North Salem Central School District

Chazen Project No. 318AJ.01

TOMPKINS FIELD STUDY
ANALYSIS AND RECOMMENDATIONS

August 16th, 2019

Prepared for:

North Salem Central School District
230 June Rd, North Salem, NY 10560

Prepared By:

Chazen Engineering, Land Surveying & Landscape Architecture Co., D.P.C.
20 Elm Street, Suite 110 Glens Falls, New York 12801 | (518) 812-0513
in association with:
KSQ Design

TABLE OF CONTENTS

TOMPKINS FIELD FEASIBILITY STUDY

1. Project Goals and Understanding
2. Existing Conditions
3. Site Evaluation
4. Factors for Consideration
5. Recommendations

ATTACHMENTS

1. Soil Analysis Report
2. Existing Conditions
3. Site Analysis Diagram
4. Opinion of Probable Cost

1 PROJECT GOALS AND UNDERSTANDING:

Project Goal:

To evaluate the current conditions of Tompkins Field and provide recommendations for improving the natural grass surface quality of play for the District's high school field sports.

Project Understanding:

This report is presented to evaluate the existing field area (for condition of the grass surface, slope, drainage system and utilities) and to present practical solutions the District may undertake to enhance Tompkins Field without undue monetary and permitting expenses.

The site analysis work assembles background information to determine what the most prudent measures may be to provide a healthier grass stand and address the lack of playability of the field due to wet conditions. In the course of the study the existing grades of the field were assessed to ascertain if grade adjustments would improve drainage or whether installation of a subsurface drainage system would be practical and/or successful, understanding that a proper drainage system is critical to ensuring player safety, reducing rain outs and increasing the longevity of the field over time.

Deciding what field improvement option(s) are the most prudent for the District is not easy. Investing capital funds on largely invisible features can be difficult. This report will expand on the elements for an improved turf field and present several options to be considered.

2 EXISTING CONDITIONS:

Tompkins Field experiences poor drainage conditions which has resulted in an unhealthy grass stand and unsafe playing conditions for field sports - leading to limited play time and practices/games that must be rescheduled or relocated during the fall and spring seasons. Several factors contribute to the poor drainage conditions including; the field profile, existing drainage system, change in seasonal ground water elevations and heavy rain events.

There are generally two types of natural grass turf fields - native and sand filled fields. The native turf field is constructed on the natural soils of the surrounding area whereas a sand filled turf filed is constructed by importing soils (often sand based) to improve drainage. Tompkins Field appears to be a sand fill type field bounded by areas of poorly permeable or hydric soils (as evidenced by the adjacent wetland area west of the track/field).

The following is an excerpt regarding the influence of external environmental conditions in our geography:

> The current weather patterns in the area have led to more frequent, higher intensity storms. According to the National Integrated Drought Information System (NDIS) "The Northeast's spring average temperature was near normal, ranking in the middle third of all years. The Northeast received 112% of normal precipitation during spring, ranking in the wettest third of all years.".
>
> According to the NYS DEC "Climate change impacts are likely to intensify, increasing the value of resilience measures adopted now." The Department issued a paper entitled "Observed and Projected Climate Change in New York State: An Overview", Developed for the Community Risk and Resiliency Act (CRRA) Drafting Teams, dated: 12/31/15. Below is an excerpt from the report:
>
> *Observed Climate Change*
>
> *Changes from the historical climate have already been observed across New York State, mirroring observations for the northeastern United States as a whole.*
>
> *Temperature*
>
> *The annual average temperature statewide has risen about 1.3° C (2.4 °F) since 1970, with winter warming exceeding 2.4° C (4.4 °F); New York has warmed at an average rate of 0.14° C (0.25 °F)/decade since 1900. Annual average temperatures increased in all regions.*
>
> *Precipitation*
>
> *All seven stations used for the trend analysis in the 2014 ClimAID update show increasing average annual precipitation since 1900. In addition to increased mean annual precipitation across New York State, year-to-year (and multiyear) variability of precipitation has become more pronounced. The pattern of precipitation has changed with increased precipitation in the winter and decreased precipitation in the summer, raising the risk of drought while adversely affecting drinking water supply.*
>
> *The northeastern United States has experienced a greater recent increase in extreme precipitation than any other region in the United States; between 1958 and 2010, the northeast saw more than a 70% increase in the amount of precipitation falling in very heavy events (defined as the heaviest 1% of all daily events).*

3 SITE EVALUATION

A site evaluation was conducted in early August 2019 to assess the condition of the field. At that time several soil samples were obtained for testing and evaluation. During the site visit the existing drainage system was evaluated for condition, depth of water, and pipe sizing.

There is a network of existing storm drainage structures at the perimeter of the field. The drainage structures are structurally sound, however have a limited depth between the rim and standing water thereby limiting their capacity to store water prior to discharge. The pipe network appears to have positive flow in a westerly direction toward the existing wetland area. The drainage system outside the fenced area includes interceptor trenches and swales.

Source: Goolge Maps, 2019

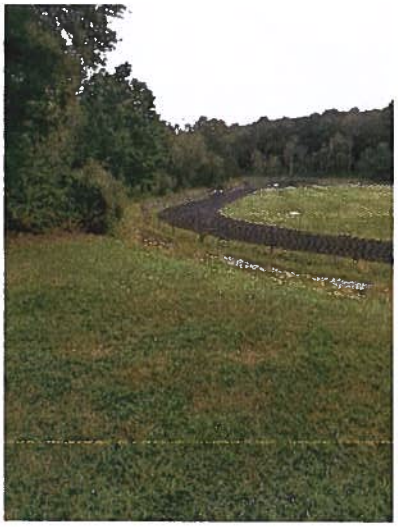
The location the existing field is located at the lowest elevation on the school campus. The adjacent roads and access drive to the school are higher in elevation. The adjacent wetland, west of the field is at a slightly lower elevation. Neither Hardscrabble Road nor June Road have a closed drainage system.

A diversion swale exists outside the fence between the track and Hardscrabble Road and June Road. Soils and vegetation have built up along the outside of the fence and the swale shape is inconsistent and undulating. Along the northern portion of the track, between the track and the parking area is a gravel French drain. A portion of the underdrain is evident at grade. It appears that stormwater runoff from Hardscrabble and June Road enter the wetland area south of the athletic field and does not contribute directly to the outside of track swale. Reference photos of the swale and French drain are below.

A perimeter drain system is in place for the track that is located between the track and the athletic field. The drainage system consists of catch basins that are connected by corrugated metal and plastic pipe out letting to the west. Corrugated plastic 4" to 6" underdrain pipe runs parallel to the track surface and connects to the basins.

East swale - Looking north

East swale - looking south



North swale - looking south

Based on limited topographic survey data for the northwest corner of the existing field the filed has a slight slope from center to sideline of 0.5%. The invert elevation of the pipe in the field is 0.9' higher then the outlet invert and 0.4' higher than the adjacent marshy area.

