Case Study
Woodridge Estates, Town of Delafield

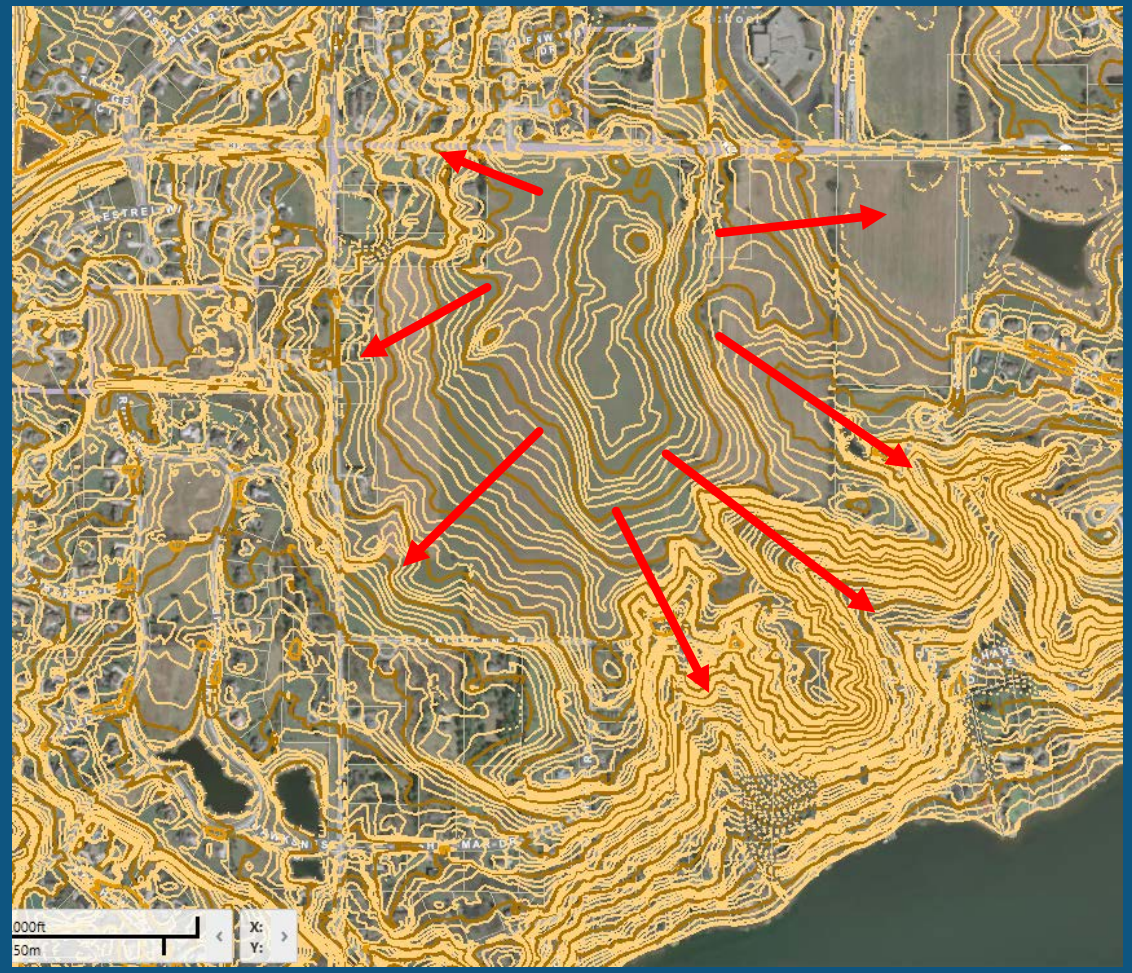
Brian Pehl, PE – SEH Inc.
Leif Hauge, PE – Waukesha County

