



**Town of Greenville, Outagamie County, WI  
NOTICE OF THE SANITARY DISTRICT #2 MEETING**

**DATE:** Monday, February 11, 2019  
**TIME:** Immediately Following Sanitary District #1  
**LOCATION:** Greenville Town Hall, W6860 Parkview Drive, Greenville, WI 54942

**OPENING:**

- 1. Call to Order/Roll Call**

**PRESENTATIONS & PUBLIC FORUM:**

- 2. Public Hearings: NONE**

- 3. Presentations: NONE**

- 4. Public Comment Forum:**

*Members of the public are welcome to address the Sanitary District/Storm Water Utility. Individuals wishing to speak on an item (whether on the agenda or not) must sign in prior to the start of the meeting and may speak during the Public Comment Forum segment of the meeting. **This segment is placed early in the agenda so the public may make their comments prior to any discussion or action by the Sanitary District/Storm Water Utility.** Individual comments are limited to no more than three minutes each. The Public Input section is limited to a total of 15 minutes. Once the public input segment ends there will be no additional discussion from the audience. The Board may suspend this rule if deemed necessary.*

***Note regarding non-agenda Town related matters: Pursuant to WI Statutes 19.83(2) and 19.84(2), the public may present matters; however, they cannot be discussed or acted upon until specific notice of the subject matter of the proposed action can be given.***

**SANITARY DISTRICT #2 BUSINESS AGENDA:**

*Notice is hereby given that the Greenville Town Board may take action on any item listed within this agenda.*

- 5. Consent Agenda:**

*(Items on the Consent Agenda are routine in nature and require one motion to approve all items listed. Prior to voting on the Consent Agenda, items on the Consent Agenda may be removed at the request of any Supervisor and addressed immediately following the motion to approve the other items on the Consent Agenda.)*

- a. Approval of Regular Sanitary District #2 Meeting Minutes, January 14, 2019
- b. Approval of February 2019 Sanitary District #2 Vouchers.
- c. Routine Reports.
  - i. Stormwater Superintendent

- 6. Unfinished Business for Discussion & Possible Action: NONE**

**7. New Business for Discussion & Possible Action:**

- a. Season Fields Subdivision Mini-Storm Concepts Design.

**CLOSING:**

**8. Adjournment**

Wendy Helgeson, Town Clerk  
Dated/Posted: February 7, 2019



**Town of Greenville, Outagamie County, WI  
SANITARY DISTRICT #2 MEETING MINUTES**

**DATE:** Monday, January 14, 2019  
**TIME:** Immediately Following Sanitary District #1  
**LOCATION:** Greenville Town Hall, W6860 Parkview Drive, Greenville, WI 54942

**OPENING:**

**1. Call to Order/Roll Call**

The meeting was called to order at 6:33 p.m.

PRESENT: Jack Anderson, Dean Culbertson, Andy Peters, Mark Strobel, Mike Woods

**PRESENTATIONS & PUBLIC FORUM:**

**2. Public Hearings: NONE**

**3. Presentations: NONE**

**4. Public Comment Forum:**

*Members of the public are welcome to address the Sanitary District/Storm Water Utility. Individuals wishing to speak on an item (whether on the agenda or not) must sign in prior to the start of the meeting and may speak during the Public Comment Forum segment of the meeting. **This segment is placed early in the agenda so the public may make their comments prior to any discussion or action by the Sanitary District/Storm Water Utility.** Individual comments are limited to no more than three minutes each. The Public Input section is limited to a total of 15 minutes. Once the public input segment ends there will be no additional discussion from the audience. The Board may suspend this rule if deemed necessary.*

***Note regarding non-agenda Town related matters: Pursuant to WI Statutes 19.83(2) and 19.84(2), the public may present matters; however, they cannot be discussed or acted upon until specific notice of the subject matter of the proposed action can be given.***

Motion by Jack Anderson, second by Mark Strobel to close the public comment forum.

Motion carried 5-0.

**SANITARY DISTRICT #2 BUSINESS AGENDA:**

*Notice is hereby given that the Greenville Town Board may take action on any item listed within this agenda.*

**5. Consent Agenda:**

*(Items on the Consent Agenda are routine in nature and require one motion to approve all items listed. Prior to voting on the Consent Agenda, items on the Consent Agenda may be removed at the request of any Supervisor and addressed immediately following the motion to approve the other items on the Consent Agenda.)*

- a. Approval of Regular Sanitary District #2 Meeting Minutes, December 17, 2018
- b. Approval of January 2019 Sanitary District #2 Vouchers.
- c. Routine Reports.
  - i. Stormwater Superintendent

Motion by Mark Strobel, second by Jack Anderson to approve the consent agenda.

Motion carried 5-0.

**6. Unfinished Business for Discussion & Possible Action: NONE**

**7. New Business for Discussion & Possible Action: NONE**

**CLOSING:**

**8. Adjournment**

Motion by Jack Anderson, second by Mark Strobel to adjourn. Motion carried 5-0.  
Meeting adjourned at 6:34 p.m.

Wendy Helgeson, Town Clerk  
Approved:



TOWN OF GREENVILLE

Payment Approval Report - Stormwater unpaid invoices  
Report dates: 1/15/2019-2/11/2019Page: 1  
Feb 06, 2019 02:28PM