An important factor that contributes to field degradation is overuse and inability to rest fields, leading to over-compaction of soils and poor root zone development. The quality of the turf stand depends on a variety of elements - quality soils, adequate drainage, correct grass species and adequate rainfall or irrigation. The existing turf stand is dense with patches of crab grass, clover and broad leaf weeds within the turf stand. Weeds appear to be more prevalent in the boundary area between the field of play and the track and in areas of the play field where intense play occurs (faceoff, goal areas).

Soils at the site consist of evenly graded sandy loam and silts with little to no particles larger than ½".

Limited soils investigations were performed to assist in determining if soils amendments are recommended. The soil tests were conducted on individual and a composite of three grab samples obtained in the play field in the top 6" of soil. The laboratory results are included in the Appendix and summarized below.

Element:	**Unit**
Soil pH	6.02
Soil Textural Class	Sandy Loam
Organic Matter	5.4%
Moisture content	16.5%
Percent fines	30-45%

4 FACTORS FOR CONSIDERATION:

4.1 SOILS:

Soils can affect field drainage in several ways. The soils permeability (ability to drain water down through the layers) soil compaction (soils open pore space) and the soils composition along with factors such as soil nutrient levels and chemical makeup affect the establishment of turf and its ability to withstand play.

A. SOIL PERMEABILITY:

As materials become saturated (the air permeability reduces and the water permeability increases), the pores fill with water air pressure can accumulate within these pores as there are less-interconnected channels for the air to flow through.

A lower permeability value or longer flow length will decrease the flow rate and a larger depth of ponded water will increase the flow rate. Infiltration rate is a simplified form of permeability and describes the velocity of flow through the field surface.

Other factors that affect the permeability rate include stone materials used for transport and drainage, geotextile fabrics, and grading.

B. SOIL COMPACTION:

When stress is applied to the soil it causes densification in the matrix as air is displaced. Limiting the stress placed on the field, either by vehicles or use and soils are saturated (soil consolidation). Limiting the number of practices, games and events on the field will reduce the stress placed on the playing surface.

C. SOIL COMPOSITION:

Soils are comprised of minerals solids (sand, silt, clay), organic matter, water, air, and micro and macro organisms. Sands typically drain better, are less susceptible to compaction but have limited water and nutrient holding capacity than clay.

4.2 GRADING:

The amount of slope on a field directly relates to how well it sheds water. Fields may be crowned in the center (so that water runs to both sides) or they may be tilted to one side. Different governing bodies will require varying degrees of slope for each sport. The most current version of the rules for the correct governing body should considered. Below is a table including various sports and their relative crown direction and acceptable slope per the 2016 National Federation of State High School Associations for soccer and football and US Lacrosse for lacrosse:

Sport	Direction of crown	Acceptable field slope
Soccer	Center to side	Natural Grass (min. 1.5% without underdrain), with underdrain < 1%
Lacrosse	N/A	Flat
Football	Center to side	Natural Grass (2% without underdrain)

4.3 DRAINAGE:

There are a number of drainage practices that may be employed for natural turf fields, these are generally categorized below.

A. PERIMETER DRAINS:

The amount of slope a field directly relates to how well it can shed water. Fields may be crowned in the center (so that water runs to both sides) or they may be tilted to one side. Tompkins field is a crowned field with a perimeter swale and catch basins between the edge of play and the running track.


NE Corner

B. UNDERDRAINS:

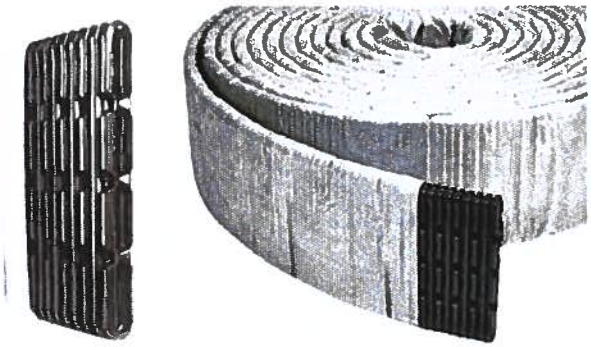
The traditional type of drainage system for a grass sports field is a round 'tile' pipe drain system which uses perforated pipe placed in the subgrade. These pipes are laid in trenches, surrounded by coarse sand or clean stone to within 4 inches of the surface of the subgrade and capped with sand and turf. Field underdrains are often aligned in a herringbone pattern. Water drains downward through the rootzone and stops in the trench where it enters the pipe from the bottom. Drains are typically placed 5 to 10 feet apart for native soil, and 10 to 30 feet apart for sand-based fields. They are typically surrounded by clean stone or coarse sand and placed three (3') below finish grade. Their sizing is typically based on the contributing drainage area, inside and outside of the field of play.

Often the field surface gradient has a preferential horizontal path over the vertical infiltration path. Until ponding at or near ponding occurs the underdrain system's function is overplayed. Consideration of the hydraulic grade line in the storm drainage system is an important factor to ensure the field underdrains and collector drains are not inundated by downstream backwater.

The design of the drain tile is based on a number of factors including: adequate outlet, soils K value (hydraulic conductivity (K) value, suitable depth, spacing based on soils textural guidelines, sizing of the laterals and mains.

C. STRIP DRAINS:

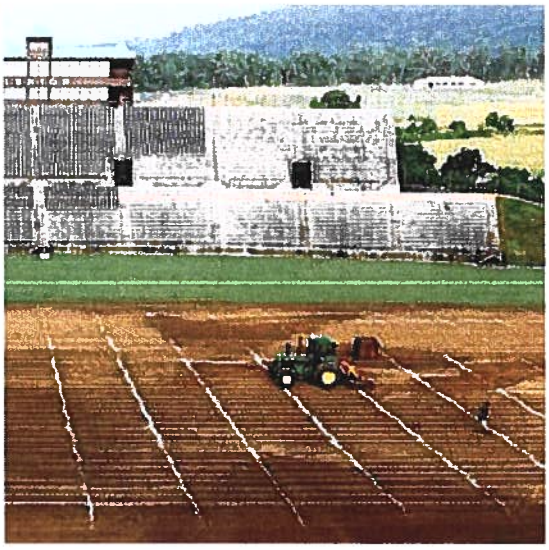
Strip drains are relatively inexpensive vertical tubing systems (in horizontal called flat drains) 6 to 18 inches wide and 1 to 2 inches thick, with a wrapping of filter fabric, which are placed vertically in the subgrade. Strip drain spacing is similar to perforated pipe underdrain systems. The advantage of using strip drains for a retrofit application is that there is less disturbance of the field area required for installation as compared to round perforated pipe – with similar surface area for water infiltration. Below is a representative photo for a typical strip drain system.



AdvanEDGE system

D. SAND GRID SYSTEM:

A sand grid incorporates sand grid trenches, typically 2" wide, with a crossing sand grid collector system that often includes a small diameter underdrain. The system is then connected to the existing pipe and drainage structure network. This system can be installed as part of an existing field renovation or new field construction. The process uses specialized machinery to minimize compaction while out loading material and importing trench sand.



