2016

# Groff Memorial Park Meadow Design and Management Plan

Trish Kemper



An independent study project report by The Martha S. Miller Endowed Urban Forestry Intern (2015-2016)

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The park is a peaceful respite for the community that showcases the beauty of trees and shrubs native to Pennsylvania. The new meadow would expand the plant collection to include native forbs and grasses. The borough plans to create a stormwater basin/rain garden at the end of the meadow, which will provide the opportunity to feature plants that can be a used in a wet and challenging environment.

The project's second part was to produce a Management Plan for the park. The plan will guide the borough as the park continues to evolve and will include recommendations for future tree, shrub, and forb additions. To preclude contaminants from entering the well's water supply, synthetic fertilizer, pesticides, and herbicides cannot be used in the park. The Management Plan includes recommended organic practices for the care of the lawn, woodland, meadow, and rain garden. Since there previously were no guidelines, the new Management Plan will be a valuable resource in protecting the health and investment of this collection of native plants and the groundwater for the well.

**Disciplines**
Horticulture

**Comments**
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**Date:** **March 10, 2016**

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## METHODS

The method used to design the meadow and rain garden was first to determine the soil characteristics by doing soil tests, including a particle size test and a simple percolation test to further understand the site conditions. The plants were then chosen that were suitable for the site and were native to Lancaster County. The Pennsylvania Flora Project of Morris Arboretum was used to obtain a list of native plants for Lancaster County. The soil tests confirmed that the pH was high as suspected for soil atop limestone bedrock. Plant communities were then researched at the Pennsylvania Natural Heritage Program to find native herbaceous species that are adapted to grow on limestone. The method for design utilized the heights, bloom time, and bloom color to arrange the plants in an aesthetically pleasing manner that also corresponded to the moisture level of the soil. The Wetland Plant Indicator Code was used to define plants that would perform well in the rain garden.

The Management Plan uses recommendations from the International Society of Arboriculture (ISA), the Natural Lands Trust (NLT), and the Northeast Organic Farming Association (NOFA) to define the maintenance and care of the park using organic methods.

### SOIL AND PERCOLATION TESTS AND RESULTS

The soil for the park is defined as Hagerstown silt loam per the U.S. Department of Agriculture Natural Resources Conservation Services (USDA NRCS) and the typical soil profile consist of 10 inches of silt loam followed by 50 inches of silty clay. The soil is derived from limestone bedrock, which was suspected to have a high pH and be alkaline. To assess the pH, six different areas were defined for collecting soil samples. The area for the new meadow and rain garden were tested as well as existing areas of the park to inform plant maintenance and care. Below are the 6 areas that were tested.

***Area 1*** – northwest corner where the stormwater/rain garden is proposed
***Area 2*** – middle of the proposed meadow
***Area 3*** – middle of the whole park, where the well head is located
***Area 4*** – rocky southwest corner in the woodland
***Area 5*** – potential area for acid loving species to get a baseline pH
***Area 6*** – another potential area for acid loving species to get a baseline pH.

Figure 1: Map of soil samples and percolation test. Base map by Becker Engineering


At each location, four samples of soil were collected and combined from the top 6 inches for the surface soil submission and four samples of soil were collected and combined from the next 6 inches for the subsurface submission. At each location the four samples spots where the cardinal points (north, east, south, and west) and were approximately 20 feet from the center. The samples were then dried, rocks were removed and they were mailed to Penn State's Agricultural Analytical Service Laboratory. To limit costs for the client, the soils samples for Area 4 and 5 were combined because they were both rocky areas in the woodland.

The U.S. Department of Agriculture (USDA) defines pH values from acid, neutral and alkaline in the following manner:

| | |
|---|---|
| Extremely acid | 3.5 – 4.4 pH |
| Very strongly acid | 4.5 – 5.0 pH |
| Strongly acid | 5.1 – 5.5 pH |
| Moderately acid | 5.6 – 6.0 pH |
| Slightly acid | 6.1 – 6.5 pH |
| Neutral | 6.6 – 7.3 pH |
| Slightly alkaline | 7.4 – 7.8 pH |
| Moderately alkaline | 7.9 – 8.4 pH |
| Strongly alkaline | 8.5 – 9.0 pH |

