Feasibility Study
Stormwater Demonstration Site

Cattaraugus County Department of Public Works Campus
Little Valley, New York

Prepared for

Southern Tier West
Regional Planning & Development Board

August 2013

ecoSTRATEGIES
CIVIL ENGINEERING

Feasibility Study
Stormwater Demonstration Site

Cattaraugus County Department of Public Works Campus
Little Valley, New York

Andrew R. Johnson, PE, CPESC
Principal Engineer

Richard Constantino
Senior Biologist / Eco-Services Manager

Prepared for:
Southern Tier West Regional Planning & Development Board

Prepared by:
EcoStrategies
1890 East Main Street
Falconer, New York 14733
Phone: 716.664.5602 Ext. 400
Email: ajohnson@ecostrategiespllc.com

Date:
August 8, 2013

Table of Contents

Executive Summary

The Stormwater Demonstration Site will serve as a permanent hands-on training facility showcasing stormwater Best Management Practices. The site location was selected to serve communities within the Southern Tier West Region (Chautauqua, Cattaraugus, Allegany Counties) as well as other interested communities and counties in New York State. Through a partnership with Cattaraugus County Department of Public Works (DPW), Southern Tier West Regional Planning and Development Board will have the opportunity to utilize acreage on the DPW Campus in Little Valley, New York to develop green infrastructure practices and erosion/sediment control practices for demonstration and educational purposes.

The Site will provide a "real world" educational platform to teach and train people on the sustainable practices of stormwater management. The educational outreach component will strengthen the capacity of the people in this region by allowing them to learn how these practices work and how they can be implemented. The project audience will include municipal officials (mayors, supervisors, clerks, council members), highway superintendents, planning/zoning boards, code enforcement officers, developers, contractors, engineers, logging industry, students and homeowners. The Stormwater Demonstration Site will assist professionals to better understand their problems and the potential cost effective solutions that are available. By showcasing site-specific examples, which are feasible and achievable for this region, the Stormwater Demonstration Site will provide education and encourage others to plan for and implement stormwater management practices in the future.

This Feasibility Study was funded through the Environmental Finance Center at Syracuse University for the purpose of submitting an application to the Green Innovation Grant Program offered by the Environmental Facilities Corporation. The Green Infrastructure Practices, described herein, to be developed in the "Out Front" area of the DPW Campus will be included in the GIGP application. The erosion and sediment control practices, described herein, to be developed in the "Out Back" area of the DPW Campus will be funded in part through a grant awarded by the Appalachian Regional Commission.

1. Introduction

On behalf of the Southern Tier West Regional Planning and Development Board (Southern Tier West), EcoStrategies Civil Engineering, PLLC. (EcoStrategies) has prepared this *Feasibility Study* for the proposed *Stormwater Demonstration Site* (the "Site") located on the Cattaraugus County Department of Public Works (DPW) Campus at 8810 Jack Ellis Drive (Route 242), Little Valley, New York (Figure 1). The purpose of this document is to provide the basis and justification for the design of green infrastructure (GI) and erosion and sediment control practices. The site is situated in a central location to serve Cattaraugus County, Chautauqua County, and Allegany County. The project audience will include municipal officials (mayors, supervisors, clerks, council members), highway superintendents, planning/zoning boards, code enforcement officers, developers, contractors, engineers, logging industry, students and homeowners.

1.1 Project Goals and Objectives

The goals of the Stormwater Demonstration Site are as follows:

1.) *Foster professional development and job creation:*

GI and erosion and sediment control best management practices (BMPs) have become the industry standard for stormwater professionals, although these techniques have historically been underutilized in the Southern Tier West Region. This project will serve as an educational site that will assist pubic officials and private professionals with obtaining the needed skills to manage stormwater using the best available technology.

2.) *Create opportunities for communities and stormwater professionals to contribute and collaborate on stormwater management:*

Increasing the awareness and the appreciation for sustainable stormwater management through an interactive educational site will foster good stewardship and encourage participation from public officials and private companies.

3.) *Reduce and improve the impacts on infrastructure, stream function, and water quality*:

As watersheds become more urbanized they continue to impose stress on existing infrastructure and the natural hydrologic function of streams and ultimately reduce water quality. The use of green infrastructure and stormwater BMPs are cost effective watershed based planning tools that will help communities grow in a sustainable manor.

The objectives of the Stormwater Demonstration Site are as follows:

a.) Select stormwater BMPs that are most suitable and cost-effective for this region.
b.) Demonstrate how surface run-off from impervious surfaces can be retained and re-used where it lands.

c.) Utilize GI practices that demonstrate how volume-based retention standards are feasible and achievable for this region.
d.) Quantify the performance of the GI practices by implementing a sampling and analysis plan to measure water quality parameters and contaminants of concern (COCs).
e.) Demonstrate how erosion and sediment controls are designed and implemented and demonstrate how they work using natural rainfall or “artificial rainfall” from a water truck.
f.) Use the engineering report, plans, drawings, figures, and calculations to create signage and other displays for educational outreach at all levels.

1.2 Project Team

EcoStrategies is the New York State licensed engineering firm responsible for developing this document. The core Project Team consists of representatives from the following organizations:

Southern Tier West Regional Planning and Development Board – Ginger Malak
Cattaraugus County Department of Public Works (DPW) – Joe Pillittere
Cattaraugus County Soil and Water Conservation District (SWCD) – Brian Davis, CPESC
Allegany County SWCD – Scott Torrey and Leonard Preston
Chautauqua County SWCD – Dave Wilson
FORECON, Inc. (FORECON) – Rick Constantino
EcoStrategies – Andy Johnson, PE, CPESC

Additional input and guidance has been provided by the Regional Watershed Coalition assembled by Southern Tier West.

2. Existing Site Conditions

The following subsections describe the existing site conditions that are applicable to the Feasibility Study and funding evaluation requirements.

2.1 Project Location and Current Land Use

The Site is located at 8810 Route 242 in the Town of Little Valley, Cattaraugus County, New York on approximately 97-acres of land owned by the Cattaraugus County DPW.

Prior to development, the land was used for growing agricultural crops. The DPW facility was constructed in 1999 and consists of the main building, paved parking lots, paved and gravel driveways, equipment and material storage yard, salt storage structure, open space lawn, and two stormwater ponds. The surrounding land use is a mix of residential, agricultural, and forested areas (Figure 2).

2.2 Soil Types

The United States Geological Survey (USGS) soil classification map was developed for the Site (Figure 4). The soil types within the two watersheds are as follows: 19A, 22A, 52B, 52D, and 800. A detailed description of each soil type is provided in Appendix B. All of these soil types are classified as Hydrologic Soil Group B (silt loam and gravelly silt loam), which are suitable soils for GI and erosion and sediment control practices. These soil types are classified as very deep and well drained, have moderate infiltration rates when thoroughly wetted, low shrink-swell potential, moderately fine to moderately coarse textures, and have a moderate rate of water transmission (0.15 to 0.30 inches per hour [in/hr]).

2.3 Site Topography

Topographic information for the Site was obtained from engineering as-built drawings for the facility (Appendix A). The developed portion of the property sits on top of a hill at approximately 1,445 feet above mean sea level (msl). The developed portion, which includes the buildings, parking lots, and storage yard, is relatively flat with slopes trending from west to east at approximately 0.5% - 1.5%. The largest elevation change is “Out Front” where stormwater run-off from the developed area (1445 feet) moves downhill toward the stormwater pond (1415 feet). This results in a change in elevation of approximately 30 feet and a land slope of approximately 10%.

2.4 Stormwater Flowpaths and Receiving Water Bodies

A site inspection was conducted by Andy Johnson, PE, CPESC (EcoStrategies) on April 10, 2013 during a rain event. The purpose of the inspection was to verify drainage features on the as-built drawings (Appendix A), accurately define the watershed and sub-watersheds, take photos, and observe how stormwater moves across the Site. The stormwater flowpaths for the property are presented on Figure 2.

The developed area within the property is approximately 30 acres. Within this developed area, the existing topography and stormwater infrastructure splits the site into two watersheds. The first watershed is referred to as the "Out Front" area (11 acres) and the second is referred to as the "Out Back" area (19 acres). Each watershed utilizes a stormwater pond at the lowest elevation prior to off-site discharge. The receiving water bodies for the two watersheds include a wetland area ("Out Back") and a tributary to Little Valley Creek ("Out Front") (Figure 2).

It should also be noted that the 100-floodplain extends into the lowest elevations of the "Out Front" area, but the GI practices will be located above this area and should not be affected (see Appendix D).

2.5 Groundwater and Depth to Water Table

The exact depth to groundwater at the Site is currently unknown. However, since the developed area is on a hill, which is approximately 30 feet above the nearest creek, groundwater is expected to be between 10 and 30 feet below ground surface (bgs) depending on the location in the watershed. In addition, the Site soil types have a typical depth to the top of a seasonal high water table greater than five feet. The depth for the proposed GI and erosion and sediment control practices is not expected to extend beyond five feet. Therefore, the depth to groundwater is not expected to interfere with the proposed practices in this Feasibility Study.

2.6 Surface Cover Types

The developed areas consist of impervious and pervious surfaces. A surface cover map showing the various cover types and corresponding surface areas is presented as Figure 3. The "Out Front" area is 55% impervious surfaces, which is typical of a developed area for this region. Therefore, the "Out Front" area is conducive to demonstrating stormwater quality management practices (i.e. GI practices). The "Out Back" area includes an equipment storage yard, a salt storage enclosure, and open space. This area is only 16% impervious surfaces (mostly gravel), has ongoing heavy equipment activity, is typical of a less developed area, and is conducive to demonstrating erosion and sediment control practices.

2.7 Existing Utilities

The existing utility locations were obtained from the engineering as-built drawings provided by the Cattaraugus County DPW (Appendix A). Known utilities include underground electric, underground telephone, 2-inch gas line, 8-inch water line, 6-inch fire water line, sanitary sewer line, and 10- and 12-inch stormwater pipelines. These utilities begin at or near the driveway entrance along Route 242 and extend up the main driveway toward the center of the building. There are no known utilities in the "Out Back" area except for stormwater pipelines. The proposed green infrastructure locations were selected to avoid conflicts with existing utilities.

2.8 Existing Stormwater Best Management Practices

There are a few existing GI and erosion and sediment control practices already present at the Site that can be used for demonstration purposes and displayed at little to no cost. These include a riparian buffer, conservation of natural areas, and a vegetated swale. There are also a few existing erosion and sediment control practices. These include rock outlet protection, 270 feet of existing drainage swales, 130 feet of rip-rap lined drainage swale, and two stormwater/sediment ponds.

3. Project Description

The purpose of the project is to provide a “real world” educational platform to teach and train people on the sustainable practices of stormwater management. The educational outreach component will strengthen the capacity of the people in this region by allowing them to learn how these practices work and how they can be implemented. The site location was selected to serve Cattaraugus County, Chautauqua County, and Allegany County as well as other interested communities in the region or watershed. The project audience will include municipal officials (mayors, supervisors, clerks, council members), highway superintendents, planning/zoning boards, code enforcement officers, developers, contractors, engineers, logging industry, students and homeowners.

A key objective for the project is to select stormwater BMPs that are most suitable to the three counties involved. For example, certain GI practices such as rain gardens, constructed wetlands, and bio-retention areas are less expensive and more suitable to this climate and location, while other techniques such as porous pavement are less suitable due to relatively high material cost and the potential for damage and clogging of pore space due to snow plowing and sand/salt applications. A few examples of erosion and sediment control practices that would fulfill a need for this region include the proper use of check dams, bank stabilization techniques, and improved ditch/channel design. The highway superintendents encounter erosion issues along roads, streams, ditches, and culverts every year, which require on-going maintenance and recurring costs each year. The Stormwater Demonstration Site would help professionals better understand their problems and the potential solutions that are available.

The project team believes that showcasing site-specific examples, which are feasible and achievable for this region, will educate and encourage others to plan for and implement stormwater management practices in the future. The intent is to stimulate interest and achieve the project goals and objectives described under Section 1.1.

3.1 Conceptual Site Plan

A simple way to explain the conceptual plan for the two watersheds is as follows:

- The “Out Front” area will demonstrate stormwater BMPs from the *New York State Stormwater Management Design Manual* (called “The White Book”). This area will demonstrate GI practices.

- The “Out Back” area will demonstrate stormwater BMPs from the *New York State Standards and Specifications for Erosion and Sediment Control* (called “The Blue Book”). This area will demonstrate temporary and permanent erosion and sediment control practices.

The conceptual site plan presents the existing and proposed stormwater management practices for the Site (Figure 5). These practices are briefly explained in the sections below.

3.2 Proposed Green Infrastructure Practices

3.2.1 Large Rain Garden

A large rain garden is proposed at the southwest corner of the main parking lot (Figure 6). This area is located at the south side of the main building entrance and is highly visible to the public. The size and dimensions may vary from 50 feet by 50 feet (2,500 square feet [ft^2]) up to 7,500 ft^2 depending on available funding.

It is feasible to design the rain garden to receive stormwater run-off from the DPW building roof and/or the main parking lot by disconnecting and re-routing the existing storm drains (Figure 6). The rooftop drain pipe located at the southwest corner of the DPW building could be re-routed to the rain garden using approximately 210 feet of 10-inch pipe with a minimum 0.5% slope. Currently, this section of rooftop run-off feeds into an existing 10-inch pipe with a 0.5% slope (see Appendix A). The parking lot drain pipe located near the center of the main parking lot can also be re-routed to the rain garden using approximately 60 feet of 10-inch pipe at a 1% slope. Currently, the parking lot run-off feeds into an existing 10-inch pipe with a 1% slope (see Appendix A). The existing pipelines could be isolated, left in place, and used as an alternate diversion in case stormwater flow to the rain garden needs to be "shut-off" for maintenance or other reasons. The existing pipelines could also be modified and used as a "flow regulator" for the rain garden so high-volume rain events greater than 1-2 inches can be diverted (if needed).

The rain garden is situated at a lower elevation (0-2 feet below the parking lot) on hydrologic class B soils with a slope of less than 4%. The edge of the garden should be at least 20 feet from the building foundation to prevent water from seeping into the basement or causing frost damage. The system will be designed in accordance with the *New York State Stormwater Management Design Manual* recommendations for rain gardens and bio-retention areas. The design would include 6-12 inches of washed stone base layer, 12-24 inches of soil media, 3:1 side slopes, and a maximum ponded water depth of 6 inches. An under drain is not anticipated since the garden will have a relatively large surface area and the overflow(s) can be designed to release ponded water in excess of 6 inches as sheet flow using a level spreader or similar device. Any excess water (overflow) would run down the vegetated hillside, which would function as a 100 foot long grass filter strip, and migrate toward the bio-retention area and wetland area below (Figure 6).

Native plants species shall be the only type of plants acceptable for use in GI practices at the Site. When selecting plants for the rain garden, it is best to break the garden up into "zones". Each zone will have different moisture levels. For example, the zones in the middle of the rain garden will have more moisture due to ponding than other zones near the edges. The blooming period for each zone must also be considered to enhance the aesthetics of the green scape. There are four different types of rain garden designs that will be considered for this project. These rain gardens can also be modified and incorporated into the infiltration gardens, bio-retention area, and the critical planting area described below. They include 1) Native Prairie Garden, 2) Bird and Butterfly Garden, 3) Shrub Garden, and 4) Mixed Sunny Garden (Appendix C). Each garden has its own unique attributes. Appendix C provides diagrams showing the recommended plant species composition, blooming periods from April-October (for each zone), and the height range of plant species. The base list of preferred species on the diagrams are adapted for clay or loam soils, which are suitable for the Site. However, there are options to substitute different species. It should be noted that some of the plants and flowers listed may not tolerate pollutant loading from the parking lots. Careful attention as to how and where these plants are placed will be important. A specific list of plants that are more tolerant to pollutants and other factors is discussed below.

The native plants selected for GI practices are based on a variety of factors including tolerance to ponding, salt, oil/grease, metals, insects/disease, and other factors such as root system (deep rooted species are preferred) and aesthetics. A list of recommended “tolerant” or “hardier” plant species for the GI practices at the Site is provided below:

Tree Species:
Red Maple (Acer rubrum)
Sweet Gum (Liquidambar styraciflua)
Black Gum (Nyssa sylvatica)
Curley Stem Willow (Salix)

Shrub Species:
Red Osier Dogwood (Cornus stolonifera or Cornus sericea)
Spice Bush (Lindera benzoin)
Bayberry (Myrica pennsylvanica)
Red Chokeberry (Aronia arbutifolia or Pyrus arbutifolia)
Sweet Pepperbush (Clethra Alnifolia)
Witch Hazel (Hamamelis virginiana)
Service Berry (shrub or tree version, preferably the multi-trunk version)
Inkberry (llex glabra)
Tassel-white, Virginia Sweetspire (Itea virginica)

Herbaceous Species:
Indian Grass
Little Bluestem
Switchgrass
Birdsfoot-trefoil (Lotus Coniculatus)

The plant species list was developed by EcoStrategies using a variety of sources with review and consultation provided by the Cornell Cooperative Extension of the Chautauqua County Master Gardener Program.

3.2.2 Disconnection of Rooftop and Parking Lot Runoff

As described above, run-off can be piped to the Rain Garden from the DPW roof and/or the main parking lot by disconnecting and re-routing the existing storm drains (Figure 6). The rooftop drain pipe at the southwest corner of the DPW building is estimated to receive run-off a 10,000 ft^2 area. Design guidelines for rain gardens suggest that the surface area of the rain garden be approximately 1/3 of the contributing drainage area, which equates to approximately 3,333 ft^2 (e.g. 55 feet by 55 feet). The main parking lot is estimated to receive run-off from a 15,000 ft^2 area. Therefore 1/3 of the contributing drainage area would equate to approximately 5,000 ft^2 (e.g. 100 feet by 50 feet or 70 feet by 70 feet) of rain garden surface area. Since there is plenty of space available, the rain garden can be designed to receive run-off from one or both of these contributing areas.

Another point of storm drain disconnection is at the mid-point along the front driveway (Figure 6). It is feasible to disconnect the drain pipe at the existing catch basin and route the water to the bio-retention area described below. The existing pipeline going from the catch basin to the existing stormwater pond (along the driveway) could be isolated, left in place, and used as an alternate diversion if maintenance to the bio-retention area or the constructed wetland area is required. The existing pipeline could also be used as "flow control" to the bio-retention area during high-volume rain events (if needed).

3.2.3 Infiltration Gardens

Two infiltration gardens are proposed for the two existing parking lot islands in the main parking lot (Figure 6). The existing islands are each approximately 400 ft^2 in size and consist of a raised soil bed with grass and a 6-inch continuous curb around the perimeter. These islands are highly visible to the public and it is feasible and cost-effective to transform them into infiltration gardens.

The infiltration gardens, also referred to as a bio-retention cell, are similar in construction to the large rain garden described above. However, infiltration trenches could be added to the island subsoil to promote infiltration and groundwater recharge. These trenches can be engineered and backfilled with gravel to increase soil water storage capacity. The existing curb would be modified to include inlets to allow parking lot runoff to enter the garden. The maximum depth of ponded water is 6 inches. Any excess water beyond 6 inches would flow back to the existing storm drain inlet (catch basin) in the center of the parking lot.

Additional soil testing (e.g. percolation tests) would need to be completed prior to construction. Also, it should be noted that a fire hydrant and a firewater utility line are located in the island located on the east end of the parking lot (Appendix A). This is the only known utility that would need to be factored in to the design.

If soil testing results in poor infiltration rates, another option would be to install an under drain in the garden and pipe the water to the existing catch basin located in the center of the main parking lot. This option would require 50 feet of 10-inch pipe for each island. It would also involve additional cost for materials and construction to break-out and restore the existing asphalt.