Hummer Turfgrass – sand grid

5 RECOMMENDATIONS:

Chazen's recommendations are based on the site analysis and information exchanged with the District, with a primary goal to inform committee members of potential solutions that would address the poor performance and upgrade the level of quality of Tompkins Field. The recommendations contemplate three levels of effort (presented as 'Initial', 'Interim' and 'Intensive') for the District's consideration. The initial and interim measures are quantified in an opinion of probable cost (see Appendix).

A.) Initial measures/strategy for improvements (low-cost, low impact, no permitting):

- The following improvements could be self-performed, or contracted, by the District.
  - Re-establish the perimeter swale outside the fence to allow for positive drainage away from the field and track toward the wetland along the western edge of the field area. Poor functionality of the perimeter swale can cause water to build up (from upland road drainage) and migrate into the sub-grade of the field. Repair the trench drain (elevated underdrain) at the north end of the field to a functional condition.
  - Perform a detailed evaluation of the existing collection piping and outlet elevations to quantify their capacity. Install check valves on existing storm discharge pipes if evidence of backflow from the wetlands is evident.
  - Obtain a topographic survey of the existing field including detailed information on the existing drainage features.
  - Clean existing drainage basins.
  - Aerate, over-seed and top-dress with sand and compost. Over-seeding on a repeated basis will establish a much more vigorous grass stand and, with top-dressing, aid in

water absorption in the upper layer of soil. In conversation with Rutgers University their turfgrass experts indicated that, under adequate weather conditions, weekly over-seeding for a period of six weeks has shown to restore lawns and increase blade percentage by up to 30%.

B.) Interim measures/strategy for improvements (medium cost, significant impact, no permitting):

- The following improvements would likely be contracted out as a capital project:
  - Perform detailed survey and design for a new drainage system.
  - Install strip drains in a herringbone pattern at 15'-20' interval within the field of play. Can install with a trenching machine with minimal disturbance (installed so that surface restoration is limited to a narrow 12" +/- trench) and backfill with a course material. Surface restoration could include seeding or sod strips.
  - Install a second perimeter drain for collection of the new field drainage system piping.

C.) Intensive measures/strategy for improvements (high cost, complete field replacement, permitting)

- The following improvements would necessitate execution as a capital project:
  - Coordinate design and permitting with ACOE and DEC/DEP and others having jurisdiction.
    - Permit project with DEC/DEP interaction for disturbance greater than 1 acre – would require construction of additional stormwater management features for water quality.
    - Permit project through the ACOE/DEC for potential impacts to wetlands and aquatic resources.
    - Perform SEQRA permitting.
  - Strip/remove existing turfgrass.
  - Install subsurface drainage system (sand grid or underdrains with stone).
  - Install perimeter drainage collection system.
  - Slightly raise the field of play area and crown the existing field with a 1 to 1.5% slope from center to sideline.
  - Install sod play field.

TOMPKINS FIELD STUDY

SUPPORTING ATTACHMENTS

RUTGERS
New Jersey Agricultural Experiment Station

Soil Testing Laboratory
Rutgers, The State University
ASB II
57 US Highway 1 South
New Brunswick, NJ 08901-8554

Soil Test Report
Lab #: 2019-78196

Chazen Company
Linda Stancliffe
547 River Street
Troy, NY 12180

lstancliffe@chazencompanies.com
(518)266-7362

Date Received: 2019-08-09
Date Reported: 2019-08-15

Referred To: Cooperative Ext. of Westchester-NY
(914)285-4640

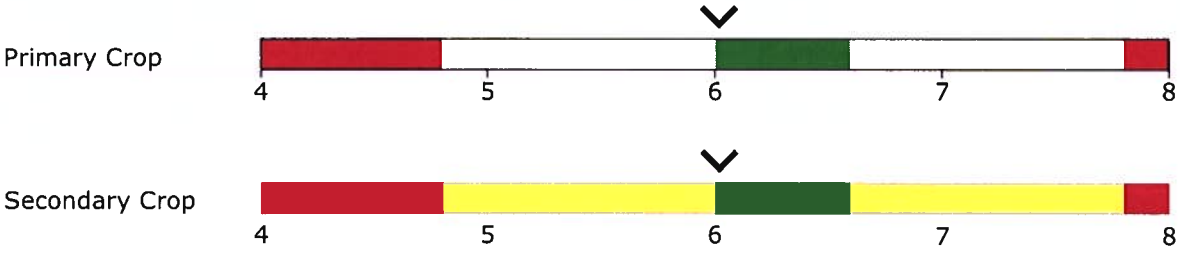
Crop or Plant
Established Turfgrass, cool season (primary)
New Turfgrass, cool season (secondary)

Sample ID: North Salem Tompkins Field

Results and Interpretations

Sandy Loam

pH: 6.02 Slightly acidic; optimum pH range of many plants except acid-loving species.

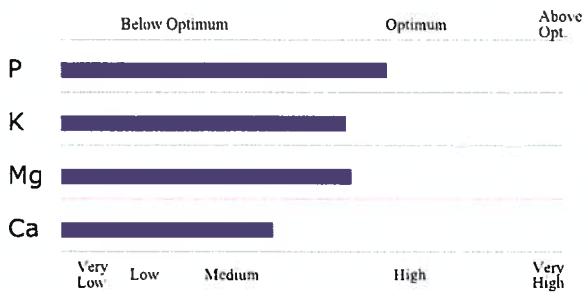


Lime Requirement Index: 7.35

The Lime Requirement Index (LRI) is a measure of the buffering capacity of the soil, its resistance to pH change, and is used to determine the appropriate amount of limestone, when necessary. LRI value near 8.0 indicates low buffering capacity of soil and a lower rate of limestone amendment compared to soil with high buffering capacity (LRI near 7.0).

Macronutrients (pounds per acre)

		by Mehlich 3 extraction
Phosphorus:	100	(Optimum)
Potassium:	179	(Optimum)
Magnesium:	186	(Optimum)
Calcium:	1368	(Below Optimum)



Micronutrients (parts per million)

Zinc(Zn)	Copper(Cu)	Manganese(Mn)	Boron(B)	Iron(Fe)

1.80 (Adequate)	2.34 (Adequate)	20.54 (Adequate)	0.46 (Low)	147.80 (High)

Estimated Cation Exchange Capacity and Basic Cation Saturation

CEC	Base Saturation	Calcium	Magnesium	Potassium
9.6 meq/100g		3.4 meq/100g	0.8 meq/100g	0.2 meq/100g
(100%)	46%	36%	8%	2%
Suggested Range of Cation Saturation:		65-76%	10-15%	4-7%

Special Tests Results

Soil Textural Class: Sandy Loam

Soluble Salts- Electrical conductivity= 0.10 mmho/cm
(Satisfactory)

Organic matter by loss on ignition- Organic Matter= 5.4%

Very High for Sandy Loam

pH, Calcium, and Magnesium Recommendations

Primary Crop - Established Turfgrass, cool season

The soil pH is in the optimum range of 6.00 to 6.60 for the growth of most Turfgrass, cool season. Do not apply any limestone.