Vendor	Vendor Name	Invoice Number	Description	Net Invoice Amount
<b>Bassett Mechanical</b>				
155	Bassett Mechanical	6034563C	maintenance contract	164.20
Total Bassett Mechanical:				164.20
<b>BMO Harris Bank N.A. - Payments</b>				
5203	BMO Harris Bank N.A. - Payment	TOWN STMT	acct# 5112 7700 0002 3400	206.59
5203	BMO Harris Bank N.A. - Payment	TOWN STMT	acct# 5112 7700 0002 3400	38.74
5203	BMO Harris Bank N.A. - Payment	TOWN STMT	acct# 5112 7700 0002 3400	69.83
5203	BMO Harris Bank N.A. - Payment	TOWN STMT	acct# 5112 7700 0002 3400	29.39
Total BMO Harris Bank N.A. - Payments:				344.55
<b>Cenex Fleetcard</b>				
229	Cenex Fleetcard	170296CL	acct# 3766763	87.71
Total Cenex Fleetcard:				87.71
<b>City of Green Bay</b>				
5891	City of Green Bay	116139	equip rental / mastic	900.00
Total City of Green Bay:				900.00
<b>Civic Systems, LLC</b>				
245	Civic Systems, LLC	CVC17687	50% down pymt	2,205.00
Total Civic Systems, LLC:				2,205.00
<b>Complete Office</b>				
204	Complete Office	11686	office supplies	3.16
204	Complete Office	14299	office supplies	14.08
204	Complete Office	17090	office supplies	9.37
204	Complete Office	20691	office supplies	22.50
204	Complete Office	5905	office supplies	9.73
204	Complete Office	7294	office supplies	7.35
Total Complete Office:				66.19
<b>Marco</b>				
687	Marco	INV6000025	town hall copies	46.67
Total Marco:				46.67
<b>Minnesota Life Insurance Co</b>				
663	Minnesota Life Insurance Co	002832L FEB2	policy # 002832L	7.39
Total Minnesota Life Insurance Co:				7.39
<b>NEWSC</b>				
690	NEWSC	1710	2019 membership	1,100.00
Total NEWSC:				1,100.00
<b>Office Technology Group</b>				
5238	Office Technology Group	221930	IT Service contract	149.60

Vendor	Vendor Name	Invoice Number	Description	Net Invoice Amount
Total Office Technology Group:				149.60
<b>Postmaster</b>				
758	Postmaster	STAMPS JAN	stamps (1000 @ .50)	250.00
Total Postmaster:				250.00
<b>Proclean Janitorial Services,</b>				
764	Proclean Janitorial Services,	STMT JAN201	Cleaning for Jan2019	218.76
Total Proclean Janitorial Services,:				218.76
<b>Revize LLC</b>				
5441	Revize LLC	7641	annual sftwr,tech supp,updates,web host	290.00
Total Revize LLC:				290.00
<b>Speedy Metals</b>				
928	Speedy Metals	4765920-NB	steel-culvert trailer	567.00
Total Speedy Metals:				567.00
<b>Time Warner Cable</b>				
1021	Time Warner Cable	708075801011	10404-708075801	47.86
1021	Time Warner Cable	708130301011	10404-708130301	6.05
1021	Time Warner Cable	715640501010	10404-715640501	7.18
1021	Time Warner Cable	603810901012	10404-603810901	86.17
Total Time Warner Cable:				147.26
<b>Verizon Wireless</b>				
1108	Verizon Wireless	9821378887	acct#685970983-00001	46.71
1108	Verizon Wireless	9821378887	acct#685970983-00001	68.05
1108	Verizon Wireless	9821378888	acct#685970983-00002	19.15
Total Verizon Wireless:				133.91
<b>WE Energies</b>				
1135	WE Energies	3871142632 J	grp bill# 3871-142-632	244.75
1135	WE Energies	5254287230 D	strmwtr grp bill# 5254-287-230	72.68
Total WE Energies:				317.43
<b>YMCA of the Fox Cities</b>				
1205	YMCA of the Fox Cities	CM10098	corp program memberships jan2019	19.00
Total YMCA of the Fox Cities:				19.00
Grand Totals:				7,014.67

**MEETING:** Town Board  
**DATE:** February 11, 2019

**AGENDA ITEM #:** SD2 - 5ci  
**ACTION TYPE:** Discussion Only



*"Town of Greenville"*

## AGENDA MEMORANDUM

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**To:** Honorable Town Chairperson and Town Supervisors  
**From:** Chris Pagels, Stormwater Superintendent  
**Date:** February 11, 2019  
**RE:** Stormwater Superintendent Report

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**ACTION TYPE:** All items discussion only.

**BACKGROUND & SUMMARY:** This report lists the items that were worked on or completed during the month of October:

1. MS4 Report writing. End of February Board Submittal.
2. Airport Credit Report/Documentation. End of February Stormwater Committee Board Submittal.
3. Season Fields Subdivision Mini Storm. See agenda item.
4. Greenville elementary Basin. Waiting for boring report, but have some preliminary soils data and leaking/bank slumping that is occurring. Working with site engineer on appropriate fix.
5. Migrating files to electronic format to conform to Town policy standards. Compiling and locating old files from multiple locations across Town offices/buildings.
6. Submitted Spring Road Dredging to DNR under local Road program. This action does not have any permit fees. Once permit obtained, it will then apply for a County Conditional Use Permit.
7. Submitted inquiry for Sunnyvale Road just east of Fairwinds. Significant bank undercutting on the road fore-slope (almost under pavement) is occurring as the stream meanders. The plan is to install large rip-rap to stabilize the area. Stream is considered non-navigable, but protocol is to first send inquiry if DNR has any issues.
8. Dredging permit application for Everglade phase 2 and 3 will likely have already been submitted.
9. Working on final completion of Community Park Dredging application. Decision was made to dredge entire extent as recent inspections revealed significant cattail blockages is occurring.
10. Discussing with DNR rep about Town submittal to apply for a future planning grant for upcoming TMDL implementation on the Rat River and Bear Creek Watersheds. This pre-application discussion is required before applying. I'll be putting together a proposal for review by the end of February or early March Board Meeting.
11. Some limited ROW tree and brush cutting for drainage occurred. Extreme cold/Ice and Snow events limited time spent on this activity.

