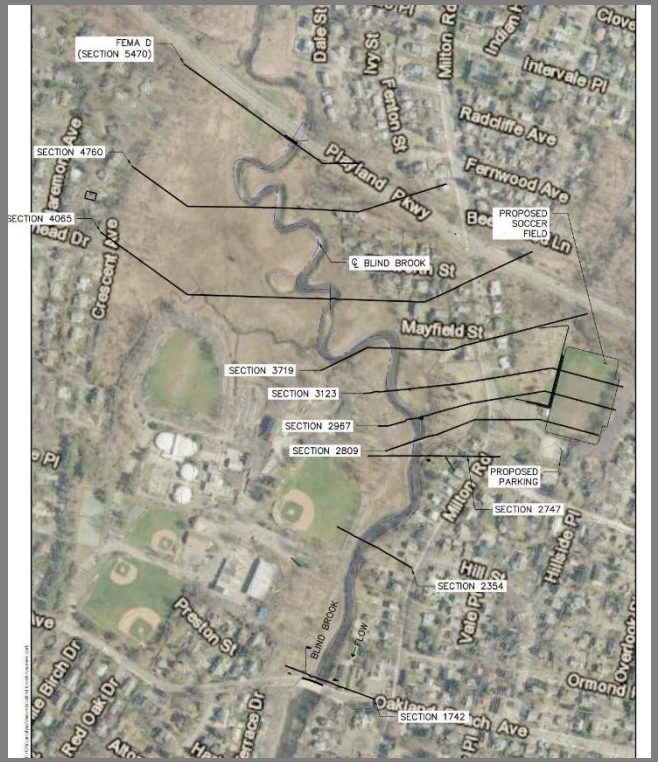


Hydraulic Analysis



Hydraulic Analysis Methodology:

- FEMA Information (flows, starting WSEs)
- Surveyed Cross Sections
- Existing Conditions Model
- Proposed Conditions Model