3.2.4 Critical Treatment Area

The critical treatment area is located on a steep slope (>50%) just north of the stormwater pond (Figure 6). The area is approximately 100 feet long by 50 feet wide and is a safety hazard for mowing and lawn maintenance. To mitigate this hazard, the grass lawn will be transformed into a mix of native plants and wildflowers that will provide a “green scape” and eliminate the need for mowing in this area. The plants and wildflowers will be selected to provide sufficient ground coverage, bank stabilization, and an aesthetically pleasing green scape for people entering the main driveway. The treatment area will also enhance the wildlife habitat for the Site. Although this practice has marginal benefits in terms of reducing the water quality volume or improving stormwater quality, it is an important example of how site maintenance hazards can be mitigated by using green techniques.

The design of the critical treatment area will consist of site preparation work (disking, etc.), soil amendments (lime, fertilizer, mulch), installation of native seed mix (and potentially potted plants and shrubs), and some type of anchoring system such as a jute net or other erosion control netting.

The native seed mix will be selected for a typical disturbed site that is dry and sunny with steep slopes. The choice of seed mix should provide forage and cover for a wide range of desirable wildlife, including butterflies and pollinators. An example “Native Upland Wildlife Forage and Cover Meadow Mix” that is suitable for the Site is presented below.

15%	Eastern Gamma Grass	*Tripsacum dactyloides*
12%	Canada Wild Rye	*Elymus Canadensis*
10%	Big Bluestem, Niagara	*Andropogon gerardii*
10%	Little Bluestem	*Andropogon scoparius*
10%	Fringed Brome Grass	*Bromus ciliates*
10%	Switch Grass, Shelter	*Panicum virgatum*
8%	Indian Grass	*Sorghastrum nutans*
6%	Partridge Pea	*Chamaecrista fasciculate*
5%	Atlantic Coastal Panic Grass	*Panicum amarum*
5%	Fowl Bluegrass	*Poa palustris*
4%	Plains Coreopsis	*Coreopsis tinctoria*
3%	Black Eyed Susan	*Rudbeckia hirta*
2%	Showy Tick Trefoil	*Desmodium canadense*

*Seeding rate: 15 lbs per acre (lb/acre), or 1/3-1/2 lb per 1,000 square feet.

*Seed mix information was obtained from *Ernst Conservation Seeds*.

3.2.5 Bio-Retention Area

The bio-retention area is located on a natural bench between the DPW building and the stormwater pond (Figure 6). The natural bench is approximately 150 feet long by 50 feet wide and slopes to the southwest at a slope of <4%. The bio-retention system has been sized to fit within this natural bench and the post-construction surface run-off can be designed to follow the existing pattern across this area.

As stated previously, the existing storm drain can be disconnect at the mid-point along the front of the driveway and re-routed across the hillside to the bio-retention area. There are at least five known utilities in this area that would need to be investigated to determine their respective depths and elevations to ensure this route is feasible. Known utilities that would need to be crossed include the underground electric line, underground telephone line, 2-inch gas line, 8-inch water line, and potentially a sanitary sewer line (see Appendix A).

The existing pipeline going from the catch basin to the existing stormwater pond (along the driveway) could be isolated, left in place, and used as an alternate diversion in case stormwater flow to the bio-retention area or the constructed wetland area needs to be shut-off for maintenance or other reasons. The existing pipeline could also be modified and used as a "flow control" to the bio-retention area and receive stormwater only during high-volume rain events (if needed).

The bio-retention area is situated on hydrologic class B soils and is approximately 15 feet lower in elevation than the DPW building and parking lots. It is approximately 10 feet higher in elevation than the existing stormwater pond and the proposed wetland. The system will be designed in accordance with the *New York State Stormwater Management Design Manual* recommendations for bio-retention areas. The design would include stormwater inlet controls to convert the concentrated flow from the pipe to sheet flow. The filter bed and media would include a 4 foot planting soil bed, 1 foot of gravel, 300 feet of perforated drain pipe (size to be determined), 20 feet of 12-inch culvert to route drain pipes to the constructed wetland. The under drains would tie into a discharge pipe at the southwest corner. The pipe would discharge into the wetland, which would be situated approximately 3-4 feet below the pipe outlet. An emergency overflow would be placed at the west end to allow any excess water (great than 6 inches) to flow out of the bio-retention area and into the constructed wetland for additional treatment.

3.2.6 Constructed Wetland

The constructed wetland area is located below the bio-retention area (Figure 6). This area is a natural drainage depression approximately 150 feet long and width ranging from 10-20 feet. The water in this area either flows to the existing stormwater pond or infiltrates to groundwater. A small amount of standing water (<1 foot) was observed in this area during the site visit on April 10, 2013. The proposed wetland has been sized to fit the natural depression and the post-construction surface run-off is designed to follow the existing pattern across this area.

The proposed wetland would essentially enhance the existing shape by increasing the width along the south side by another 5-10 feet. This would result in dimensions of approximately 150 feet long and width ranging from 15-25 feet and a surface area of approximately 3,000 ft^2. The soil beneath the wetland is a class B soil (type 800 = Holderton silt loam) but is more suitable for the wetland compared to the other areas since these soils are somewhat poorly drained with a depth to the top of a seasonal high water table ranging from 6 – 18 inches. If soil testing indicates that the soil will not hold an adequate amount of water then a liner may need to be factored in to the design.

The wetland will be designed in accordance with the *New York State Stormwater Management Design Manual* guidelines. The inlet would include a forebay to receive treated water and untreated overflow water from the bio-retention area. The water depth would vary across the wetland from 1-3 feet and include low and high marshes. A 12 inch culvert 50 feet in length would be installed at the outlet (east end) to connect the wetland to the existing stormwater pond. Wetland plant species may include cattails (*Typha spp.*), common reeds (*Phragmites communis*), rushes (*Juncus spp.*), bulrushes (*Scirpus spp.*), and sedges (*Carex spp.*).

3.2.7 Porous Pavement

A porous pavement demonstration area is proposed for the Site. The demonstration area will include 2 or 3 different types of pervious surfaces, including porous concrete, porous asphalt, and/or reinforced turf with pavers. The exact location(s) for this demonstration area has not been determined, but a couple of options are feasible. One potential location is along the north side of the DPW building where the driveway enters the maintenance shop. This area is approximately 200 feet long by 40 feet wide (8,000 ft^2). Other areas may include individual parking spots, sidewalks, or walkways around the rain garden. The cost of the porous pavement demonstration area is estimated to be approximately $\$2.50/ft^2$. It should be noted that porous pavement can be challenging in colder climates (i.e. clogging, freeze/thaw, etc.) but since this is a stormwater demonstration site, the team feels that the pros and cons of this technology should be demonstrated as part of educational outreach.

3.2.8 Cistern

A cistern or industrial size rain barrel is proposed to capture and store roof top runoff from the DPW building. The non-potable water can then be used for irrigation, filling water trucks (for dust control) and so on. There are four potential locations to install the cistern at the DPW building. Two rooftop downspouts are located along the east side of the building and two are located along the north side. The cistern would be designed so that any overflow would simply go back down the existing drain pipe system. The cistern would be approximately 5,000 – 10,000 gallons in size. An average cistern is estimated to cost approximately $0.75/gallon. Therefore, the cistern and pump system may cost approximately $4,000 – $8,000 depending on the size selected.

3.2.9 Green Roof

The location for the green roof has not been defined as of the writing of this study but several locations may be feasible including: a portion of the primary office building, the wash plant building, future equipment garage, or the utility building near the site entrance. A range in value (minimum to maximum) has been provided for this improvement to allow for flexibility should a site be identified.

There are generally two types of green roofs, extensive and intensive, that differ by cost, depth of growing medium, plant types and the potential for accessibility or use. An extensive style green roof has been selected for use on this project since they are more commonly used in a retrofit scenario. In general the extensive green roof that will be designed for this project will weigh between 10-50 pounds per square foot and cost $15-$35 per square foot to install. It will require between 2"- 6" of growing medium and consist of low growing, shallow rooting, and horizontally spreading ground cover vegetation such as mosses, grasses and succulents. Plants that are drought, wind and frost resistant and heat tolerant will be selected. The roof surface will not be designed or intended for use or as open space and does not require extensive maintenance.

3.3 Water Quality Volume (WQv) Calculations

The Water Quality Volume (WQv) for the "Out Front" area was calculated using the Unified Design Approach (90% Rule) for sizing green infrastructure. The WQv is designed to improve water quality sizing to capture and treat 90% of the average annual stormwater runoff. In general, the goal is to capture and treat the "first flush" (approximately the first 1-inch) of rainfall during a storm event because it contains the most pollutants. The WQv is directly related to the amount of impervious cover at the site and was calculated using the equation below:

WQv (acre-feet) = [(P)(Rv)(A)]/12

Where,
P (inches) = 90% Rainfall Event Number = 0.85 inches.
Rv = 0.05 + 0.009(I) = 0.05 + 0.009(56%) = 0.51
I (%) = Impervious Cover = 55% (see Figure 3)
A (acres) = Site Watershed Area = 10.6 acres

Substituting the numbers above equals the following:

WQv = [(0.85)(0.51)(10.6)]/12
WQv = 0.38 acre-feet
Which is equivalent to:
WQv = 16,554 ft^3, or

WQv = 123,823 gallons

3.4 Green Infrastructure Sizing

The next step was to try various combinations of GI practices to determine how much of the WQv is being captured. Each GI practice has its own Runoff Reduction Volume (RRv) capacity that was calculated to determine how much of the WQv is being treated. The RRv calculations for each proposed GI practice are provided below.

Large Rain Garden:

- Volume pond (V_P) min = 2,500-ft^2 x 0.5-ft x 7.48 gal/ft^3 = 9,350 gal (min)
- Volume pond (V_P) max = 7,500-ft^2 x 0.5-ft x 7.48 gal/ft^3 = 28,050 gal (max)

- Volume soil media (V_{SM}) min = 2,500-ft^2 x 1.5-ft x 0.20 x 7.48 gal/ft^3 = 5,610 gal
- Volume soil media (V_{SM}) max = 7,500-ft^2 x 1.5-ft x 0.20 x 7.48 gal/ft^3 = 16,830 gal

- Volume drainage layer (V_{DL}) min = 2,500-ft^2 x 0.5-ft x 0.40 x 7.48 gal/ft^3 = 3,740 gal
- Volume drainage layer (V_{DL}) max = 7,500-ft^2 x 0.5-ft x 0.40 x 7.48 gal/ft^3 = 11,220 gal

Therefore,
Minimum RRv = 9,350 + 5,610 + 3,740 = 18,700 gallons.
Maximum RRv = 28,050 + 16,830 + 11,220 = 56,100 gallons.

Infiltration Gardens (Two Islands in Parking Lot, Each Island is 400 ft^2):

- V_P = 400-ft^2 x 0.5-ft x 7.48 gal/ft^3 x 2= 2,992 gal

- V_{SM} = 400-ft^2 x 1.5-ft x 0.20 x 7.48 gal/ft^3 x 2 = 1,795 gal

- V_{DL} = 400-ft^2 x 1.0-ft x 0.40 x 7.48 gal/ft^3 x 2 = 2,394 gal

Therefore,
RRv = 2,992 + 1,795 + 2,394 = 7,181 gallons.

Bioretention Area:

- V_P = 150-ft x 50-ft x 0.5-ft x 7.48 gal/ft^3 = 28,050 gal

- V_{SM} = 150-ft x 50-ft x 4-ft x 0.20 x 7.48 gal/ft^3 = 44,880 gal

- V_{DL} = 150-ft x 50-ft x 1.0-ft x 0.40 x 7.48 gal/ft^3 = 22,440 gal

Therefore,
RRv = 28,050 + 44,880 + 22,440 = 95,370 gallons.

Wetland Area:

- V_P = 150-ft x 20-ft x 1.5-ft x 7.48 gal/ft^3 = 33,660 gal

Therefore,
RRv = 33,660 gallons.

The total RRv from the GI practices could range from approximately 155,000 – 190,000 based on initial calculations. Recall that the target WQv for treatment is approximately 124,000 gallons. The minimum design goal for a developed site like the DPW is to treat at least 25% of the WQv. On new sites the goal would be 100% treatment of the WQv. Based on initial calculations, the proposed GI practices could treat over 100% of the WQv. However, there are some design considerations, alternatives and additional data needs that must be considered before implementing all or part of the conceptual plan. This information is discussed in more detail in the following sections.

3.5 Water Quality Sampling Plan

A proposed sampling plan has been developed to measure the performance of the GI practices. Baseline samples will be collected prior to the installation of GI practices to assess the current water quality discharge from the “Out Front” area. Baseline samples will include measuring water quality at the main parking lot catch basin and at the existing stormwater pond outlet to the creek. Water quality will be measured using a multi-meter, which will obtain results for various parameters such as pH, dissolved oxygen (DO), conductivity, salinity, total dissolved solids (TDS), turbidity, temperature, and oxidation-reduction potential (ORP). It is also recommended that water samples are collected and sent to a lab to analyze for COCs such as hydrocarbons (e.g. gas, diesel, etc.) and metals (lead, copper, zinc, arsenic, etc.) since these are common pollutants. The sources of these pollutants would be vehicle fluids (oil and grease), emissions, brake pads, brake linings, tires, and so on.

The project team identified six sample locations to measure water quality coming into and out of each treatment system (Figure 6). These locations are as follows:

1.) Inlet to the rain garden or main parking lot catch basin (drain inlet)
2.) Outlet of the rain garden
3.) Inlet to the bio-retention area
4.) Outlet of the bio-retention area/Inlet to the constructed wetland
5.) Outlet of the constructed wetland/Inlet to the stormwater pond
6.) Outlet of the stormwater pond (prior to entering the creek)
7.) Creek

After the GI practices have been installed, water quality measurements could be recorded at each location using a multi-meter. A sample event using the multi-meter would be triggered any time a half-inch or more of rainfall is predicted for the Site. Annual or semi-annual sampling for hydrocarbons and metals is recommended for comparison to baseline conditions (prior to GI practices).

The cost of a 10 parameter multi-meter can run from $2,000-$5,000 to buy new, or they can be rented for approximately $125 per day. Laboratory costs for analyzing gasoline range hydrocarbons, diesel range hydrocarbons, and metals can cost $100-$200 per sample. Therefore, if six samples are collected from the six locations above, plus one duplicate sample for quality assurance/quality control (QA/QC), the lab cost of an annual sample event would be in the range of $700-$1,400. Below is a summary of the proposed sampling plan

- Baseline Sample Event: Rent or borrow a multi-meter ($125) and collect three samples for lab analysis of hydrocarbons and metals. Sample locations would include the main parking lot catch basin, the stormwater pond discharge, and a duplicate (QA/QC) sample at the stormwater pond discharge. This event would cost approximately $700.

- Post-Construction Events: Consider buying a multi-meter for $3,000 to allow for flexibility and immediate use after rain events in excess of one half inch.

- Annual Sample Event: Collect seven samples for lab analysis as described above. Total laboratory cost would be approximately $1,000.

The sampling program will depend on available funding, equipment (i.e. available multi-meters), and participation from local colleges, students, and the SWCD's.

3.6 Design Considerations and Alternatives

The design of the GI practices is flexible depending on available funding and donations, which is discussed in more detail under the Project Cost Estimate section. This is why a minimum and maximum cost range was developed for each item. The goal is to be funded for the maximum cost, but if not, the GI practices can be altered and prioritized to work with the funding that is available.

3.7 Additional Design Data Needed

It is worth noting a few key items that will need to be investigated further before a full engineering design package is prepared. The items are as follows:

- Five known utilities will need to be located and exposed along the hillside where the proposed storm drain will be installed to route water to the Bio-Retention area. The exact location of each utility and the depth (elevation) below ground surface will need to be determined to ensure that re-routing the storm drain across this area is feasible and safe.

- Additional survey work will be required at the Large Rain Garden, Bio-Retention Area, Constructed Wetland, and the Drainage Ditch/Channel Demonstration Area. Slopes and elevations obtained from maps, as-built drawings, and a site visit will need to be confirmed with survey equipment so adjustments can be made if needed.

- Soil testing (percolation tests) will need to be conducted for the rain garden, infiltration gardens, bio-retention area, and the constructed wetland. Although all soils at the Site are class B soils, it is possible that historical land grading and compaction from equipment may have altered the soil profile. This can be confirmed with visual soil inspections and low-cost percolation tests.

3.8 Proposed Erosion and Sediment Control Practices

The “Out Back” area is ideal for designing, constructing, and implementing various erosion and sediment control BMPs (Figure 6). It is also ideal for viewing and teaching due to the available open space and topography. A list of BMPs was generated based on cost, suitability to the local region, and the anticipated audience.

A list of proposed erosion and sediment control BMPs under consideration are as follows:

1.) Design and build three different ditches/channels in the existing field, which will drain to the existing sediment pond.

   a. Ditches/channels will be approximately 200-400 feet in length with 10-20% slopes.

   b. Dimensions and specifications will change to demonstrate pros and cons of each design.

   c. Sections would be lined with various materials and also unlined for comparison.

   d. Sections will contain different check dams and other features listed below.

   e. Artificial run-off (using a water truck) would be used for the demonstration.

2.) Silt Fence (along or around existing soil stockpile areas)

3.) Fiber Rolls (along or around existing soil stockpile areas)

4.) Storm Drain Inlet Protection (pre-fabricated and block-and-stone type) around existing inlets

5.) Check Dams (rock, pre-cast concrete, etc.)

6.) Rock Outlet Protection (at existing culvert outlets)

7.) Riprap Slope Protection (example section on hill side)

8.) Earth Berm (for perimeter controls and diversions)

9.) Vegetated Swale (captured under item #1)

10.) Temporary Swale (captured under item #1)

11.) Grassed Waterway (captured under item #1)

12.) Lined Waterway or Outlet (captured under item #1)

13.) Land Grading (example section on hill side)

14.) Level Spreader (show an example)

15.) Surface Roughening (example section)

16.) Streambank Protection (possibly)

17.) Rolled erosion type products (blankets, nets, mats, etc.)

As stated previously, there are a few existing BMPs already present in this area that can either be pointed out or enhanced at little to no cost (Figure 5). These include rock outlet protection, 270 feet of existing drainage swales, 130 feet of rip-rap lined drainage swale, and a sediment pond. A small amount of riprap is also available as well.

3.9 Signage

Educational outreach is an important component to the stormwater demonstration site. As stated previously, this site will serve a large audience across three counties. It is anticipated and encouraged that the site is utilized for educational purposes even when there are no scheduled training sessions and instructors are not available to explain project features. Therefore, having good signage and/or kiosks to explain the different GI practices and concepts is critical for educational outreach. Signage costs are estimated to be $5,000 - $10,000.

4. Project Schedule

The project schedule is dependent upon available funding. Much of the initial planning and design work is currently underway or completed. The Project Schedule for the Green Infrastructure Practices is based on a favorable GIGP grant announcement in December 2013.

"Out Back" Erosion and Sediment Control Practices

- Fall 2013 - Construction of erosion and sediment control practices; and preparation of the demonstration areas for stormwater BMP training sessions

"Out Front" Green Infrastructure Practices

- February 2014 – Complete Design Phase
- March 2014 – Purchase Materials
- April 2014 – Start Construction
- October 2014 – Complete Construction

5. Anticipated Regulatory Approval and Permits

As required by the NYS Environmental Facilities Corporation, the State Environmental Review pursuant to the State Environmental Quality Review Act (SEQRA) and the State Historic Preservation Review pursuant to the NYS Office of Parks, Recreation and Historic Preservation (SHPO) will be completed.

The need for coverage under a General Permit for Stormwater Discharges from Construction Activities (Stormwater General Permit) is not anticipated because ground disturbing activities will be less than one acre. The estimated disturbance “Out Front” will be approximately 0.5 acres and the disturbance “Out Back” will be approximately 0.3 acres. The project will have a streamlined plan to prevent discharges of construction-related pollutants to surface waters.

The need for local building permits is not anticipated for the project but will be confirmed prior to construction.