12. Putting together RFP for Town Owned Stormwater Ponds, Managed Natural Landscapes and Stream Spraying.

#### **Action Items:**

1. **Pebble Ridge Retention Pond:** This project will be a part of a larger plan to fix Pebble Ridge Pond Flooding issue, comply with water quality requirements and to correct flooding near Zebra Tech off of Levi Drive which occurred in early September. An on-site meeting will take place in early October to discuss all options and begin preliminary concepts for corrective action. All grant opportunities will be explored for part or in whole. **Updated (Nov)** discussed with Cedar Corp of the many issues and opportunities to meet objectives. Had some preliminary discussions with the Outagamie County Drainage Board on their future policy implementation regarding fees. This project is temporarily postponed until a Drainage District flood study is completed by Outagamie County consultant OMNNI. This study may or may not have an impact on the proposed Town's project.
2. **TMDL for Lake Winnebago, Upriver Pool Lakes and Fox/Wolf Rivers:** (Dec) Updated. I just recently learned about the kind of wasteload allocations that are going to be implemented for the Rat River/Bear Creek (Everglade Swamp) Watersheds. This also happens to be where most of our residential development is located. I will be attending some workshops/meetings to gather information, but I will say it appears this is the next evolution of stormwater that is being forced down. Similar to the early 2000's when we went from no water quality requirements to wet ponds. I hope to have some information for the January meeting, but with the Holidays coming up February is most likely.
3. **STH 15 Dry Pond:** in preliminary study/design, renewed discussions with DNR over Act 183. **Updated (Dec)** All topo work complete. Some of the wetlands to be submitted under the new DNR wetland legislation that took effect July of 2018.
4. **Retention Ponds East of CTY CB:** Part of the Design Drive TIFF project. Still in design process. (Nov) See Community Development Director for additional information regarding potential development opportunities. **(Dec) Updated: McMahon continues to design pond that will meet DNR and County requirements.**
5. **DNR Permitting projects:** See STH 76 drainage mentioned in this document.
6. **Community Park Drainage (Dec) Updated:** cattail growth over the past year is going to cause blockages behind the ballfields. I'm submitting permits to dredge the entire reach of stream.
7. **Rain Gardens on Fairwinds Drive: (Dec) Updated:** Complete. Payment voucher submitted.
8. **Rain Gardens Public Works Site: (Dec) Updated:** All infrastructure in. Site went from wet muck straight to completely frozen. Will complete landscaping in spring of 2019.
9. **Lions Park Drainage Correction (western boundary):** To be completed by Town Park staff. **Updated (Nov)** I will be marking off stone water velocity check dams to reduce erosion within the ditch. This area is from the newer storage barn south to the pond. To the north of the storage barn the conditions are like a bog from all the fall rains. We fully expect the northern portion of the project will have to wait until spring along with all the turf damage from the Craft Fair event.
10. **Sports Complex Drainage Correction:** DOT has questions and would like Park Master Plan with the amount of storm water coming to STH 96 roadside ditch. **Update: Rettler presented another concept plan for review.**

11. **Season Fields Subdivision mini storm:** (Dec) Update: All topo work for entire project area complete. Planning Locate for all Utilities complete. See agenda item
12. **Country Meadows Pond & Pro-Build Dry Basin (pond west of Post Office on Everglade, dry basin just east of Pro-Build buildings):** Updated (Dec) All topo work completed. Wetlands to be submitted to DNR for exemption as man-made under new DNR wetland rules that took effect July of 2018.
13. **Greenville Elementary School detention Basin Repair:** Discussed with Hortonville School District of problem. Engineer is determining if liner, berm reconstruction or some other fix is necessary for repair of water leaking through north berm during storm events. Site work to lead to a corrective action and implementation plan and stamped by an engineer. The berm in question acts much similar to a dam or levee that has a lot of stress placed upon it when full. The issue arises when the small leaks can lead to larger leaks that ultimately result in a catastrophic failure or breach during a large storm event when the basin is full. This scenario can lead to potential private and Town infrastructure damage such as homes flooding and road washouts. **Updated (Jan) Have preliminary soils data. Waiting for full report.**
14. **Heavenly Drive Drainage issue:** This area received flooding and the Board approved reconstructing a berm/swale modification to prevent water from outside the subdivision from getting into basement window wells and around the foundations of homes. **Updated (Dec) Attempted to start project. A combination of water/soil moisture and very cold temps prevented starting the project. This will get moved to spring of 2019.**
15. **W6564 Quality Drive (Qcomp):** (Dec) It appears drainage modifications were performed at N982 Craftsman Drive sometime in the past that does not allow drainage water to make it to the Town owned Pebble Ridge Stormwater Pond. The Town will meet with property owners to re-establish drainage as storm water backups are occurring in the Town Road Right of Way during storm events that also back up and into a parking lot. It appears that a culvert still exists on the south entrance to N982 Craftsman Drive, though it's buried. The town will pothole/hydraulic dredge in spring to find the culvert inverts. We energies will have to be contacted. They just installed new gas facilities that most likely would be negatively impacted if drainage was restored.

Upcoming Town led Stormwater Utility during February.

1. Easement and right of way brushing/tree removal.
2. Permitting (DNR)
3. RFP for pond, natural managed landscapes, spraying(chemical control) of vegetation
4. Ordinance Updates

**STAFF RECOMMENDATION:** N/A

**POLICY/PLAN REFERENCE(S):** Town of Greenville Municipal Code: Chapter 37-8B(4) Responsibilities to the Town Board.

**FISCAL IMPACT:** N/A

**Attachments:** N/A

**MEETING:** Town Board  
**DATE:** February 11, 2019

**AGENDA ITEM #:** SD2 - 7a  
**ACTION TYPE:** Approval/Denial



*"Town of Greenville"*

## AGENDA MEMORANDUM

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**To:** Honorable Town Chairperson and Town Supervisors  
**From:** Chris Pagels, Stormwater Superintendent  
**Date:** February 11, 2019  
**RE:** Season Fields Subdivision Mini-Storm Concepts Design

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**ACTION TYPE:** Approval/Denial

**BACKGROUND & SUMMARY:**

Season Fields Subdivision is a rural road development originally constructed in 2003. Significant development did not take off until around 2013-14, the subdivision did not fill out with new homes until 2017-18. As more and more homes were constructed, sump pump discharges started to take a noticeable effect as the water was always present and cattails started growing where there were originally dry ditches.