The rain garden surface and subsurface samples both have a pH of 7.5 which is slightly alkaline and will have an influence on the plant selection. The meadow surface sample has a 6.9 pH and the subsurface had a pH of 7.2 and the well head area was similar with a 6.8 pH for surface and 7.1 pH for subsurface. The soil in these areas is neutral and allows the use of the majority of native trees, shrubs, grasses, and perennials. The upper woodland area, samples 4 and 5 combined had a pH of 7.3 for both the surface and subsurface samples and are on the border of neutral and slightly alkaline. Acid loving plants will probably do poorly here unless they are in an area that is amended to change the pH. Lastly, the area on the east was also tested as a potential site for acid loving plants and had a pH of 7.3 for the surface soil and 7.8 for subsurface soil. This is slightly alkaline and more difficult to lower the pH for plants adapted to a more acidic environment.

A soil sample from the surface and subsurface was also collected from Area 2 and sent in for a particle size analysis. The makeup of the soil is 18.4% sand, 50.7% silt and 30.8 % clay, which is classified as silty clay loam. The results of the composition test are shown in Addendum II.

An onsite simple percolation test was done in Area 1, which is the proposed stormwater management rain garden, to determine if it will adequately drain. A 1’ x 1’ x 1’ square hole was dug and filled with approximately 5 gallons of water. The original level of the water was noted and then checked 4 hours later. The water level dropped one inch so the percolation rate was .25 inches per hour. Albert Jarrett from the Pennsylvania State University, defines permeability as greater than .2 inches per hour, therefore, this soil is permeable and should be acceptable for the proposed rain garden.

## WELLHEAD PROTECTION ZONE

The 2 acres of land, which will become the meadow and rain garden, is being added to the original 4 acres of the park to create the 200-foot radius circle that is Zone 1 of the well head protection zone (WHPZ). To understand the implications of having a WHPZ in the park, I met with Jeff Bologna from Becker Engineering, the firm that has installed the new well and is working to obtain the permits. I learned that the well was installed two years ago and the long permitting process is underway. This well is a backup for another municipal well in the area, in

case that well becomes inoperable. The original 4-acre park is in New Holland Borough and the new 2-acre meadow and rain garden addition is in Earl Township. The two municipalities would share the water from the new well.

The East Lancaster County Source Water Protection Coalition (ELANCO SWP) is a partnership between Terre Hill Borough, Blue Ball Water Authority; Western Heights Water Authority; New Holland Borough; Earl Township, and East Earl Township, and has been working to define the Wellhead Protection Ordinance. Under the Pennsylvania Wellhead Protection Program, agricultural fertilizers and pesticides, household lawn chemicals and stormwater basins are potential sources of groundwater contamination and should not be used in Zone 1 of the WHPZ. This information has influenced the Management Plan for Groff Memorial Park to include organic methods for park maintenance. Also, the rain garden, which is a stormwater basin, is outside of Zone 1. On previous visits to the park, broadleaved weeds were not present in the lawn, which leads me to believe that synthetic lawn herbicide has been previously used for maintenance.

PLANT SELECTION

The knowledge that the site's parent material is limestone and that some areas are slightly alkaline has affected the planting plan by choosing plants adapted to those conditions, which ensures long-term plant viability. Since the park highlights Pennsylvania native plants, a species list for Lancaster County was downloaded from the Morris Arboretum's Pennsylvania Flora Project. Vegetation adapted to limestone, known as calcareous plant communities, was researched using the Pennsylvania Natural Heritage Program to find species that naturally occur in alkaline environments. These communities include:

- Calcareous Cliffs and Calcareous Openings
- Side Oats Gramma Calcareous Grassland
- Red Cedar - Redbud Shrubland
- Sedge - Mixed Forb Fen
- Yellow Oak - Redbud Woodland