However, the soil calcium level is low. To increase the calcium level without changing the pH apply 10 pounds/1000 square feet of agricultural gypsum (calcium sulfate).

Secondary Crop - New Turfgrass, cool season

The soil pH is in the optimum range of 6.00 to 6.60 for the growth of most Turfgrass, cool season. Do not apply any limestone.

However, the soil calcium level is low. To increase the calcium level without changing the pH apply 10 pounds/1000 square feet of agricultural gypsum (calcium sulfate).

Fertilizer Recommendations

Primary Crop - Established Turfgrass, cool season

Reported management conditions: Light-Full Sun Irrigation-None/Minimal Clippings-Recycled

For this management level, prescribed fertilizer should be applied two to three times yearly: 1) in EARLY APRIL and 2) in LATE AUGUST, and 3) OCTOBER. Do not apply when grass is not growing (dormant). For sandy soils, split each application into two doses spaced 3 to 5 weeks apart to minimize potential for leaching loss. N.J. law prohibits application of fertilizer containing nitrogen or phosphorus after November 15 (December 1 for professional certified applicators) and before March 1.

Target ratio for fertilizer product is: 2:1:1 ,which represents the fertilizer's relative amounts of nitrogen (N), phosphorus as P_2O_5, and potassium as K_2O.

The estimated yearly nitrogen (N) need of this crop/planting is 2 pounds per 1000 square feet.

DO THIS: Uniformly apply fertilizer(s) with N:P:K ratio indicated above on the Turfgrass to achieve 0.75 pound Nitrogen per 1000 square feet. A gentle rain or light watering after application will help rinse fertilizer into the root zone, but do not apply fertilizer prior to expected heavy rainfall to avoid loss of fertilizer and pollution of stormwater.

WHAT ABOUT NEXT YEAR? For this management level, twice-yearly fertilization is appropriate: 1) in March or early April and 2) repeated in late August or September. Do not apply when grass is not growing (dormant). For sandy soils, it is also suggested that each application be split into two doses spaced 3 to 5 weeks apart to minimize potential for leaching loss.

The fertilizer prescription above is intended to bring soil nutrients to optimal or near-optimal conditions, and subsequent management recommendations are intended to maintain soil nutrients levels near optimum. The best nutrient ratio for maintenance fertilization of the turf beyond 2 years is best determined by another soil test.

DO THIS: return grass clippings to the Turfgrass when mowing to recycle nutrients. Use fertilizer with N:P:K ratio of: 1:0:0 (nitrogen only) or 4:0:1 or 2:0:1 or 1:0:1 (representing increasing amounts of potassium; supplemental potassium may be necessary for sandy, low organic matter soils) to achieve 0.75 pound Nitrogen per 1000 square feet.

Secondary Crop - New Turfgrass, cool season

Reported management conditions: Light-Full Sun Irrigation-None/Minimal Clippings-Recycled

LATE SUMMER OR EARLY FALL is the best time to establish cool-season grasses. EARLY SPRING establishment can also be successful but is riskier and may require more input of effort and resources. N.J. law prohibits application of fertilizer containing nitrogen or phosphorus after November 15 (December 1 for professional certified applicators) and before March 1.

Target ratio for fertilizer product is: 1:2:2 ,which represents the fertilizer's relative amounts of nitrogen (N), phosphorus as P_2O_5, and potassium as K_2O.

The estimated yearly nitrogen (N) need of this new seeding/sodding is 1 pound per 1000 square feet.
New plantings allow mixing of the fertilizer into the soil to build up root zone fertility before planting.

DO THIS: Uniformly apply fertilizer(s) with N:P:K ratio indicated above to achieve 0.9 pound Nitrogen per 1000 square feet, and mix into soil depth of 4 inches.

TWO to FOUR WEEKS AFTER EMERGENCE of seedlings or placing sod, additional fertilizer is recommended to promote rapid establishment. If seeding/sodding in spring, this application should be repeated in September and October, at least 5 weeks apart; or for sandy soils, split applications into half-rate and apply four times, 3 weeks apart.

Rutgers Cooperative Extension encourages use of fertilizers having a water-insoluble nitrogen (WIN) component as specified on the label. WIN serves as a slow, extended release source of nitrogen. A gentle rain or light watering after application will help rinse fertilizer into the root zone, but do not apply fertilizer just prior to expected heavy rainfall to avoid loss of fertilizer and pollution of stormwater.

DO THIS: Using a 2:1:1 fertilizer, apply 0.75 pound Nitrogen per 1000 square feet spread uniformly over the turf.

WHAT ABOUT NEXT YEAR? In the 2nd year of establishment, two periods of fertilization are suggested: 1) April, and 2) September. Avoid applying fertilizer during very hot, very dry weather. For sandy soils, it is also suggested that each application be split into two doses spaced 3 to 5 weeks apart to minimize potential for leaching loss.

The fertilizer prescription above is intended to bring soil nutrients to optimal or near-optimal conditions, and subsequent management recommendations are intended to maintain soil nutrients levels near optimum. A gentle rain or light watering after application will help rinse fertilizer into the root zone, but do not apply fertilizer prior to expected heavy rainfall to avoid loss of fertilizer and pollution of stormwater.
The best nutrient ratio for maintenance fertilization of the turf beyond 2 years is best determined by another soil test.

DO THIS: return grass clippings to the Turfgrass when mowing to recycle nutrients. Use fertilizer with N:P:K ratio of: 1:0:0 (nitrogen only) or 4:0:1 or 2:0:1 or 1:0:1 (representing increasing amounts of potassium; doses of potassium may be necessary for sandy, low organic matter soils) to achieve 0.75 pound Nitrogen per 1000 square feet.

How do I find the proper fertilizer product?

For help finding appropriate fertilizers and rates, consult the Rutgers Soil Testing Laboratory website: benedick.rutgers.edu/FertProducts/. The website lists commercially available products according to their nutrient analyses to assist you with product selection and calculation of amount required.

Select a fertilizer that has a nutrient grade (also known as guaranteed minimum analysis) the same as or a multiple of the values recommended, or select a close match to that ratio. When no single fertilizer product matches or approximates the recommended $N:P_2O_5:K_2O$ nutrient ratio, it will be necessary to use two or more fertilizers to reach the correct balance of nutrients. The proper amount of fertilizer to apply in a single application depends on the actual fertilizer grade of the fertilizer product selected, the total area (square feet) to be treated, and the total number of fertilizer applications to be made throughout the year.

Micronutrient Statements

Zinc does not appear to be a limiting factor. For information about zinc in soil for plant nutrition, see FS721.

Copper does not appear to be a limiting factor. As with most other micronutrients, copper availability is related to soil pH. Do not over-lime. For more information about soil copper, see FS720.

