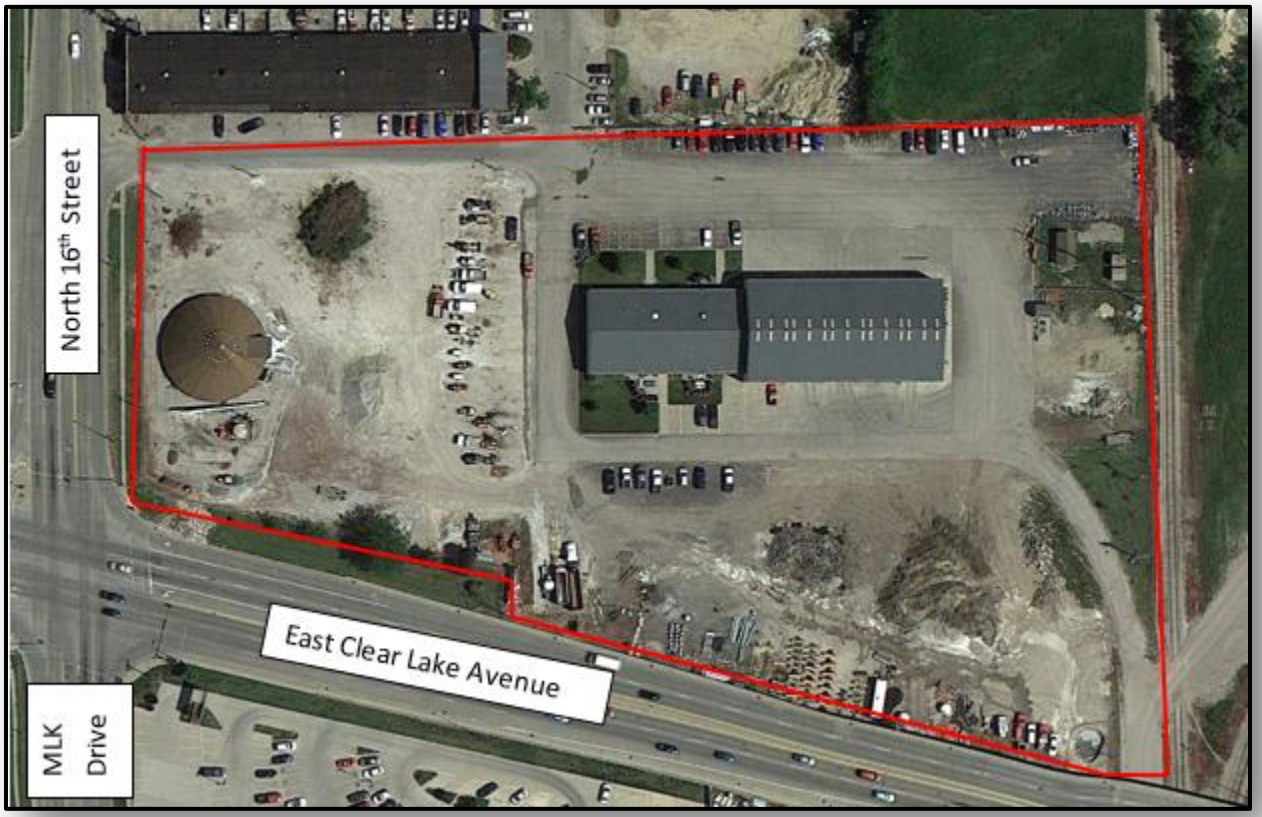
Green Infrastructure
Bio-Swale, Stormwater Capture and Reuse Project
City of Springfield, Illinois

HANSON
Engineering | Planning | Allied Services

Presented by:
Lee Bloome, P.E. – Hanson Professional Services Inc.

Project Need:

- The City of Springfield's Sewer Garage facility is an active site that contains the City's salt dome, equipment storage and temporary storage of construction debris and yard waste.



Project Need:

- Existing site issues included salt laden runoff leaving the site to the southwest and the potential for high suspended solids entering the combined sewers that serve the site.

Construction material storage.
No vegetated buffers.

Brine Runoff and Eroded Soil

Project Need:

- Existing site drainage is collected by storm sewers on the east side of the site and one inlet on the west side of the site which are tributary to a combined sewer running from north to south.