Development Background Information

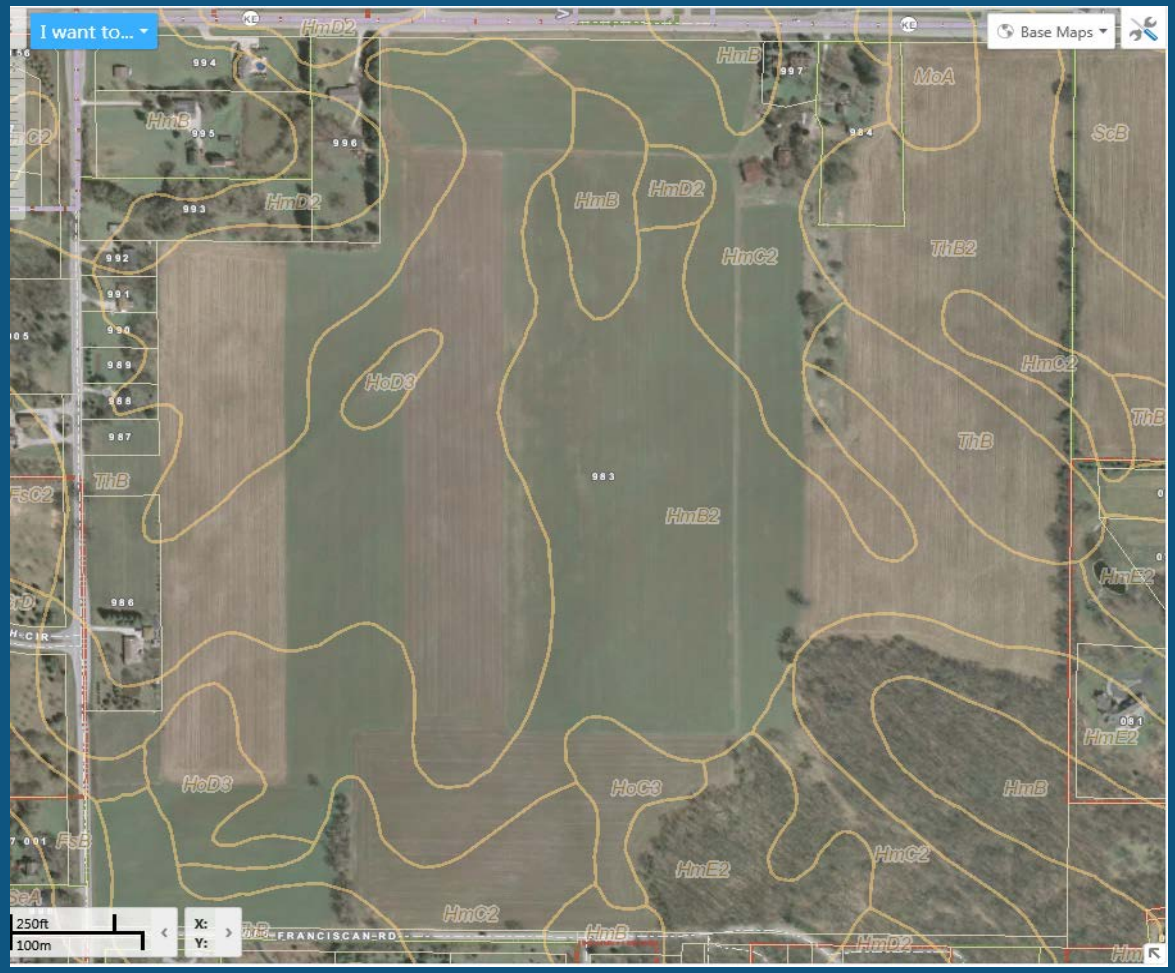
- Proposed 80 - lot subdivision located on top of hill north of Pewaukee Lake
- Planned in two phases
  - Phase I – 36 Lots
  - Phase II – 44 Lots
- Lot size – Varies from 0.7 to 1 acre
- Connected to public sanitary sewer (Lake Pewaukee Sanitary Sewer District)
- Private, individual wells for water
- Soils mostly Hochheim silt loam with some Theresa silt loam
- Seven sub-watersheds & discharge points
- Most discharge points are sensitive to volume increases

Existing Site Conditions

Pre-development Drainage



Existing Soil Conditions



Existing Site Conditions

Test Pit 1 Log

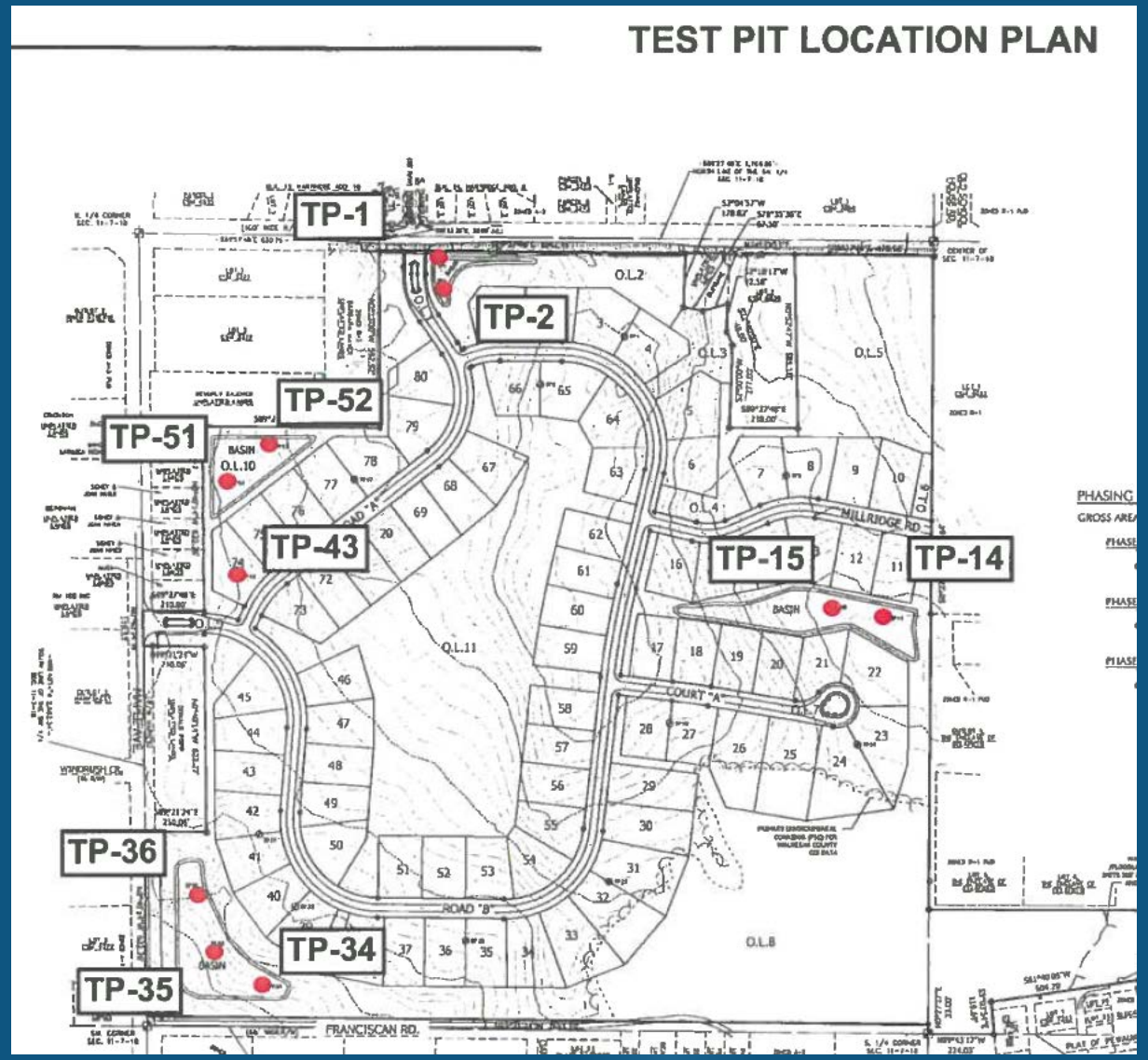
Depth Below Surface/Elev. (ft)		VISUAL SOIL CLASSIFICATION Ground Surface Elevation: 1015.97	Sample No.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	PID (ppm)
1	1015.0	12"± 10YR, 3/3, Dark Brown SILTY CLAY LOAM, roots (2,f), 0, cr, mfr - moist	1-HA	-	-	-	-	-
2	1014.0	10YR, 5/4, Yellowish Brown, SILTY CLAY LOAM, with 7.5YR, 5/6, Strong Brown, f, 2, d, spots, (1,f), 2, abk, m, mfi - moist	2-HA	-	-	-	-	-
3	1013.0							
4	1012.0							
5	1011.0	10YR, 5/3, Brown, GRAVELLY SANDY LOAM, with 7.5YR, 5/6, Strong Brown, f, 2, d, spots, 2, abk , m, mfr - moist	3-HA	-	-	-	-	-
6	1010.0							
7	1009.0							
8	1008.0							
9	1007.0	10YR, 5/4, Yellowish Brown, GRAVELLY LOAMY SAND, 2, pl, thick, ml - moist	4-HA	-	-	-	-	-
10	1006.0							