Stantec

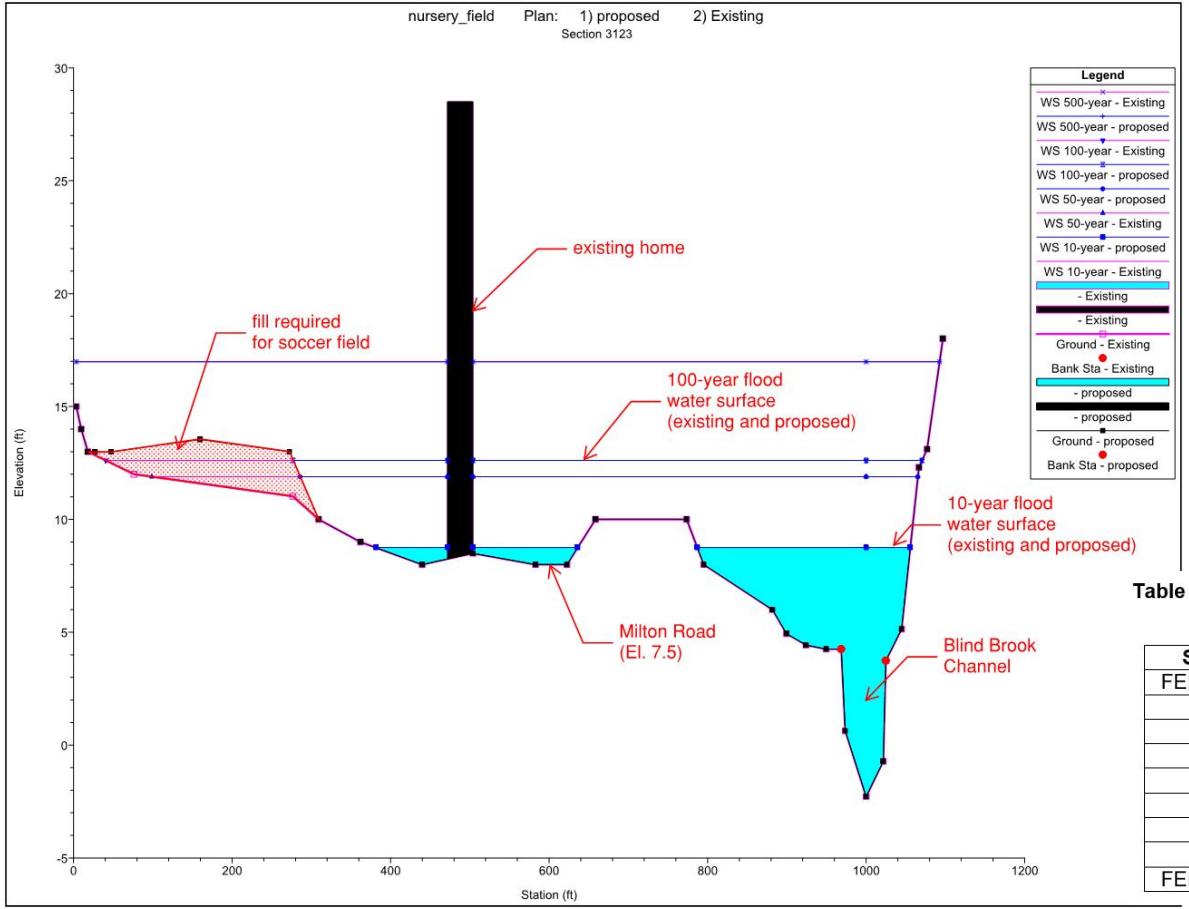
Hydraulic Analysis

Nursery Field | Rye, New York

Stantec

February 2020

Hydraulic Analysis



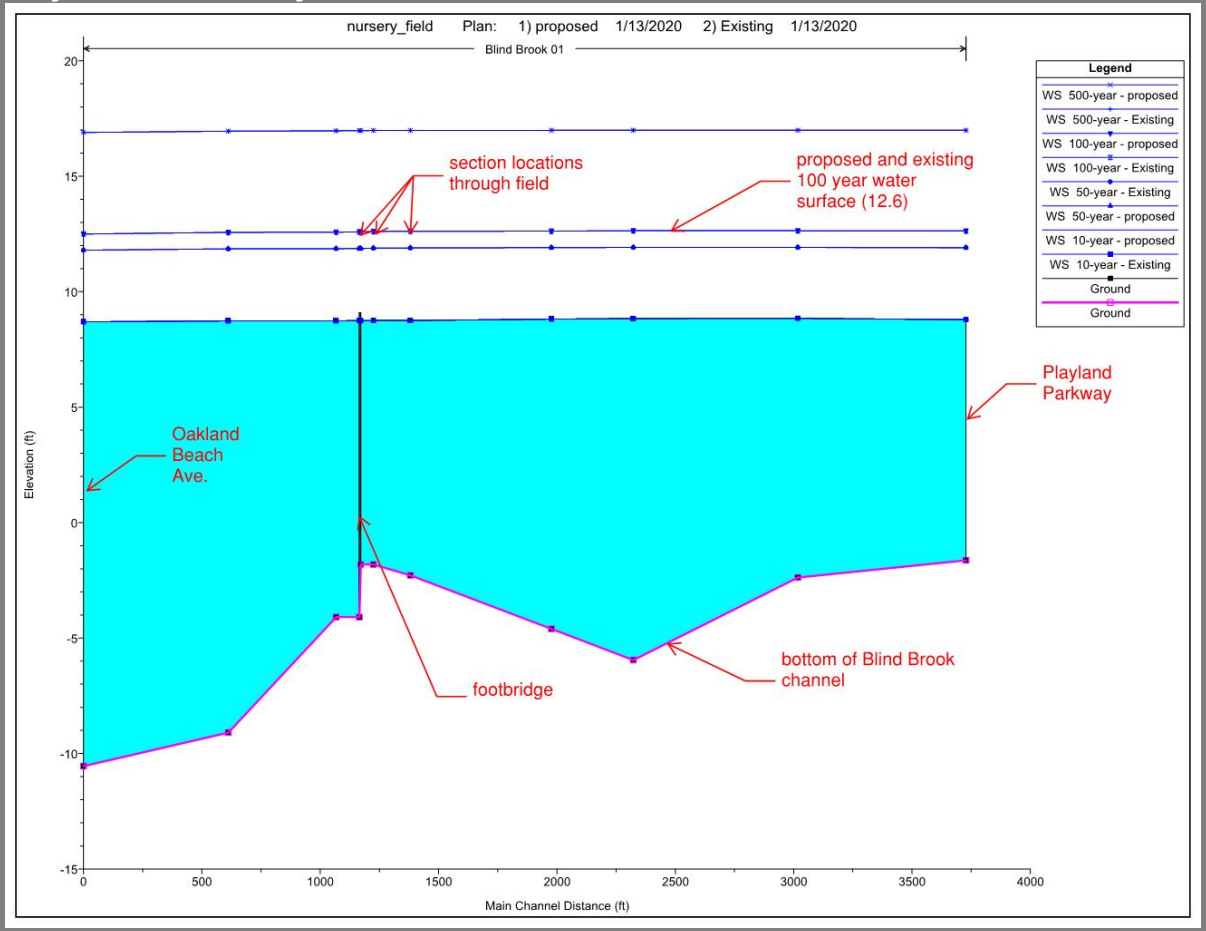
Cross Section Through Field

- Field at edge of floodplain (ineffective flow area)
- Fill is above 10-year water surface

Table 2: Existing and Proposed Water Surface Elevations – 100-Year Storm

Section ID	WSE Existing (ft.)	WSE Proposed (ft.)	Difference (ft)
FEMA D (5470)	12.63	12.63	0.00
4760	12.64	12.64	0.00
4065	12.64	12.64	0.00
3719	12.63	12.63	0.00
3123	12.62	12.62	0.00
2967	12.61	12.61	0.00
2747	12.58	12.58	0.00
2354	12.57	12.57	0.00
FEMA C (1742)	12.50	12.50	0.00

Hydraulic Analysis



Blind Brook Water Surface Profile:

- Flood elevations governed by tidal conditions
- Volume of flood storage in reach is 600,000 cubic yards
- Volume of fill for field is 1,800 cubic yards

Programming and Hours of Use

Programming and Hours of Use

» HOURS OF USE

In order to maintain a high-quality surface, natural systems are limited in the play they can withstand, and weather only impacts these limitations.

- CURRENT NURSERY FIELD PROGRAM DEMAND:
  - 44.5 HOURS PER WEEK IN SPRING
  - 0 HOURS PER WEEK IN SUMMER : PREPARATION FOR FALL US, UNABLE TO PROGRAM
  - 36.5 HOURS PER WEEK IN FALL

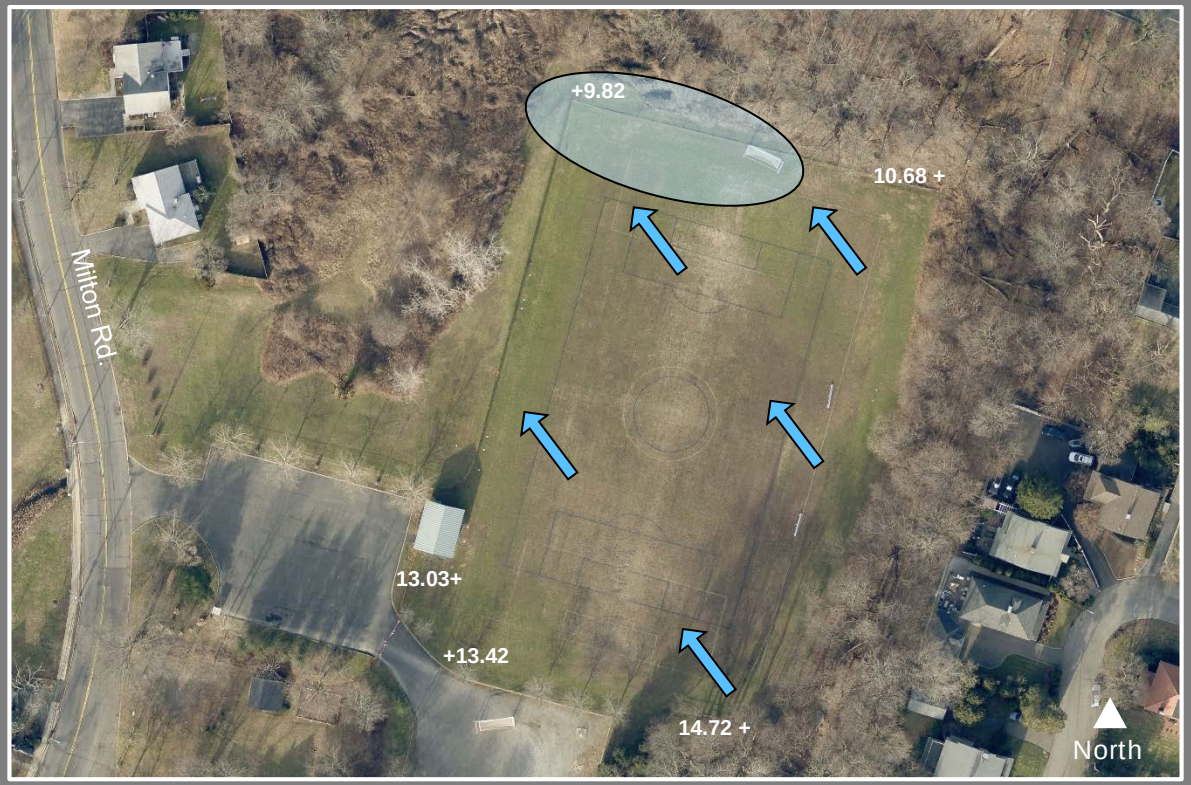
» In 2018, 40% of Nursery Field programming was cancelled or relocated due to rain or unplayable conditions.

» SUGGESTED PROGRAM USE TO MAINTAIN IDEAL CONDITIONS

NATIVE SOIL NATURAL GRASS	10-15 HOURS PER WEEK (FOR IDEAL SURFACE CONDITIONS WITH CONSISTENT GRASS COVERAGE)
SAND BASED (UNDER DRAINED)	15-25 HOURS PER WEEK
HYBRID NATURAL GRASS	20 – 30 HOURS PER WEEK
SYNTHETIC TURF SYSTEMS	50+ HOURS PER WEEK (FOR IDEAL SURFACE CONDITIONS WITH CONSISTENT INFILL COVERAGE