Manganese does not appear to be a limiting factor. Maintain soil pH in the optimum range, as directed in "Recommendations". See FS973 for more information about manganese in soil and plant nutrition.

Plant types differ in their susceptibility to boron deficiency; certain fruit, vegetable, and field crops are most susceptible. Symptoms include improper development or dieback of growing tips, poor flowering or fruit set, twisting and yellowing of young leaves from base to tip, and black heart of roots. Lime only as necessary, since pH above 7.0 limits boron availability. Building up organic matter content of soil will increase boron availability. Use of boron fertilizer must be done only with extreme care because of the toxicity that might occur if over-applied and the difficulty of applying the low rates necessary. See FS873 for more information and follow recommendations above.

Plant availability to iron is highly dependent on soil pH. Although soil iron appears plentiful, high soil pH could limit its availability. On the other hand, plant damage due to iron toxicity, though not common, could occur at low soil pH (acidic soil). Maintain soil pH in the optimum range as described in Recommendations. See FS971 for more information.

Comments: *Football, soccer, lax field. Daily use. Inconsistent turf stand with patchy dense turf. Limited aeration and overseeding seasonally. Poor drainage.**

ATLANTIC TESTING LABORATORIES

Albany
22 Corporate Drive
Clifton Park, NY 12065
518-383-9144 (T)
518-383-9166 (F)

WBE certified company

August 15, 2019

Chazen Engineering, Land Surveying & Landscape
Architecture
21 Fox Street
Poughkeepsie, NY 12601
Attn: Matthew Korn PE

Re: Soil Lab
LSA - Chazen Companies
Clifton Park, New York

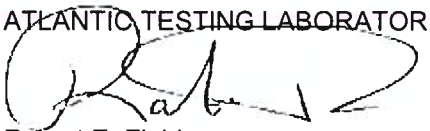
Dear Mr. Korn,

Enclosed is the following report:

Report Number AT354SL-19-08-19 Soil Lab Report, dated August 15, 2019

Please contact our office should you have any questions or if we may be of further service.

Sincerely,
ATLANTIC TESTING LABORATORIES, Limited



Robert E. Field
Laboratory Manager
bfield@atlantictesting.com

REF/RML

ATLANTIC TESTING LABORATORIES

Albany
22 Corporate Drive
Clifton Park, NY 12065
518-383-9144 (T)
518-383-9166 (F)

WBE certified company

August 15, 2019

Chazen Engineering, Land Surveying & Landscape Architecture
21 Fox Street
Poughkeepsie, NY 12601
Attn: Matthew Korn PE

Re: Soil Laboratory Testing
LSA - Chazen Companies
Clifton Park, New York
ATL Report No.: AT354SL-718-08-19

Dear Mr. Korn,

On August 07, 2019, our representative obtained one Soil sample from North Salem CSD -Tomkins Field (#1) and delivered it to our Albany, New York facility for testing. A pH of Soils in accordance with ASTM D 4972, and Moisture, Ash, and Organic Matter of Peat and Other Organic Soils in accordance with ASTM D 2974 were performed on this sample. The results follow:

pH of SOILS
ASTM D 4972

ATL Sample No.	pH	Project Specification	Test Method	Sieved Fraction	Soaking Procedure
AT354S-18-1	6.2	---	A	#10	Distilled Water

PERCENT ORGANICS, ASH CONTENT, AND MOISTURE CONTENT
ASTM D 2974

ATL Sample No.	Organics (%)	Project Specification	Furnace Temperature (°C)	Ash (%)	Project Specification	Moisture (%)	Test Method A	Oven Drying Temperature (°C)
AT354S-18-1	4.9	---	440	95.1	---	17.6	Oven-Dried	110

Please contact our office should you have any questions or if we may be of further service.

Sincerely,
ATLANTIC TESTING LABORATORIES, Limited

Robert E. Field
Laboratory Manager
bfield@atlantictesting.com

REF/RML

ATLANTIC TESTING LABORATORIES

Albany
22 Corporate Drive
Clifton Park, NY 12065
518-383-9144 (T)
518-383-9166 (F)

WBE certified company

August 15, 2019

Chazen Engineering, Land Surveying & Landscape Architecture
21 Fox Street
Poughkeepsie, NY 12601
Attn: Matthew Korn PE

Re: Soil Laboratory Testing
LSA - Chazen Companies
Clifton Park, New York
ATL Report No.: AT354SL-718-08-19

Dear Mr. Korn,

On August 07, 2019, our representative obtained one jar sample of Soil material from North Salem CSD -Tomkins Field (#1) and delivered it to our Albany, New York facility for testing. A Laboratory Determination of Moisture Content of Soil in accordance with ASTM D 2216 was performed on this sample. The results follow:

LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS
ASTM D 2216

ATL Sample No.	Client Identification	Moisture Content (%)
AT354S-18-1	#1	17.0

Please contact our office should you have any questions or if we may be of further service.