End of Test Pit: 10'

Notes:

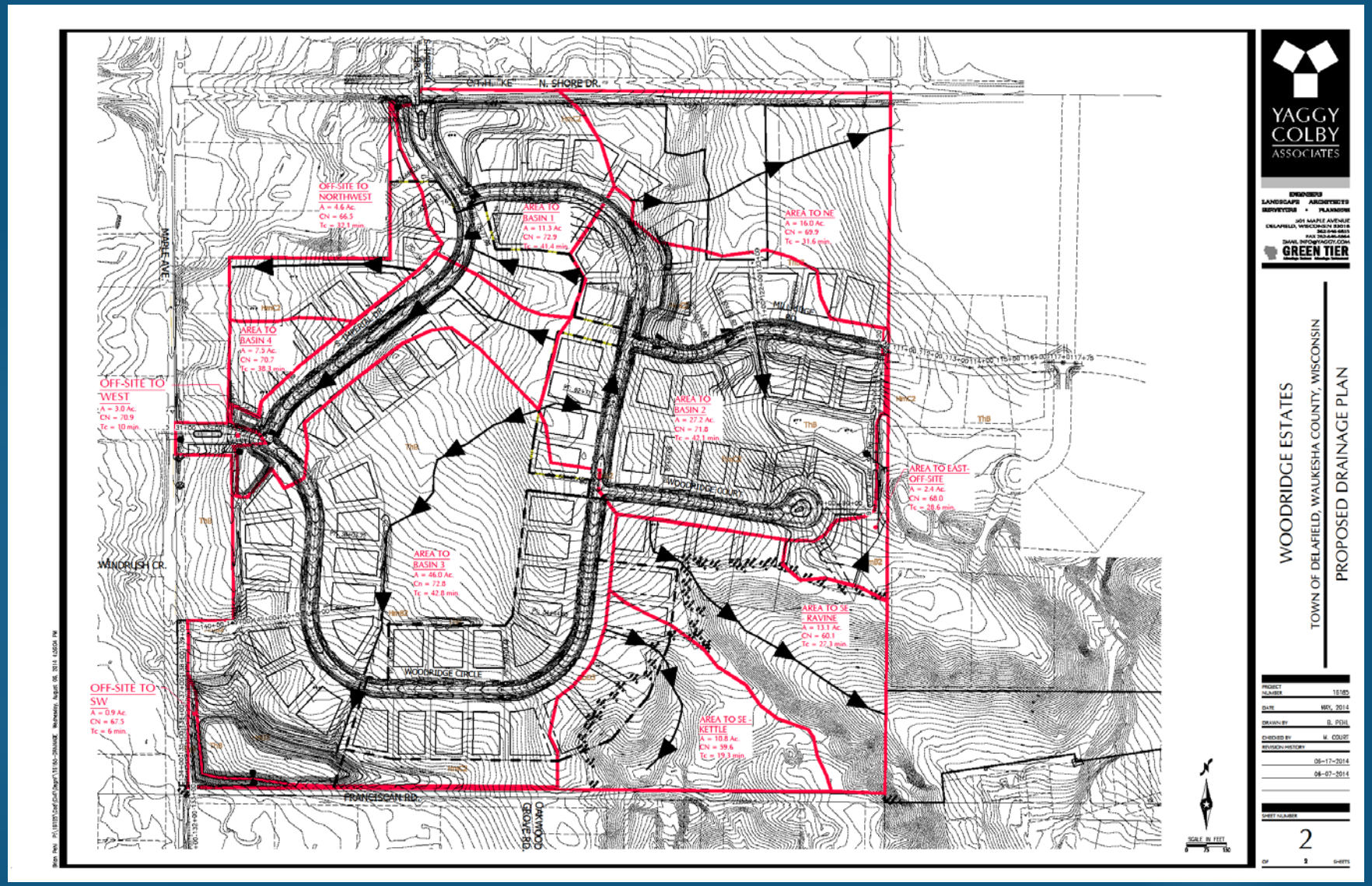
Water Level / Caving Observations:
Water Level During Excavation: None
Water Level Upon Completion: None
Caved at Upon Completion: None