Existing Field & Potential Improvements

Existing Conditions Review



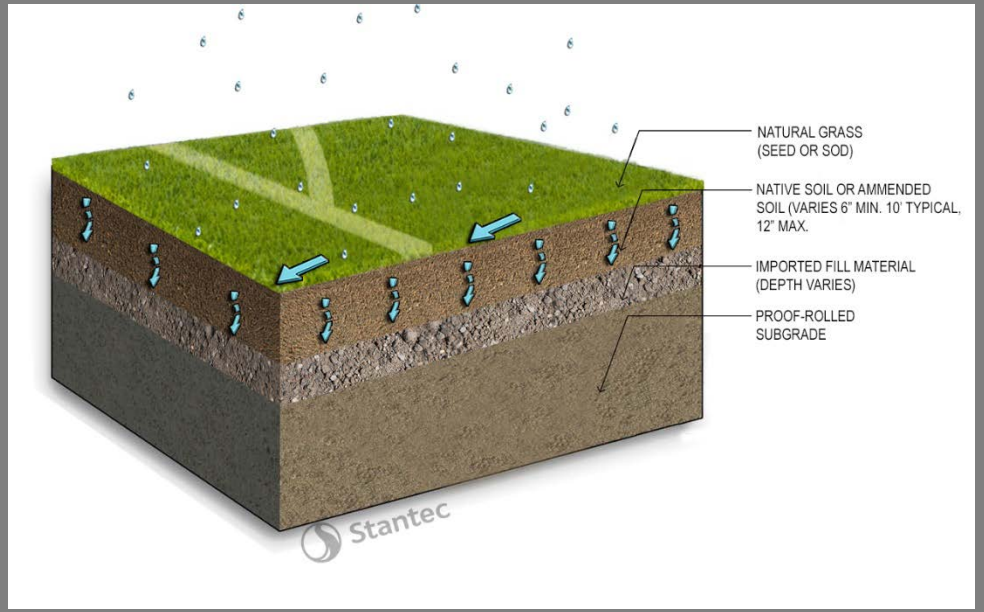
- 200’x330’ field size
- Infiltration is poor
  - (0.1” of rain per hour)
- The balance of rainwater ponds within one end and corner of field and flows uncontrolled across the field and into the existing wetlands

Proposed Field Layout

- 204’ x 345’ proposed field to accommodate soccer, lacrosse, field hockey up to high school level of play
- Field elevation lowered to elevation 12.5 at perimeter. Finished elevation is 6” above the 100-year flood elevation taking the entire field out of impacts from flooding
- Field layout shifted south to fit within current fence line with no direct impacts to the existing wetlands

Proposed Field Layout – Natural Grass Field Renovation – Native Topsoil Rootzone

» How will the field drain?



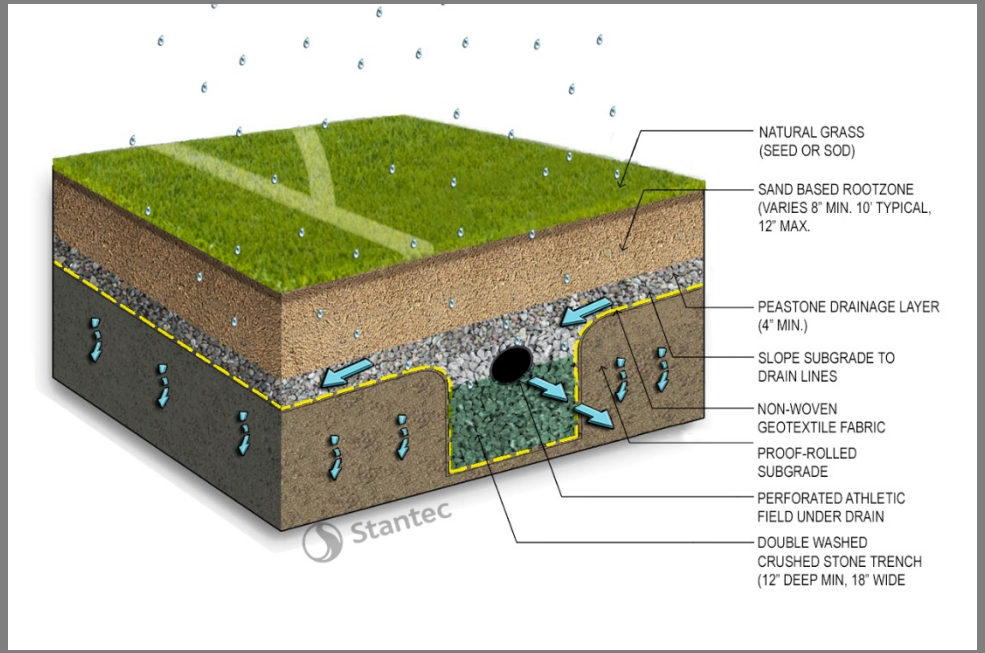
- NATIVE NATURAL GRASS SYSTEMS
  - Surface runoff
  - 1.5-2% slope to field sideline perimeter drainage system
  - Balance of water would be control released

Proposed Field Layout – Natural Grass Field Renovation– Native Topsoil Rootzone

- NATIVE NATURAL GRASS SYSTEMS
  - Surface runoff, Crown Field Minimize water on the surface
  - 1.5-2% slope to field sideline perimeter drainage system
  - Balance of water would be control released

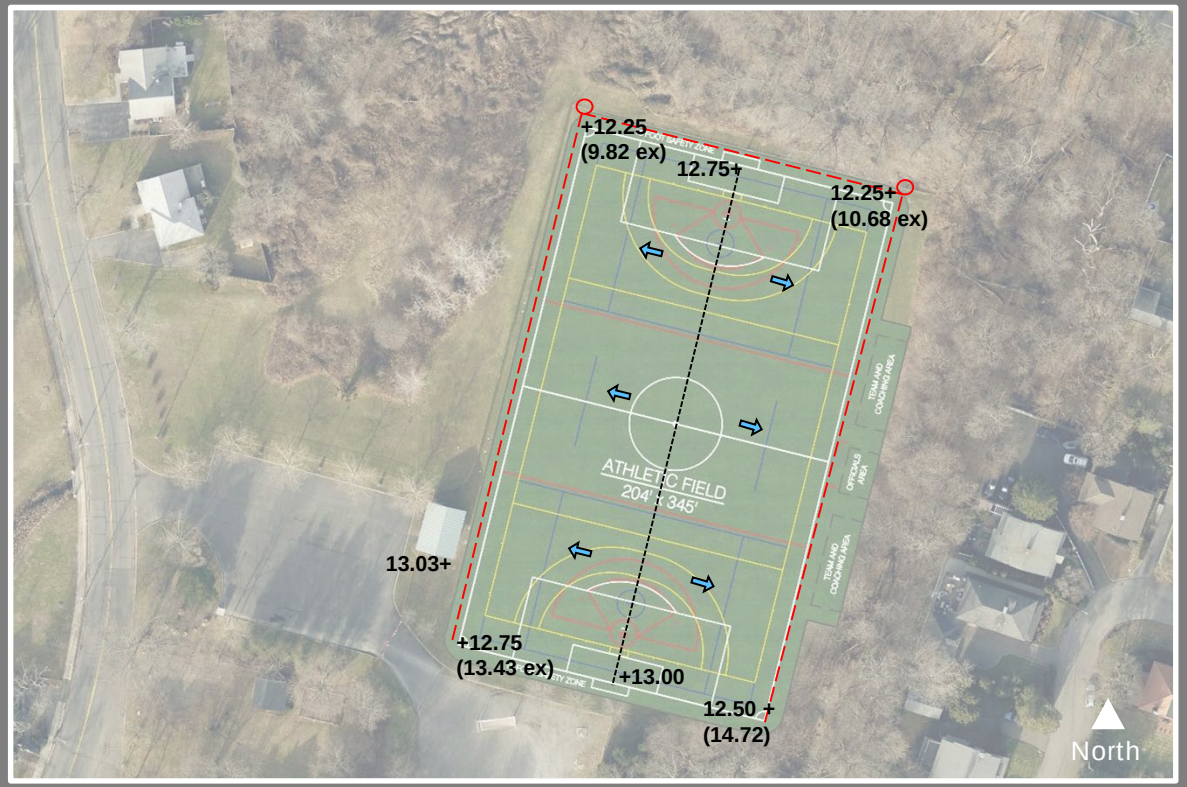
Proposed Field Layout – Natural Grass Field Renovation – Sand Based Rootzone

» How will the field drain?