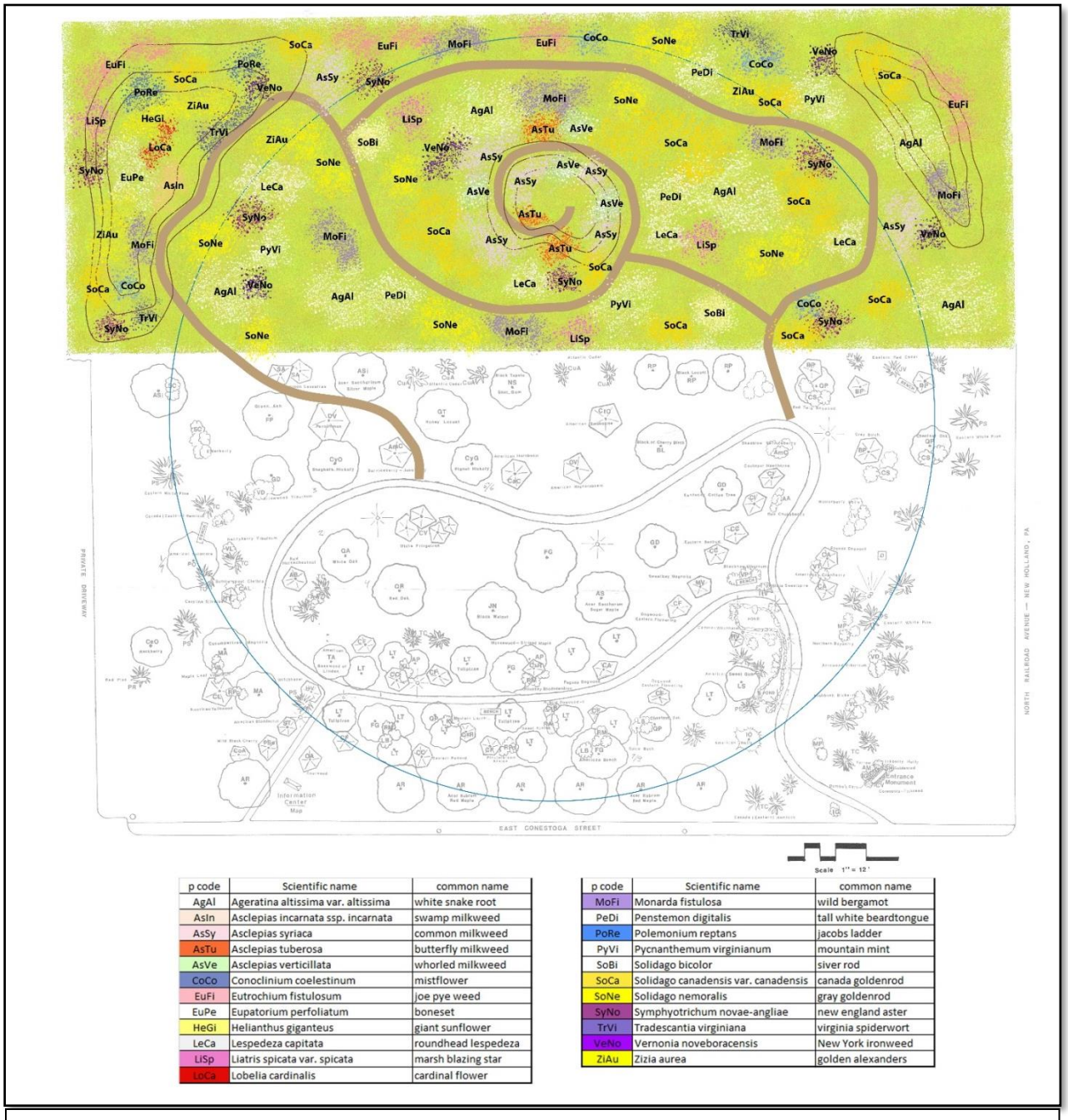
Although, several of these communities exist more in the western portion of Pennsylvania and not in Lancaster County, it was logical to see what plants grow in these communities for possible use in the park, especially since the design is not an ecological restoration. Not surprisingly, there was considerable overlap of species between the communities. The grasses and perennials in the side oats gramma calcareous grassland were especially useful for the proposed meadow and the species in the sedge - mixed forb fen informed the plant list for the rain garden. The list of potential plant additions for the woodland area came from the red cedar – redbud shrubland, the calcareous cliff and openings, and the yellow oak – redbud woodland plant communities.

The species lists for the different communities were not extensive; therefore, additional plants, which are native to Lancaster and adapted to the pH range of the given park areas, were also included. The Ladybird Johnson Wildflower Center and the Ernst Conservation Seed

catalogue were excellent sources for finding the acceptable pH ranges of many individual plants. Also the Wetland Indicator Status was used to choose plants for the rain garden.