Wet ditches are not unique rural road sections. In fact, it is very common and a problem for most rural communities. Wet ditches cause mostly aesthetic issues with property owners who have a high standard of property maintenance and pride in their neighborhood. The constant problems wet ditches bring to Town in the form of complaints and increased maintenance costs over time led previous Town Boards to go to a curb and gutter with storm sewer profile. While this will work in the Sanitary District with sewer and water with homes on about a third of an acre of land, curb and gutter with storm sewer is not typically or economically viable on acre plus country lots.

There is a naturally high groundwater table in the area. When the land was cropped in agriculture, the "low spots" were drained via perforated tile lines to carry excess water away and lower the water table to allow crops to grow and thrive. As the construction process increases and trees planted, the original tile lines become non-functional over time. The only method of draining the excess ground water is through the home basement foundation where there is perforated tile lines surrounding the outside wall that is directed to the sump pit. The water from the sump pit is then discharged to the roadside ditch.

Sub-surface ground water elevations are the result of precipitation events such as rain and snow that is not taken up by plants (transpiration) or by evaporation. Another method water is entering into the ground is via the private on-site waste treatment systems. This subdivision is not within the Greenville

Sanitary District for sewer and water. This excess water can then make it over to a home's basement drain tile and is pumped up and into the roadside ditch.

As water has increased within the ditches of Season Fields Subdivision, the complaints to Town staff have increased in frequency. It was an aesthetic issue until the winter of 2017-18 where the Town was called out on three separate occasions of blocked culverts from ice and water flowing over the centerline of Summer View Drive that had iced up as temperatures dropped below freezing at night. This created a safety hazard and a significant maintenance expenditure and multiple pieces of equipment such as dump trucks, front end loaders, skid steer and loads of salt had to be used each time this type of event happened.

### **Summary**

An attached Study by Cedar Corp was conducted into examining the viability of a mini-storm concept to install a small diameter pipe to each lot within the subdivision that would connect into where the sump pump pipe discharges into the roadside ditch. By installing a sump pump only mini storm system, this would help keep the ditches in a much dryer state that would appeal to the aesthetic view of the neighborhood. From a Town Stormwater Utility Standpoint, there would be benefits as well. Typically, ditches that are excessively wet (like season fields) need maintenance on a 7-year interval due to cattail accumulation and residents eventually giving up on maintenance. This situation is apparent in many of the older sections of Town where there is not an underdrain in the ditch line. Another benefit is that when the ditches are dry, there is additional capacity in the first part of a storm event to infiltrate reducing the stormwater volumes and some peak (flood) flow issues. The final benefit is to comply with the impending TMDL or Total Mass Daily Load, Section 303 Federally listed impaired waterway regulations (Rat River). This subdivision was originally modeled as a wet pond AND using grass ditches to treat stormwater to meet water quality goals as established by DNR and EPA. Some ditches that are constantly wet will not get credit under the current rules and thus the TSS/Phosphorous reductions will have to be made up in another fashion.

**This Mini Storm Sewer Concept Study is meant to satisfy residents requirement to fully enjoy their neighborhood while also realizing there are benefits to the Town as well.**

**STAFF RECOMMENDATION:** For the Greenville Sanitary District Board to provide direction to staff on the study prepared by the Town's Engineer. This will include: (1) Whether the Town should continue with further designing of the project. (2) What methods of financing the Town use to support the project (Utility vs. Special Assessment). (3) Whether staff should schedule a meeting with area residents to discuss the study, to gather feedback and a preferred direction.

**POLICY/PLAN REFERENCE(S):** Town Purchasing Policy – Adopted August 2017



**FISCAL IMPACT:**

**Option 1:** is estimated to be approximately \$455,650 (see plan for additional details) Mini Storm on both sides of road.

**Option 2:** is estimated to be approximately \$420,550 (see plan for additional details) Mini Storm on one side of road.

**Stormwater Utility budget includes \$80,000 in 2020 for this project as part of 2019-2020 Town of Greenville Capital Improvement Plan.**

**Attachments:**

- 1. Cedar Stormwater Study**
- 2. Stormwater Budget**
- 3. Photos of Ice Event**

**DATE:** January 21, 2019

**TO:** Joel Gregozeski, Administrator  
Brian Rickert, P.E., Director of Public Works  
Chris Pagels, Storm Water Utility Superintendent  
Town of Greenville

**FROM:** Thad Majkowski, P.E.  
Justin Keen, P.E.

**REGARDING:** Season Fields Storm Water Study

**PROJECT #** 5992-0009

**DRAFT**

## INTRODUCTION

Season Fields Subdivision is a single-family rural residential subdivision located off School Road between Julius Drive and North Road in the Town of Greenville. (See Appendix A for a location map.) The subdivision was originally constructed in 2003, but only a few homes were constructed in the first 10 years due to the housing market. From 2014 to 2017, the subdivision started filling up with newly constructed homes. In 2016–2017, the drainage problems became more widespread in the subdivision ditches. Now there is additional water in the ditches due to the excessive sump pump flows from the houses.

The standing water was considered a nuisance problem for the last several years by the Town, although it did not affect the overall health and safety of the residents. The standing water creates problems with mowing and contributes to unappealing areas of heavy vegetation in the ditches. In the winter of 2016–2017, more severe problems started occurring. The standing water created problems with freezing culverts and caused water to overtop the road and freeze on the asphalt pavement causing safety concerns for vehicles. The Town staff was called to the subdivision on three separate occasions to remove 6”–8” of ice on the roadway. The intent of this Study is to evaluate the options available to decrease the water in the roadside ditches in order to reduce problems with ice in the winter.

## SCOPE OF SERVICES

The scope of services included a field survey of the roadways, ditches, and culverts in the subdivision. The existing drainage basins and stormwater plans were reviewed to determine if the construction was in conformance with the plans. The key driveway and crossroad culverts were modeled to determine the capacity and evaluate whether any culvert sizes were causing the drainage problems. A mini-storm sewer system was evaluated to determine if it is cost-effective to construct the system to minimize the additional water present in the ditches. Finally, cost estimates were prepared in order to evaluate the most cost-effective option and to allow for future planning and possible cost responsibilities of the property owners.