- NATURAL GRASS SAND BASED SYSTEMS
  - Primarily vertical infiltration, minimal runoff
  - 0.5-1% slope to field sideline with underdrains to perimeter drainage system
  - Balance of water would be control released

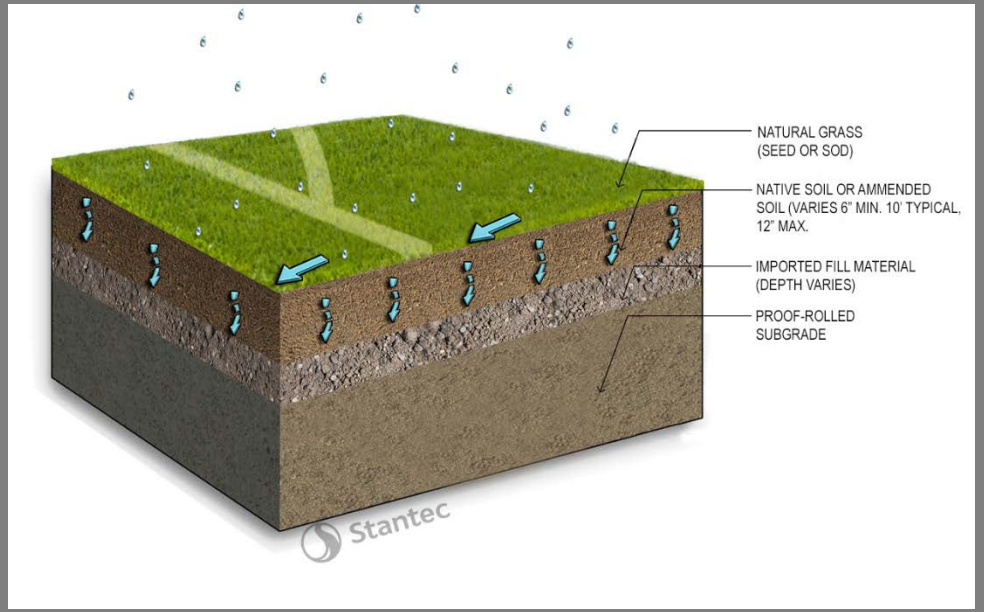
Proposed Field Layout – Natural Grass Renovation– Sand Based Rootzone



- NATURAL GRASS SAND BASED SYSTEMS
  - Primarily vertical infiltration, minimal runoff
  - 0.5-1% slope to field sideline with underdrains to perimeter drainage system
  - Balance of water would be control released

Proposed Field Layout – Hybrid Grass Field Renovation – Native Topsoil Rootzone

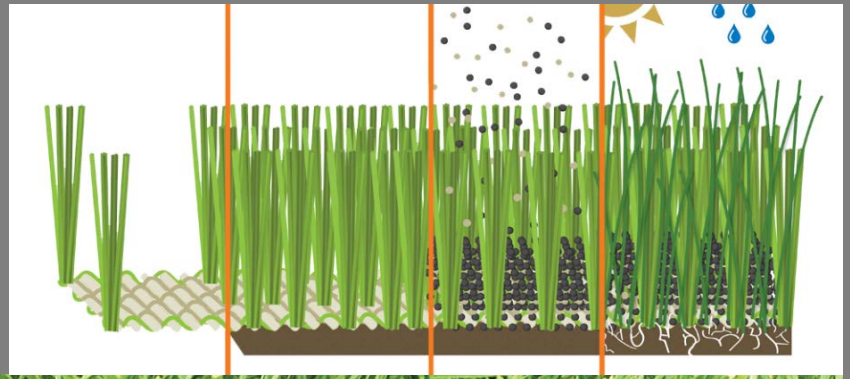
» How will the field drain?

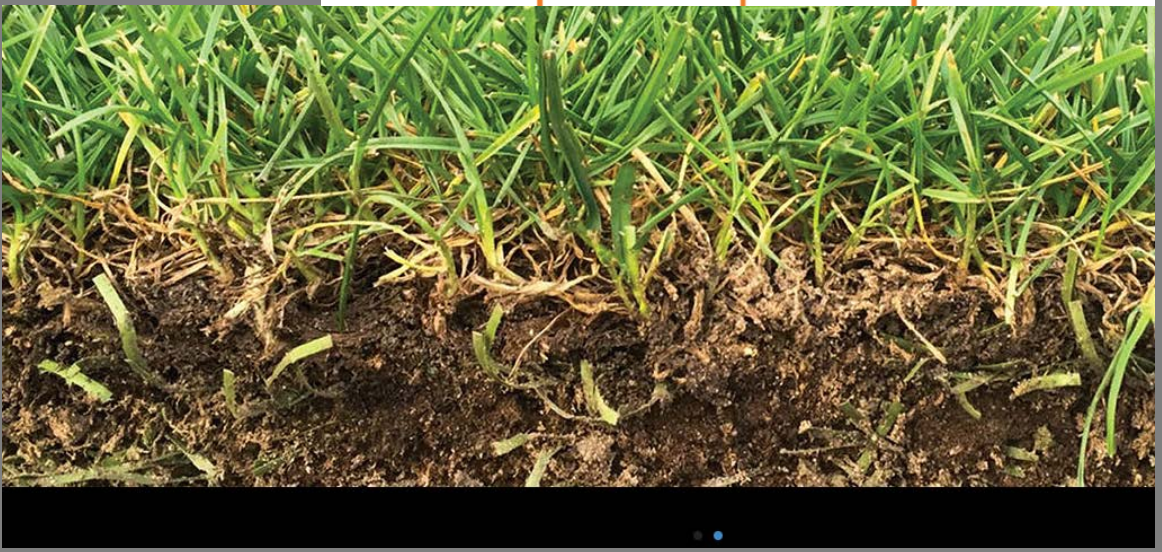


- HYBRID NATURAL GRASS SYSTEMS
  - Surface runoff
  - 1.5-2% slope to field sideline perimeter drainage system
  - Balance of water would be control released
  - Blend of natural grass and synthetic turf fibers

*Potentially more durable than sand based and easier to maintain

Proposed Field Layout – Hybrid





- HYBRID NATURAL GRASS SYSTEMS
  - Surface runoff
  - 1.5-2% slope to field sideline perimeter drainage system
  - Balance of water would be control released