Sincerely,
ATLANTIC TESTING LABORATORIES, Limited

Robert E. Field
Laboratory Manager
bfield@atlantictesting.com

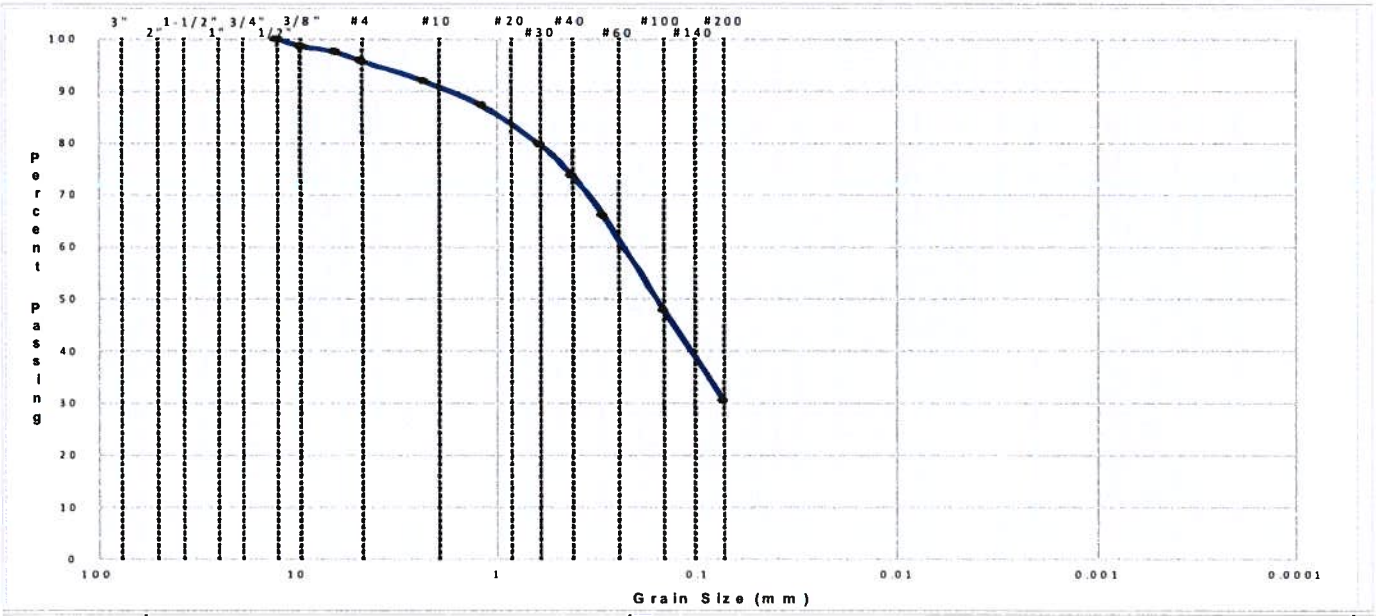
REF/RML

ATLANTIC TESTING LABORATORIES

PARTICLE SIZE ANALYSIS REPORT No.: AT354SL-718-08-19

WBE certified company

Client:	Chazen Engineering, Land Surveying & Landscape Archite	Sample Date:	August 07, 2019
Project:	LSA - Chazen Companies	Sampled By:	CLIENT
	Clifton Park, New York	Service Order No.:	22594
		Sample No.:	AT354S-18
Location:	North Salem CSD -Tomkins Field (#1)		



% +3"	% Gravel			% Sand		
	Coarse	Medium	Fine	Coarse	Medium	Fine
--	--	--	--	--	--	--

SIEVE SIZE	PERCENT FINER	SPEC.* LOW	SPEC.* HIGH	OUT OF SPEC. (X)
1/2 in	100			
3/8 in	99			
1/4 in	98			
No. 4	96			
No. 8	92			
No. 16	87			
No. 30	80			
No. 40	74			
No. 50	66			
No. 100	48			
No. 200	31			

* (no specification provided)

% Fines: 31

Soil Description

Brown Soil Client Sample #1

Atterberg Limits

PL= --- LL= --- PI= ---

Coefficients

D_{85}= 0.9804 D_{60}= 0.2362 D_{50}= 0.1621

D_{30}= --- D_{15}= --- D_{10}= ---

C_u = --- C_c = ---

Classification

USCS= AASHTO=

Remarks

Delivered by Client on August 7, 2019.
ASTM D-422

Reviewed by: _____ Date: Aug 15, 2019

Laboratory Manager
bfield@atlantictesting.com

ATLANTIC TESTING LABORATORIES

Albany
22 Corporate Drive
Clifton Park, NY 12065
518-383-9144 (T)
518-383-9166 (F)

WBE certified company

August 15, 2019

Chazen Engineering, Land Surveying & Landscape Architecture
21 Fox Street
Poughkeepsie, NY 12601
Attn: Matthew Korn PE

Re: Soil Laboratory Testing
LSA - Chazen Companies
Clifton Park, New York
ATL Report No.: AT354SL-719-08-19

Dear Mr. Korn,

On August 07, 2019, our representative obtained one jar sample of Soil material from North Salem CSD - Tomkins Field (#2) and delivered it to our Albany, New York facility for testing. A Laboratory Determination of Moisture Content of Soil in accordance with ASTM D 2216 was performed on this sample. The results follow:

LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS
ASTM D 2216

ATL Sample No.	Client Identification	Moisture Content (%)
AT354S-19-1	#2	16.5

Please contact our office should you have any questions or if we may be of further service.

Sincerely,
ATLANTIC TESTING LABORATORIES, Limited

Robert E. Field
Laboratory Manager
bfield@atlantictesting.com

REF/RML

ATLANTIC TESTING LABORATORIES

Albany
22 Corporate Drive
Clifton Park, NY 12065
518-383-9144 (T)
518-383-9166 (F)

WBE certified company

August 15, 2019

Chazen Engineering, Land Surveying & Landscape Architecture
21 Fox Street
Poughkeepsie, NY 12601
Attn: Matthew Korn PE

Re: Soil Laboratory Testing
LSA - Chazen Companies
Clifton Park, New York
ATL Report No.: AT354SL-720-08-19

Dear Mr. Korn,

On August 07, 2019, our representative obtained one jar sample of Soil material from North Salem CSD - Tomkins Field #3 and delivered it to our Albany, New York facility for testing. A Laboratory Determination of Moisture Content of Soil in accordance with ASTM D 2216 was performed on this sample. The results follow:

LABORATORY DETERMINATION OF MOISTURE CONTENT OF SOILS
ASTM D 2216

ATL Sample No.	Client Identification	Moisture Content (%)
AT354S-20-1	#3	20.7

Please contact our office should you have any questions or if we may be of further service.