Project Need:

- Hanson approached the City of Springfield after learning of the Illinois Green Initiative Grant (IGIG) program to see if there was an opportunity for a project.
- We saw it as an opportunity to reduce the amount of stormwater and associated pollutants entering the City's combined sewer at several locations throughout the City.
- Upon meeting we found out the City was already planning on reworking their sewer garage site, adding future buildings and adjusting their equipment layout.
- The City asked Hanson if a project could be put together for the sewer garage site.

Illinois Green Initiative Grant:

- The Illinois Green Initiative Grant (IGIG) program was administered through the Illinois Environmental Protection Agency (IEPA).
- The program provided matching grants to projects located within Municipal Separate Storm Sewer System (MS4) or Combined Sewer Overflow (CSO) areas.
- There were three categories of grants issued; CSO rehabilitation, retention/infiltration, and small project.
- Since the sewer garage facility is tributary to a CSO, we selected the CSO rehabilitation category which consisted of an 85% grant, 15% match program.

Project Need:

- Hanson conducted site visits, obtained drawings with existing utilities and proposed the following to the City:
  - Grade the west half of the site to drain to a bioswale that would provide both detention and filtration to the site runoff as well as improve the site aesthetics.
  - Intercept stormwater on the east site, filter it, store it, and use it for the City's sewer jetting trucks, street sweepers and for watering the downtown planters.
  - The City agreed to the improvements and the grant application was written.
  - And we waited…. The grant award announcements came almost 9 months after they were scheduled to be announced.

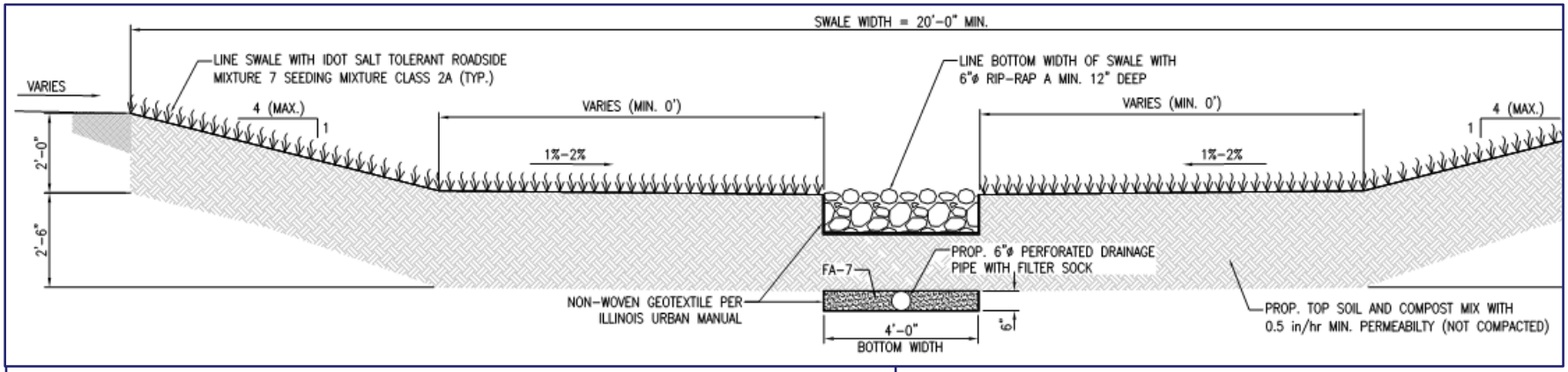
Project Need West Site:

- Intercept site runoff.
- Redirect drainage to the south.
- Maintain site usefulness.
- Do not impact future material storage building.

West Design:

- The Iowa Stormwater Management Manual was used when designing the bioswale.
  - 4:1 max side slopes will allow for maintenance and mowing.
  - The underdrain pipe and drainage medium will be encapsulated in geotextile to prevent clogging.
  - The engineered soil ratios were field tested by the contractor and confirmed by the engineer before the final matrix was mixed and installed.
  - The resulting basin tapers from west to east and has a volume of 5,575 cubic feet and can capture up to a 0.91” of a 1 year rain event.
  - Greater rain events are bypassed to the combined sewer inlet east of the basin.