## **EXISTING CONDITIONS**

Season Fields Subdivision consists of 33 single-family residential lots along Summer View Drive and Winds End Lane. As stated earlier in the Study, this subdivision was constructed in 2003, but there has been rapid house construction only since 2014. At the time of this Study, there was only one undeveloped lot remaining in the subdivision.

The majority of the stormwater flows from the north end down to a stormwater facility (wet pond) on the south end of the subdivision. (See the Recorded Plat Map and Aerial Map in Appendix B.) All stormwater is carried via ditch and culverts. The stormwater facility discharges to a 30" crossroad culvert in the School Road ditch.

The subdivision roadways each have a PASER rating of 7 according to the latest ratings conducted in 2017. A rating of 7 means that the road asphalt pavement is in good condition, but is starting to show signs of aging. A full roadway reconstruction project is not necessary now; therefore, we recommend any storm sewer work to be completed with directional boring, if cost-effective, to minimize open cutting of the roadway/driveways.

## **PROBLEM AREAS**

### *Excessive Sump Pump Flows*

The subdivision has excessive sump pump flow discharges into the roadway ditches. This is due to high groundwater elevations naturally occurring in the subdivision. The high groundwater level creates conditions where the sump pump is constantly pumping groundwater from around the house foundation.

Another issue compounding the high groundwater level is that there is no municipal sanitary sewer service in this subdivision. All homes have private onsite wastewater treatment systems. The majority of the treatment systems are mound systems in the backyards due to the soil types and high groundwater level. The wastewater is treated on each site, but every time water goes down the drain, it eventually flows back into the groundwater system. This creates more groundwater that gets into the home's sump pump system and is then discharged to the roadside ditch.

### *Standing Water*

The roadside ditches in the subdivision have standing water problems in almost all areas of the subdivision. (See Appendix D for the original Season Fields Drainage Plans.) The standing water is due to the excessive sump pump flow as described above and longitudinal ditch slopes that are less than 1% slope in certain parts of the subdivision. The subdivision drainage plan also has stormwater from the backyards draining to the roadside ditches. The standing water in the ditch makes mowing and maintenance of the ditch more difficult and unmanageable at certain times of the year. (See Appendix E for site photos of the subdivision.)

The standing water also creates conditions that promote the growth of heavy vegetation like cattails and phragmites. The heavy vegetation slows down the flow of the water, which makes conditions worse and promotes more vegetation growth. Once the ditches cannot be managed and heavy vegetation takes over, it gets very difficult to correct the problems without heavy equipment or specialized herbicide treatments. Cattails and phragmites may also require special permits and wetland delineations to remove them or dispose of them offsite. All maintenance and cleaning of the roadside ditches has been the responsibility of the property owners in the subdivision. The Town has not completed any ditch cleaning or maintenance work in the Season Fields Subdivision.

#### Road and Culvert Ice Problems

The standing water in the roadside ditches creates problems with freezing culverts and has caused water to overtop the road and freeze in the past. When there is standing water in the ditch, it creates areas of frozen water. The sump pumps continue to run upstream which contributes more water. This freezing can happen in the ditches, but is more troublesome when it occurs in the culverts. A frozen culvert traps all water in the ditch upstream and does not thaw out as fast as water in the ditch. Eventually, the water will back up in the ditch and overtop the roadway. Once the water moves across the roadway, it can freeze on the road and cause safety concerns for the residents. The Town had to respond to the subdivision concerns on three separate occasions to remove 6”– 8” of ice on the roadway during the winter of 2016–2017.

## **SOLUTIONS**

#### Mini-Storm Sewer System

A mini-storm sewer system is a way to convey water from the sump pumps through a storm sewer instead of discharging it to the ditch. This type of system consists of constructing a mini-storm sewer pipe (6”–12” typical) in the ditch back slope, which connects to all the sump pump discharge pipes from the homes. This system would take all the groundwater that is discharging from the sump pumps and convey it via a pipe downstream instead of to the current ditch system. The existing ditches will remain in place, but are only used to convey the stormwater from rain events. The ditches will not be filled in like an urbanized road with curb and gutter.

#### Culvert Replacement

The culverts in the subdivision were modeled to determine if any culverts are causing the stormwater to back up due to insufficient capacity or installation issues. If a culvert has insufficient capacity, it may cause drainage problems upstream because it is too small to convey the stormwater. If a culvert is flat or back-pitched, it may also cause drainage issues in the ditch upstream because it has no slope or insufficient pipe slope to convey the stormwater through the pipe. If the insufficient capacity or installation issues are severe, it could cause the ditches to back up and raise the water elevations in the ditch. The stormwater may eventually overtop the roadway. In cold temperatures, the water can freeze and cause problems with ice.

### Rain Gardens

Rain gardens are small depressions created in the ditch or drainage easement to treat stormwater by promoting infiltration of the stormwater rather than just conveying the stormwater downstream. A rain garden will not directly stop the excessive water flow in the ditches, but it can help alleviate some of the drainage problems by infiltrating a portion of the water. There have been other projects in the Town where rain gardens have been installed in key locations throughout a subdivision or in the roadside ditches. While infiltration is typically encouraged to help treat stormwater, in this case a rain garden is being dismissed because of the excessive groundwater present in this subdivision.

## **RESULTS**

### Mini-Storm Sewer System

The subdivision was evaluated for a proposed mini-storm sewer system. The mini-storm sewer system may be configured in two ways. The pipe may be installed in the ditch back slope on both sides of the road or it may be installed on one side with lateral crossings in the roadway every 200'–300'.

The mini-storm sewer system may be installed with either configuration on the upstream end of the subdivision, which is north and west of the Summer View Drive and Winds End Lane intersection. There is adequate roadway slope and cover over the proposed pipe for the mini-storm sewer system to function properly.