6. Project Cost Estimate

The project cost estimate associated with green infrastructure implementation can be categorized as material costs and labor and equipment costs (collectively “construction costs”), and design or planning costs. Green infrastructure construction costs associated with this project have been presented in a low to high range. This is due to the variability in options with the design for each of the selected GI features. This was done in order to maximize available funding and allow for design features to be prioritized depending on available funding. For example, some sites may allow an existing drainage pattern to be intercepted with simple curb cuts or similar features, which is a low-cost retrofit. At the same time, upgrades involving utility conflicts, complicated grading, substantial removal of existing materials, or major drainage infrastructure modifications may have increased project costs. The low cost option includes the essential elements of the GI practice, while the high cost option includes an upgraded or expanded feature(s).

The project cost estimate is presented in Table 1 below. The estimates are construction costs only and have been separated into material cost and labor and equipment costs. It is anticipated that the majority of the labor and equipment cost will be covered by project partners as in-kind services. A scaled approach was developed for this feasibility study using minimum and maximum cost estimates for each stormwater BMP. This approach will allow the team to select the best plan depending on the available funding.

Table 1 – Construction Cost Estimates

STORMWATER BMP	MATERIAL COST ESTIMATES		LABOR & EQUIPMENT COST ESTIMATES		TOTAL CONSTRUCTION COST ESTIMATE	
"Out Front" Area	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
Large Rain Garden	$ 5,000	$ 15,000	$ 4,800	$ 8,000	$ 9,800	$ 23,000
Rooftop & Parking Lot Drain Disconnection	$ 2,000	$ 4,000	$ 1,600	$ 3,200	$ 3,600	$ 7,200
Infiltration Garden/Bio-Retention Cell #1	$ 2,000	$ 4,000	$ 4,800	$ 8,000	$ 6,800	$ 12,000
Infiltration Garden/Bio-Retention Cell #2	$ 2,000	$ 4,000	$ 4,800	$ 8,000	$ 6,800	$ 12,000
Bio-Retention Area	$ 15,000	$ 20,000	$ 8,000	$ 9,600	$ 23,000	$ 29,600
Constructed Wetland Area	$ 3,000	$ 5,000	$ 4,800	$ 8,000	$ 7,800	$ 13,000
Critical Area Treatment (Planting Steep Slope)	$ 3,000	$ 6,000	$ 1,600	$ 1,600	$ 4,600	$ 7,600
Porous Pavement	$ 10,000	$ 20,000	$ 4,800	$ 8,000	$ 14,800	$ 28,000
Cistern	$ 4,000	$ 8,000	$ 1,600	$ 3,200	$ 5,600	$ 11,200
Green Roof	$ 5,000	$ 10,000	$ 3,200	$ 4,800	$ 8,200	$ 14,800
Signage	$ 5,000	$ 10,000	$ 2,000	$ 3,600	$ 7,000	$ 13,600
Subtotal – "Front"	**$ 56,000**	**$ 106,000**	**$ 42,000**	**$ 66,000**	**$ 98,000**	**$ 172,000**
"Out Back" Area	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
Drainage Ditch Demonstration Area	$ 5,000	$ 8,000	$ 1,200	$ 2,400	$ 6,200	$ 10,400
Erosion & Sediment Control BMPs	$ 10,000	$ 15,000	$ 2,000	$ 3,600	$ 12,000	$ 18,600
Subtotal – "Back"	**$ 15,000**	**$ 23,000**	**$ 3,200**	**$ 6,000**	**$ 18,200**	**$ 29,000**
TOTAL	**$ 71,000**	**$ 129,000**	**$ 45,200**	**$ 72,000**	**$ 116,200**	**$ 201,000**

*Disclaimer – Material costs quotes for vegetation have not been obtained but estimates have been included.

Planning and Design Cost Range - $10,000 to $20,000

Planning and design costs for green infrastructure projects can differ from other civil engineering projects due to the unique elements of these systems. For the purposes of this study, design costs were assumed to be 15% of construction costs. This proportion could be higher for GI designs involving highly detailed site specific work. It could also be lower for projects that utilize basic modifications of standard designs.

Water Quality Sampling Plan Cost Range - $6,200 to $9,800

As stated under Section 3.5, a water quality sampling plan is proposed to measure the performance of the GI practices. The cost estimate for the sampling plan accounts for the "material cost" of a new multi-meter ($3,000) and laboratory costs ($700-$1,7000) to analyze water samples, which is estimated at $3,000 - $5,000. The estimate for "equipment and labor" during sampling events is estimated at $3,200-$4,800.

6.1 Cost Summary

The cost information above has been summarized below:

Material Cost:

"Out Front" Area =	$56,000 (Min)	$106,000 (Max)
"Out Back" Area =	$15,000 (Min)	$ 23,000 (Max)
Total Range (Both Areas)	**$71,000 (Min)**	**$129,000 (Max)**

Labor and Equipment Cost:

"Out Front" Area =	$42,000 (Min)	$66,000 (Max)
"Out Back" Area =	$ 3,200 (Min)	$ 6,000 (Max)
Total Range (Both Areas)	**$45,200 (Min)**	**$72,000 (Max)**

Planning and Design Cost: **$10,000 (Min) – $20,000 (Max)**

Water Quality Sampling Plan Cost: Range - $6,200 to $9,800

6.2 Potential Funding Sources

For the implementation of the Stormwater Demonstration Site, the Southern Tier West Regional Planning and Development Board is seeking funding from the Appalachian Regional Commission (ARC) and the New York State Environmental Facilities Corporation (EFC).

Southern Tier West anticipates applying under the NYS Consolidated Funding Application Round III in August 2013 for green infrastructure practices described in the "Out Front" area of the Demonstration Site. The application will be made to the EFC under their Green Innovation Grant Program.

On August 2, the ARC awarded a grant of $131,636 to Southern Tier West for a Stormwater Education and Training project. $37,050 of the grant is earmarked for the development of the Stormwater Demonstration Site, specifically for the installation of the erosion and sediment control BMPs in the "Out Back" area. These Federal monies may also be used for items that are determined essential for the implementation and operation of the site that are not covered by an EFC award.

It is anticipated that a majority of the labor and equipment costs will be donated by Cattaraugus County DPW and other STW Watershed Coalition members. However, it is also anticipated that it may be necessary to hire a contractor for a portion of the project.

ecoSTRATEGIES
CIVIL ENGINEERING

Tables

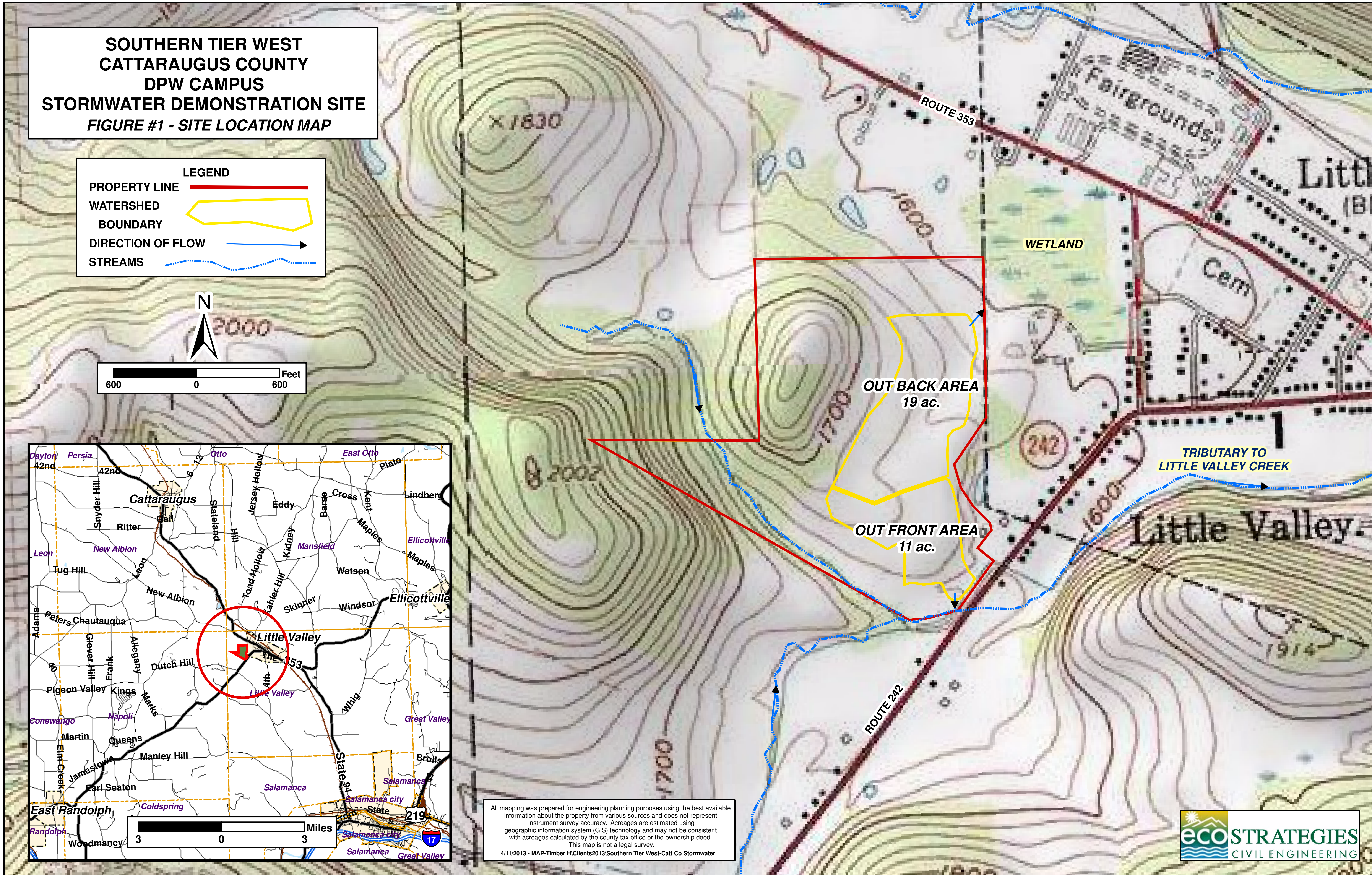
TABLE 1

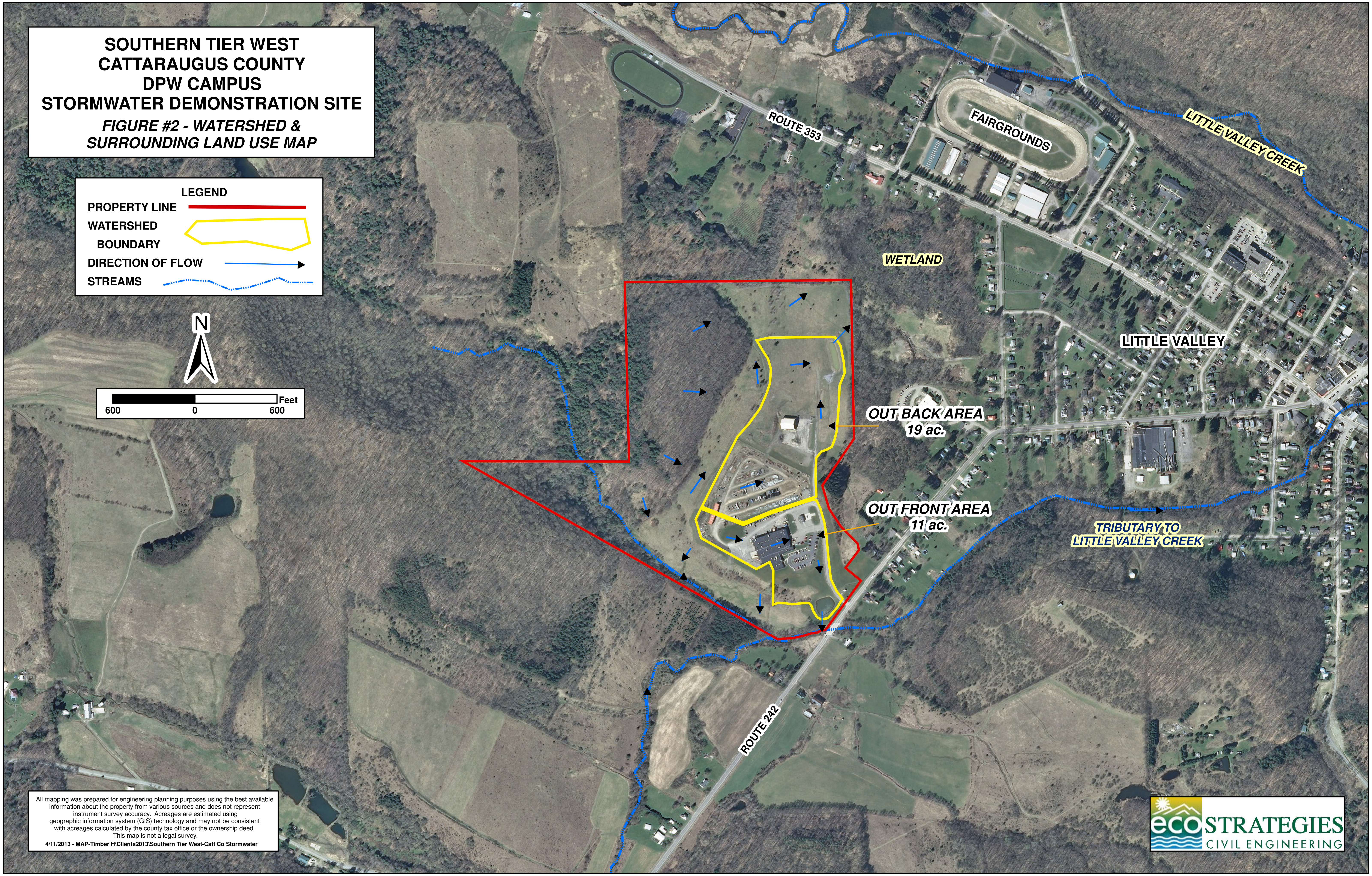
CONSTRUCTION COST ESTIMATES
STORMWATER DEMONSTRATION SITE
LITTLE VALLEY, NEW YORK

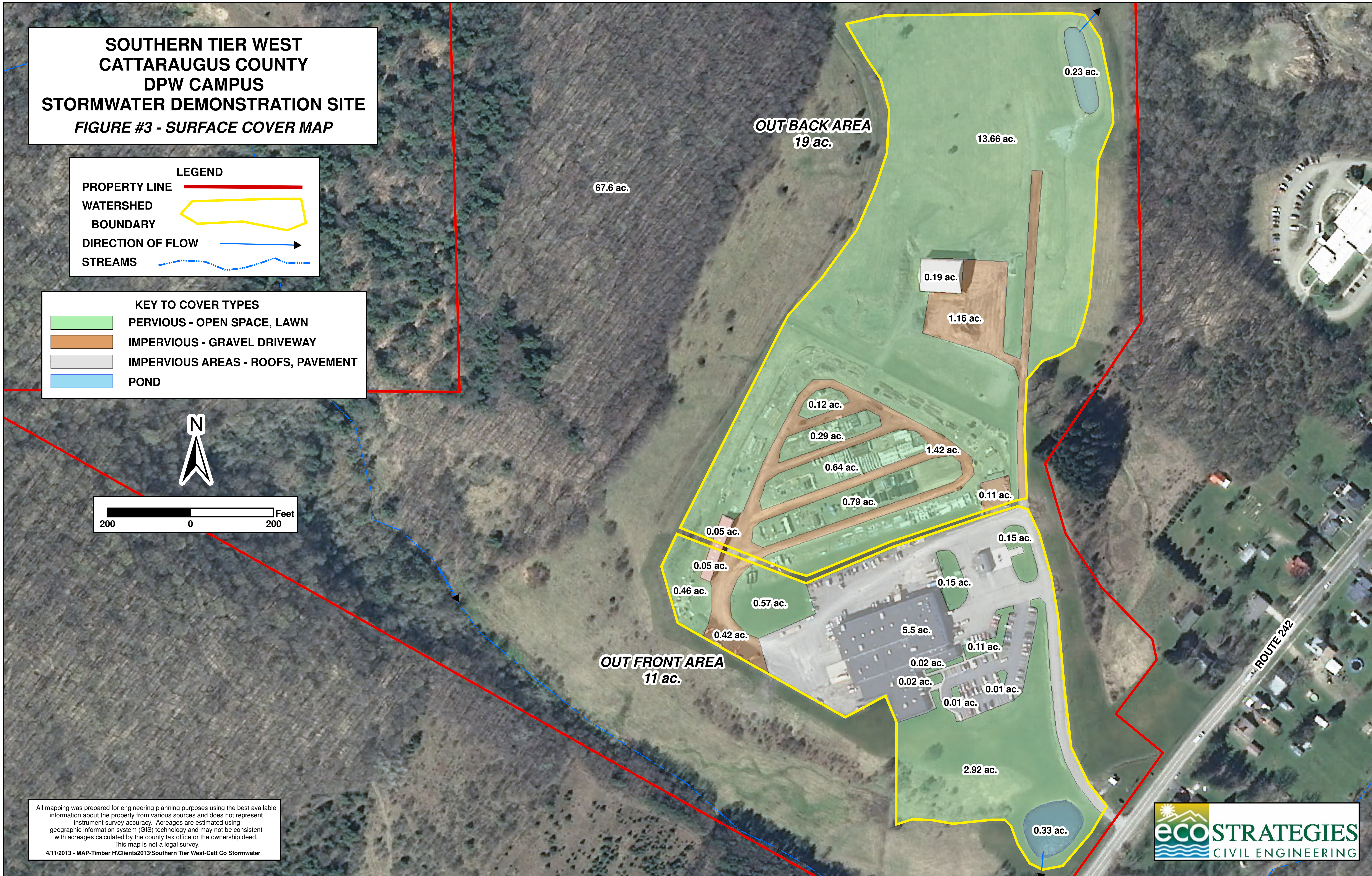
STORMWATER BMP	MATERIAL COST ESTIMATES		LABOR & EQUIPMENT COST ESTIMATES		TOTAL CONSTRUCTION COST ESTIMATE	
“Out Front” Area	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
Large Rain Garden	$ 5,000	$ 15,000	$ 4,800	$ 8,000	$ 9,800	$ 23,000
Rooftop & Parking Lot Drain Disconnection	$ 2,000	$ 4,000	$ 1,600	$ 3,200	$ 3,600	$ 7,200
Infiltration Garden/Bio-Retention Cell #1	$ 2,000	$ 4,000	$ 4,800	$ 8,000	$ 6,800	$ 12,000
Infiltration Garden/Bio-Retention Cell #2	$ 2,000	$ 4,000	$ 4,800	$ 8,000	$ 6,800	$ 12,000
Bio-Retention Area	$ 15,000	$ 20,000	$ 8,000	$ 9,600	$ 23,000	$ 29,600
Constructed Wetland Area	$ 3,000	$ 5,000	$ 4,800	$ 8,000	$ 7,800	$ 13,000
Critical Area Treatment (Planting Steep Slope)	$ 3,000	$ 6,000	$ 1,600	$ 1,600	$ 4,600	$ 7,600
Porous Pavement	$ 10,000	$ 20,000	$ 4,800	$ 8,000	$ 14,800	$ 28,000
Cistern	$ 4,000	$ 8,000	$ 1,600	$ 3,200	$ 5,600	$ 11,200
Green Roof	$ 5,000	$ 10,000	$ 3,200	$ 4,800	$ 8,200	$ 14,800
Signage	$ 5,000	$ 10,000	$ 2,000	$ 3,600	$ 7,000	$ 13,600
Subtotal – “Front”	**$ 56,000**	**$ 106,000**	**$ 42,000**	**$ 66,000**	**$ 98,000**	**$ 172,000**
“Out Back” Area	**Minimum**	**Maximum**	**Minimum**	**Maximum**	**Minimum**	**Maximum**
Drainage Ditch Demonstration Area	$ 5,000	$ 8,000	$ 1,200	$ 2,400	$ 6,200	$ 10,400
Erosion & Sediment Control BMPs	$ 10,000	$ 15,000	$ 2,000	$ 3,600	$ 12,000	$ 18,600
Subtotal – “Back”	**$ 15,000**	**$ 23,000**	**$ 3,200**	**$ 6,000**	**$ 18,200**	**$ 29,000**
TOTAL	**$ 71,000**	**$ 129,000**	**$ 45,200**	**$ 72,000**	**$ 116,200**	**$ 201,000**