Sincerely,
ATLANTIC TESTING LABORATORIES, Limited

Robert E. Field
Laboratory Manager
bfield@atlantictesting.com

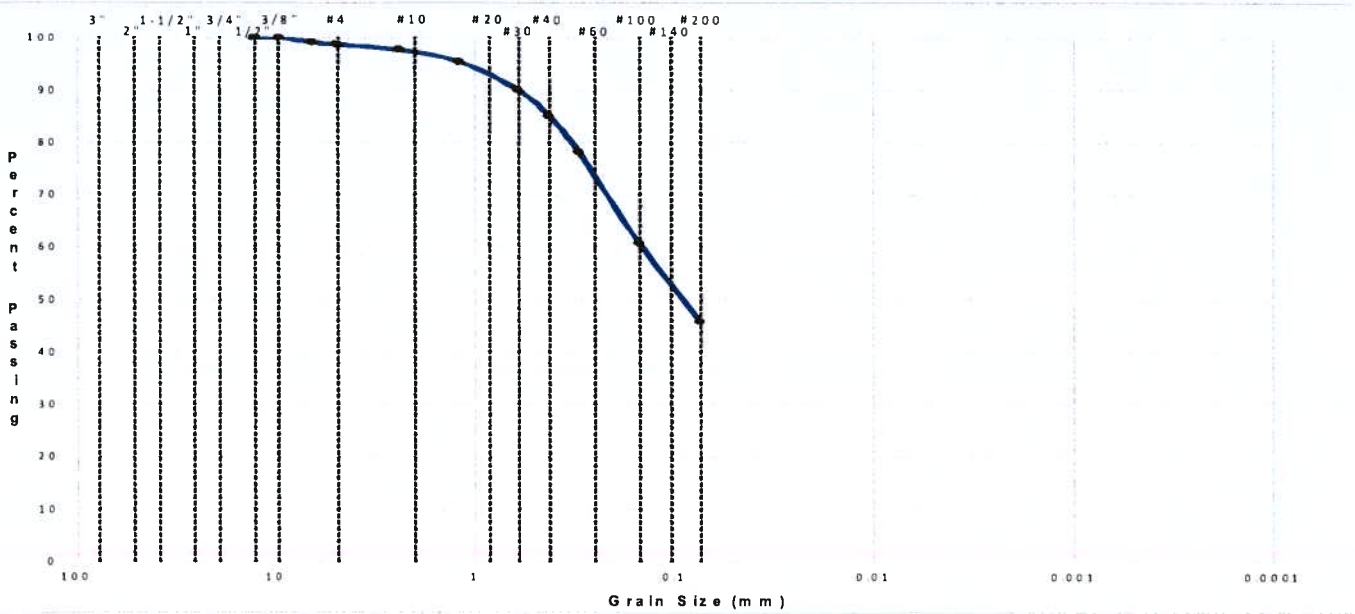
REF/RML

ATLANTIC TESTING LABORATORIES

PARTICLE SIZE ANALYSIS REPORT No.: AT354SL-720-08-19

WBE certified company

Client:	Chazen Engineering, Land Surveying & Landscape Archite	Sample Date:	August 07, 2019
Project:	LSA - Chazen Companies	Sampled By:	CLIENT
	Clifton Park, New York	Service Order No.:	22594
		Sample No.:	AT354S-20
Location:	North Salem CSD - Tomkins Field #3		



% +3"	% Gravel			% Sand		
	Coarse	Medium	Fine	Coarse	Medium	Fine
--	--	--	--	--	--	--

SIEVE SIZE	PERCENT FINER	SPEC.* LOW	SPEC.* HIGH	OUT OF SPEC. (X)
1/2 in	100			
3/8 in	100			
1/4 in	99			
No. 4	99			
No. 8	98			
No. 16	95			
No. 30	90			
No. 40	85			
No. 50	78			
No. 100	61			
No. 200	46			

* (no specification provided)

% Fines: 46

Soil Description

Brown Soil Client Sample #3

Atterberg Limits

PL= --- LL= --- PI= ---

Coefficients

D_{85}= 0.4180 D_{60}= 0.1447 D_{50}= 0.0901

D_{30}= --- D_{15}= --- D_{10}= ---

C_u = --- C_c = ---

Classification

USCS= AASHTO=

Remarks

Delivered by Client on August 7, 2019.
ASTM D-422

Reviewed by: _____

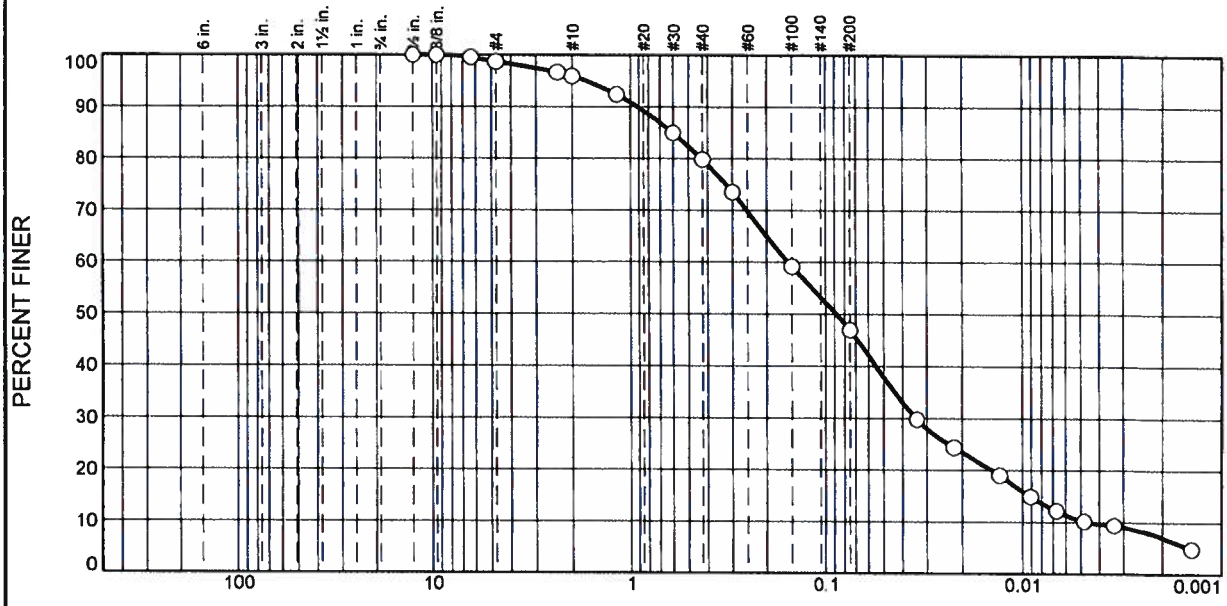
Laboratory Manager
bfield@atlantictesting.com

Date: Aug 15, 2019

ATLANTIC TESTING LABORATORIES

WBE certified company

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	3	16	33	37	10

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	OUT OF SPEC (X)
.5	100		
.375	100		
.25	100		
#4	99		
#8	97		
#10	96		
#16	92		
#30	85		
#40	80		
#50	74		
#100	59		
#200	47		

* (no specification provided)

Soil Description

Brown Soil Client sample #2
.002mm = 7% finer

Atterberg Limits

PL= --- LL= --- PI= ---

Coefficients

D_{85}= 0.6009 D_{60}= 0.1568 D_{50}= 0.0881
D_{30}= 0.0342 D_{15}= 0.0092 D_{10}= 0.0046
C_u= 34.07 C_c= 1.62