Nursery Field | Rye, New York

Stantec

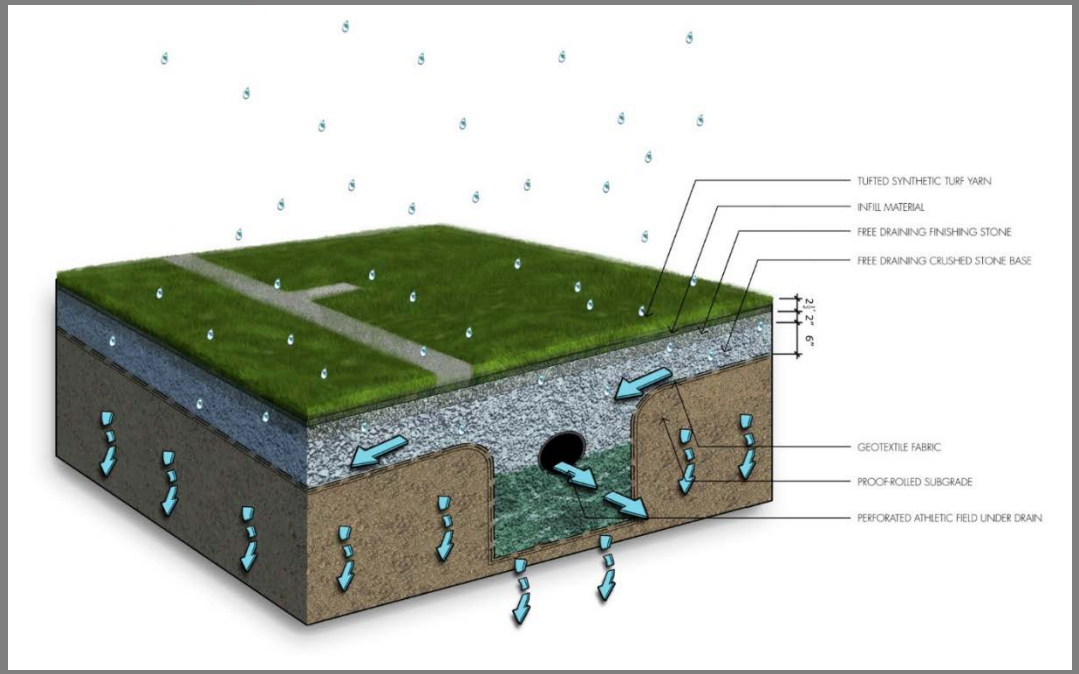
February 2020

Proposed Field Layout – Hybrid Grass Field Renovation– Native Topsoil Rootzone

- HYBRID NATURAL GRASS SYSTEMS
  - Surface runoff, Crown Field Minimize water on the surface
  - 1.5-2% slope to field sideline perimeter drainage system
  - Balance of water would be control released

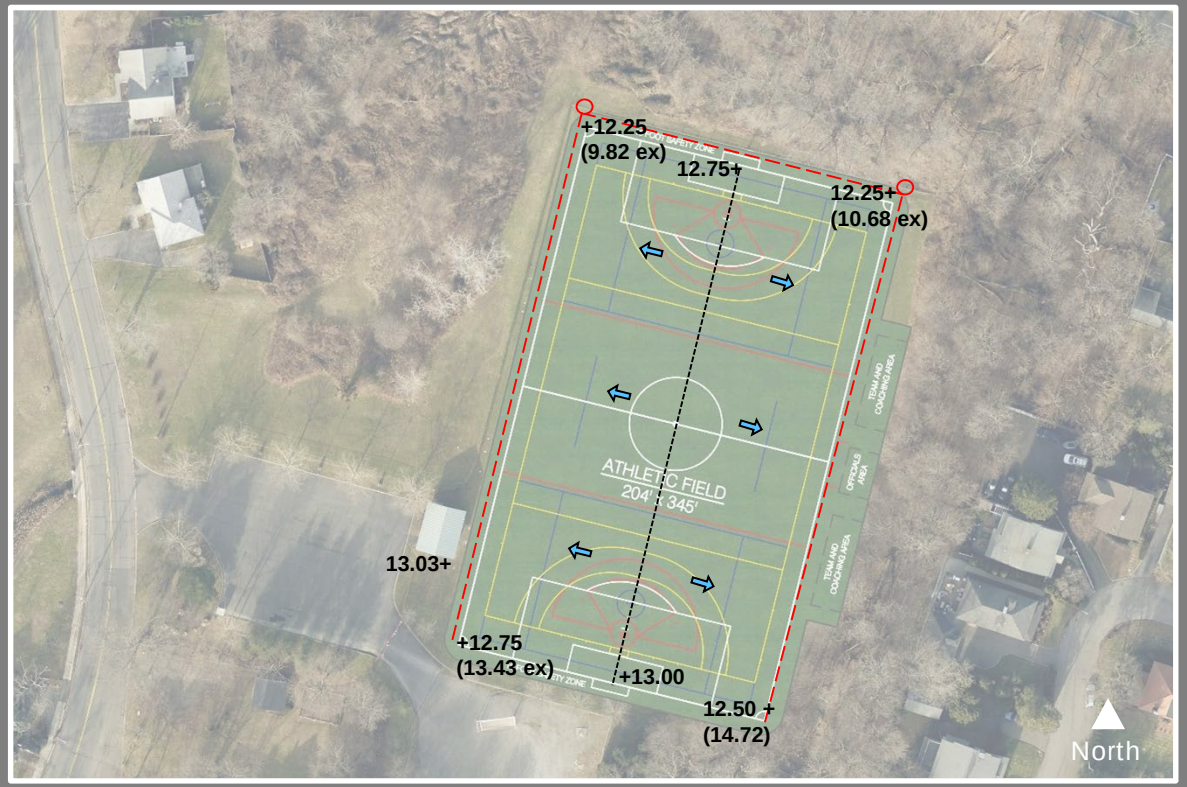
Proposed Field Layout – Synthetic Turf Field Renovation

» How will the field drain?



- SYNTHETIC TURF SYSTEMS
  - No surface runoff from field, vertical infiltration into subgrade soils
  - Field acts as a retention basin (2”+ rainstorm would be contained within the field without discharge)
  - Balance of water would be control released

Proposed Field Layout – Synthetic Turf Field Renovation



- SYNTHETIC TURF SYSTEMS
  - No surface runoff from field, vertical infiltration into subgrade soils
  - Field acts as a retention basin (2”+ rainstorm would be contained within the field without discharge)
  - Balance of water would be control released

Natural Grass Renovation : Native vs Sand Based Rootzones

» ADVANTAGES AND DISADVANAGES

	Native Topsoil Rootzone	Sand Based Rootzone
PROS….	▪ SURFACE TEMPERATURE ▪ MAINTAIN NATURAL SURFACE ▪ INITIAL COST ▪ MAINTENANCE/FERTILIZER/ WATER/$	▪ SURFACE TEMPERATURE ▪ RESILENCY; RESISTING COMPACTION ▪ WEATHER / LESS FIELD CLOSURES
CONS….	▪ DURABILITY ▪ COMPACTION & DRAINAGE REQUIRING FIELD CLOSURES	▪ MAINTENANCE/FERTILIZER/WATER/$$$

» ADVANTAGES AND DISADVANAGES

	Natural Grass Systems	Synthetic Turf
PROS….	▪ SURFACE TEMPERATURE ▪ MAINTAIN NATURAL SURFACE ▪ INITIAL COST (NATIVE)	▪ COST PER HOUR OF USE ▪ DURIBILTY/HOURS OF USE ▪ WEATHER RESISTANCE ▪ LESS MAINTENANCE/NO FERTILIZER/NO WATER ▪ SURFACE CONSISTENCY
CONS….	▪ MAINTENANCE/FERTILIZER/WATER ▪ DURABILITY/HOURS OF USE ▪ WEATHER/FIELD CLOSURES ▪ OVERALL COST (SAND BASED AND HYBRID)	▪ INITIAL COST ▪ SURFACE TEMPERATURE
	Native Topsoil Rootzone $ Sand Based Rootzone $$$ Hybrid $$$	Synthetic Turf $$$

Heath & Human Safety

What are the health impacts of natural grass systems?

NEW YORK STATE
Department of Environmental Conservation

PESTICIDES

- No pesticide use on grounds at schools and day cares centers.
  - **No** school or day care center can apply pesticides to any playgrounds, turf or athletic fields, under amendments to the New York State Education Law (Section 409-k) and Social Services Law (Section 390-g) *Emergency situation

FERTILIZERS

- NPK (Nitrogen, Phosphorus, Potassium) Run-off
  - **Phosphorus is one of the leading causes of water pollution**, according to the New York State Department of Environmental Conservation

» What are the health impacts of natural grass systems?