There are design issues near the south end of the subdivision that must be evaluated further in the design phase of the project. The ditches are flatter at the southern end of the subdivision. Therefore, the cover over the pipe will be critical in the design of the mini-storm sewer system. Roadway crossings will need to be minimized to prevent freezing. See Appendix H for a schematic of the two mini-storm sewer system configurations and proposed placement of the storm sewer.

The flat ditches and minimal cover available over the pipe make it impossible to bypass the stormwater facility and discharge directly to the School Road ditch at the Summer View Drive intersection. The School Road ditch elevation is higher than the ditch elevation in Summer View Drive near the stormwater facility. This does not make it feasible to bypass the stormwater facility with the discharge from the sump pumps. Therefore, all mini-storm sewer will discharge to the stormwater facility.

There is an alternative option that may be further evaluated in the design phase. This option may require easements from property owners to work effectively. The alternative option consists of constructing the mini-storm sewer discharge pipe along the north property line of the stormwater pond or along the north property line of Lot 1, N1323 Summer View Drive. The discharge pipe could be constructed along the west property line of the subdivision and bypass the stormwater management facility. The discharge pipe would daylight at the School Road ditch and would drain to the existing crossroad culvert. This alternative option will benefit the stormwater facility by removing excess stormwater from the system. The

stormwater facility is typically not designed for the sump pump discharges. The sump pump discharge is considered clean water and therefore does not require treatment from the stormwater management facility. See Appendix G for a sketch of the proposed alternate discharge locations for the mini-storm sewer system.

### Culvert Analysis and Capacity

Season Fields Subdivision had a drainage plan, completed by others, when it was initially constructed which provided the minimum culvert sizes required for each lot. See Appendix D for the original Drainage Plan and see Appendix I for the Culvert Hydraulic Analysis and Results.

The culvert capacities were calculated for key driveway culverts and crossroad culverts throughout the subdivision. The stormwater flows in the ditch during a 5-Year and 10-Year storm event were calculated. The flows were compared to the capacity of the culverts. See Table 2-2 in Appendix I for details.

All modeled culverts passed a 5-Year storm event, except for Lot 27. After further review, it was determined that Lot 27 has a 15" CMP driveway culvert currently installed instead of the 18" CMP as required in the drainage plan. A review of the drainage plan indicates that there is an existing detention basin in the backyard easement behind Lot 27. A preliminary analysis was completed for this Study regarding the stormwater detention provided in the basin. The stormwater discharge calculated from the detention basin is an estimated flow based on approximate data. The estimated flow will need to be verified in the design phase of the project in order to determine the amount of stormwater passing through the Lot 27 culvert.

The sizing results indicate that Lots 27–30 do not pass a 5-Year storm event with an 18" driveway culvert. A larger culvert may be required to pass a 5-Year storm event. A more detailed survey of the detention basin in Out-lot 3 shall be completed prior to recommending any culvert replacements in Lots 27–30.

### Preliminary Cost Estimates

See Appendix K for preliminary cost estimates for a mini-storm sewer system to be constructed.

## **RECOMMENDATIONS**

Our recommended course of action is for the Town of Greenville to review the Study and evaluate the benefits of each option with the associated costs in order to make the most cost-effective decision. The Capital Improvement Plan should be reviewed to determine a schedule of the proposed improvements. Upon review of the Capital Improvement Plan, a Public Informational Meeting should be held to present the options to the residents and get their feedback regarding the proposed improvements.

Based on the feedback received at the Public Informational Meeting, the total project costs can be determined based on the options available. The Town will need to review the policy for allocation of costs to residential properties that may be necessary to fund this project based on the total project cost.

Cedar Corporation can be present at a Town Board meeting, if requested, to review and answer any questions the Board may have regarding this Study and next steps that will need to be completed.