Classification

USCS= AASHTO=

Remarks

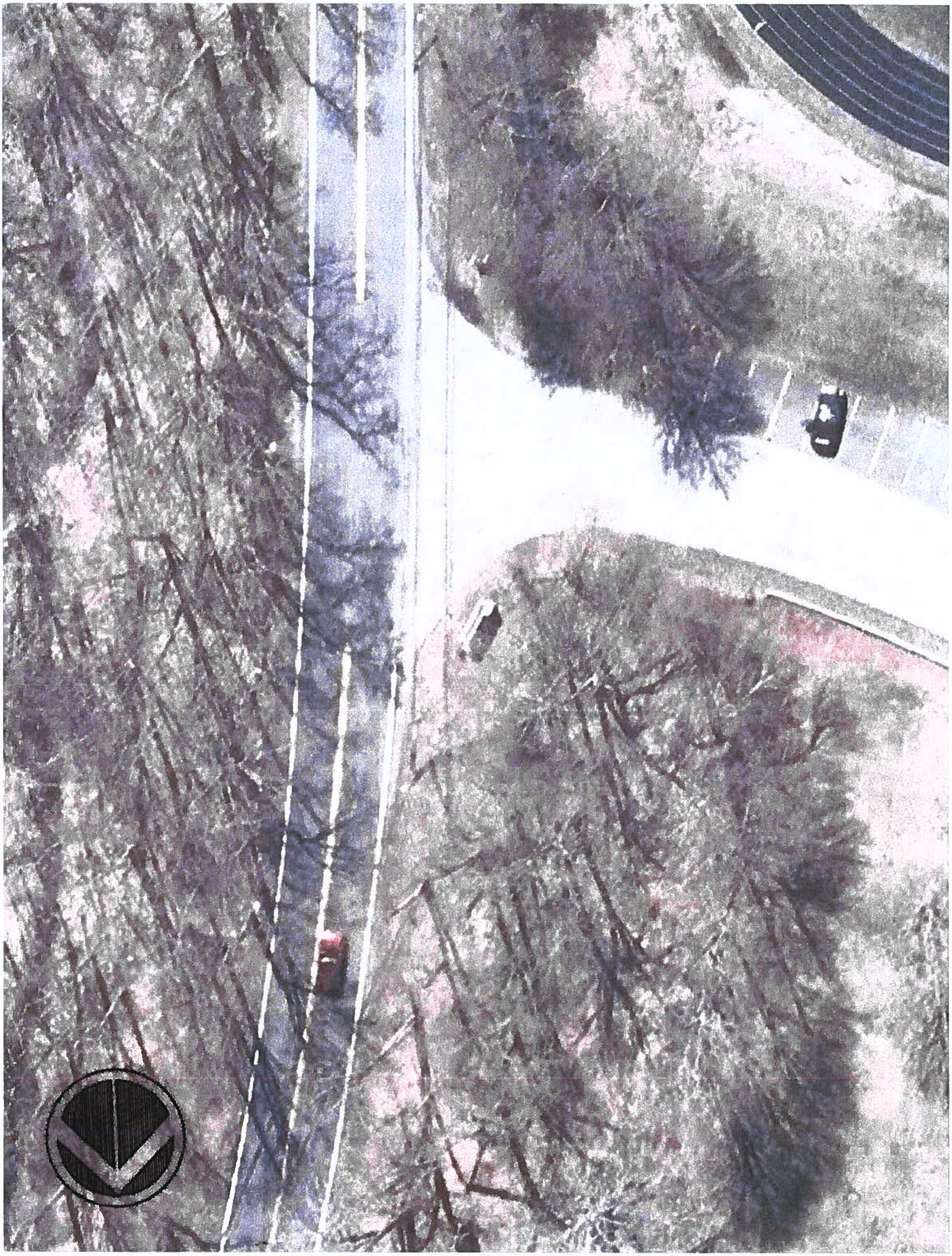
Material delivered by client on 8/07/19
ASTM D 422 with hydrometer

Source of Sample: North Salem CSD - Tomkins Field **Depth:** N/A
Sample Number: AT354S719

ATLANTIC TESTING LABORATORIES, LIMITED
Albany, New York

Client: The Chazen Companies
Project: North Salem CSD - Tomkins Field
Job No. 318AJ.01
Report No: At354SL-719-08-19 **Date:** 8/15/19

Tested by: RL Date: 8/14/19
Reviewed by: RFF Date: 8/15/19




Existing
Parking

North Salem CSD - Tompkins Field Improvements

North Salem, NY

Opinion of Probable Cost

The Chazen Companies | August 14, 2019

Field Restoration - Interim Measures/Improvements

	Description	Quanity	Unit	Unit Cost	Total Cost	Notes
General						$14,900
	Mobilization/Demobilization/Staging	1	LS	*$3,700.00*	*$3,700*	*3% of Construction Cost (+/-)*
	Construction Layout and As-Builts	1	LS	*$1,500.00*	*$1,500*	
	Topographic Survey	1	LS	*$6,000.00*	*$6,000*	
	Erosion & Sediment Control	1	LS	*$3,700.00*	*$3,700*	*3% of Construction Cost (+/-)*
Site Preparatation						$5,000
	Track and field protection	1	LS	$5,000.00	*$5,000*	
Earthwork outside of the fenced track and field area						$15,375
*	Unclassified Excavation along exterior drainage swale	175	CY	$65.00	*$11,375*	
*	Repair French drain (task could be self performed)	200	LF	$20.00	*$4,000*	
Athletic Field Site Drainage Improvements						$95,250
	Install strip drainage system	4,200	LF	$20.00	*$84,000*	
	Install course drainage backfill for strip drains	150	CY	$75.00	*$11,250*	
Landscaping						$9,000
	Topsoil, seed and mulch (task could be self performed)	6,000	SF	$1.50	*$9,000*	

General Notes

Note 1: This Opinion of Probable Cost is intended to be used for order of magnitude pricing for budget purposes only.

Note 2: Over an acre of site disturbance would require a SWPPP and any associated engineering/inspection costs are not contained herein.

Construction Subtotal		**$139,525**
Construction Contingency	15% (+/-)	*$20,900*
Construction Subtotal		**$160,425**

THE Chazen COMPANIES

North Salem CSD - Tompkins Field Improvements

North Salem, NY

Opinion of Probable Cost

The Chazen Companies | September 13, 2019

Complete Field Reconstruction - Intensive Measures/Improvements

Description	Quanity	Unit	Unit Cost	Total Cost	Notes
General					$33,700
Mobilization/Demobilization/Staging	1	*LS*	*$14,100.00*	*$14,100*	*3% of Construction Cost (+/-)*
Construction Layout and As-Builts	1	*LS*	*$4,000.00*	*$4,000*	
Erosion & Sediment Control	1	*LS*	*$15,600.00*	*$15,600*	*3% of Construction Cost (+/-)*
Site Preparatation					$72,500
Track and Field Protection	1	LS	$5,000.00	*$5,000*	
Sod/Lawn Removal	67,500	SF	$1.00	*$67,500*	
Earthwork					$101,750
Unclassified Excavation Along Drainage Swale	175	CY	$65.00	*$11,375*	
Imported Sand Based Topsoil for Field	625	CY	$95.00	*$59,375*	
Repair French Drain	200	LF	$20.00	*$4,000*	
Digital Grading	67,500	SF	$0.40	*$27,000*	
Field Site Drainage Improvements					$175,900
Underdrain (4"dia. per pipe @ 20' o.c.)	3,600	LF	$20.00	*$72,000*	
Collector (Header) Pipe - each side of field (with trench backfill)	800	LF	$60.00	*$48,000*	
Drainage Stone for Underdrain	180	CY	$80.00	*$14,400*	
Geotextile Fabric	1,100	SY	$5.00	*$5,500*	
12" Backflow Prevention Valves	3	EA	$12,000.00	*$36,000*	
Landscaping					$169,500
Turf - Sod	67,500	SF	$2.40	*$162,000*	
Topsoil, seed and mulch other disturbed areas	5,000	SF	$1.50	*$7,500*	

General Notes

Note 1: This Opinion of Probable Cost is intended to be used for order of magnitude pricing for budget purposes only.

Note 2: Estimate does not include temporary or permanent irrigation.

Note 3: Over an acre of site disturbance would require a SWPPP and any associated engineering/inspection costs are not contained herein.

THE Chazen COMPANIES

Proud to be Employee Owned

Construction Subtotal		**$553,350**
Construction Contingency	15% (+/-)	*$83,000*
Construction Subtotal		**$636,350**