## DESIGN

The design consists of a meadow, rain garden and pathway through these areas. To create the rain garden, which will be a stormwater detention basin, the soil will have to be excavated to create the depression. To reduce costs, it will be advantageous to retain the soil on




| p code | Scientific name | common name |
|---|---|---|
| AgAl | Ageratina altissima var. altissima | white snake root |
| AsIn | Asclepias incarnata ssp. incarnata | swamp milkweed |
| AsSy | Asclepias syriaca | common milkweed |
| AsTu | Asclepias tuberosa | butterfly milkweed |
| AsVe | Asclepias verticillata | whorled milkweed |
| CoCo | Conoclinium coelestinum | mistflower |
| EuFi | Eutrochium fistulosum | joe pye weed |
| EuPe | Eupatorium perfoliatum | boneset |
| HeGi | Helianthus giganteus | giant sunflower |
| LeCa | Lespedeza capitata | roundhead lespedeza |
| LiSp | Liatris spicata var. spicata | marsh blazing star |
| LoCa | Lobelia cardinalis | cardinal flower |

| p code | Scientific name | common name |
|---|---|---|
| MoFi | Monarda fistulosa | wild bergamot |
| PeDi | Penstemon digitalis | tall white beardtongue |
| PoRe | Polemonium reptans | jacobs ladder |
| PyVi | Pycnanthemum virginianum | mountain mint |
| SoBi | Solidago bicolor | siver rod |
| SoCa | Solidago canadensis var. canadensis | canada goldenrod |
| SoNe | Solidago nemoralis | gray goldenrod |
| SyNo | Symphyotrichum novae-angliae | new england aster |
| TrVi | Tradescantia virginiana | virginia spiderwort |
| VeNo | Vernonia noveboracensis | New York ironweed |
| ZiAu | Zizia aurea | golden alexanders |

**Figure 2: Groff Memorial Park Meadow and Rain Garden design with existing woodland design by Gary Schwetz**

site. The design capitalizes on using the soil to create a berm along the street side that would provide a barrier to the street noise and establish the feeling of enclosure.

A small knoll will also be created in the middle of the meadow to add topographical interest and be a viewing point to look out over the meadow. The preliminary design provides a sketch to denote these landforms and is not a true grading plan.

The township is still in the process of defining the area that will have stormwater managed so it is difficult to quantify the amount and produce accurate contours. Since the town is proposing to do grading to create the rain garden, the two-acre addition will be exposed bare soil; therefore, the rain garden and meadow will be established from seed mixes. After the vegetation has established, the township and the Friends of Groff Memorial Park can add perennials to make vibrant clumps of color that will give the meadow a more intentional design. If the yearly budget is too constrained, plants could be added over several years. The design uses color, bloom time, and plant height to arrange the perennials in an aesthetically pleasing manner. Taller perennials were kept to the outer edges of the property, similar to the use of tall plants at the back of a perennial border and shorter perennials were used along the pathway. Figure 2 shows the design for the meadow and rain garden

The material for the four-foot-wide pathway through the meadow and rain garden will be wood chips, which is consistent with the existing woodland path. Also, the first two feet on either side of the path should be mowed at between four to eight inches. This mowing regime has been shown to make people feel comfortable with the tall vegetation. The path will guide the park visitor to the rain garden to view the selection of plants in this area. The path then proceeds around and up to the knoll, where the visitor will have a view over the meadow. The top of the knoll would be a quiet open mowed space that could be used for self-reflection or picnicking. A bench is suggested for this area. The pathway will then bring the visitor through the meadow, over to the berm and back to the woodland path.

## MANAGEMENT PLAN

Groff Memorial Park currently does not have a Management Plan and the new plan will articulate the board's wishes on how the park should be maintained by the hired grounds keeping crew and volunteers. The Management Plan is organized by the following areas: the woodlands; including trees, shrubs and ground cover; the turf area, the rain garden, the meadow, and the ornamental pond. An important issue in the plan is how to maintain the park organically since it is in Zone 1 and Zone 2 of a the WHPZ.

Tree management in the woodlands is based on the recommendations from The International Society of Arboriculture (ISA) and includes guidelines for healthy tree selection, tree planting, tree pruning, and mulching. A list of native trees for expanding the woodland is also included. As the existing trees have grown, lawn areas are being shaded and the plan advises extending the mulched areas under the trees and adding groundcovers from the list of plants adapted to alkaline soil. Also, the sustainable practice of mulching the leaves in the fall and adding them to the mulched areas is recommended.