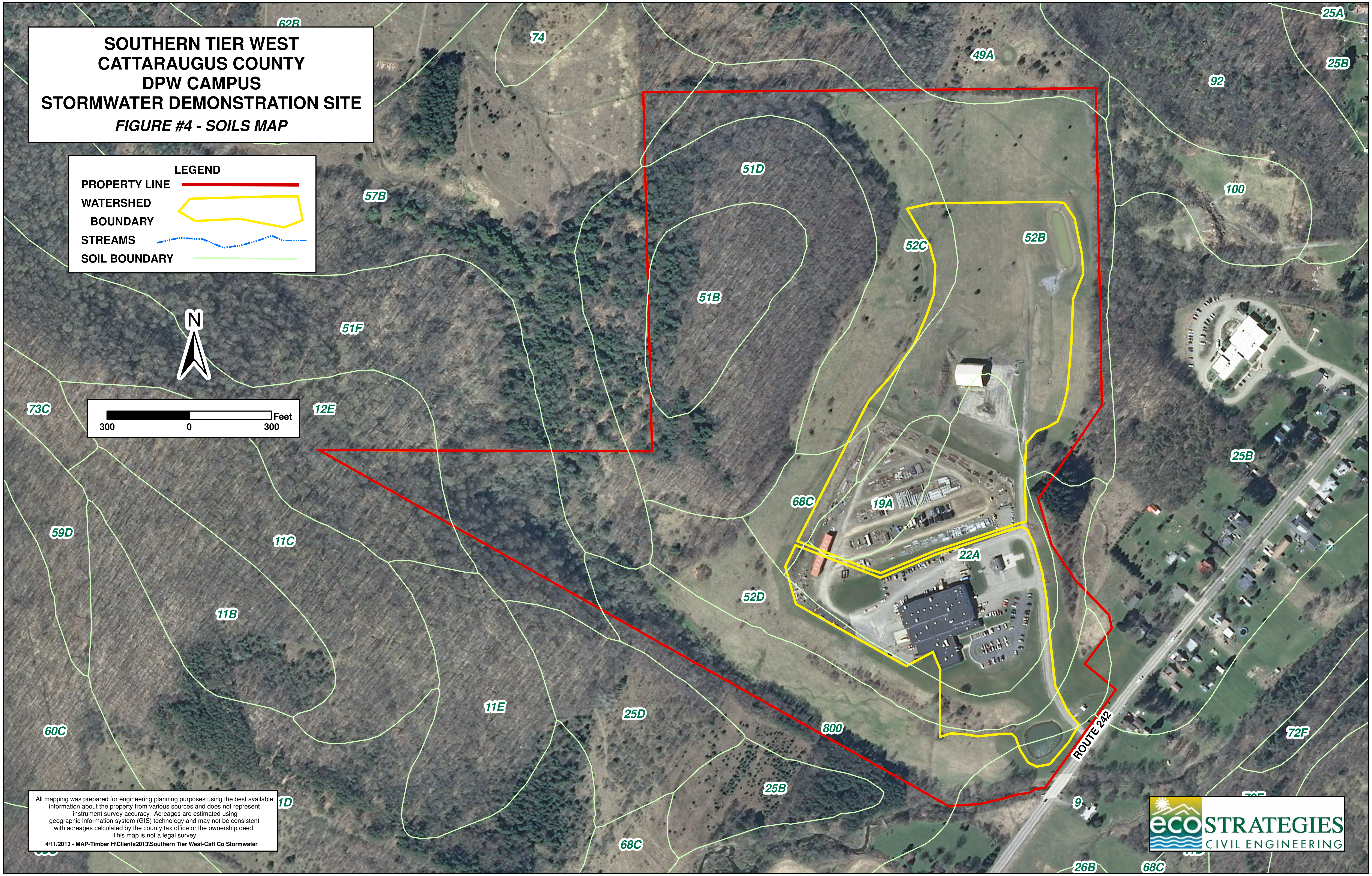
ecoSTRATEGIES CIVIL ENGINEERING

Figures

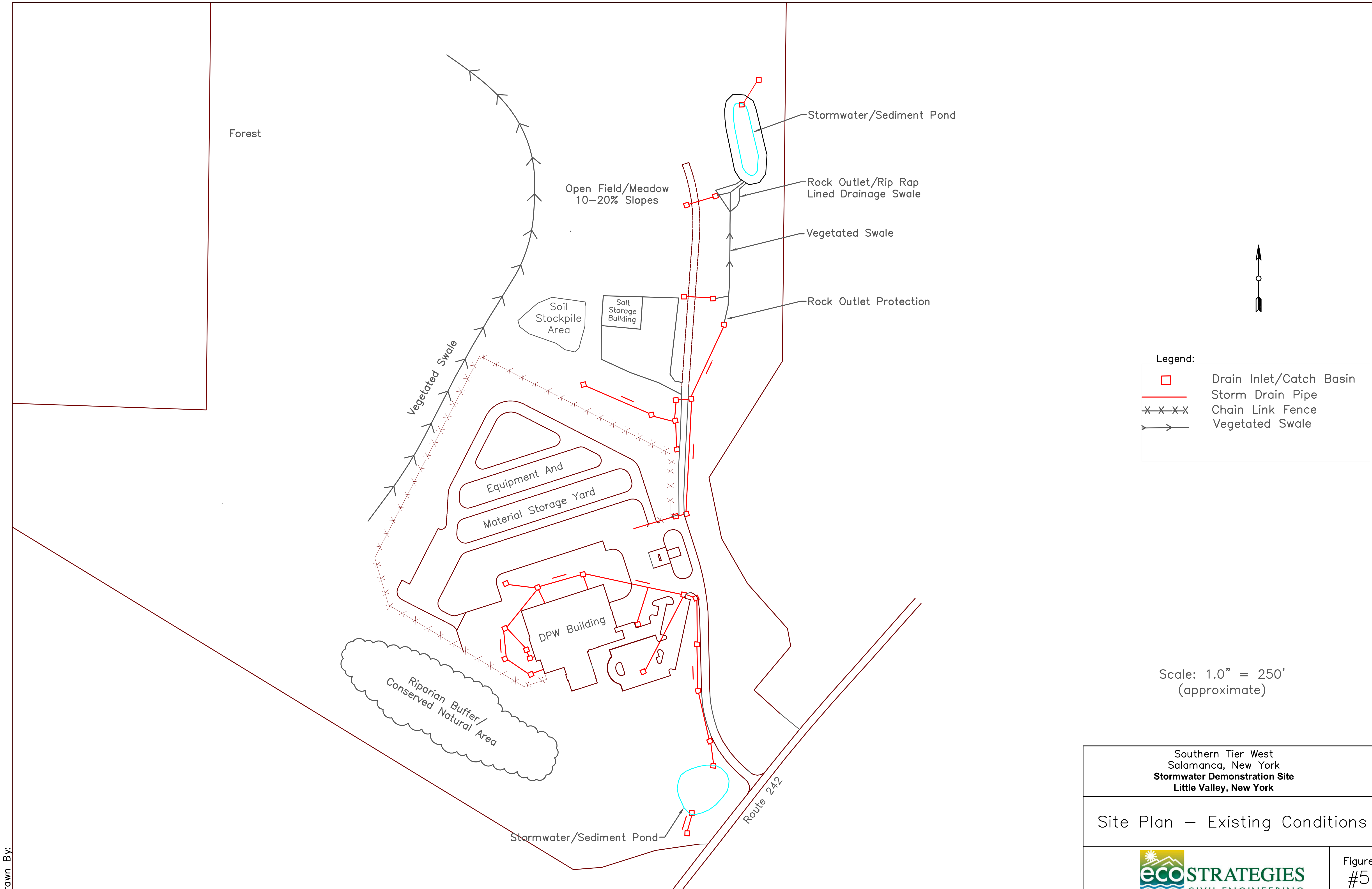

SOUTHERN TIER WEST
CATTARAUGUS COUNTY
DPW CAMPUS
STORMWATER DEMONSTRATION SITE
FIGURE #1 - SITE LOCATION MAP
LEGEND
PROPERTY LINE
WATERSHED BOUNDARY
DIRECTION OF FLOW
STREAMS
N
600 0 600 Feet
ROUTE 353
Fairgrounds
WETLAND
Cem
OUT BACK AREA 19 ac.
OUT FRONT AREA 11 ac.
TRIBUTARY TO LITTLE VALLEY CREEK
Little Valley
ROUTE 242
242
1830
2000
2002
1700
1600
1800
1914
All mapping was prepared for engineering planning purposes using the best available information about the property from various sources and does not represent instrument survey accuracy. Acreages are estimated using geographic information system (GIS) technology and may not be consistent with acreages calculated by the county tax office or the ownership deed. This map is not a legal survey.
4/11/2013 - MAP-Timber H\Clients2013\Southern Tier West-Catt Co Stormwater
ecoSTRATEGIES CIVIL ENGINEERING
Dayton
Persia
Otto
East Otto
Plato
Cattaraugus
Eddy
Ritter
Lindberg
New Albion
Mansfield
Ellicottville
Leon
Tug Hill
Watson
New Albion
Skinner
Windsor
Ellicottville
Peters
Chautauqua
Little Valley
Dutch Hill
353
Pigeon Valley
Kings
Little Valley
Whig
Conewango
Napoli
Great Valley
Martin
Queens
Manley Hill
Salamanca
Earl Seaton
Salamanca
Salamanca city
East Randolph
Coldspring
219
Randolph
Woodmancy
Salamanca
Great Valley
3 0 3 Miles
17


SOUTHERN TIER WEST
CATTARAUGUS COUNTY
DPW CAMPUS
STORMWATER DEMONSTRATION SITE
FIGURE #2 - WATERSHED & SURROUNDING LAND USE MAP
LEGEND
PROPERTY LINE
WATERSHED BOUNDARY
DIRECTION OF FLOW
STREAMS
N
600 0 600 Feet
ROUTE 353
FAIRGROUNDS
LITTLE VALLEY CREEK
WETLAND
LITTLE VALLEY
OUT BACK AREA 19 ac.
OUT FRONT AREA 11 ac.
TRIBUTARY TO LITTLE VALLEY CREEK
ROUTE 242
All mapping was prepared for engineering planning purposes using the best available information about the property from various sources and does not represent instrument survey accuracy. Acreages are estimated using geographic information system (GIS) technology and may not be consistent with acreages calculated by the county tax office or the ownership deed. This map is not a legal survey.
4/11/2013 - MAP-Timber H\Clients2013\Southern Tier West-Catt Co Stormwater
ecoSTRATEGIES CIVIL ENGINEERING


SOUTHERN TIER WEST
CATTARAUGUS COUNTY
DPW CAMPUS
STORMWATER DEMONSTRATION SITE
FIGURE #3 - SURFACE COVER MAP
LEGEND
PROPERTY LINE
WATERSHED BOUNDARY
DIRECTION OF FLOW
STREAMS
KEY TO COVER TYPES
PERVIOUS - OPEN SPACE, LAWN
IMPERVIOUS - GRAVEL DRIVEWAY
IMPERVIOUS AREAS - ROOFS, PAVEMENT
POND
N
200
0
200
Feet
67.6 ac.
OUT BACK AREA
19 ac.
13.66 ac.
0.23 ac.
0.19 ac.
1.16 ac.
0.12 ac.
0.29 ac.
1.42 ac.
0.64 ac.
0.79 ac.
0.11 ac.
0.05 ac.
0.05 ac.
0.15 ac.
0.46 ac.
0.57 ac.
0.15 ac.
5.5 ac.
0.42 ac.
0.11 ac.
0.02 ac.
0.02 ac.
0.01 ac.
0.01 ac.
OUT FRONT AREA
11 ac.
2.92 ac.
0.33 ac.
ROUTE 242
All mapping was prepared for engineering planning purposes using the best available information about the property from various sources and does not represent instrument survey accuracy. Acreages are estimated using geographic information system (GIS) technology and may not be consistent with acreages calculated by the county tax office or the ownership deed. This map is not a legal survey.
4/11/2013 - MAP-Timber H\Clients2013\Southern Tier West-Catt Co Stormwater
ecoSTRATEGIES
CIVIL ENGINEERING



SOUTHERN TIER WEST
CATTARAUGUS COUNTY
DPW CAMPUS
STORMWATER DEMONSTRATION SITE
FIGURE #4 - SOILS MAP
LEGEND
PROPERTY LINE
WATERSHED BOUNDARY
STREAMS
SOIL BOUNDARY
N
Feet
300
0
300
62B
74
49A
25A
25B
92
100
57B
51D
51B
51F
52C
52B
73C
12E
68C
19A
22A
59D
11C
52D
11B
25B
11E
25D
800
60C
ROUTE 242
72F
25B
9
26B
68C
All mapping was prepared for engineering planning purposes using the best available information about the property from various sources and does not represent instrument survey accuracy. Acreages are estimated using geographic information system (GIS) technology and may not be consistent with acreages calculated by the county tax office or the ownership deed. This map is not a legal survey.
4/11/2013 - MAP-Timber H\Clients2013\Southern Tier West-Catt Co Stormwater
ecoSTRATEGIES
CIVIL ENGINEERING

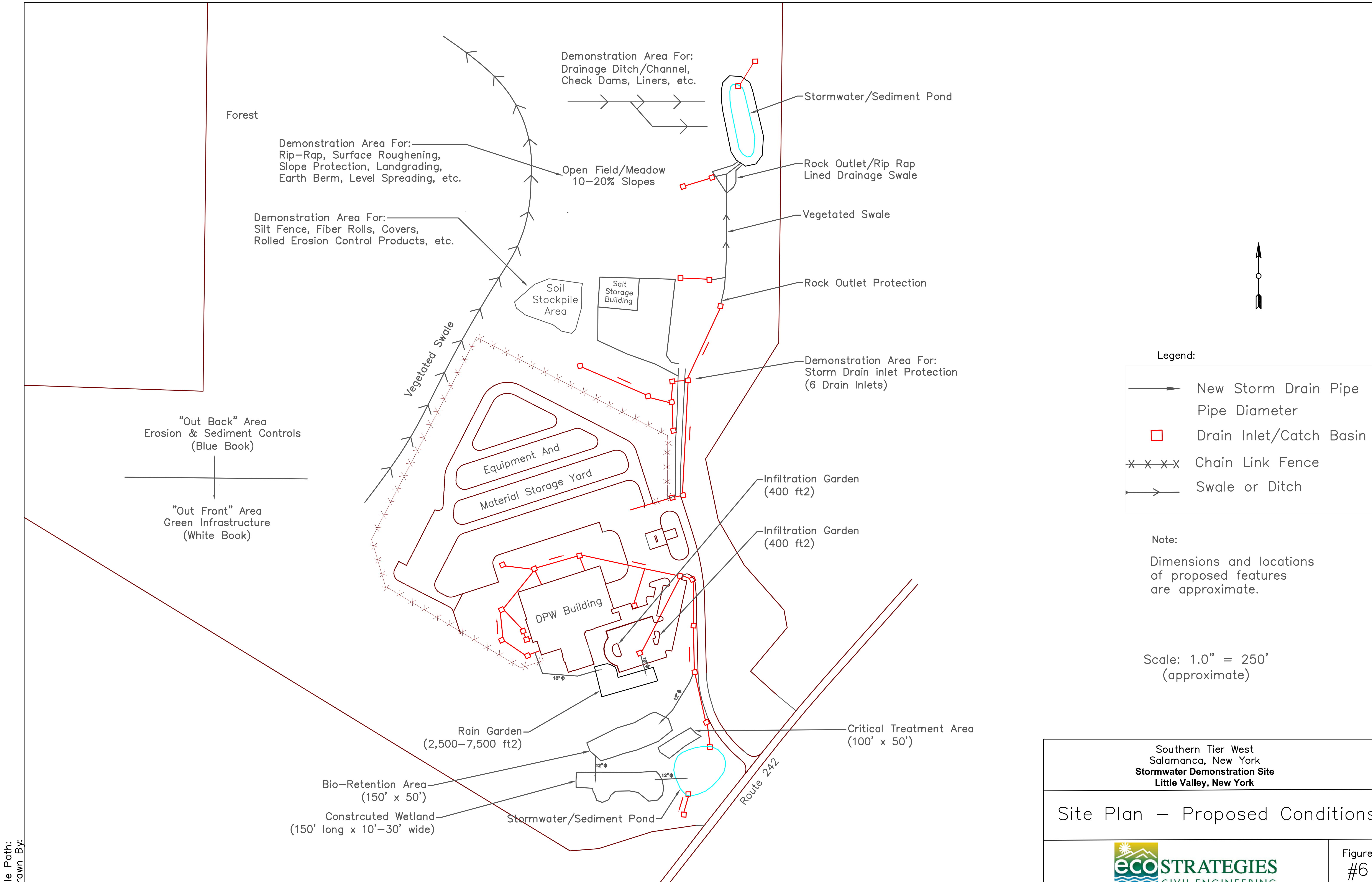


Southern Tier West
Salamanca, New York
Stormwater Demonstration Site
Little Valley, New York

Site Plan – Existing Conditions

ecoSTRATEGIES
CIVIL ENGINEERING

Figure
#5

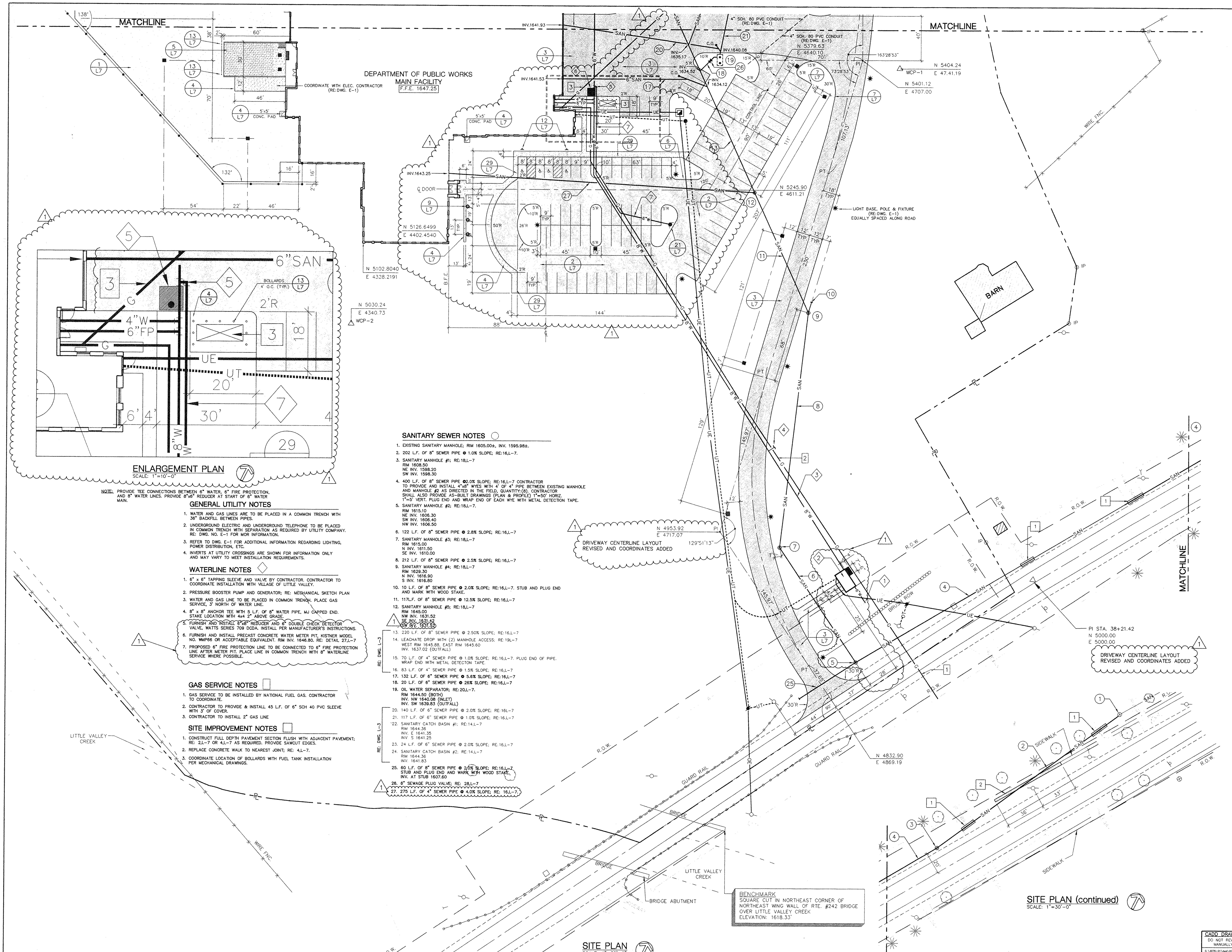

Forest
Demonstration Area For:
Drainage Ditch/Channel,
Check Dams, Liners, etc.
Stormwater/Sediment Pond
Demonstration Area For:
Rip–Rap, Surface Roughening,
Slope Protection, Landgrading,
Earth Berm, Level Spreading, etc.
Open Field/Meadow
10–20% Slopes
Rock Outlet/Rip Rap
Lined Drainage Swale
Vegetated Swale
Demonstration Area For:
Silt Fence, Fiber Rolls, Covers,
Rolled Erosion Control Products, etc.
Soil Stockpile Area
Salt Storage Building
Rock Outlet Protection
Vegetated Swale
Demonstration Area For:
Storm Drain inlet Protection
(6 Drain Inlets)
"Out Back" Area
Erosion & Sediment Controls
(Blue Book)
"Out Front" Area
Green Infrastructure
(White Book)
Equipment And
Material Storage Yard
Infiltration Garden
(400 ft2)
Infiltration Garden
(400 ft2)
DPW Building
Rain Garden
(2,500–7,500 ft2)
Critical Treatment Area
(100' x 50')
Bio–Retention Area
(150' x 50')
Constrcuted Wetland
(150' long x 10'–30' wide)
Stormwater/Sediment Pond
Route 242
Legend:
New Storm Drain Pipe
Pipe Diameter
Drain Inlet/Catch Basin
Chain Link Fence
Swale or Ditch
Note:
Dimensions and locations
of proposed features
are approximate.
Scale: 1.0" = 250'
(approximate)
Southern Tier West
Salamanca, New York
Stormwater Demonstration Site
Little Valley, New York
Site Plan – Proposed Conditions
ecoSTRATEGIES
CIVIL ENGINEERING
Figure
#6
File Path:
Drawn By:

ECOSTRATEGIES
CIVIL ENGINEERING

Appendix

Appendix A

Engineering As-Built Drawings for the
Cattaraugus County DPW Campus



NOTE: PROVIDE TEE CONNECTIONS BETWEEN 6" WATER, 6" FIRE PROTECTION, AND 8" WATER LINES. PROVIDE 8"x6" REDUCER AT START OF 6" WATER MAIN.

GENERAL UTILITY NOTES

1. WATER AND GAS LINES ARE TO BE PLACED IN A COMMON TRENCH WITH 36" BACKFILL BETWEEN PIPES.
2. UNDERGROUND ELECTRIC AND UNDERGROUND TELEPHONE TO BE PLACED IN COMMON TRENCH WITH SEPARATION AS REQUIRED BY UTILITY COMPANY. RE: DWG. NO. E-1 FOR MOR INFORMATION.
3. REFER TO DWG. E-1 FOR ADDITIONAL INFORMATION REGARDING LIGHTING, POWER DISTRIBUTION, ETC.
4. INVERTS AT UTILITY CROSSINGS ARE SHOWN FOR INFORMATION ONLY AND MAY VARY TO MEET INSTALLATION REQUIREMENTS.

WATERLINE NOTES ◇

1. 6" x 6" TAPPING SLEEVE AND VALVE BY CONTRACTOR. CONTRACTOR TO COORDINATE INSTALLATION WITH VILLAGE OF LITTLE VALLEY.
2. PRESSURE BOOSTER PUMP AND GENERATOR; RE: MECHANICAL SKETCH PLAN
3. WATER AND GAS LINE TO BE PLACED IN COMMON TRENCH. PLACE GAS SERVICE, 3' NORTH OF WATER LINE.
4. 8" x 8" ANCHOR TEE WITH 5 L.F. OF 8" WATER PIPE, MJ CAPPED END. STAKE LOCATION WITH 4x4 2" ABOVE GRADE.
5. FURNISH AND INSTALL 6"x8" REDUCER AND 6" DOUBLE CHECK DETECTOR VALVE, WATTS SERIES 709 DCDA. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
6. FURNISH AND INSTALL PRECAST CONCRETE WATER METER PIT, KISTNER MODEL NO. WMP66 OR ACCEPTABLE EQUIVALENT. RIM INV. 1646.80. RE: DETAIL 27,L-7
7. PROPOSED 6" FIRE PROTECTION LINE TO BE CONNECTED TO 6" FIRE PROTECTION LINE AFTER METER PIT. PLACE LINE IN COMMON TRENCH WITH 8" WATERLINE SERVICE WHERE POSSIBLE.

GAS SERVICE NOTES ☐

1. GAS SERVICE TO BE INSTALLED BY NATIONAL FUEL GAS. CONTRACTOR TO COORDINATE.
2. CONTRACTOR TO PROVIDE & INSTALL 45 L.F. OF 6" SCH 40 PVC SLEEVE WITH 3' OF COVER.
3. CONTRACTOR TO INSTALL 2" GAS LINE

SITE IMPROVEMENT NOTES ☐

1. CONSTRUCT FULL DEPTH PAVEMENT SECTION FLUSH WITH ADJACENT PAVEMENT; RE: 2,L-7 OR 4,L-7 AS REQUIRED. PROVIDE SAWCUT EDGES.
2. REPLACE CONCRETE WALK TO NEAREST JOINT; RE: 4,L-7.
3. COORDINATE LOCATION OF BOLLARDS WITH FUEL TANK INSTALLATION PER MECHANICAL DRAWINGS.

SANITARY SEWER NOTES ○

1. EXISTING SANITARY MANHOLE; RIM 1605.00±, INV. 1595.98±.
2. 202 L.F. OF 8" SEWER PIPE @ 1.0% SLOPE; RE:16,L-7.
3. SANITARY MANHOLE #1; RE:18,L-7
   RIM 1608.50
   NE INV. 1598.20
   SW INV. 1598.30
4. 400 L.F. OF 8" SEWER PIPE @2.0% SLOPE; RE:16,L-7 CONTRACTOR TO PROVIDE AND INSTALL 4"x8" WYES WITH 4' OF 4" PIPE BETWEEN EXISTING MANHOLE AND MANHOLE #2 AS DIRECTED IN THE FIELD, QUANTITY:(8). CONTRACTOR SHALL ALSO PROVIDE AS-BUILT DRAWINGS (PLAN & PROFILE) 1"=50' HORIZ. 1"=5' VERT. PLUG END AND WRAP END OF EACH WYE WITH METAL DETECTION TAPE.
5. SANITARY MANHOLE #2; RE:18,L-7.
   RIM 1615.10
   NE INV. 1606.30
   SW INV. 1606.40
   NW INV. 1606.50
6. 122 L.F. OF 8" SEWER PIPE @ 2.8% SLOPE; RE:16,L-7
7. SANITARY MANHOLE #3; RE:18,L-7
   RIM 1615.00
   N INV. 1611.50
   SE INV. 1610.00
8. 212 L.F. OF 8" SEWER PIPE @ 2.5% SLOPE; RE:16,L-7
9. SANITARY MANHOLE #4; RE:18,L-7
   RIM 1629.30
   N INV. 1616.90
   S INV. 1616.80
10. 10 L.F. OF 8" SEWER PIPE @ 2.0% SLOPE; RE:16,L-7. STUB AND PLUG END AND MARK WITH WOOD STAKE.
11. 117L.F. OF 8" SEWER PIPE @ 12.5% SLOPE; RE:16,L-7
12. SANITARY MANHOLE #5; RE:18,L-7
    RIM 1645.00
    NW INV. 1631.52
    SE INV. 1631.42
    SW INV. 1631.52

RE: DWG. L-3

13. 220 L.F. OF 8" SEWER PIPE @ 2.50% SLOPE; RE:16,L-7
14. LEACHATE DROP WITH (2) MANHOLE ACCESS; RE:19L-7
    WEST RIM 1645.88. EAST RIM 1645.60
    INV. 1637.02 (OUTFALL)
15. 70 L.F. OF 4" SEWER PIPE @ 1.0% SLOPE; RE:16,L-7. PLUG END OF PIPE. WRAP END WITH METAL DETECTON TAPE.
16. 83 L.F. OF 4" SEWER PIPE @ 1.5% SLOPE; RE:16,L-7
17. 132 L.F. OF 6" SEWER PIPE @ 5.6% SLOPE; RE:16,L-7
18. 20 L.F. OF 6" SEWER PIPE @ 26% SLOPE; RE:16,L-7
19. OIL WATER SEPARATOR; RE:20,L-7.
    RIM 1644.50 (BOTH)
    INV. NW 1640.08 (INLET)
    INV. SW 1639.83 (OUTFALL)

RE: DWG. L-3

20. 140 L.F. OF 6" SEWER PIPE @ 2.0% SLOPE; RE:16L-7
21. 117 L.F. OF 6" SEWER PIPE @ 1.0% SLOPE; RE:16,L-7
22. SANITARY CATCH BASIN #1; RE:14,L-7
    RIM 1644.36
    INV. E 1641.35
    INV. S 1641.25
23. 24 L.F. OF 6" SEWER PIPE @ 2.0% SLOPE; RE:16,L-7
24. SANITARY CATCH BASIN #2; RE:14,L-7
    RIM 1644.36
    INV. 1641.83
25. 60 L.F. OF 8" SEWER PIPE @ 2.0% SLOPE; RE:16,L-7 STUB AND PLUG END AND WARK WITH WOOD STAKE. INV. AT STUB 1607.60
26. 6" SEWAGE PLUG VALVE; RE: 28,L-7
27. 275 L.F. OF 4" SEWER PIPE @ 4.0% SLOPE; RE: 16,L-7.

2" SCALE BAR

NOTES

NO.	DATE	REVISION	BY	APPD.
1	7/24/97	BID PHASE NO. 2		
0	6/10/97	BID PHASE NO. 1		

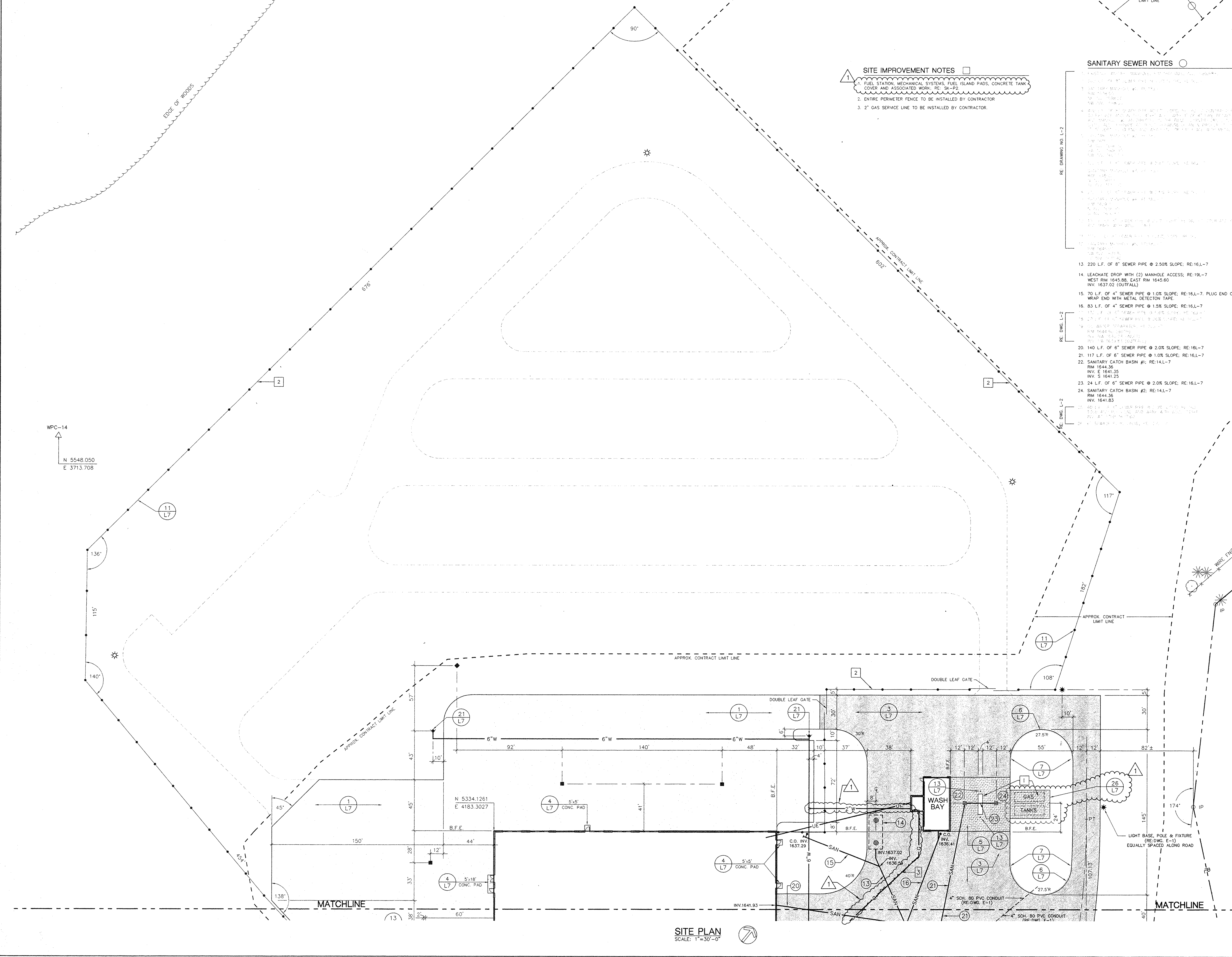
WENDEL
BUFFALO, N.Y.
LOCKPORT, N.Y.
ENGINEERING • ARCHITECTURE
LANDSCAPE ARCHITECTURE
SURVEY • CONSTRUCTION

NEW FACILITY
CATTARAUGUS COUNTY DEPT. OF PUBLIC WORKS
LITTLE VALLEY, NEW YORK

SITE LAYOUT & UTILITY PLAN (SOUTH)

DWN.	DLK
CHK.	ACG
APPD.	PLJ
DATE	7/24/97
SCALE	1"=30'-0"
PROJ. No.	3076-01
DWG. No.	L-2
REV. No	1

CADD DRAWING
DO NOT REVISE MANUALLY
C:\3076-01\dwg\2CAT-L2
2694
7/25/1997 7:11 A.M.
1.0000000000000



SITE PLAN
SCALE: 1"=30'-0"

SITE IMPROVEMENT NOTES

1. FUEL STATION, MECHANICAL SYSTEMS, FUEL ISLAND PADS, CONCRETE TANK COVER AND ASSOCIATED WORK; RE: SK-P2.
2. ENTIRE PERIMETER FENCE TO BE INSTALLED BY CONTRACTOR
3. 2" GAS SERVICE LINE TO BE INSTALLED BY CONTRACTOR.

SANITARY SEWER NOTES

RE: DRAWING NO. L-2

13. 220 L.F. OF 8" SEWER PIPE @ 2.50% SLOPE; RE:16,L-7
14. LEACHATE DROP WITH (2) MANHOLE ACCESS; RE:19L-7
    WEST RIM 1645.88, EAST RIM 1645.60
    INV. 1637.02 (OUTFALL)
15. 70 L.F. OF 4" SEWER PIPE @ 1.0% SLOPE; RE:16,L-7. PLUG END OF PIPE. WRAP END WITH METAL DETECTON TAPE.
16. 83 L.F. OF 4" SEWER PIPE @ 1.5% SLOPE; RE:16,L-7

RE: DWG. L-2

20. 140 L.F. OF 6" SEWER PIPE @ 2.0% SLOPE; RE:16L-7
21. 117 L.F. OF 6" SEWER PIPE @ 1.0% SLOPE; RE:16,L-7
22. SANITARY CATCH BASIN #1; RE:14,L-7
    RIM 1644.36
    INV. E 1641.35
    INV. S 1641.25
23. 24 L.F. OF 6" SEWER PIPE @ 2.0% SLOPE; RE:16,L-7
24. SANITARY CATCH BASIN #2; RE:14,L-7
    RIM 1644.36
    INV. 1641.83

RE: DWG. L-2

CADD DRAWING
DO NOT REVISE MANUALLY

2" SCALE BAR

NOTES

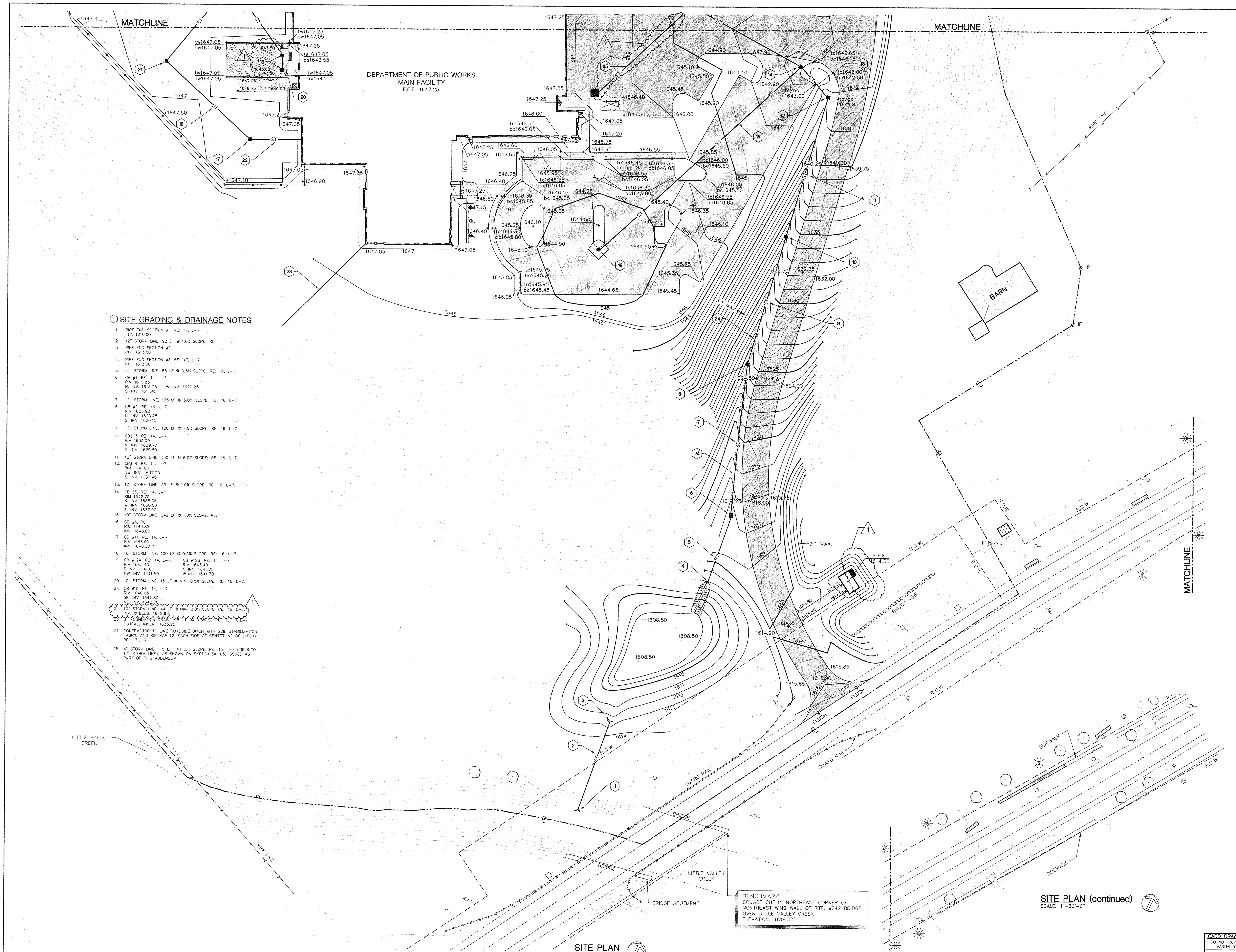
NO.	DATE	REVISION	BY	APPD.
1	7/24/97	BID PHASE NO. 2		
0	6/10/97	BID PHASE NO. 1		