Additional Comments:



Proposed Site Conditions

Overall Site Drainage Map

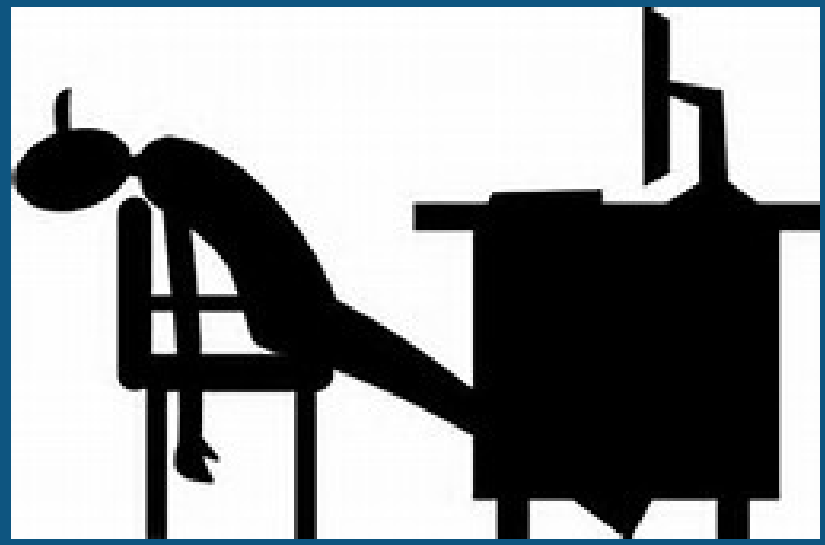


Planning Objectives

- Meet ordinance requirements for:
  - Peak discharge limitation (match pre- and post-development discharge rates in 1, 2, 10, and 100-year storm events)
  - Water quality (80% TSS reduction)
  - Infiltration (25% of 2-year storm runoff or 90% of pre-dev infiltration volume)
- Avoid increases in discharge volume to the maximum practical extent to minimize downstream impacts
- Protect Pewaukee Lake

Design Challenges

- How to build successful infiltration basins that also control construction site sediment
- How to limit discharge volume when the site soils are not conducive to infiltration
- How to protect basins from sediment during home construction



Sediment Trap Design

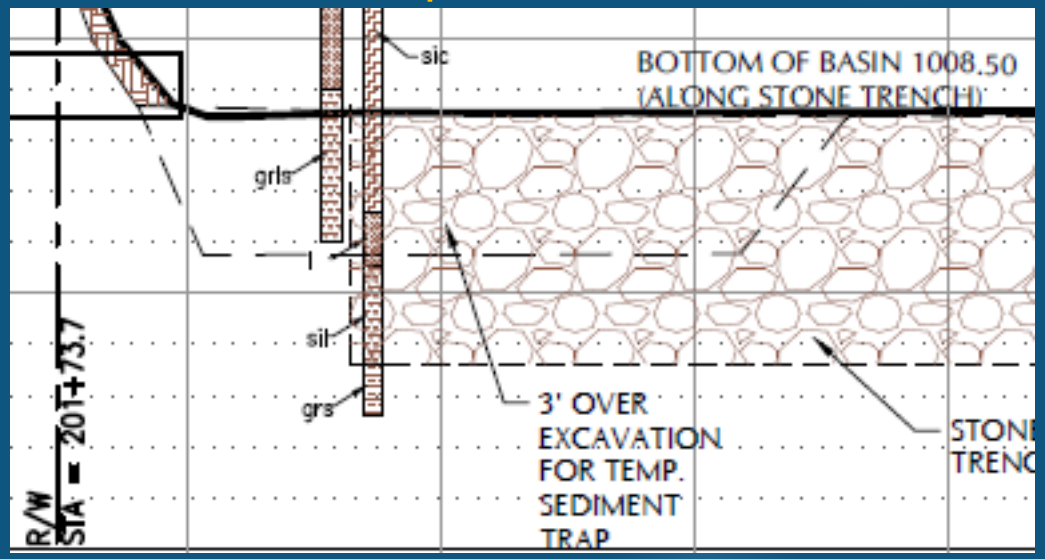
- Part of each basin designated as non-permanent sediment trap
- Sediment Trap Calculations:
  - Sizing Factor is based on soil type
  - Sediment Trap Area (SF) = Drainage Area (AC) x Sizing Factor

BASIN OVEREXCAVATION SCHEDULE				
BASIN #	DRAINAGE AREA (SF)	DRAINAGE AREA (AC)	SIZING FACTOR	SED. TRAP AREA (SF)
1	200295	4.6	1560	7173
2	567955	13.0	1560	20340
3	742877	17.1	1560	26604
4	131487	3.0	1560	4709

Sediment Trap Design

- Sediment trap installed during initial Basin construction to control construction site sediment
- After each Basin's contributing drainage area becomes vegetated, infiltration trench installed
  - Suitable material from trench used to fill sediment trap
  - Stone Infiltration Trench filled with requisite stone & structures
  - Site vegetation, new home construction silt fences and Bio-log barriers (discussed later) help keep sediment out of basins