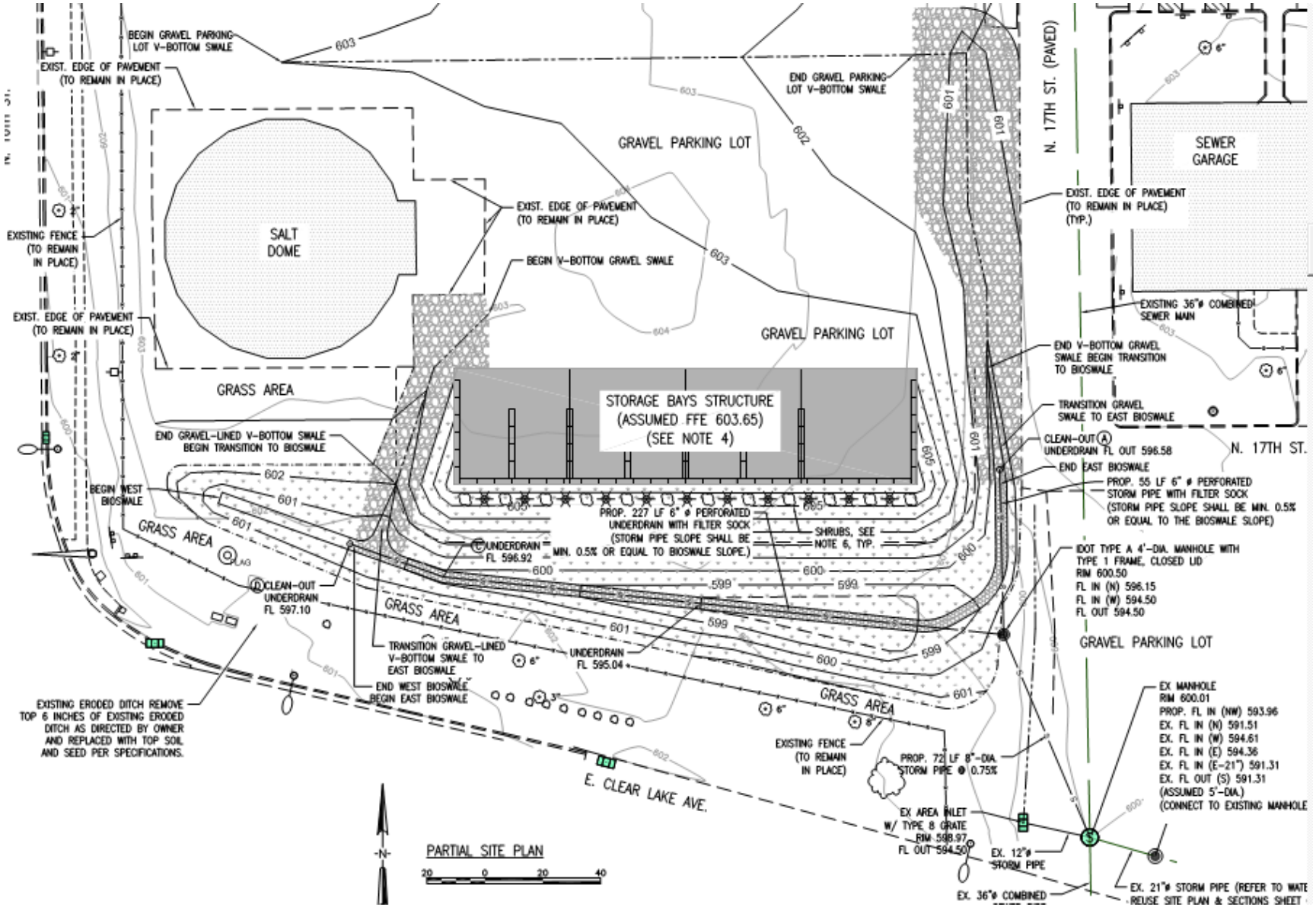
West Construction:



Bioswale Typical Cross Section

- **Bioswale Layers:**
- **Salt Tolerant Grass, IDOT Mix 7**
- **Rip-Rap Pilot Channel**
- **Engineered Soil**
- **Sand Underdrain with 6” Perforated Underdrain Pipe**

West Construction:



West Site Preconstruction:

West site looking west prior to construction.

West site looking east prior to construction.

West Construction:

Looking west at the start of grading.

No surprises were found while excavating. Since the area used to be residential there was the potential for house foundations.