WENDEL
BUFFALO, N.Y.
LOCKPORT, N.Y.
ENGINEERING • ARCHITECTURE
LANDSCAPE ARCHITECTURE
SURVEY • CONSTRUCTION

NEW FACILITY
CATTARAUGUS COUNTY DEPT. OF PUBLIC WORKS
LITTLE VALLEY, NEW YORK

SITE LAYOUT & UTILITY PLAN (NORTH)

DWN.	DLK
CHK.	ACG
APPD.	PLJ
DATE	7/24/97
SCALE	1"=30'
PROJ. No.	3076-01
DWG. No.	L-3
REV. No.	1



SITE GRADING & DRAINAGE NOTES

1. PIPE END SECTION #1, RE: 17, L-7.
   INV. 1610.00
2. 12" STORM LINE, 92 LF @ 1.0% SLOPE; RE:
3. PIPE END SECTION #2
   INV. 1613.00
4. PIPE END SECTION #3, RE: 17, L-7.
   INV. 1613.00
5. 12" STORM LINE, 85 LF @ 0.5% SLOPE; RE: 16, L-7.
6. CB #1, RE: 14, L-7.
   RIM 1616.85
   N. INV. 1613.25 W. INV. 1620.25
   S. INV. 1611.45
7. 12" STORM LINE, 135 LF @ 5.0% SLOPE; RE: 16, L-7.
8. CB #2, RE: 14, L-7.
   RIM 1623.90
   N. INV. 1620.25
   S. INV. 1620.15
9. 12" STORM LINE, 120 LF @ 7.9% SLOPE; RE: 16, L-7.
10. CB# 3, RE: 14, L-7.
    RIM 1633.00
    N. INV. 1629.70
    S. INV. 1629.60
11. 12" STORM LINE, 130 LF @ 6.0% SLOPE; RE: 16, L-7.
12. CB# 4, RE: 14, L-7.
    RIM 1641.60
    NW. INV. 1637.55
    S. INV. 1637.45
13. 12" STORM LINE, 35 LF @ 1.0% SLOPE; RE: 16, L-7.
14. CB #5, RE: 14, L-7.
    RIM 1642.75
    S. INV. 1638.55
    W. INV. 1638.00
    E. INV. 1637.90
15. 10" STORM LINE, 242 LF @ 1.0% SLOPE; RE:
16. CB #6, RE:
    RIM 1643.85
    INV. 1640.00
17. CB #11, RE: 14, L-7.
    RIM 1646.00
    INV. 1643.30
18. 10" STORM LINE, 100 LF @ 0.5% SLOPE; RE: 16, L-7.
19. CB #12A, RE: 14, L-7. RIM 1643.40 E INV. 1641.60 NW. INV. 1641.50 — CB #12B, RE: 14, L-7. RIM 1643.40 N INV. 1641.70 W INV. 1641.70
20. 10" STORM LINE, 15 LF @ MIN. 0.5% SLOPE; RE: 16, L-7.
21. CB #10, RE: 14, L-7.
    RIM 1646.05
    SE. INV. 1642.80
    NE. INV. 1642.70
22. 10" STORM LINE, 44 LF @ MIN. 2.0% SLOPE, RE: 16, L-7. INV. @ BLDG. 1642.62 (1)
23. ~~6" FOUNDATION DRAIN 105 L.F. @ 0.5% SLOPE; RE: 16,L-7~~
    OUTFALL INVERT 1635.25
24. CONTRACTOR TO LINE ROADSIDE DITCH WITH SOIL STABILIZATION FABRIC AND RIP RAP (2' EACH SIDE OF CENTERLINE OF DITCH) RE: 17,L-7.
25. 4" STORM LINE, 115 L.F. AT .5% SLOPE. RE: 16, L-7 (TIE INTO 12" STORM LINE), AS SHOWN ON SKETCH SK-L5, ISSUED AS PART OF THIS ADDENDUM.

BENCHMARK
SQUARE CUT IN NORTHEAST CORNER OF NORTHEAST WING WALL OF RTE. #242 BRIDGE OVER LITTLE VALLEY CREEK
ELEVATION: 1618.33'

SITE PLAN
SCALE: 1"=30'-0"

SITE PLAN (continued)
SCALE: 1"=30'-0"

2" SCALE BAR

NOTES

NO.	DATE	REVISION	BY	APPD.
1	7/24/97	BID PHASE NO. 2		
0	6/10/97	BID PHASE NO. 1		

WENDEL
BUFFALO, N.Y.
LOCKPORT, N.Y.
ENGINEERING • ARCHITECTURE
LANDSCAPE ARCHITECTURE
SURVEY • CONSTRUCTION

NEW FACILITY
CATTARAUGUS COUNTY DEPT. OF PUBLIC WORKS
LITTLE VALLEY, NEW YORK

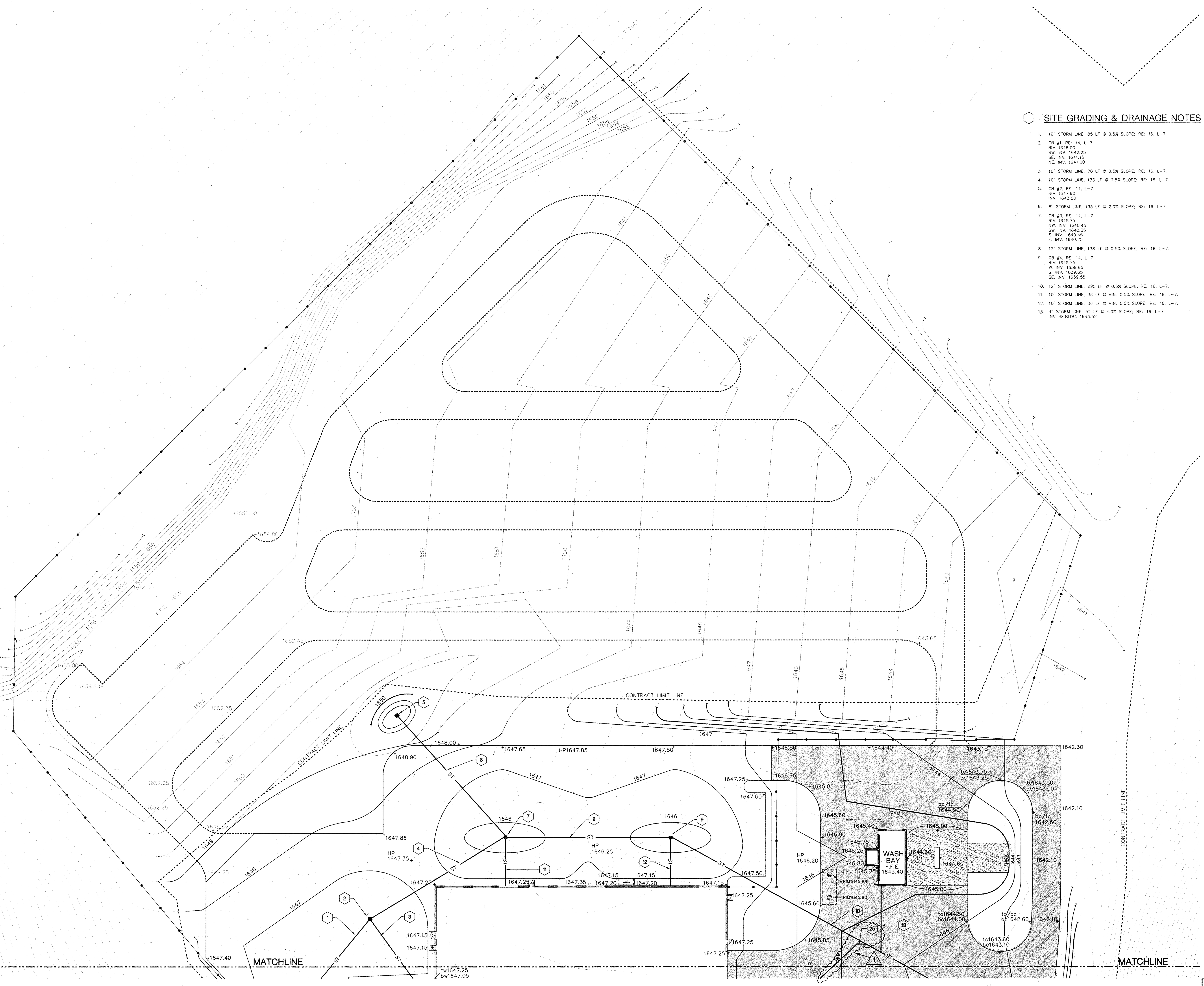
SITE GRADING & DRAINAGE PLAN (SOUTH)

DWN.	DLK
CHK.	AC6
APPD.	DLJ
DATE	7/24/97
SCALE	1"=30'
PROJ. No.	3076-01
DWG. No.	L-4
REV. No.	1

CADD DRAWING
DO NOT REVISE MANUALLY

SITE GRADING & DRAINAGE NOTES

1. 10" STORM LINE, 85 LF @ 0.5% SLOPE; RE: 16, L-7.
2. CB #1, RE: 14, L-7.
   RIM 1646.00
   SW. INV. 1642.25
   SE. INV. 1641.15
   NE. INV. 1641.00
3. 10" STORM LINE, 70 LF @ 0.5% SLOPE; RE: 16, L-7.
4. 10" STORM LINE, 133 LF @ 0.5% SLOPE; RE: 16, L-7.
5. CB #2, RE: 14, L-7.
   RIM 1647.60
   INV. 1643.00
6. 8" STORM LINE, 135 LF @ 2.0% SLOPE; RE: 16, L-7.
7. CB #3, RE: 14, L-7.
   RIM 1645.75
   NW. INV. 1640.45
   SW. INV. 1640.35
   S. INV. 1640.45
   E. INV. 1640.25
8. 12" STORM LINE, 138 LF @ 0.5% SLOPE; RE: 16, L-7.
9. CB #4, RE: 14, L-7.
   RIM 1645.75
   W. INV. 1639.65
   S. INV. 1639.65
   SE. INV. 1639.55
10. 12" STORM LINE, 295 LF @ 0.5% SLOPE. RE: 16, L-7.
11. 10" STORM LINE, 36 LF @ MIN. 0.5% SLOPE; RE: 16, L-7.
12. 10" STORM LINE, 36 LF @ MIN. 0.5% SLOPE; RE: 16, L-7.
13. 4" STORM LINE, 52 LF @ 4.0% SLOPE; RE: 16, L-7.
    INV. @ BLDG. 1643.52



SITE PLAN
SCALE: 1"=30'-0"

2" SCALE BAR

NOTES

NO.	DATE	REVISION	BY	APPD.
1	7/24/97	BID PHASE NO. 2		
0	6/10/97	BID PHASE NO. 1		

WENDEL
BUFFALO, N.Y.
LOCKPORT, N.Y.

ENGINEERING • ARCHITECTURE
LANDSCAPE ARCHITECTURE
SURVEY • CONSTRUCTION

NEW FACILITY
CATTARAUGUS COUNTY DEPT. OF PUBLIC WORKS
LITTLE VALLEY, NEW YORK

SITE GRADING & DRAINAGE PLAN (NORTH)

DWN.	DLK
CHK.	ACG
APPD.	DLJ
DATE	7/24/97
SCALE	1"=30'
PROJ. No.	3076-01
DWG. No.	L-5
REV. No.	1

CADD DRAWING
DO NOT REVISE MANUALLY

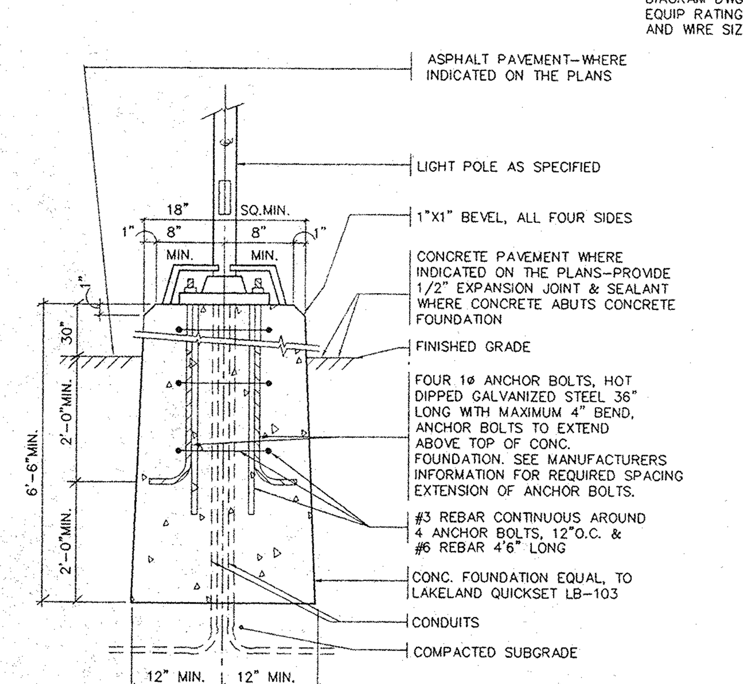
C:\3076-01\dwg\2CAT-L5
269K
7/25/1997 1.35 P.M.
1.0000000000000000

LIGHT FIXTURE SCHEDULE:

TYPE	DESCRIPTION	LENS	BALLAST	LAMPS
AA	400 WATT HIGH PRESSURE SODIUM AREA LIGHTING FIXTURE. HEAVY DUTY DIE CAST ALUMINUM HOUSING AND DOOR. SUITABLE FOR WET LOCATIONS. AS MANUFACTURED BY G.E. LIGHTING CAT. NO. DSMT40S5(480V)A2G WITH TYPE III DISTRIBUTION AND PHOTOCELL MOUNTED ON A VALMOUNT SQUARE NON-TAPERED POLE 30'-0" . (WHERE MOUNTED ON 30" CONCRETE BASE THIS POLE IS TO BE CUT BY MANUFACTURER TO 27'-6") AND INSTALLED ON 30" HIGH CONCRETE BASE POLE CATALOG CAT. NO. 500W300 WITH FULL BASE COVER.	HEAT AND IMPACT RESISTANT FLAT GLASS LENS	AUTOREG FOR USE ON 480V SYSTEM 1 PER FIXTURE	GE 400 WATT HIGH PRESSURE SODIUM LAMP 1 PER FIXTURE
BB	1000 WATT HIGH PRESSURE SODIUM FLOOD LIGHTING FIXTURE. HEAVY DUTY DIE CAST ENCLOSED AND AND GASKETED CORROSION RESISTANT HARDWARE AS MANUFACTURED BY G.E. LIGHTING CAT. NO. PF1K-01-S-5-A-1-6 X 3-DB (480 VOLT) MOUNTED ON A VALMOUNT SQUARE NON-TAPERED POLE 30'-0" CAT. NO. 500W300 WITH FULL BASE COVER. 2 FIXTURES PER POLE LOCATION. (WHERE MOUNTED ON 30" CONCRETE BASE THIS POLE IS TO BE CUT BY MANUFACTURER TO 27'-6")	HEAT AND IMPACT RESISTANT FLAT GLASS LENS	AUTOREG FOR USE ON 480V SYSTEM 1 PER FIXTURE	GE 1000 WATT HIGH PRESSURE SODIUM LAMP 1 PER FIXTURE
CC	250 WATT METAL HALIDE FLOOD LIGHT FIXTURE. HEAVY DUTY DIE CAT ENCLOSURE AND GASKETED CORROSION RESISTANT HARDWARE AS MANUFACTURED BY KIM LIGHTING CAT. No. AFL7-250MH480 WITH STANCHION MOUNTING KIT CAT. No. SM2.	HEAT AND IMPACT RESISTANT FLAT GLASS LENS	AUTOREG FOR USE ON 480V SYSTEM 1 PER FIXTURE	GE 250 WATT METAL HALIDE LAMP 1 PER FIXTURE

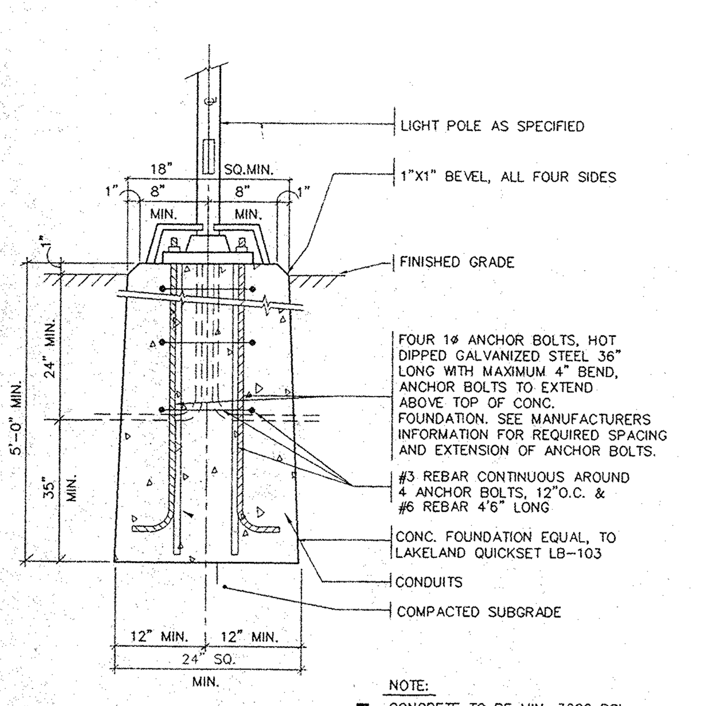
GENERAL NOTE:
ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL COSTS FOR TRENCHING AND BACKFILLING FOR ALL WORK SHOWN ON THIS DRAWING

GENERAL NOTE:
PROVIDE PULLBOXES EVERY 300LF OR AS REQUIRED BY CODE FOR ALL CONDUIT RUNS SHOWN ON THIS DRAWING. USE PULLBOXES AS MANUFACTURED BY QUAZITE COMPOSITE PULLBOXES SIZED PER NEC.