OTHER NUTRIENTS FOUND IN FERTILIZER

The other nutrients found in fertilizers fall into two categories: **secondary nutrients and micronutrients**. Most plants need smaller amounts of secondary nutrients than they do macronutrients, and they require micronutrients in even smaller quantities still. Although plants need less of these nutrients, they still perform vital roles.

Secondary nutrients include calcium (Ca), magnesium (Mg), and sulfur (S):

- **Calcium** reduces the acidity of soil and helps the plant absorb nutrients. It also improves disease resistance and supports cell division, cell wall formation, and the activation of enzyme systems related to plant growth.
- **Magnesium** is necessary for photosynthesis. As an element of chlorophyll, it also helps the plant to metabolize phosphorous. It impacts crop quality, plant development and aids in the production of oils, fats, and sugars.
- **Sulfur** helps plants to synthesize various amino acids and proteins. It is an essential component of chlorophyll as well and helps promote hardiness through winter. Additionally, it helps to decrease nitrate and non-protein nitrogen build-up in the plant. It improves the structure and water filtration in the soil, too.

Micronutrients together support various aspects of plant growth and contribute to increasing yields, improving structural integrity, and producing vitamins. You may find the following micronutrients in fertilizers:

- **Boron (B)** helps move sugars from the roots to the rest of the plant, assists in cell division, and helps with amino acid production.
- **Chlorine (Cl)** aids in plant metabolism, disease resistance, and photosynthesis.
- **Copper (Cu)** activates enzymes and helps with protein synthesis and the creation of chlorophyll.
- **Iron (Fe)** is required for the production of chlorophyll and is a component of enzymes.
- **Manganese (Mn)** also contributes to chlorophyll production and activates enzymes.
- **Molybdenum (Mo)** reduces nitrates to help with protein synthesis.
- **Nickel (Ni)** is also necessary for the creation of chlorophyll.
- **Zinc (Zn)** activates enzymes and helps with plant hormone balance.

- What are the health impacts of synthetic turf systems?

  PLEASE NOTE: THE INFILL TYPE FOR A SYNTHETIC TURF SYSTEM HAS NOT BEEN SELECTED, HOWEVER CRUMB RUBBER WILL NOT BE CONSIDERED.

SYNTHETIC TURF FIBERS AND INFILL

- Cancer Concern (Infill)?
- Toxicology – Heavy Metals, PAH's, PFA's
- Leaching Metals (Infill)
- Emissions (Infill)
- Surface Temperature

SYNTHETIC TURF – CANCER LINK?

- Dr. Laura Green, Ph.D., D.A.B.T. – Memorandum to comment on CPSC Report #20150608-22F81-2147431268
- Washington State Department of Health – Investigation of Reports Cancer Among Soccer Players in Washington State, Revised April 2017
- UC Davis Study – Lymphoma and Synthetic Turf Fields
- Letter to the Seacoast Editor from Michael Peterson, board-certified toxicologist

SYNTHETIC TURF – TOXICOLOGY

- Concord study - Stantec
- Various Metals, PAHs, VOCs Tests

- Studies above can be provided as requested.

Synthetic Turf Infill – Crumb Rubber Testing – EN-71-3

www.sportslabsusa.com

LABORATORY TESTING
HEAVY METALS ANALYSIS

firefly SPORTS LABS USA

Project Information

Project Name	[redacted] Infill Heavy Metals Analysis	
Client Information	Stantec 226 Causeway St., #600 Boston, MA 02114-2155	
Date	October 25, 2019	
Job no.	95373/5748	
Report Status	Final	
Prepared by	*Megan Illsley* *Laboratory Director*	Megan Illsley
Checked by	*Jeffrey Gentile* *Operations Director*	

Notes:

1. This report has been prepared by Firefly Sports Labs USA with all reasonable skill, care and diligence within the terms of the contract with the Client and within the limitations of the resources devoted to it.

2. This report is confidential to the Client and Firefly Sports Labs USA accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

3. This report shall not be used for engineering or contractual purposes unless signed by the Author and the Checker and unless the report status is "Final."

Standard / Regulation:

The STC suggests that any toxicological test and analysis of infill for synthetic turf fields be performed according to European Standard EN 71-3 – Safety of Toys Part 3: Migration of certain elements. The analytical method for each metal can be found in the results table below.

Requirements:

The target detection limits for each metal can be found in the results table below. The limits shown are per European Standard EN 71-3 – Safety of Toys Part 3: Migration of certain elements.

Results:

All results were found to be below the limit criteria referenced above.

www.sportslabsusa.com

LABORATORY TESTING
HEAVY METALS ANALYSIS

firefly SPORTS LABS USA

Results Table:

Analyte	*Target Detection Limit (mg/kg)	Sample Detection Limit (SDL) Based Result	PASS / FAIL
Extractable Aluminum	*70,000*	4.4 mg/kg	PASS
Extractable Antimony	*560*	0.51 mg/kg	PASS
Extractable Arsenic	*47*	< 0.5 mg/kg	PASS
Extractable Barium	*18,750*	0.86 mg/kg	PASS
Extractable Boron	*15,000*	< 25 mg/kg	PASS
Extractable Cadmium	*17*	< 0.5 mg/kg	PASS
Extractable Chromium III	*460*	< 0.5 mg/kg	PASS
Extractable Chromium VI	*0.2*	< 0.2 mg/kg	PASS
Extractable Cobalt	*130*	0.62 mg/kg	PASS
Extractable Copper	*7,700*	2.9 mg/kg	PASS
Extractable Lead	*160*	0.69 mg/kg	PASS
Extractable Manganese	*15,000*	1.4 mg/kg	PASS
Extractable Mercury	*94*	0.19 mg/kg	PASS
Extractable Nickel	*930*	< 0.5 mg/kg	PASS
Extractable Selenium	*460*	< 2.5 mg/kg	PASS
Extractable Strontium	*56,000*	< 0.5 mg/kg	PASS
Extractable Tin	*180,000*	< 0.5 mg/kg	PASS
Extractable Organic Tin	*12*	< 0.5 mg/kg	PASS
Extractable Zinc	*46,000*	97 mg/kg	PASS

*Limits per European Standard EN 71-3 – Safety of Toys Part 3: Migration of certain elements.

Synthetic Turf Infill – Crumb Rubber Testing – ASTM F3188-16

www.sportslabsusa.com

LABORATORY TESTING
HEAVY METALS ANALYSIS

firefly SPORTS LABS USA

Project Information

Project Name	[redacted] Infill Heavy Metals Analysis F3188	**Job no.**	95373/5748
Client Information	Stantec 226 Causeway St., #600 Boston, MA 02114-2155		
Date of Report	October 25, 2019	**Sample Arrival**	October 1, 2019
Report Status	Final		
Prepared by	*Megan Illsley* *Laboratory Director*		
Checked by	*Jeffrey Gentile* *Operations Director*		

Notes:

1. This report has been prepared by Firefly Sports Labs USA with all reasonable skill, care and diligence within the terms of the contract with the Client and within the limitations of the resources devoted to it.

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3. This report shall not be used for engineering or contractual purposes unless signed by the Author and the Checker and with it the report status is "Final."

Standard / Regulation:

ASTM F3188-16, Standard Specification for Extractable Hazardous Metals in Synthetic Turf Infill Materials

Requirements:

This specification relates to the amount of certain metals that have the potential to be extracted from synthetic turf infill materials if ingested. The time, temperature, and pH of the extraction fluid approximate the conditions the infill material would experience in the stomach during the digestive process. The levels of extractable metals are compared to maximum levels allowed in children's toys.