West Construction:

Looking west at the finished bioswale prior to seed germination.

Looking east. The drop down pilot channel from the west side of the site is visible to the left.

Finished Bioswale:

Photo taken after a 0.81 inch rain event

Nov. 17, 2015.

Project Need East Site:

- Intercept storm runoff.
- Provide storage.
- Maintain site usefulness.
- Keep the footprint as small as possible.
- Convenient truck filling location.

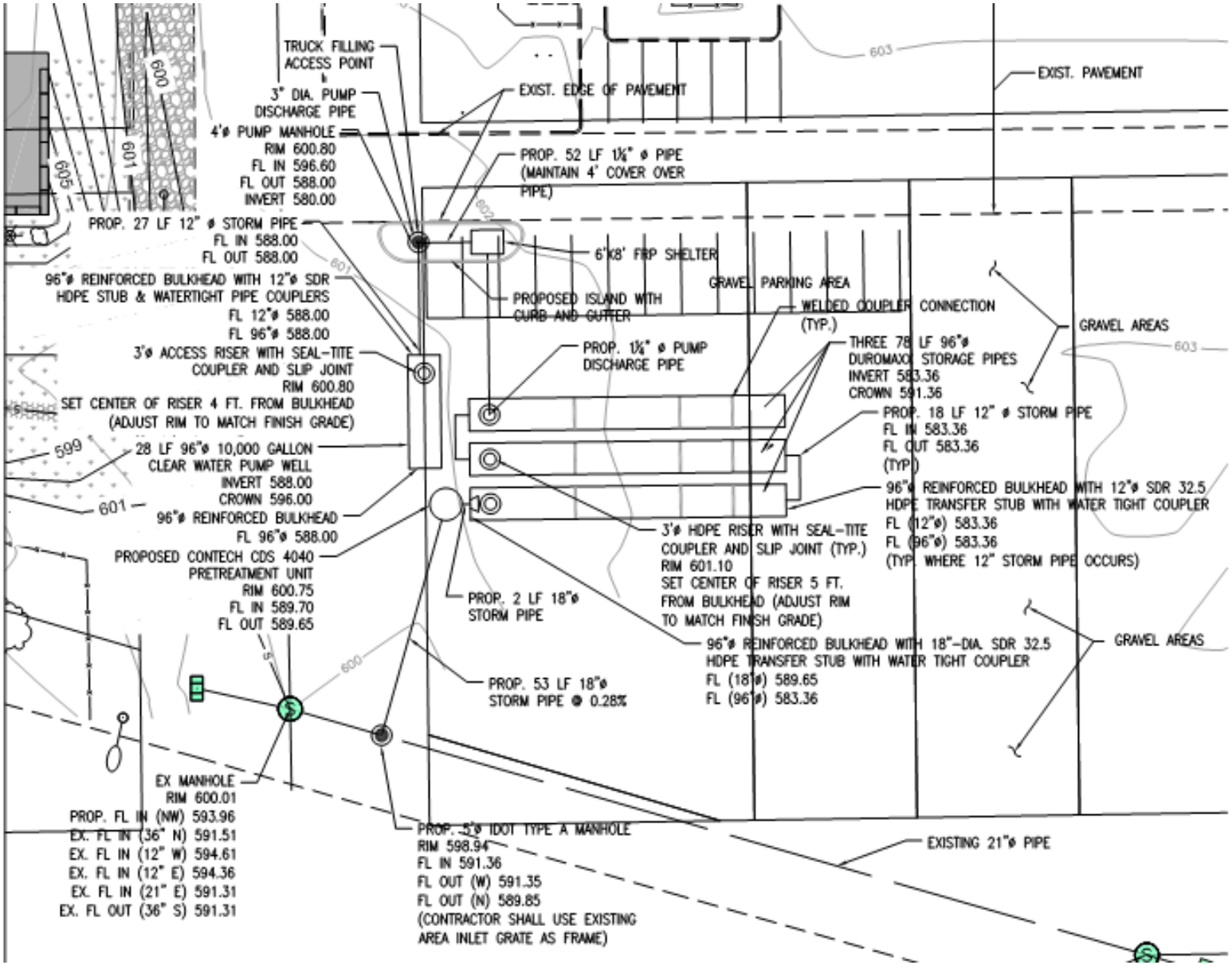
Project Need East Site:

- As Hanson reviewed the site, the following base design criteria was used for the east project:
  - The east project would harvest rainwater for reuse.
  - Water use by the City's sewer jetting and planter watering totals 1.4 million gallons per year at the sewer garage facility or roughly 117,000 gallons per month.
  - The water reuse would need to filter to 10 microns to protect the pumps in the sewer jetting trucks.
  - Disinfection would be required per Department of Public Health requirements for plant watering.