## **LIST OF APPENDICES**

Appendix A: Location Map

Appendix B: Plat Map/Aerial Map

Appendix C: PASER Information

Appendix D: Season Fields Subdivision – Original Drainage Plans

Appendix E: Site Photos

Appendix F: Plan – Profile Sheets Option A

Appendix G: Mini-Storm Sewer Alternate Discharge Options

Appendix H: Typical Section/Cross section of Mini-Storm Location and Laterals

Appendix I: Culvert Modeling Hydraulic Analysis and Evaluation

Appendix J: Rain Garden Evaluation

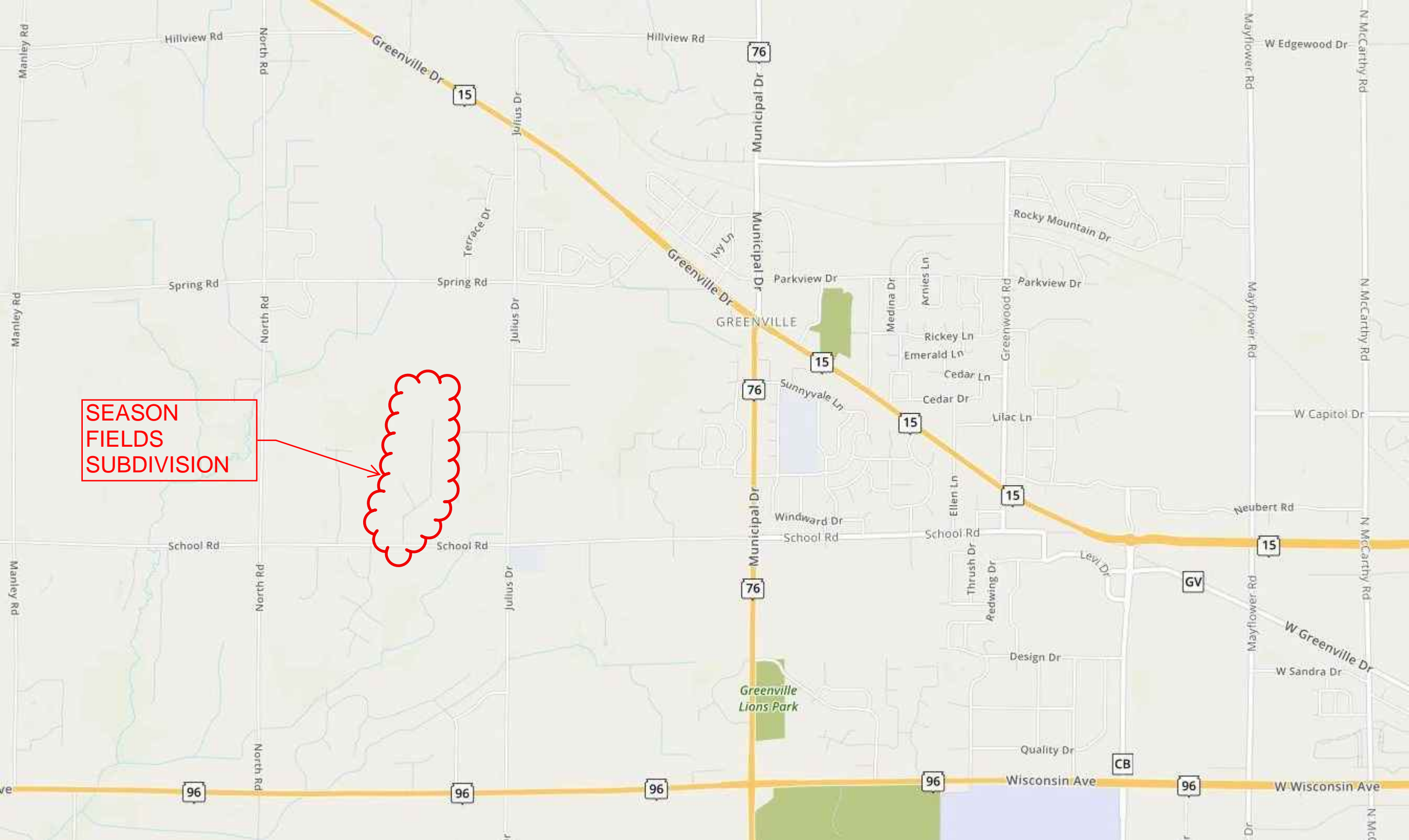
Appendix K: Preliminary Cost Estimates



## **Appendix A**

### **Location Map**

SEASON  
FIELDS  
SUBDIVISION



## **Appendix B**

### **Plat Map/Aerial Map**






Legend

- Parcel Lines
- Display Parcel Lines
- Plat Boundary Lines

Season Fields Subdivision



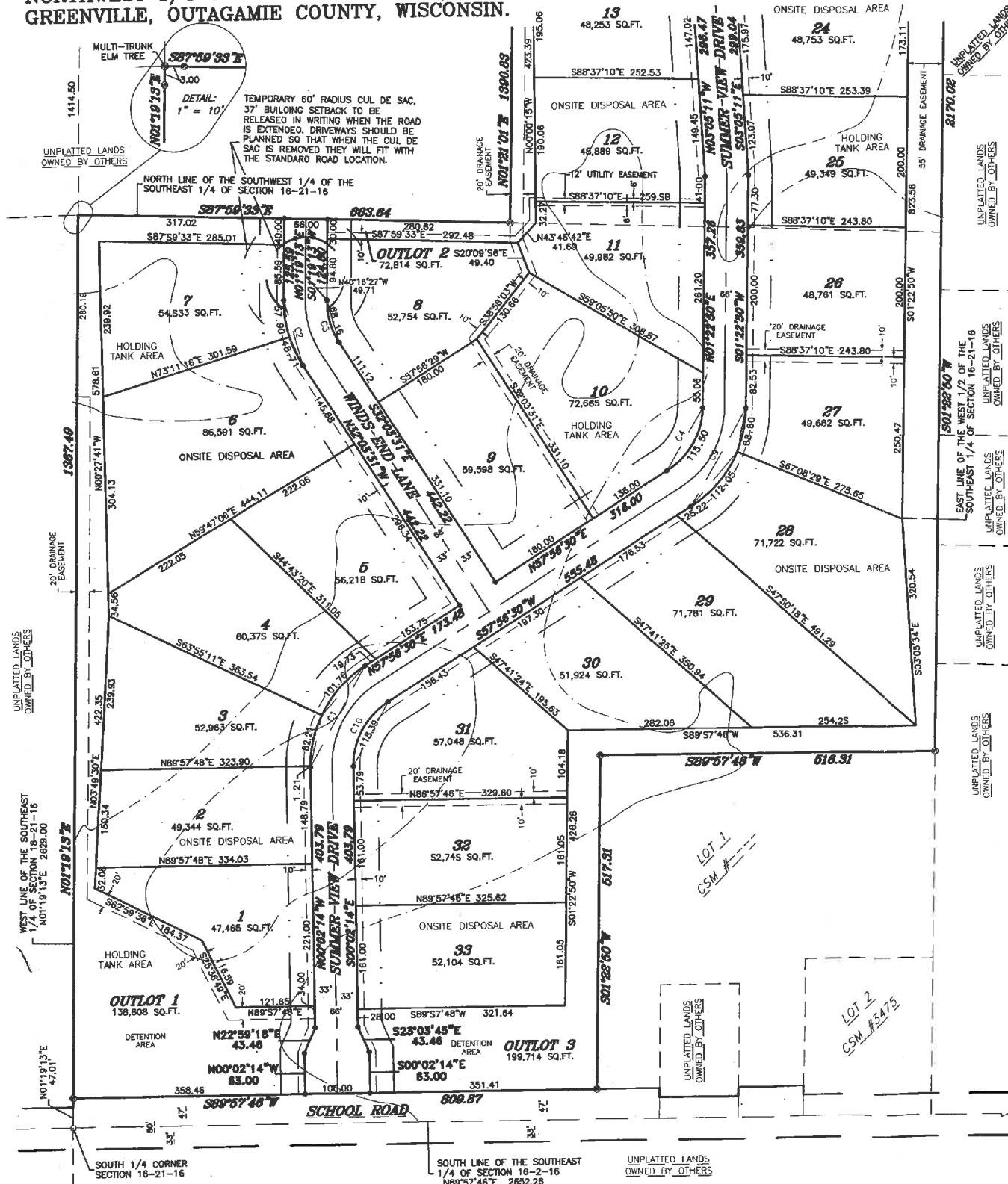
DISCLAIMER: This map is not guaranteed to be accurate, correct, current, or complete and conclusions drawn are the responsibility of the user.