Sediment Trap Cross-Section View



Basin 1 – Sediment Trap In Action

Looking North Toward Northview Road

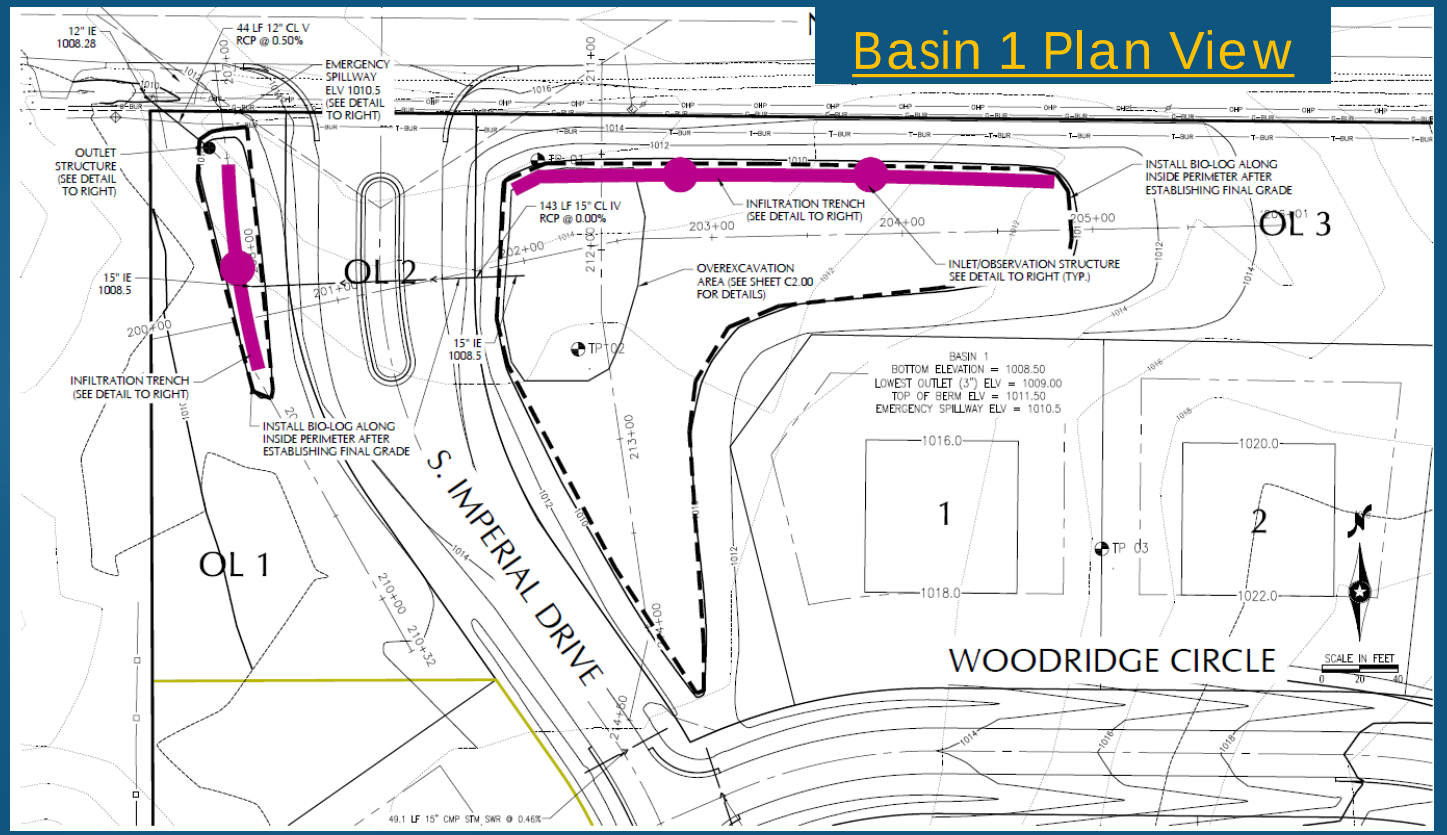
Basin 2 – Sediment Trap In Action

Looking South Toward Pewaukee Lake

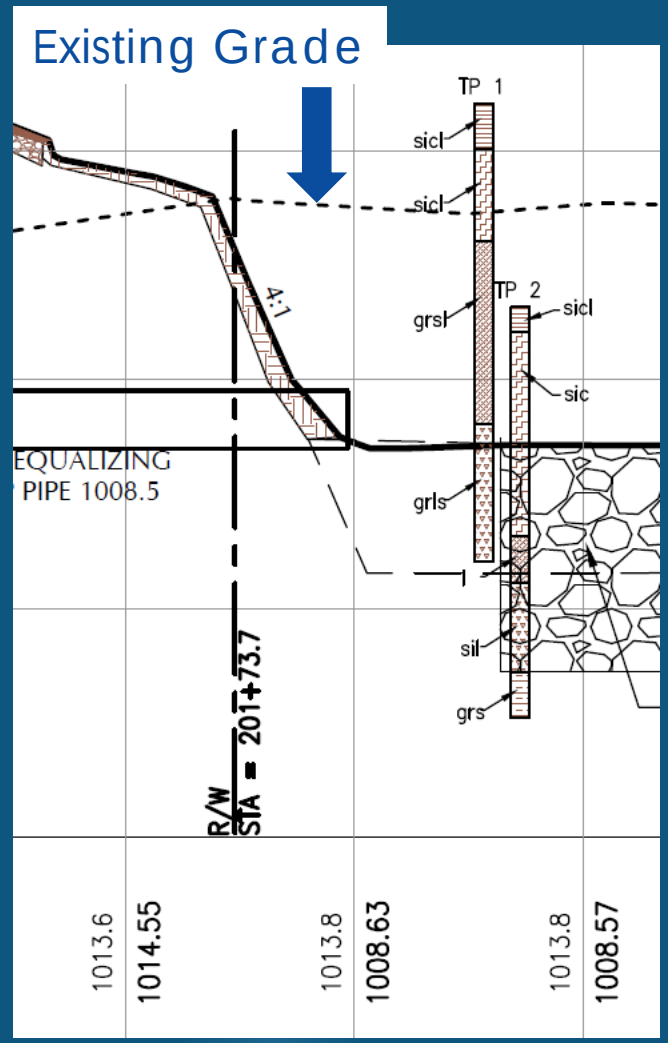
Infiltration Design

- Soil testing showed deeper granular soil
- How do we get storm water past poor infiltrating soils and into said granular soils?

Basin 1 Plan View



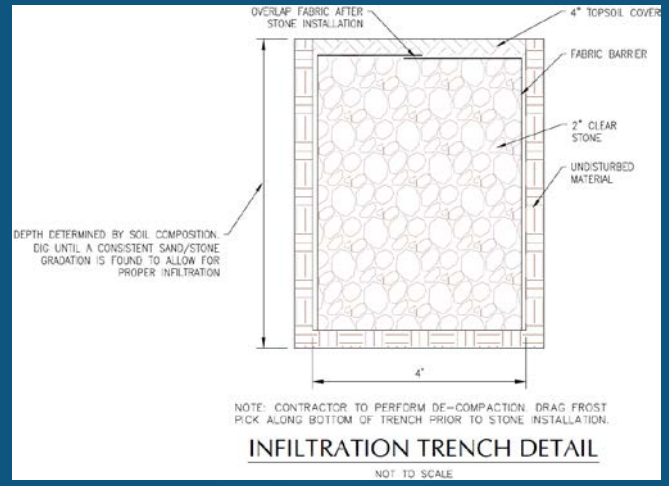
TP-1 & 2 Soil Borings

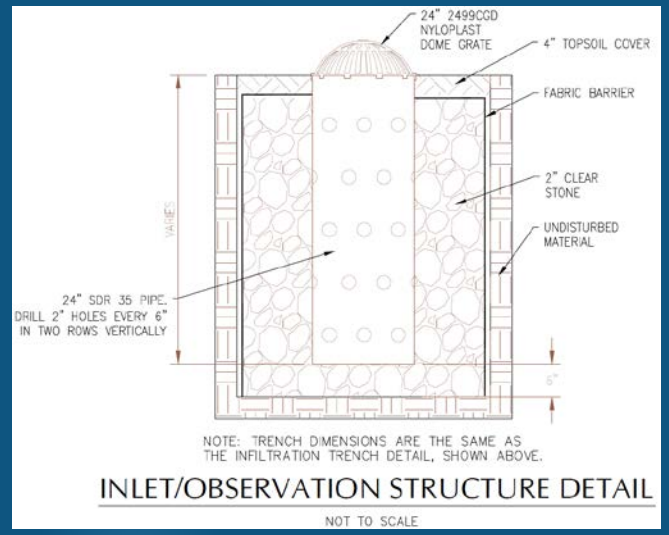


Infiltration Design

- Solution - Design a trench that will resist sedimentation while also allowing storm water to infiltrate to conducive soils
- Trench Design
  - Excavate trench to the depth of better infiltrating soils
  - Line trench with filter fabric to keep surrounding fine soils out of clear stone
  - Backfill trench with 2” clear stone, cover stone with filter fabric & then topsoil soil/vegetation
  - During stone backfill, install Inlet/Observation Structures that are used to:
    - Increase trench infiltration
    - Observe water level within trench