This specification applies to all materials (man-made or natural) that are intended for use as infill materials for synthetic turf sports surfaces.

Results:

All results were found to be below the limit criteria referenced above.

www.sportslabsusa.com

LABORATORY TESTING
HEAVY METALS ANALYSIS

firefly SPORTS LABS USA

Results Table:

Analyte	Analytical Method	*Suggested Concentration Limit (mg/kg)	Sample Result (mg/kg)	PASS / FAIL
Antimony	ASTM F3188	60	< 0.5	PASS
Arsenic	ASTM F3188	25	< 0.5	PASS
Barium	ASTM F3188	1000	< 0.5	PASS
Cadmium	ASTM F3188	75	< 0.5	PASS
Chromium	ASTM F3188	60	< 0.5	PASS
Lead	ASTM F3188	90	< 0.5	PASS
Mercury	ASTM F3188	60	< 0.02	PASS
Selenium	ASTM F3188	500	< 2.5	PASS

*The suggested concentration limits shown are based on screening levels per ASTM F3188-16 Migration of Certain Elements. These limits have been included for reference and are not project specific.

End of Report

Synthetic Turf Infill – Crumb Rubber Testing – CAL 1350 Emissions

LABOSPORT PTL DALTON GA, USA

TEST REPORT

DATE: 05-05-2016	TEST NUMBER: 0401751
CLIENT	[redacted]
TEST CONDUCTED	CAL 1350 Emissions Testing
PRODUCT NAME	Infill Product
DESCRIPTION OF PRODUCT TESTED	Black

CAL 01350 Test Report

The submitted product was tested for VOC emissions by test method-ASTM D5116 Modified Organic Emissions Testing. The capture media used were Solid Sorbent Tubes (tenax TA/Carbon) and 2,4 DNPH on SiO_2. The day 11 results below show the highest levels detected over the 4 timed readings.

TEST RESULTS

Test Results			Test Results	
Target Compound	Emission (µg/m³)		Target Compound	Emission (µg/m³)
1,1-Dichloroethylene	<4.0		Formaldehyde	<5.0
1,4-Dichlorobenzene	<4.0		Hexane	<4.0
1,4-Dioxane	<4.0		Isophorone	<10.0
Acetaldehyde	<5.0		Isopropanol	<10.0
Benzene	<4.0		Methyl Chloroform	<4.0
Carbon Disulfide	<10.0		Methylene Chloride	<4.0
Carbon Tetrachloride	<4.0		Methyl t-butyl Ether	<4.0
Chlorobenzene	<4.0		N,N-Dimethylformamide	<10.0
Chloroform	<4.0		Napthalene	<4.0
Epichlorohydrin	<1.0		Phenol	<10.0
Ethyl Benzene	<4.0		Propylene glycol Monomethyl ether	<10.0
Ethylene Glycol	<4.0		Styrene	<4.0
E.G. Monomethyl ether	<4.0		Tetrachlorethylene	<4.0
E.G. Monomethyl ether acetate	<4.0		Toluene	<4.0
Ethylene glycol Monomethyl ether	<4.0		Trichloroethylene	<4.0
E.G. Momomethyl ether acetate	<4.0		Vinyl Acetate	<4.0
			Xylenes	<12.0

LABOSPORT PTL DALTON GA, USA

TEST REPORT

All chemicals of concern were found ***to be under*** the CAL 01350 required criteria at the 11, 12 13, and 14 day marks indicating the material as submitted meets the requirements set forth under CAL 01350.

Synthetic Turf Fiber – CAL 17

ANALYTICAL INDUSTRIAL RESEARCH LABORATORIES, INC.

State of Tennessee (ID #02034)

Alabama Dept. of Environmental Management (ID #40780)

IS NOW
AIRL, INC.
1550 37TH ST., NE
CLEVELAND, TN 37312
423.476.7766 FAX: 423.476.7714

Scope of Accreditation:
Wastewater, Surface Water, Ground Water, Drinking Water, Solids, Hazardous Waste, Soils, Sediments, and Sludges.

Lab Report 282043

8609
Shaw Sports Turf/Dalton
Attention: Phil Stricklen
1010 V.D. Parrot Parkway
Dalton, GA 30720

Date Received 7 /21/2015
Date Sampled None Given
Date Requested 7 /31/2015
Rush Status Normal
Phone (706) 532-2150
Extension
☐ *Fax* (706) 331-5407
☑ *eMail:* phil.stricklen
PO#

Sample Information

Shaw HP Slit Tape
Turf Yarn

Lab Report: 282043	*Result*		*LCL*	*Method*	*SDL*	*Date*	*Time*	*Analyst*
CAM 17 Metals								
Antimony (Sb)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Arsenic (As)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Barium (Ba)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Beryllium (Be)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Cadmium (Cd)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Chromium (Cr)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Cobalt (Co)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Copper (Cu)	3.09	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Lead (Pb)	5.40	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Molybdenum (Mo)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Nickel (Ni)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Selenium (Se)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Silver (Ag)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Thallium (Tl)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Vanadium (V)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Zinc (Zn)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/5/2015	10:29	JAG
Mercury (Hg)	< 0.1	mg/Kg	0.1	EPA 7471B	0.1	8/4/2015	15:15	JAG

≥ 250 mg/kg
≥ 50 mg/kg

Lowest Calibration Level [LCL] - reporting limit; Sample Detection Level [SDL] - Sample Specific

QA/QC Procedures required by the Method(s) were followed unless otherwise noted. Performance and acceptance standards for required QA/QC procedures were achieved unless otherwise noted. No significant modifications have been made to the Method(s). I attest that, based upon my inquiry of those individuals immediately responsible for reviewing the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Nursery Field | Rye, New York

Synthetic Turf Backing – CAL 17

Dalton, GA 30720

PO#

Sample Information

Shaw Sports Turf
Primary Backing

Lab Report: 282462	Result		LCL	Method	SDL	Date	Time	Analyst
PAH - SIMS								
2-Methylnaphthalene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Acenaphthene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Acenaphthylene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Anthracene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Benzo(a)anthracene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Benzo(a)pyrene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Benzo(b)fluoranthene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Benzo(g,h,i)perylene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Benzo(k)fluoranthene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Chrysene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Dibenz(a,h)anthracene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Fluoranthene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Fluorene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Indeno(1,2,3-cd)pyrene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Naphthalene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Phenanthrene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
Pyrene	< 10	ug/L	10	8270C SIMS	10	8/22/2015	17:11	RRP
CAM 17 Metals								
Antimony (Sb)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Arsenic (As)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Barium (Ba)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Beryllium (Be)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Cadmium (Cd)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Chromium (Cr)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Cobalt (Co)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Copper (Cu)	6.17	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Lead (Pb)	5.90	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Molybdenum (Mo)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Nickel (Ni)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Selenium (Se)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Silver (Ag)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Thallium (Tl)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Vanadium (V)	< 0.25	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Zinc (Zn)	73.4	mg/Kg	0.25	EPA 6010	0.25	8/26/2015	16:17	JAG
Mercury (Hg)	< 0.1	mg/Kg	0.1	EPA 7471B	0.1	8/26/2015	8:20	JAG
Hexavalent Chromium	< 4	mg/Kg	0.1	EPA 7196 A	4	8/11/2015	13:25	JAG

Nursery Field | Rye, New York

Infill and Temperature

Location Field Surface (Infill Type)	Air Temp. (°F) (weather.com)	Surface Temp. Fiber/ Grass (°F)	Surface Temp. Infill (°F)	12” Above Field Temp. (°F)	30” Above Field Temp. (°F)	48” Above Field Temp. (°F)
Harvard Soccer Field Natural Grass	88	80.6	87.0	87.6	86.2	87.2
Harvard Stadium Synthetic Turf (Sand/Rubber)	89	119.5	97.9	91.0	88.0	88.8
BC Natural Grass	83	71.3	85.6	87.0	88.0	88.0
BC Soccer Synthetic Turf (Sand/TPE)	83	130.6	99.8	90.0	89.2	87.8
Belmont Hill School Natural Grass	82	82.0	77.6	82.0	81.4	81.6
Belmont Hill School Synthetic Turf (Sand/Rubber)	78	93.5	87.6	82.9	82.1	83.8

Infill – Surface Temperature

- Are there other options for infill other than recycled (crumb infill) rubber?