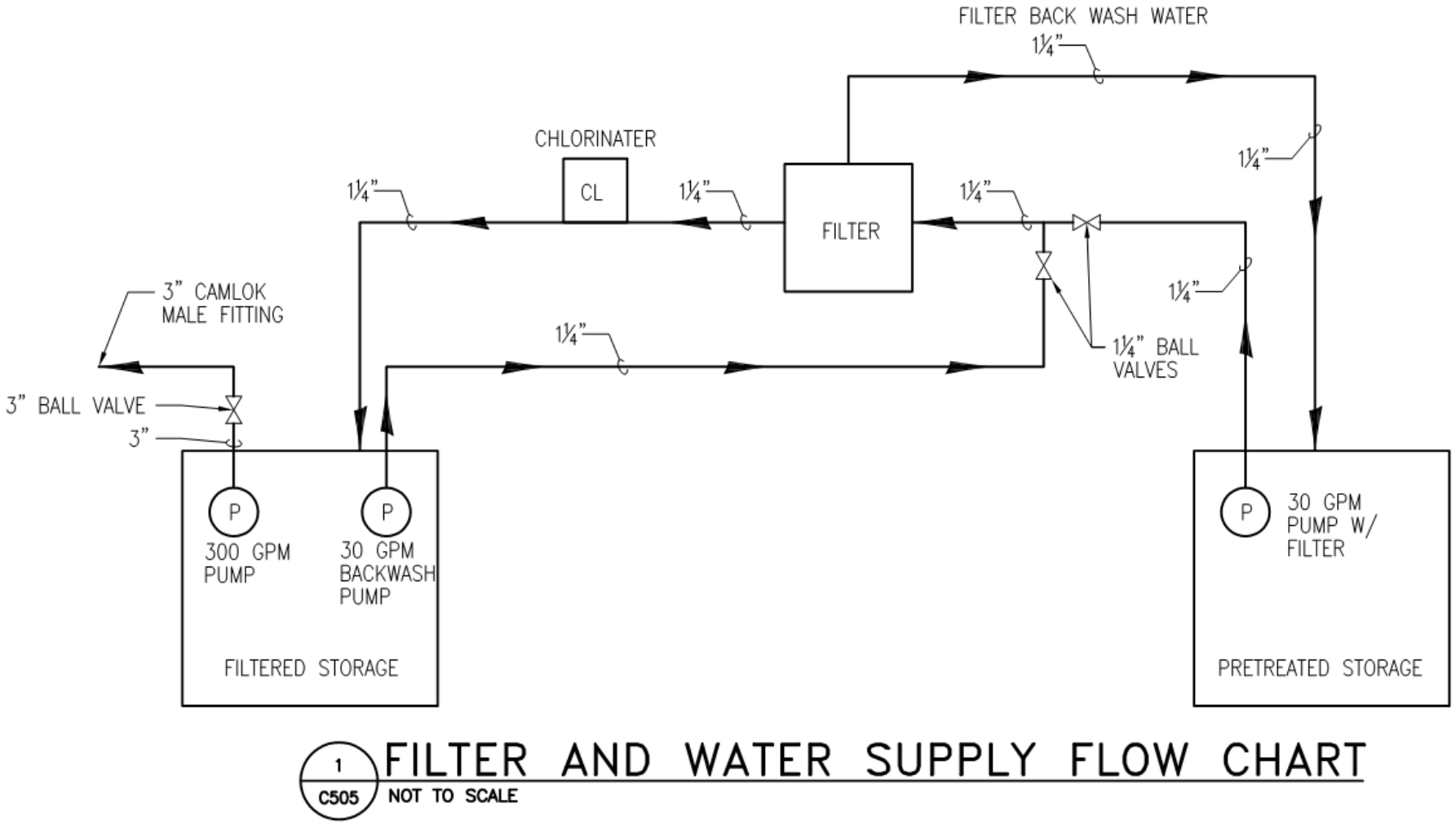
Project Need East Site:

- A rainwater harvesting runoff calculator from Contech was utilized to optimize rainwater storage vs site stormwater runoff.
- The following parameters were entered into the calculator:
  - Drainage areas with runoff coefficients.
  - Project location.
  - Daily water demand.
- The calculator simulates runoff using 20 years of historical rainfall data for your specific location.
- The calculator confirmed we had enough site runoff to provide the 117,000 gallons per month and the optimized storage volume was calculated at 124,000 gallons.