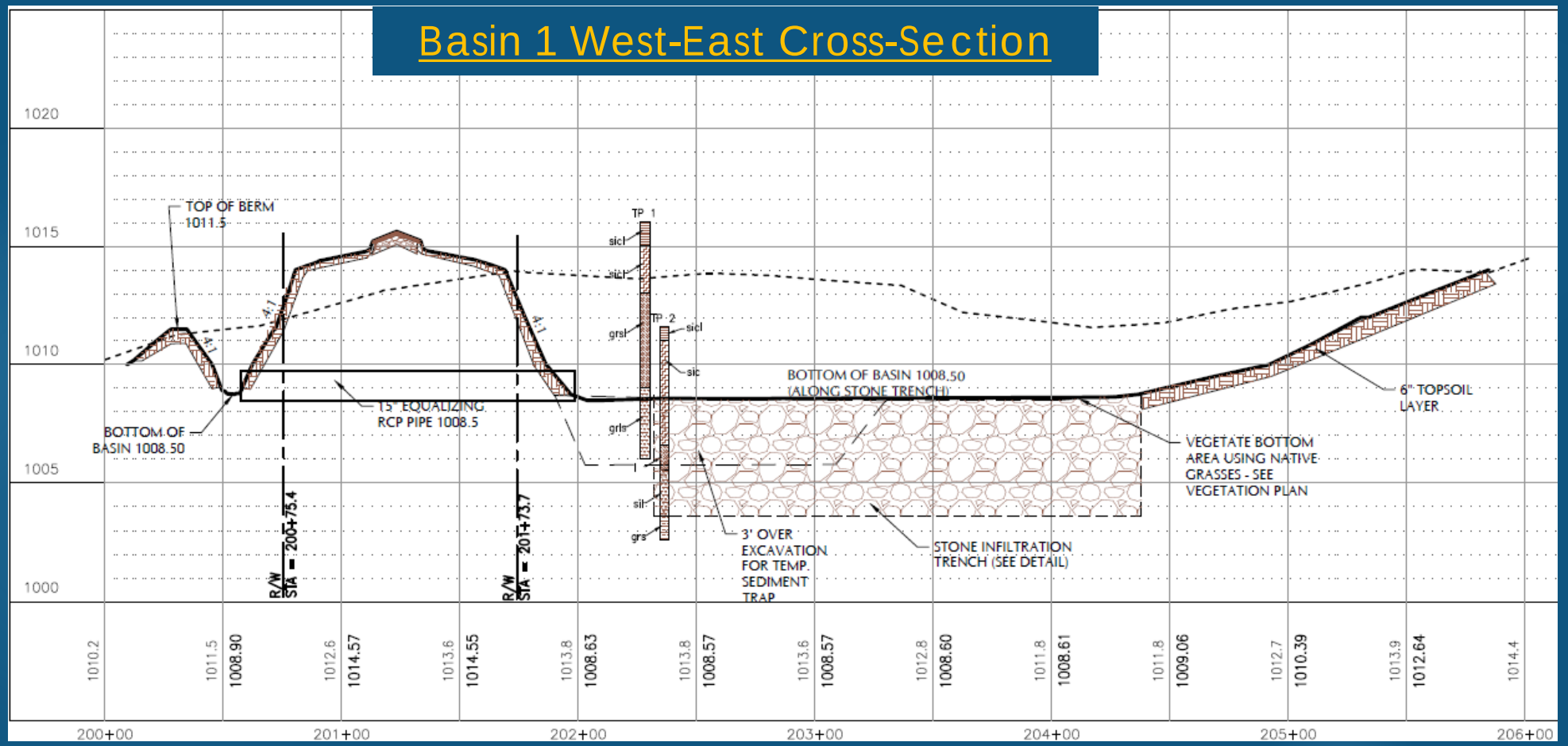
Trench Details



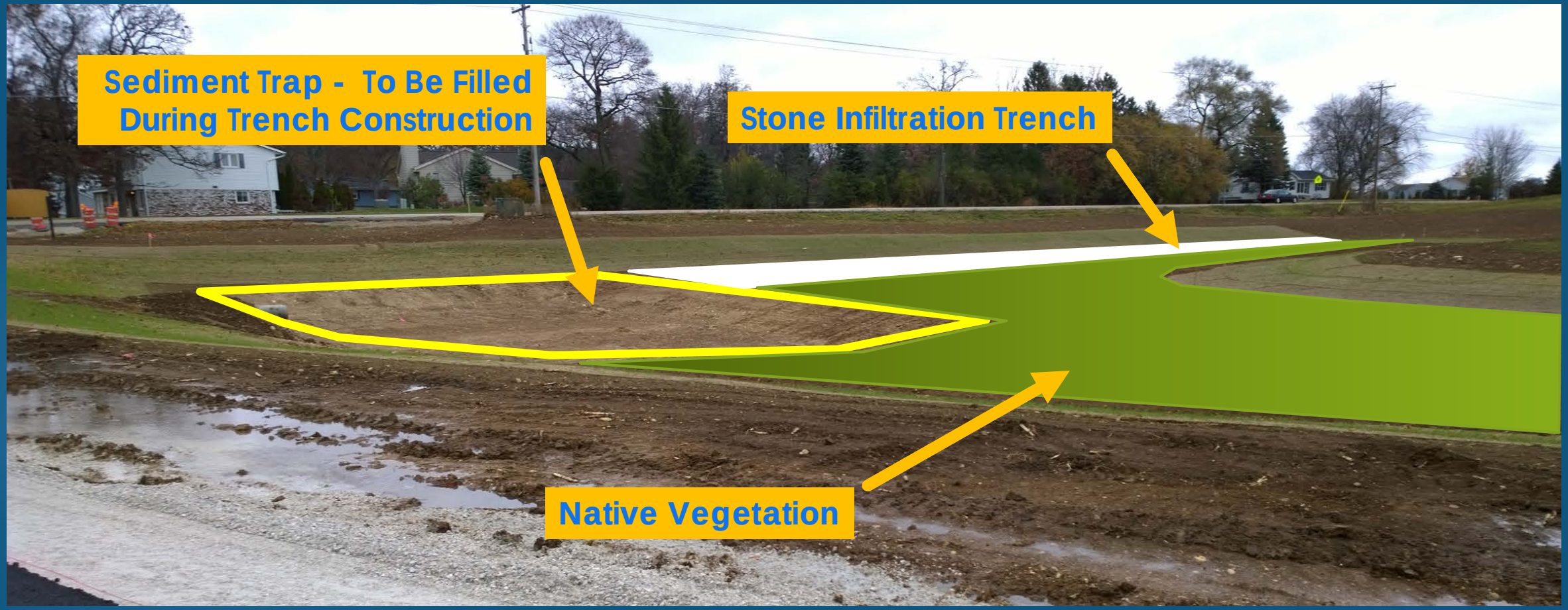


Infiltration Design

- Basins otherwise designed like typical basins
- Still provide storm water detention and TSS reduction