Infill – Surface Temperature

Nursery Field | Rye, New York

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Infill – Surface Temperature

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Infill – Surface Temperature

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Infill – Surface Temperature

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Field Maintenance and Turf Field Recycling

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Nursery Field
Typical Annual Natural Grass with Native Soil Maintenance Schedule

	TASK	FREQUENCY	SCHEDULE JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	**FERTILIZATION**													
	0.25-1 lb soluble Nitrogen/1,000 s.f.	1			■	■								
	1.5 lb insoluble Nitrogen/ 1,000 s.f.	1					■							
	0.7 lb Nitrogen/ 1,000 s.f.	1						■	■					
	1.0 lb Nitrogen/ 1,000 s.f.	1								■	■	■	■	
	1-2 lb soluble Nitrogen/ 1,000 s.f.	1												■
	Lime (Immediately after aeration)	1											■	
2	**MOWING**													
	Height of 2-3 inches, not more than 1/3 of removal	As Needed				■	■	■	■	■	■	■	■	
3	**AERATION**													
	Spring - Hollow tine	1				■								
	Fall (Beginning of fall and end of fall season) - Hollow tine	1-2 As Needed									■		■	
4	**OVERSEEDING**													
	After aeration, 2 passes 1/2 rate each	1				■								
	Re-seed bare spots	As Needed				■								
5	**WEED CONTROL**													
	Crabgrass control / preemergence when soil temp above 60°. NOT to be applied if over seeded/re-seeded	1					■							
	Chickweed/knotweed control. NOT to be applied if over seeded/re-seeded	1					■							
	Clover control. NOT to be applied if over seeded/re-seeded	As Needed						■	■					
6	**INSECT CONTROL**													
	Grub control	1					■							
7	**SOIL TEST**													

Typical Annual Natural Grass with Native Soil Maintenance Schedule

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Nursury Field
Typical Annual Synthetic Turf Maintenance Schedule

	TASK	FREQUENCY	SCHEDULE JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	**BRUSHING / RAKING**													
	Decompacts and displaces high and low infill areas to level infill and stands up matted fibers	6-8 weeks or 80-120 hours of use			■		■		■		■		■	
2	**SWEEPING AND MAGNET TOW**													
	Removes debris from field	Seasonal / As Needed			■			■		■			■	
3	**INFILL TOP DRESSING**													
	Goal mouths, center spots, and high use areas	As Needed								■				
	Entire field / as needed	1			■									
4	**PERFORMANCE TESTING**													
	GMAX shall be between 70 and 120	1			■									
	HIC shall be under 900 @ 1.3M drop	1			■									

NOTES:

1. These are recommendations to allow for budget and planning for schedules to serve as an outline. The schedules can vary 2-4 weeks and are dependent on field use and weather.
2. Recommended maintenance varies per manufacturer. Synthetic Turf Manufacturer will provide actual Maintenance Log when field is constructed.
3. Maintenance on an as needed basis:
    a. High use areas requiring periodic infill topdressing; including the corner kicks, center spots, and extra point pick spot.
    b. The turf seems and line markings should be inspected by towns facilities crew periodically to ensure proper sewing/gluing

Typical Annual Synthetic Turf Maintenance Schedule

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Synthetic Turf Recycling

- 8-12 year life cycle
- Carpet cut and infill removed
- Carpet rolled up and recycled
- Infill – Depending on infill selection
  - 1. Can be tested and re-used
  - 2. Can be composted
  - 3. Can be recycled

- Existing drainage system, stone base, and shock pad can be re-used and re-laser graded

Cost Comparison

Cost Comparison - Capital Cost – Field Footprint Only

NATIVE TOP SOIL FIELD

- Strip and amend topsoil
- Fill and Grade subgrade
- Perimeter drainage
- Spread and laser grade amended soil
- Seed or sod, grow-in time

$550K - $700K

- HYBRID GRASS FIELD
  - Strip and amend topsoil
  - Fill and Grade subgrade
  - Perimeter drainage
  - Spread and laser grade amended soil
  - Install hybrid carpet
  - Seed grow-in time

$800K - $1M

SAND BASED TOP SOIL FIELD

- Remove and dispose topsoil
- Fill and grade subgrade
- Import new topsoil
- Perimeter and underdrainage
- Spread and laser grade new soil
- Seed or sod, grow-in time

$900K - $1.2M

- SYNTHETIC TURF FIELD
  - Remove and dispose topsoil
  - Fill and Grade subgrade
  - Drainage layer and perimeter drainage
  - Finishing stone and laser grade
  - Turf system installation (shock pad, carpet, & infill)

$1.2M - $1.5M

*These are rough costs for comparison and not actual project costs

Cost Comparison

TYPICAL ANNUAL MAINTENANCE	TOTAL
» NATIVE SOIL NATURAL GRASS FIELD	+/-$30,000
» SAND BASED SOIL NATURAL GRASS FIELD	+/-$50,000
» HYBRID NATURAL GRASS FIELD	+/-$35,000
» SYNTHETIC TURF FIELD	+/-$14,000

*These include labor costs

**These are rough costs for comparison and not actual project costs

Cost Comparison

FIELD LIFE CYCLE COST FOR 20 YEARS	TOTAL
» NATIVE SOIL NATURAL GRASS FIELD	+/-$1.3M
» SAND BASED SOIL NATURAL GRASS FIELD	+/-$2.5M
» HYBRID NATURAL GRASS FIELD	+/-$2.2M
» SYNTHETIC TURF FIELD	+/-$2.4M

*These include labor costs

**These are rough costs for comparison and not actual project costs

Summary

Summary

HYDRAULIC ANALYSIS – H&H STUDY FINDINGS

- Wetland is hydrologically isolated
- Field edge is in ineffective flood area and proposed fill is above 10 year water surface

PROPOSED FIELD LAYOUT

- Natural Grass Native Topsoil Rootzone, Sand Based Topsoil Rootzone, Hybrid Grass, and Synthetic Turf Options
- Size of field staying the same in all systems
- Drainage improvements with all systems

ADVANTAGES AND DISADVANTAGES OF SYSTEMS

- Natural Grass Native Topsoil Rootzone : Cost the cheapest, but involves typical field maintenance
- Natural Grass Sand Based Topsoil Rootzone : Most expensive grass option, involves the most extensive maintenance
- Hybrid Grass : Costs more than Native Topsoil alone, but provides better coverage and about the same maintenance
- Synthetic Turf : Cost the most upfront, but requires the least amount of maintenance

HEALTH & HUMAN SAFETY

- Scientific studies show no elevated risk for the synthetic turf option

INFILL AND TEMPERATURE

- Improvements in synthetic turf systems to reduce temperature

FIELD MAINTENANCE AND TURF FIELD RECYCLING

- Natural grass requires more maintenance than synthetic turf


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Questions?
Thank you