Meadow establishment and management is drawn from the Natural Lands Trust document "Meadows in Southeastern Pennsylvania" and from the Morris Arboretum Urban Forestry Department's recommendations for the establishment and maintenance of meadows at the University of Pennsylvania's Veterinary School in Kennett Square, Pennsylvania. The Penn State guide on rain gardens was used as a reference for detailing the establishment and maintenance of the rain garden.

For the first two to three years, weed management will be very important while the meadow and rain garden develop. A separate section outlines how to manage several of the most common invasive weeds. The Plant Conservation Alliance's Alien Plant Working Group provided the details on how to remove specific invasive plants.

## CONCLUSION

This project's final result is the creation of a meadow and rain garden design for the 2-acre addition to the Groff Memorial Park in New Holland, Pennsylvania. A management plan was also written to help the borough maintain and enhance the park in the future. This project has given me hands-on experience with soil sampling, simple percolation tests, and exposure to dealing with wellhead protection zones. The planting plan has helped me increased my knowledge of calcareous plant communities and the management plan has introduced me to organic land management methods. The rain garden and meadow design will be a valuable addition to my portfolio. I believe the design and plan will be very useful documents for the Groff Memorial Park and the borough of New Holland as they continue to develop and care for this special park.

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## ACKNOWLEDGMENTS


I would like to thank Jason Lubar, Bob Wells, and Jan McFarlan for their suggestions and guidance with my project. I would also like to thank Charlie Miller, the Groff Memorial Park Board and New Holland Borough for giving me the opportunity to create a design plan and management plan for the Groff Memorial Park.

## ADDENDUMS

ADDENDUM I – SOIL RESULTS

Area 1: Raingarden - surface - soil pH 7.5

| ADDITIONAL RESULTS: | | | | | | Optional Tests: | | | [2]Trace Elements | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % Saturation of the CEC | | | | | | *See back for comments* | | |
| [2]Calcium (ppm) | [3]Acidity (meq/100 g) | [4]CEC (meq/100 g) | K | Mg | Ca | Organic Matter % | Nitrate-N ppm | Salts mmhos/cm | Zinc ppm | Copper ppm | Sulfur ppm |
| 1444 | 0.0 | 9.0 | 1.7 | 17.8 | 80.4 | 3.9 | | | 6.7 | 3.6 | 14.1 |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | |

Area 1: Raingarden subsurface - soil pH 7.5

| ADDITIONAL RESULTS: | | | | | | Optional Tests: | | | [2]Trace Elements | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % Saturation of the CEC | | | | | | *See back for comments* | | |
| [2]Calcium (ppm) | [3]Acidity (meq/100 g) | [4]CEC (meq/100 g) | K | Mg | Ca | Organic Matter % | Nitrate-N ppm | Salts mmhos/cm | Zinc ppm | Copper ppm | Sulfur ppm |
| 1116 | 0.0 | 7.3 | 1.9 | 21.1 | 76.9 | | | | 13.9 | 1.6 | 6.2 |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | |

Area 2: Meadow surface - soil pH 6.9

| ADDITIONAL RESULTS: | | | | | | Optional Tests: | | | [2]Trace Elements | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % Saturation of the CEC | | | | | | *See back for comments* | | |
| [2]Calcium (ppm) | [3]Acidity (meq/100 g) | [4]CEC (meq/100 g) | K | Mg | Ca | Organic Matter % | Nitrate-N ppm | Salts mmhos/cm | Zinc ppm | Copper ppm | Sulfur ppm |
| 1235 | 0.0 | 9.1 | 5.4 | 26.6 | 68.0 | 4.0 | | | 6.8 | 2.4 | 16.5 |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | |

Area 2: Meadow subsurface – soil pH 7.2

| ADDITIONAL RESULTS: | | | | | | Optional Tests: | | | [2]Trace Elements | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % Saturation of the CEC | | | | | | *See back for comments* | | |
| [2]Calcium (ppm) | [3]Acidity (meq/100 g) | [4]CEC (meq/100 g) | K | Mg | Ca | Organic Matter % | Nitrate-N ppm | Salts mmhos/cm | Zinc ppm | Copper ppm | Sulfur ppm |
| 903 | 0.0 | 6.8 | 7.5 | 25.9 | 66.6 | | | | 5.2 | 1.4 | 7.3 |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | |

Area 3: Well head surface – soil pH 6.8

| LABORATORY RESULTS: | | | | | | | | | | Optional Tests: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1]pH | [2]P lb/A | Exchangeable Cations (meq/100g) | | | | | % Saturation of the CEC | | | Organic Matter % | Nitrate-N ppm | Soluble salts mmhos/cm |
| | | [3]Acidity | [2]K | [2]Mg | [2]Ca | [4]CEC | K | Mg | Ca | | | |
| 6.8 | 44 | 0.0 | 0.2 | 1.7 | 4.6 | 6.5 | 3.0 | 26.0 | 70.9 | 2.0 | | |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | | |

Area 3: Well head subsurface - soil pH – 7.1

| LABORATORY RESULTS: | | | | | | | | | | Optional Tests: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1]pH | [2]P lb/A | Exchangeable Cations (meq/100g) | | | | | % Saturation of the CEC | | | Organic Matter % | Nitrate-N ppm | Soluble salts mmhos/cm |
| | | [3]Acidity | [2]K | [2]Mg | [2]Ca | [4]CEC | K | Mg | Ca | | | |
| 7.1 | 44 | 0.0 | 0.2 | 1.7 | 4.7 | 6.6 | 3.0 | 26.3 | 70.7 | | | |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | | |

Area 4 and 5 Woodland surface – soil pH 7.3

| LABORATORY RESULTS: | | | | | | | | | | Optional Tests: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1]pH | [2]P lb/A | Exchangeable Cations (meq/100g) | | | | | % Saturation of the CEC | | | Organic Matter % | Nitrate-N ppm | Soluble salts mmhos/cm |
| | | [3]Acidity | [2]K | [2]Mg | [2]Ca | [4]CEC | K | Mg | Ca | | | |
| 7.3 | 32 | 0.0 | 0.4 | 3.2 | 7.2 | 10.8 | 4.0 | 29.2 | 66.8 | 3.7 | | |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | | |

Area 4 and 5 Woodland subsurface – pH 7.3

| LABORATORY RESULTS: | | | | | | | | | | Optional Tests: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1]pH | [2]P lb/A | Exchangeable Cations (meq/100g) | | | | | % Saturation of the CEC | | | Organic Matter % | Nitrate-N ppm | Soluble salts mmhos/cm |
| | | [3]Acidity | [2]K | [2]Mg | [2]Ca | [4]CEC | K | Mg | Ca | | | |
| 7.3 | 32 | 0.0 | 0.4 | 3.2 | 7.2 | 10.8 | 4.0 | 29.2 | 66.8 | 3.7 | | |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | | |

Area 6 Potential acid soil plants surface – pH 7.3

| LABORATORY RESULTS: | | | | | | | | | | Optional Tests: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1]pH | [2]P lb/A | Exchangeable Cations (meq/100g) | | | | | % Saturation of the CEC | | | Organic Matter % | Nitrate-N ppm | Soluble salts mmhos/cm |
| | | [3]Acidity | [2]K | [2]Mg | [2]Ca | [4]CEC | K | Mg | Ca | | | |
| 7.3 | 32 | 0.0 | 0.4 | 3.2 | 7.2 | 10.8 | 4.0 | 29.2 | 66.8 | 3.7 | | |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | | |

Area 6 Potential acid soil plants subsurface – pH 7.8

| LABORATORY RESULTS: | | | | | | | | | | Optional Tests: | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1]pH | [2]P lb/A | Exchangeable Cations (meq/100g) | | | | | % Saturation of the CEC | | | Organic Matter % | Nitrate-N ppm | Soluble salts mmhos/cm |
| | | [3]Acidity | [2]K | [2]Mg | [2]Ca | [4]CEC | K | Mg | Ca | | | |
| 7.8 | 34 | 0.0 | 0.4 | 3.3 | 9.0 | 12.8 | 3.4 | 25.9 | 70.7 | | | |
| Test Methods: [1]1:1 soil:water pH, [2]Mehlich 3 (ICP), [3]Mehlich Buffer pH, [4]Summation of Cations | | | | | | | | | | | | |