East Construction:



East Construction:



1 / C505 FILTER AND WATER SUPPLY FLOW CHART

NOT TO SCALE

East Site Preconstruction:

East Site Looking East. Earth Stockpiled in the Background.

East Site Looking Northeast. Multiple stored materials.

East Site Construction:

Underground detention excavation.
Excavation dimensions 18’D, 66’W, 106’L

Installing the base course. The hydrodynamic separator is located to the right.

East Site Construction:

Installation of the 96” diameter Duramax pipe.

Three parallel storage pipes 78 feet in length.

The three pipe runs were plumbed in a serpentine fashion to allow for added stormwater clarification

East Site Construction:

Sand filter and chlorinator being installed within the insulated and heated control building.

Controls to operate the pumps are simple toggle switches. Float switches provide pump protection.

The control building and truck filling connection were incorporated into a concrete island.

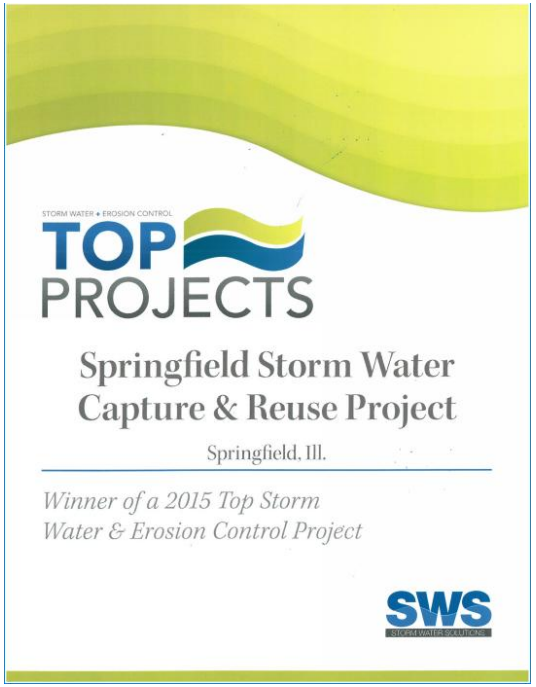
East Site Construction:

Since the east site is used for raw material storage, the finished project looks like it did before construction with the exception of the island, fill pipe and access hatches.

Sewer jetting trucks pull up parallel to the fill station, hook up their cam-lock hoses and flip the fill switch.

Project Award:

Stormwater Solutions Magazine recognized the City of Springfield's Storm Water Capture and Reuse Project as a 2015 Top Project.



Design and Construction Challenges:

- The project had several design challenges that needed to be addressed during and after construction.
- The bioswale took an exceptionally long time to fill in with grass. The filter medium was placed loose and seeded so as not to over-compact it. There was plenty of moisture, but the seed did not spread quickly.
- Spring rains submerged the basin on multiple occasions with the water draining within a day of the initial filling. With the grass not established, there was some initial erosion along the edges of the pilot channel that will need to be filled this spring

Design and Construction Challenges:

- We experienced another “lessons learned” when using the reuse water.
- There was a month between the time the system was initially charged with reuse water and the time the City started using it for jetting.
- During that time, the weather was warming up and to prepare for plant watering, the chlorinator was charged.
- We were unaware that during that startup period, a biofilm had formed on the inside of the day tank. The addition of chlorine killed it and caused it to slough off and settle out. Once pumped into the City’s jetting trucks, it clogged the pre-filters to the pumps. The material looked like white oatmeal.
- As a result, a note was added to the operations manual that if the system sits idle for an extended period of time, the day tank will be shocked with chlorine and then flushed back to the head of the system before being used by the trucks.

QUESTIONS

For more information, please contact

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