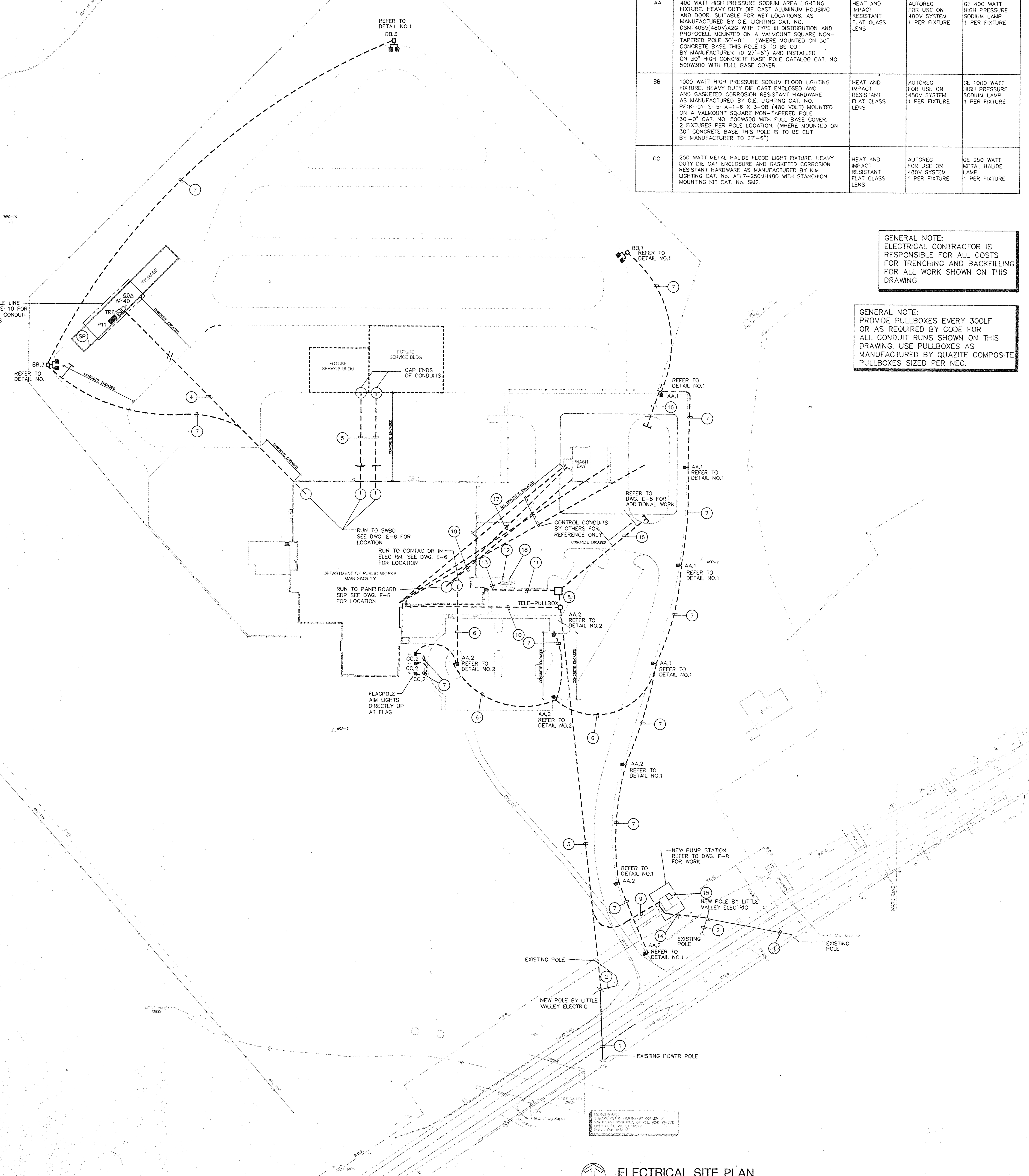
NOTE:
- CONCRETE TO BE MIN. 3000 PSI.
- IF SUBSTITUTES OF LIGHT STANDARDS ARE MADE CONTRACTOR SHALL INCREASE MINIMUM DIMENSIONS ARE REQUIRED BY THE MANUFACTURER.
- POLE BASE COVER TO BE FLUSH ON CONCRETE BASE

DETAIL NO.1
N.T.S.



NOTE:
- CONCRETE TO BE MIN. 3000 PSI.
- IF SUBSTITUTES OF LIGHT STANDARDS ARE MADE CONTRACTOR SHALL INCREASE MINIMUM DIMENSIONS ARE REQUIRED BY THE MANUFACTURER.
- POLE BASE COVER TO BE FLUSH ON CONCRETE BASE

DETAIL NO.2
N.T.S.



ELECTRICAL SITE PLAN
1"=60'

SITE WORK NOTES:

1 NEW OVERHEAD ELECTRICAL SERVICE BY LITTLE VALLEY ELECTRIC

2 NEW OVERHEAD TELEPHONE SERVICE BY OWNER

3 2-4" SCH. 80 PVC CONDUITS WITH FISH LINES FOR ELECTRIC SERVICE
2-4" SCH. 80 PVC CONDUIT WITH FISH LINE FOR TELEPHONE SERVICE
1-2" SCH. 80 PVC CONDUIT FOR CONTROL WIRING FOR LIFT STATION
ALL CONDUITS TO BE 36" BELOW FINAL GRADE AND CONCRETE ENCASED WHERE SHOWN ON THE PLANS. THE CONTRACTOR SHALL PROVIDE ALL SWINGS UP THIS POLE AS REQUIRED BY LITTLE VALLEY ELECTRIC. ALL TRENCHING AND BACKFILLING IS TO BE DONE PER LITTLE VALLEY ELECTRIC REQUIREMENTS.

4 1-1 1/4" SCH. 80 PVC CONDUIT WITH 3-No. 4 AWG. THWN 1 No. 8 GND FOR POWER
1-2" SCH. 80 PVC CONDUIT WITH FISH LINE FOR FUTURE TELEPHONE SERVICE
ALL CONDUITS TO BE 36" BELOW FINAL GRADE AND CONCRETE ENCASED WHERE SHOWN ON THE PLANS. RUN SPEAKER WIRE THROUGH SPARE CONDUIT TO TELE RM. IN BASEMENT (REFER TO DWG. E-7).

5 1-3" SCH. 80 PVC CONDUITS WITH FISH LINES FOR FUTURE ELECTRIC SERVICE
1-2" SCH. 80 PVC CONDUIT WITH FISH LINE FOR FUTURE TELEPHONE SERVICE
ALL CONDUITS TO BE 36" BELOW FINAL GRADE AND CONCRETE ENCASED WHERE SHOWN ON THE PLANS. STUB UP AT GRADE AND CAP.

6 1-1 1/4" SCH. 80 PVC CONDUITS WITH 4-No. 6 AWG. THWN AND 1-No. 6 AWG. GROUND. INSTALL THIS CONDUIT 36" BELOW FINAL GRADE

7 1-1 1/2" SCH. 80 PVC CONDUITS WITH 2-No. 6 AWG. THWN AND 1-No. 6 AWG. GROUND. INSTALL THIS CONDUIT 36" BELOW FINAL GRADE

8 TRANSFORMER PAD BY ELECTRICAL CONTRACTOR REFER TO DETAIL ON DWG. E-8 PADMOUNTED TRANSFORMER PROVIDED BY LITTLE VALLEY ELECTRIC

9 1-2" SCH. 80 PVC CONDUIT WITH FISH LINE FOR FUTURE TELEPHONE SERVICE ALL CONDUITS TO BE 36" BELOW FINAL GRADE AND CONCRETE ENCASED UNDER ROADWAY.

10 2-4" SCH 80 PVC CONDUITS WITH FISH LINE FOR TELEPHONE SERVICE TO BE RUN 36" BELOW FINAL GRADE. RUN CONDUITS TO TELEPHONE ROOM IN BASEMENT. WATER SEAL PENETRATION THROUGHT FOUNDATION. SLOPE CONDUIT AWAY FROM BUILDING. REFER TO DWG. E-7 FOR TELEPHONE ROOM LOCATION.

11 MAIN BUILDING FEEDER REFER TO DRAWING E-10 FOR SIZES. RUN CONDUITS 36" BELOW FINAL GRADE.

12 PROVIDE 350KW DIESEL STANDBY GENERATOR AS MANUFACTURED BY ONAN POWER COMMAND 350 DFCC WITH OUTDOOR WEATHERPROOF ENCLOSURE, AND DOUBLE WALL ABOVE GROUND FUEL TANK WITH GENERATOR MOUNTED ON FUEL TANK. GENERATOR PAD IS BY OTHERS COORDINATE CONDUIT MOUNTING WITH PAD INSTALLER DURING CONSTRUCTION. GENERATOR IS TO HAVE MICROPROCESSOR-BASED MONITORING, METERING AND CONTROL, AND POWER MANAGEMENT SYSTEM THAT GUARDS INTEGRITY OF THE ALTERNATOR AND POWER SYSTEM FROM THE EFFECTS OF OVERCURRENT, OVER/UNDER VOLTAGE AND OVERLOAD CONDITIONS.

13 GENERATOR FEEDER REFER TO DRAWING E-10 FOR SIZES. RUN CONDUITS 36" BELOW FINAL GRADE. COORDINATE CONDUIT RUN TO GENERATOR WITH CONCRETE PAD INSTALLER DURING CONSTRUCTION. RUN 1-1" SCH 80 PVC CONDUIT WITH 4-#6 AWG THWN FROM PANEL P5 TO GENERATOR PANEL. AND 1-2" SCH 40 PVC CONDUIT TO ROOM 124 WITH ALL REQUIRED WIRING FOR REMOTE ANNUNICATOR.

14 PUMP STATION FEEDER REFER TO DRAWING E-10 FOR SIZES. RUN CONDUITS 36" BELOW FINAL GRADE. PROVIDE RISER UP UTILITY POLE AS PER LITTLE VALLEY ELECTRIC REQUIREMENTS. RUN 2" SCHEDULE 80 PVC CONDUIT FROM TELEPHONE POLE TO BLDG. WITH FISHLINE FOR FUTURE USE. RUN 36" BELOW FINAL GRADE.

15 PROVIDE 60KW DIESEL STANDBY GENERATOR AS MANUFACTURED BY ONAN 60 DGCB WITH OUTDOOR WEATHERPROOF ENCLOSURE, AND DOUBLE WALL ABOVE GROUND FUEL TANK WITH GENERATOR MOUNTED ON FUEL TANK. GENERATOR PAD IS BY OTHERS COORDINATE CONDUIT MOUNTING WITH PAD INSTALLER DURING CONSTRUCTION. PROVIDE ALL 120V CONNECTIONS FROM PANELBOARD (SUPPLIED BY OTHERS) TO GENERATOR FOR BLOCK HEATER, BATTERY CHARGER, RECEPTACLE, ETC.

16 2-4" SCH 80 PVC CONDUITS WITH FISHLINE FOR FUTURE USE. INSTALL CONDUIT 36" BELOW FINAL GRADE. RUN FROM TRANSFORMER PAD PRIMARY SIDE TO GRASS AREA. RUN SECOND SET FROM END OF OTHER GRASS AREA ACROSS DRIVE TO NEXT GRASS AREA. CAP CONDUIT ENDS AND MARK WITH CONCRETE MARKER BURIED AT GRADE LEVEL.

17 POWER FEEDER TO WASH BAY REFER TO DRAWING E-10 FOR SIZES AND PANEL RATINGS. RUN 24" BELOW FINAL GRADE CONCRETE ENCASED WHERE SHOWN

18 PROVIDE 100A 12 SPACE 120/208V 3 PHASE OUTDOOR TYPE PANELBOARD MOUNTED INSIDE GENERATOR ENCLOSURE. RUN FEEDER FROM PANEL P5. PROVIDE CONNECTIONS FROM NEW PANEL TO ALL 120V CIRCUITS FOR GENERATOR INCLUDING BLOCK HEATER, BATTERY, CHARGER, RECEPTACALE, ETC. REFER TO DWG. E-9 FOR FEEDER INFORMATION.

19 RUN 1-1" SCHEDULE 80 PVC CONDUIT FROM ELECTRIC STRIKE IN WASH BAY TO ACP LOCATED IN ELECTRIC ROOM. REFER TO DRAWING E-6 FOR LOCATION.

2" SCALE BAR

NOTES

NO.	DATE	REVISION	BY	APPD
1	7/24/97	BID PHASE NO. 2		

WENDEL
BUFFALO, N.Y.
LOCKPORT, N.Y.
ENGINEERING • ARCHITECTURE
LANDSCAPE ARCHITECTURE
SURVEY • CONSTRUCTION

NEW FACILITY
CATTARAUGUS COUNTY DEPT. OF PUBLIC WORKS
LITTLE VALLEY, NEW YORK

ELECTRICAL SITE PLAN

DWN.	MAD
CHK.	RJM
APPD.	DJK
DATE	7/24/97
SCALE	AS NOTED
PROJ. No.	3076-01
DWG. No.	E-1
REV No.	1

CADD DRAWING
DO NOT REVISE MANUALLY

Appendix B

Soil Descriptions (for Figure 4)

APPENDIX B

SOIL DESCRIPTIONS - SEE FIGURE 4

9 = Pawling silt loam
This soil is very deep and moderately well drained. Slopes range from 0 to 3 percent. The parent material consists of loamy over sandy and gravelly alluvium. Depth to the top of a seasonal high water table ranges from 18 to 24 inches. Annual flooding is occasional. Shrink-swell potential is low. Available water capacity is moderate. The Kf erodibility factor assigned to the top mineral soil layer is .37 and the soil loss tolerance factor T is 3.
Hydrologic group: B
Farmland class: prime farmland
Hydric soil rating: no
Land capability classification: 2w

19A = Olean silt loam, 0 to 3 percent slopes
This soil is very deep and moderately well drained. The parent material consists of silty and clayey alluvium or eolian deposits over sandy and gravelly glaciofluvial or deltaic deposits. Depth to the top of a seasonal high water table ranges from 18 to 24 inches. Shrink-swell potential is moderate. Available water capacity is high. The Kf erodibility factor assigned to the top mineral soil layer is .43 and the soil loss tolerance factor T is 3.
Hydrologic group: B
Farmland class: prime farmland
Hydric soil rating: no
Land capability classification: 2w

22A = Allard silt loam, 0 to 3 percent slopes
This soil is very deep and well drained. The parent material consists of silty eolian, glaciolacustrine, or old alluvial deposits over sandy and gravelly glaciofluvial deposits. Depth to the top of a seasonal high water table is greater than 60 inches. Shrink-swell potential is low. Available water capacity is high. The Kf erodibility factor assigned to the top mineral soil layer is .43 and the soil loss tolerance factor T is 3.
Hydrologic group: B
Farmland class: prime farmland
Hydric soil rating: no
Land capability classification: 1

52B = Valois gravelly silt loam, 3 to 8 percent slopes
This soil is very deep and well drained. The parent material consists of loamy till derived mainly from sandstone, siltstone, and shale. Depth to the top of a seasonal high water table is greater than 60 inches. Shrink-swell potential is low. Available water capacity is moderate. The Kf erodibility factor assigned to the top mineral soil layer is .32 and the soil loss tolerance factor T is 4.
Hydrologic group: B
Farmland class: prime farmland
Hydric soil rating: no
Land capability classification: 2e

52C = Valois gravelly silt loam, 8 to 15 percent slopes
This soil is very deep and well drained. The parent material consists of loamy till derived mainly from sandstone, siltstone, and shale. Depth to the top of a seasonal high water table is greater than 60 inches. Shrink-swell potential is low. Available water capacity is moderate. The Kf erodibility factor assigned to the top mineral soil layer is .32 and the soil loss tolerance factor T is 4.
Hydrologic group: B
Farmland class: farmland of statewide importance
Hydric soil rating: no
Land capability classification: 3e

52D = Valois gravelly silt loam, 15 to 25 percent slopes
This soil is very deep and well drained. The parent material consists of loamy till derived mainly from sandstone, siltstone, and shale. Depth to the top of a seasonal high water table is greater than 60 inches. Shrink-swell potential is low. Available water capacity is moderate. The Kf erodibility factor assigned to the top mineral soil layer is .32 and the soil loss tolerance factor T is 4.
Hydrologic group: B
Farmland class: not prime farmland
Hydric soil rating: no
Land capability classification: 4e

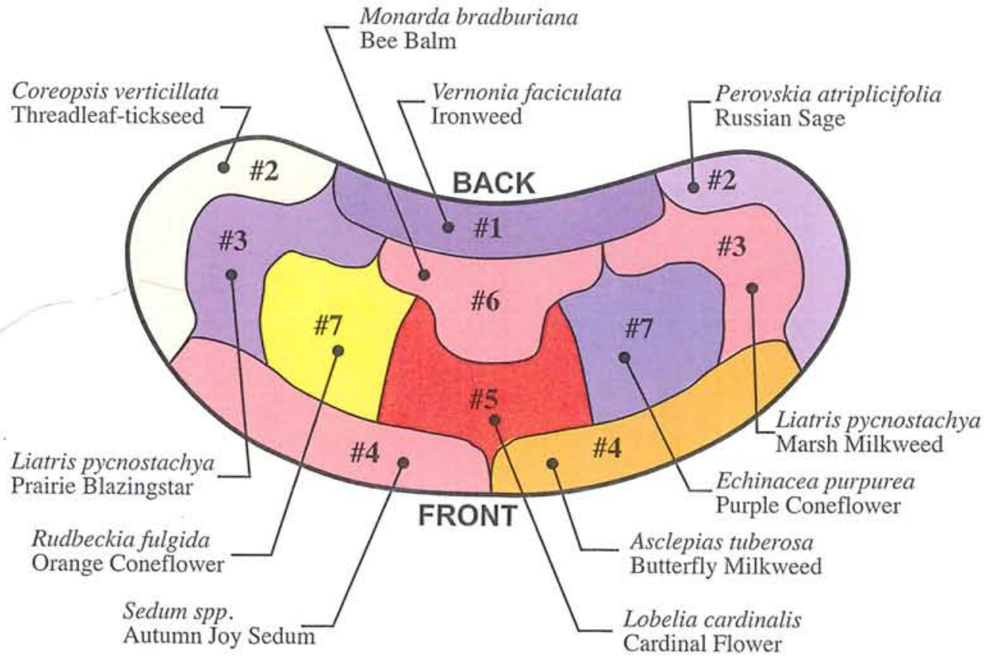
68C = Volusia channery silt loam, 8 to 15 percent slopes
This soil is very deep and somewhat poorly drained. The parent material consists of loamy till derived mainly from siltstone, sandstone, and shale or slate. Depth to a restrictive feature is 10 to 22 inches to a fragipan. Depth to the top of a seasonal high water table ranges from 6 to 18 inches. Shrink-swell potential is low. Available water capacity is very low. The Kf erodibility factor assigned to the top mineral soil layer is .32 and the soil loss tolerance factor T is 2.
Hydrologic group: C
Farmland class: farmland of statewide importance
Hydric soil rating: no
Land capability classification: 3e

800 = Holderton silt loam
This soil is very deep and somewhat poorly drained. Slopes range from 0 to 3 percent. The parent material consists of loamy alluvium. Depth to the top of a seasonal high water table ranges from 6 to 18 inches. Annual flooding is occasional. Shrink-swell potential is low. Available water capacity is high. The Kf erodibility factor assigned to the top mineral soil layer is .37 and the soil loss tolerance factor T is 5.
Hydrologic group: B
Farmland class: prime farmland if drained
Hydric soil rating: no
Land capability classification: 3w

Appendix C

Rain Garden Examples

Garden for our winged friends - Full Sun (6+ hours of sun per day)
- A mix of native and non-native plant species.
- Very showy.
- Base plant list is fairly tall (1.5 to 5 feet).
- Base list is adapted to clay or loam soils with 6-inches of infiltration or less per day. Some of the substitution plants are suited for other soil types and infiltration rates.