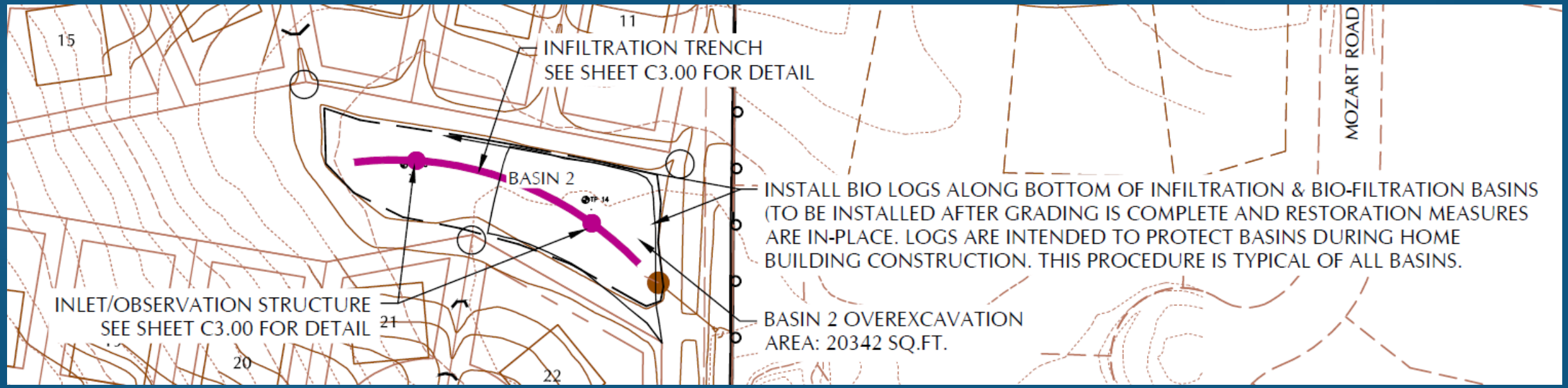
Typical Basin Construction



Sediment Control During Home Construction

- Bio-log barrier installed around Basins
  - Installed after grading and site restoration
  - Intended as another measure to protect Basins during home construction

Basin Bio-log Barrier Note Example



Groundwater Conditions vs. Basement Elevations

- Review of site soils indicated no restrictions were needed on basement elevations

Form A – Soils & Groundwater Eval. Form

Wisconsin Dept. of Safety and Professional Services
Division of Safety and Buildings

SOIL EVALUATION - STORM
in accordance with SPS 382.365 & 385, Wis. Adm. Code

Page 1 of 3

Attach complete site plan on paper not less that 8 1/2 x 11 inches in size. Plan must include, but not limited to: vertical and horizontal reference point (BM), direction and percent slope, scale or dimensions, north arrow, and BM referenced to nearest road.

Please print all information.

Personal information you provide may be used for secondary purposes (Privacy Law, s. 15.04 (1) (m)).

County: Waukesha
Parcel I.D.:
Reviewed by: Date:

Property Owner	Property Location
Neumann Companies, Inc.	Govt. Lot SW 1/4 Section 11, T 7 N, R 18 E

Property Owner's Mailing Address	Lot #	Block #	Subd. Name or CSM#
N27 W24075 Paul Court, Suite 200			Woodridge Estates

City	State	Zip Code	Phone Number	☐ City ☐ Village ☒ Town	Nearest Road
Pewaukee	WI	53072	(262) 542 9200	Delafield	North Shore Drive

Drainage area _____ ☐ sq. ft. ☐ acres
Optional:
Test Site Suitable for (check all that apply)
☐ Irrigation ☐ Bioretention trench ☐ Trench(es)
☐ Rain Garden ☐ Grassed swale ☐ Reuse
☐ Infiltration trench ☐ SDS (> 15' wide) ☐ Other _____

Hydraulic Application Test Method:
☒ Morphological Evaluation
☐ Double Ring Infiltrometer
☐ Other (specify) _____

1 Obs. # ☐ Boring ☒ Pit MES TP-1 Ground surface elev.1015.97 Depth to limiting factor >120 inches

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Roots	% Rock Frag.	Hydraulic App. Rate Inches/Hr.
1	0-12	10YR 3/3		sicl	0 cr	mfr	2 f	<15	0.63-2
2	12-36	10YR 5/4	f 2 d 7.5YR 5/6	sicl	2 m abk	mfi	1 f	<15	0.63-2
3	36-84	10YR 5/3	f 2 d 7.5YR 5/6	grsl	2 m abk	mfr		>15	2-6.3
4	84-120	10YR 5/4		grls	2 thick pl	ml		>15	6.3-20

2 Obs. # ☐ Boring ☒ Pit MES TP-2 Ground surface elev. 1011.51 Depth to limiting factor 72 inches

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Roots	% Rock Frag.	Hydraulic App. Rate Inches/Hr.
1	0-6	10YR 3/3		sicl	0 cr	mfr	2 f	<15	0.63-2
2	6-60	10YR 3/4	f 2 d 7.5YR 5/6	sic	2 m abk	mfi		<15	0.06-0.2
3	60-72	10YR 5/4		l	2 m abk	mfr		<15	0.63-2
4	72-108	10YR 6/4	c 2 d 10YR 6/1	sil	2 thin pl	mfr		<15	0.63-2
5	108-120	10YR 5/4		grs	0 sg	ml		>15	>20

CST/PSS Name (Please Print)	Signature	CST/PSS Number
Patrick J. Patterson		41631
Address	**Date Evaluation Conducted**	**Telephone Number**
821 Corporate Court, Suite 102, Waukesha, WI 53189	5/5/2014	262 521 2125

Any Questions?