ADDENDUM II – PARTICLE SIZE ANALYSIS

## Particle Size Analysis

| Customer ID | Lab ID | Sand % | Silt % | Clay % | Soil Textural Class |
|---|---|---|---|---|---|
| 2A & 2B | S16-02930 | 18.4 | 50.7 | 30.8 | Silty Clay Loam |

ADDENDUM III – MEADOW SEED MIX

| % of mix | Scientific name | Common name |
|---|---|---|
| 1% | *Asclepias tuberosa* | butterfly milkweed |
| 1% | *Carex pensylvanica* | Pennsylvania sedge |
| 1% | *Eragrostis spectabilis* | purple lovegrass |
| 1% | *Solidago bicolor* | silver rod |
| 1% | *Symphyotrichum laeve* | smooth blue aster |
| 2% | *Monarda fistulosa* | wild bergamot |
| 2% | *Symphyotrichum novae-angliae* | New England aster |
| 2% | *Tradescantia virginiana* | Virginia spiderwort |
| 2% | *Zizia aurea* | golden alexanders |
| 2% | *Andropogon gerardii* | big blue stem |
| 2% | *Pycnanthemum virginianum* | mountain mint |
| 2% | *Liatris spicata var. spicata* | marsh blazing star |
| 2% | *Asclepias syriaca* | common milkweed |
| 2% | *Asclepias verticillata* | whorled milkweed |
| 2% | *Desmodium canadense* | showy ticktrefoil |
| 2% | *Lespedeza capitata* | roundhead lespedeza |
| 2% | *Solidago nemoralis* | gray goldenrod |
| 2% | *Symphyotrichum ericoides* | white heath aster |
| 3% | *Penstemon digitalis* | tall white beardtongue |
| 4% | *Chamaecrista fasciculata* | patridge pea |
| 4% | *Rudbeckia fulgida* | blackeyed susan |
| 4% | *Senna hebecarpa* | wild senna |
| 10% | *Elymus virginicus* | virginia wildrye |
| 10% | *Bouteloua curtipendula* | sideoats gramma |
| 10% | *Sorghastrum nutans* | Indian grass |
| 24% | *Schizachyrium scoparium* | little blue stem |
| 100% | | |

ADDENDUM IV – RAIN GARDEN SEED MIX

| % of mix | Scientific name | Common name |
|---|---|---|
| 1% | *Helianthus giganteus* | giant sunflower |
| 1% | *Impatiens capensis* | jewelweed |
| 1% | *Lobelia cardinalis* | cardinal flower |
| 1% | *Onoclea sensibilis* | sensitive fern |
| 2% | *Andropogon gerardii* | big blue stem |
| 2% | *Asclepias incarnata* | swamp milkweed |
| 2% | *Carex albolutescens* | green white sedge |
| 2% | *Carex granularis var. haleana* | limestone meadow sedge |
| 2% | *Carex sterilis* | fen star sedge |
| 2% | *Carex vulpinoidea* | fox sedge |
| 2% | *Conoclinium coelestinum* | mistflower |
| 2% | *Eupatorium perfoliatum* | boneset |
| 2% | *Monarda fistulosa* | wild bergamot |
| 2% | *Penstemon digitalis* | tall white beardtongue |
| 2% | *Polemonium reptans* | Jacob’s ladder |
| 2% | *Rudbeckia hirta* | black-eyed susan |
| 2% | *Smilacina stellatum* | starry false Solomon's plume |
| 2% | *Symphyotrichum novae-angliae* | New England aster |
| 2% | *Tradescantia virginiana* | Virginia spiderwort |
| 2% | *Verbena hastata* | blue vervain |
| 2% | *Vernonia noveboracensis* | New York ironweed |
| 2% | *Zizia aurea* | golden alexanders |
| 3% | *Carex intumescens* | bladder star sedge |
| 2% | *Pycnanthemum virginianum* | mountain mint |
| 4% | *Liatris spicata* | marsh blazing star |
| 5% | *Carex prairea* | prairie sedge |
| 5% | *Carex squarrosa* | squarrose sedge |
| 10% | *Calamagrostis canadensis* | Canada bluejoint |
| 10% | *Elymus riparius* | Virginia wild rye |
| 22% | *Schizachyrium scoparium* | little blue stem |
| 100% | | |