#1 Substitutions
A. Compass Plant (*3, c, h*)
B. Yellow Coneflower (*3*, c, *h*)
C. Ox-eye Sunflower (*3, c*)
D. Big Bluestem (*grass*)
E. Indian Grass (*grass*)
F. Red-osier Dogwood (*3, shrub*)

#2 Substitutions
A. Missouri Coneflower (*5*)
B. Rattlesnake Master (*3, d, c, t*)
C. Indian Blanket (*3, c*)
D. Daylily (*3, c, t*)
E. Smooth Phlox (*c, t*)
F. Mist Flower (*5, c, h*)
G. Showy Goldenrod (*3, c, d, t*)
H. Prairie Coreopsis (*3, h, t*)
I. Large-leaf Aster (*3, shade*)
J. Spikenard (*3, t, shade*)
K. Little Bluestem (*3, d, t, grass*)
L. Spicebush (*5, shrub*)
M. Spiraea (*3, shrub*)

#3 Substitutions
A. Sky Blue or Silky Aster (*d, c, h*)
B. 'Little Joe' Joe Pye Weed (*3, d, c, h*)
C. Sneezeweed (*3, c, h , t*)
D. Rough, Meadow, or Dense Blazingstar (*h*)
E. Aromatic Aster (*c, d, h*)

#4 Substitutions
A. Columbine (*3, c, t*)
B. Purple Prairie Clover (*3, c*)
C. New England Aster 'Purple Dome' (*c, t, h*)
D. Meadow Sage (*5, c, h*)
E. Moonshine Yarrow (*3, c, t*)
F. Purple Daisy Aster (*c, d, h*)
G. Scaly Blazingstar (*5, c, h, t*)

#5 Substitutions
A. Great Blue Lobelia (*c*)
B. Blue Flag, Southern Blue Flag, or Copper Iris (*3, 5, c, h, t*)
C. Sweet Black-eyed Susan (*c, t*)

#6 Substitutions
A. Turtlehead (*3, c, h, t*)
B. Joe Pye Weed (*c, h, t*)
C. Culver's Root (*3, c, h*)
D. Greenheaded Coneflower (*h*)
E. Black Chokeberry (*3, shrub*)

#7 Substitutions
A. Rose Turtlehead (*c, h, t*)
B. Black-eyed Susan (*3, c, h, t*)

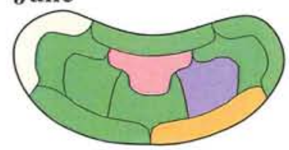
Blooming Period

How the garden changes for each month

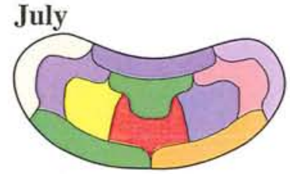
April

May

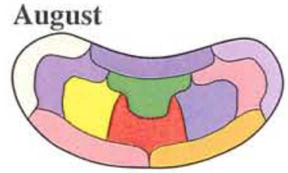
June



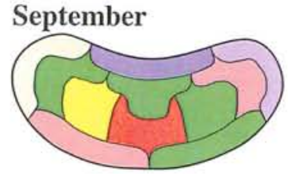
July



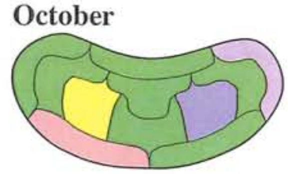
August



September



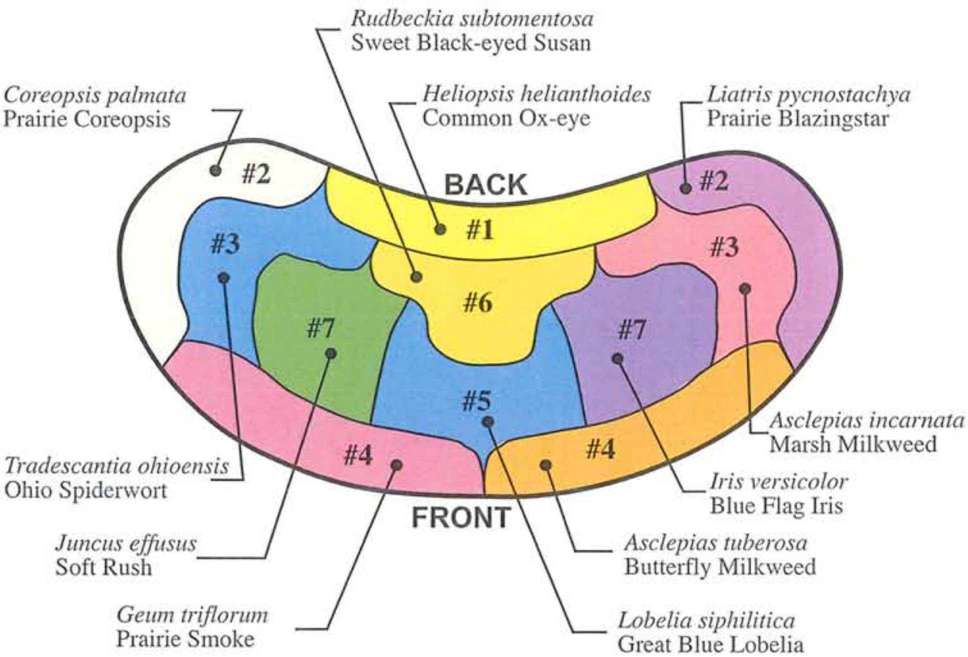
October



Substitution Codes
3 - Appropriate plant for Zone 3
5 - Appropriate plant for Zone 5
c - Change in color
d - A plant that prefers drier conditions
h - Change in height
t - Change in texture
s - Plant requires some sun

Native Prairie Garden

Authors favorite - Full Sun (6+ hours of sun per day)
- All native plant species.
- Very showy.
- Base plant list is fairly tall (1.5 to 5 feet).
- Base list is adapted to clay or loam soils with 6-inches of infiltration or less per day. Some of the substitution plants are suited for other soil types and infiltration rates.



#1 Substitutions
A. Compass Plant (*c, t*)
B. Yellow Coneflower (*h, t*)
C. Blue False Indigo (*c, t*)
D. Big Bluestem (*grass*)
E. Indian Grass (*grass*)
F. Meadow Blazingstar (*d, h, c*)

#2 Substitutions
A. Missouri Coneflower (*5*)
B. Dense Blazingstar (*h*)
C. Rough Blazingstar (*d, h*)
D. Little Bluestem (*d, t, grass*)
E. Purple Coneflower (*c, t*)
F. Rattlesnake Master (*t*)
G. Blue Star (*3, c, h*)
H. Mist Flower (*5, c, h*)
I. Showy Goldenrod (*c, d, t*)
J. Black-eyed Susan (*c, d*)
K. Threadleaf-tickseed (*h, t*)
L. Sideoats Grama (*t, grass*)
M. Prairie Dropseed (*d, t, grass*)

#3 Substitutions
A. Joe-pye Weed (*c, h*)
B. Turtlehead (*d, h*)
C. Culver's Root (*c*)
D. Silky, Skyblue, or Aromatic Aster (*c, d, h*)

#4 Substitutions
A. Harebells (*3, c, h, t*)
B. Purple Prairie Clover (*3, c, h, t*)
C. Ohio Horsemint (*5, c, h, t*)
D. Scaly Blazingstar (*c, h, t*)
E. Wild Petunia (*c, t*)
F. Purple Daisy Aster (*c, d, h*)
G. Sun Sedge (*t, grass*)

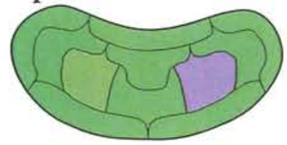
#5 Substitutions
A. Cardinal Flower (*c*)
B. Southern Blue Flag or Copper Iris (5, *h*)
C. Emory's, Hop, or Tussock Sedge (*t, grass*)

#6 Substitutions
A. Missouri Coneflower (*5, d*)
B. Bee Balm (*5, h*)
C. Ironweed (*c, h*)
D. Greenheaded Coneflower (*h*)

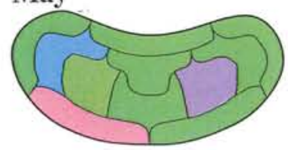
#7 Substitutions
A. Scaly Blazingstar (*h*)
B. Nodding, Fox, or Palm Sedge (*t, grass*)
C. Sneezeweed (*c, h*)

Blooming Period
How the garden changes for each month

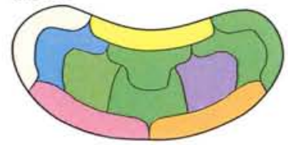
April



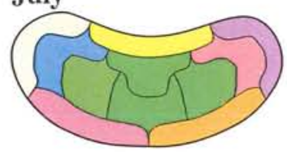
May



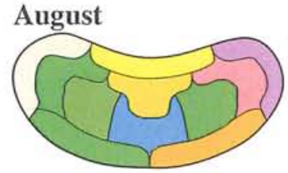
June



July

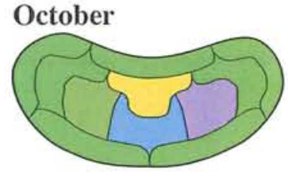


August



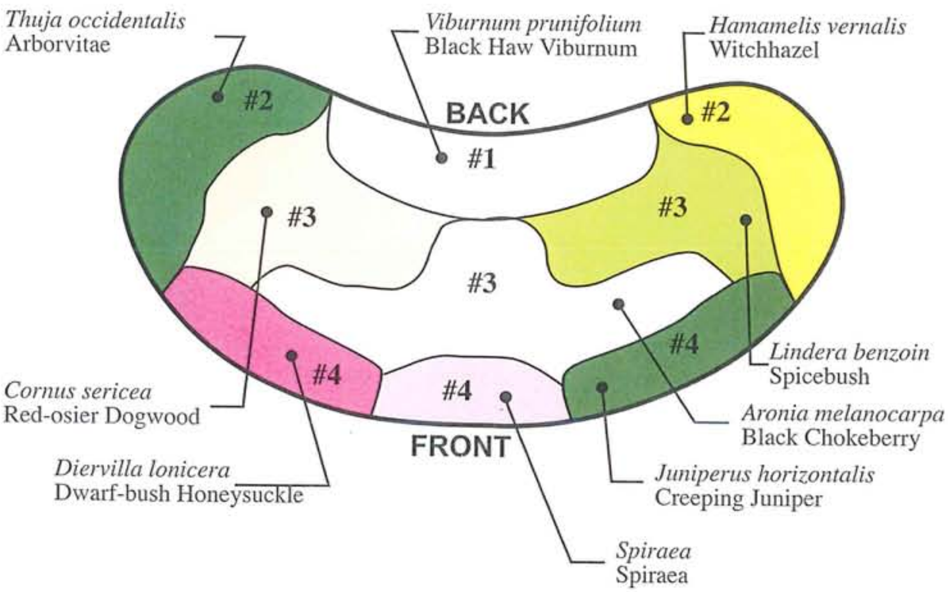
September

October



Substitution Codes
3 - Appropriate plant for Zone 3
5 - Appropriate plant for Zone 5
c - Change in color
d - A plant that prefers drier conditions
h - Change in height
t - Change in texture
s - Plant requires some sun

Shrubs and Trees - Full Sun to Shade (Base Plant List 6+ hours of sun per day)
- A mix of native and non-native plant species.
- Low maintenance.
- Base plant list is tall (3 to 15 feet).
- Base list is adapted to clay or loam soils with 6-inches of infiltration or less per day. Some of the substitution plants are suited for other soil types and infiltration rates.



#1 Substitutions
A. Nannyberry (*3, c, h*)
B. Hazelnut (*c, d, h, t*)
C. River Birch (*c, h, tree*)

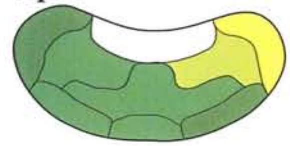
#2 Substitutions
A.Southern Arrowwood (*c, h, t*)
B. American Highbush Cranberry (*3, c, h, t*)

#3 Substitutions
A. Smooth Hydrangia (*3, c, d, t*)
B. American Highbush Cranberry 'Compacta' (*3, c, h*)

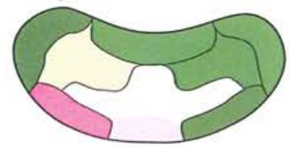
#4 Substitutions
A. Snowberry (*c, d, t*)
B. Rose (*3, c, d, h, t*)
C. Peony (*c, h, t*)

Blooming Period
How the garden changes for each month

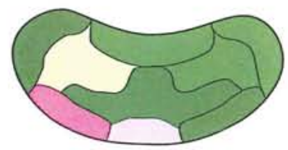
April



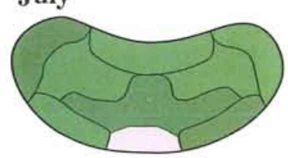
May



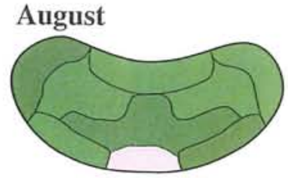
June



July



August

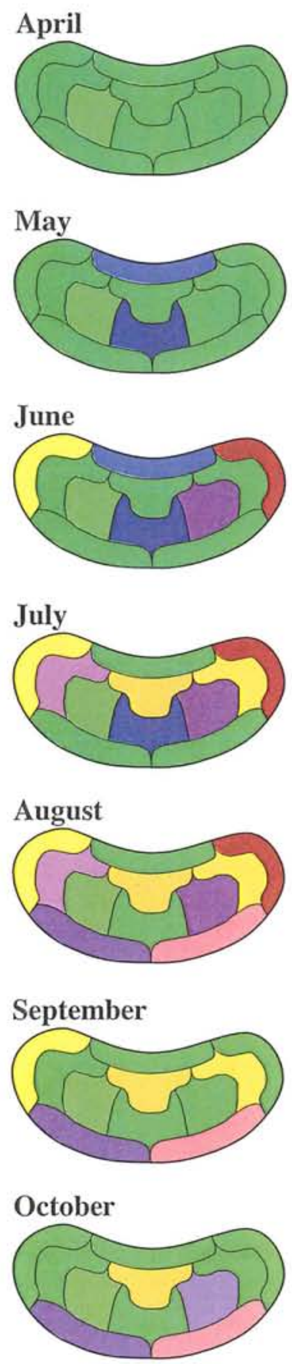


September

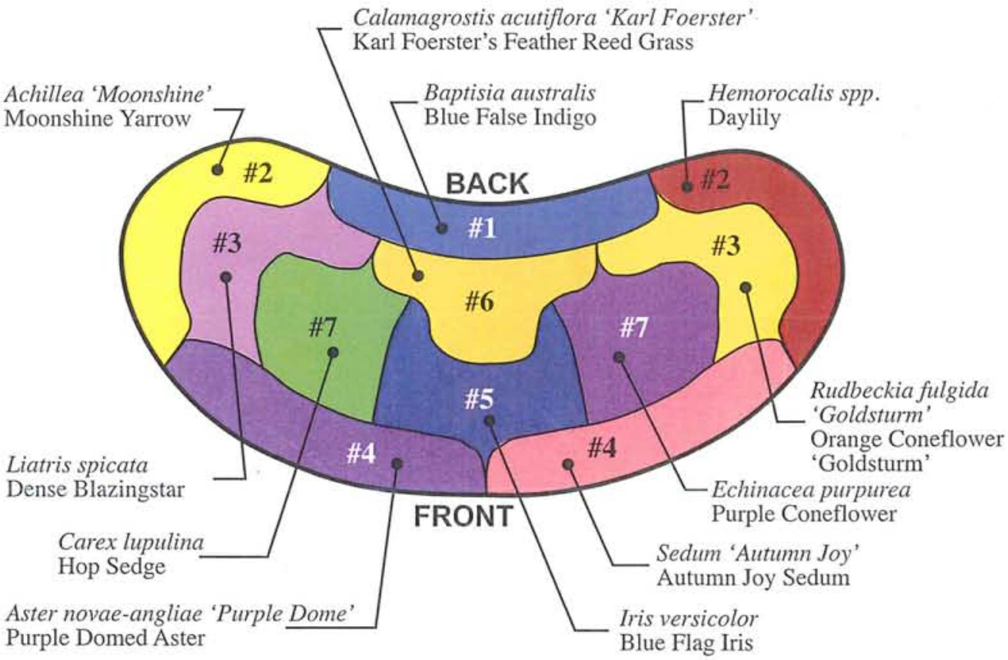
October

Substitution Codes
3 - Appropriate plant for Zone 3
5 - Appropriate plant for Zone 5
c - Change in color
d - A plant that prefers drier conditions
h - Change in height
t - Change in texture
s - Plant requires some sun

Blooming Period
How the garden changes for each month



Common Garden Favorites - Full Sun (6+ hours of sun per day)
- A mix of native and non-native plant species.
- Very showy with common garden plants.
- Base plant list is fairly tall (1 to 5 feet).
- Base list is adapted to clay or loam soils with 6-inches of infiltration or less per day. Some of the substitution plants are suited for other soil types and infiltration rates.



#1 Substitutions
A. Meadow Blazingstar (*3, c, d, h*)
B. Big Bluestem (*h, t, grass*)
C. Peony (*3, c, d, t*)
D. Rose (*3, c, d, t*)
E. Red-osier Dogwood (*3, c, h, t, shrub*)

#2 Substitutions
A. Blue Star (*3, c, h*)
B. Silky, Skyblue, or Aromatic Aster (*3, c, d, h*)
C. Prairie Coreopsis (*3, c, h, t*)
D. Rattlesnake Master (*3, c, d, t*)
E. Indian Blanket (*3, c*)
F. Rough, Prairie, or Scaly Blazingstar (*3, 5, c, h*)
G. Russian Sage (*3, c, t*)
H. Little Bluestem (*3, c, d, t, grass*)
I . Sideoats Grama or Prairie Dropseed (*3, d, t, grass*)

#3 Substitutions
A. 'Little Joe' Joe Pye Weed (*3, c, h*)
B. Bee Balm (*5, c, t*)
C. Smooth Phlox (*3, c*)
D. Missouri Coneflower (*5, h*)
E. Spiraea (*3, c, h, t, shrub*)

#4 Substitutions
A. Butterfly Milkweed (*3, c, d*)
B. Purple Daisy Aster (*5, h*)
C. Harebells (*3, c, d, t*)
D. Prairie Smoke (*3, c, h, t*)
E. Creeping Juniper (*3, c, d, t*)
F. Wild Petunia (*c, h , t*)
G. Meadow Sage (*5, c*)

#5 Substitutions
A. Great Blue Lobelia (*3, c, t*)
B. Southern Blue Flag or Copper Iris (*5, h*)

#6 Substitutions
A. Sneezeweed (*3, c, t*)
B. Ox-eye Sunflower (*3, c, t*)
C. Culver's Root (*3, c, t*)
D. Black Chokeberry (*3, c, t, shrub*)

#7 Substitutions
A. Soft Rush (*h, t*)
B. All Other Sedges (*3, h, t*)

Substitution Codes
3 - Appropriate plant for Zone 3
5 - Appropriate plant for Zone 5
c - Change in color
d - A plant that prefers drier conditions
h - Change in height
t - Change in texture
s - Plant requires some sun

Appendix D

100-Year Floodplain Map

APPENDIX D

100-YEAR FLOODPLAIN MAP

White hatching is the 100-year floodplain. GI Practices will be above this zone.

Appendix E

Photos of Existing Conditions for Green Infrastructure

APPENDIX E

PHOTOS OF EXISTING CONDITIONS FOR GREEN INFRASTRUCTURE

PHOTO 1: INFILTRATION GARDEN (400-FT^2) LOCATED AT THE WEST END OF PARKING LOT.

APPENDIX E

PHOTOS OF EXISTING CONDITIONS FOR GREEN INFRASTRUCTURE

PHOTO 2: INFILTRATION GARDEN (400-FT^2) LOCATED AT THE EAST END OF PARKING LOT.

APPENDIX E

PHOTOS OF EXISTING CONDITIONS FOR GREEN INFRASTRUCTURE

PHOTO 3: CRITICAL TREATMENT AREA (100-FT x 50-FT) LOCATED ON THE NORTH SIDE OF THE STORMWATER POND.

APPENDIX E

PHOTOS OF EXISTING CONDITIONS FOR GREEN INFRASTRUCTURE

PHOTO 4: CONSTRUCTED WETLAND (150-FT LONG x 10-30-FT WIDE) LOCATED WEST OF THE STORMWATER POND.

NOTE THAT THE BIO-RETENTION AREA WILL BE LOCATED ON THE NATURAL "SHELF" ABOVE THE WETLAND (SEE PHOTO 5).

APPENDIX E

PHOTOS OF EXISTING CONDITIONS FOR GREEN INFRASTRUCTURE

PHOTO 5: BIO-RETENTION AREA (150-FT x 50-FT) LOCATED ON A NATURAL “SHELF” ABOVE AND TO THE NORTH OF THE STORMWATER POND.

APPENDIX E

PHOTOS OF EXISTING CONDITIONS FOR GREEN INFRASTRUCTURE

PHOTO 6: RAIN GARDEN (2,500 – 7,500 FT^2) LOCATED NEAR THE DPW BUILDING ENTRANCE AND PARKING LOT.