Author:	
Date Printed: 01/17/19 9:19 AM	
Sources:	
 Ontagmie Land Information	



# SEASON FIELDS

BEING ALL OF LOT 2 OF CERTIFIED SURVEY MAP NUMBER 4521 AS RECORDED IN VOLUME 25 OF CERTIFIED SURVEY MAPS ON PAGE 4521, BEING PART OF THE NORTHWEST 1/4 OF THE SOUTHEAST 1/4 AND THE SOUTHWEST 1/4 OF THE SOUTHEAST 1/4 OF SECTION 16, TOWNSHIP 21 NORTH, RANGE 16 EAST, TOWN OF GREENVILLE, OUTAGAMIE COUNTY, WISCONSIN.



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BENCHMARKS WILL BE ESTABLISHED ON THE TAG BOLTS OF THE FIRE HYDRANTS AFTER UTILITY CONSTRUCTION HAS BEEN COMPLETED.

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GEOLOGIC DISCLOSURE STATEMENT:  
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## OUTLOT RESTRICTIONS AND COVENANTS

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4. MAINTENANCE EASEMENT. THERE SHALL BE AN AFFIRMATIVE DUTY TO MAINTAIN, PROTECT AND MANAGE OUTLOT 1 THROUGH 3 CONSISTENT WITH THE PURPOSE, PERMITTED USES AND STRUCTURES, AND PROHIBITED USES AND STRUCTURES ENUMERATED ABOVE. THE TOWN OF GREENVILLE SHALL HAVE THE UNQUALIFIED RIGHT TO ENTER UPON SUCH OUTLOTS FOR INSPECTION AND, IF NECESSARY, MAINTENANCE IN THE EVENT OF NON PERFORMANCE. TOWN MAINTENANCE COSTS SHALL BE EQUALLY ASSESSED AMONG THE OWNERS OF LOTS 1 THROUGH 33.

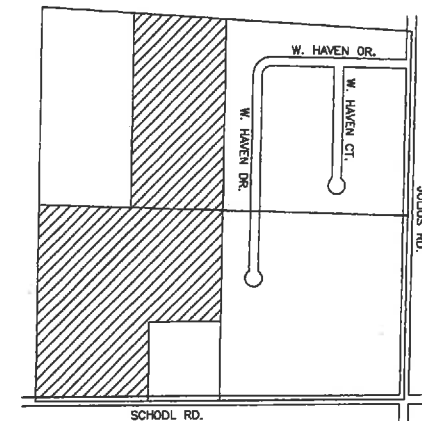
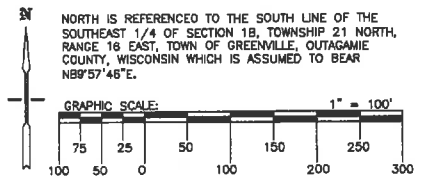
CURVE	LOT	RADIUS	CENTRAL ANGLE	ARC LENGTH	CHORD	CHORD BEARING	TANGENT BEARING
C1	2	183.00	57°58'44"	185.18	185.18	N28°57'08"E	N00°02'14"W N57°56'30"E
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	3	183.00	25°44'16"	62.21	N13°12'42"E	81.52	N00°20'34"E N26°04'50"E
	4	183.00	31°51'40"	101.78	N42°00'40"E	100.48	N26°04'50"E N57°56'30"E
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	8	183.00	15°15'08"	48.71	N24°25'58"W	48.57	N32°03'31"W N16°48'25"W
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C4	533.00	09°13'48"	89.88	N01°31'42"E	85.77	N03°05'11"W	N08°08'35"E
	13	533.00	05°12'38"	48.47	N00°28'52"W	48.46	N03°05'11"W N02°07'27"E
	14	533.00	04°01'08"	37.39	N04°08'01"E	37.38	N02°07'27"E N08°08'35"E
C5	487.00	10°18'08"	83.89	N01°00'32"E	83.58	N08°08'35"E	N04°07'31"W
	16	487.00	01°14'50"	10.18	N08°31'10"E	10.18	N08°08'35"E N04°53'45"E
	17	487.00	09°01'16"	73.53	N00°23'07"E	73.45	N04°53'45"E N04°07'31"E
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- LEGEND:
- = 1 1/4" X 24" SOLID ROUND #10 IRON REBAR SET, WEIGHING 4.303 LBS. PER LIN. FT.
  - ⊙ = 3/4" IRON REBAR FOUND
  - ⊙ = BERTINSEN MONUMENT FOUND
  - ⊙ = P.K. NAIL FOUND
  - Δ = RAILROAD SPIKE FOUND
  - ( ) = RECORDED AS

- 3/4" X 24" SOLID ROUND #8 IRON REBAR SET AT ALL OTHER LOT CORNERS, 1.502 LBS. PER LIN. FT.
- ALL DIMENSIONS COMPUTED AND MEASURED TO THE NEAREST 0.01 FOOT.
- ALL BEARINGS COMPUTED AND MEASURED TO THE NEAREST SECOND.

DENOTES 37' BUILDING SETBACK LINE UNLESS NOTED OTHERWISE

DENOTES 10' UTILITY EASEMENT UNLESS NOTED OTHERWISE



SHOWING THE SOUTHEAST 1/4 OF SECTION 16, TOWNSHIP 21 NORTH, RANGE 16 EAST, TOWN OF GREENVILLE, OUTAGAMIE COUNTY, WISCONSIN.

THIS INSTRUMENT DRAFTED BY:  
RICHARD D. DENIS  
CAROW LAND SURVEYING CO., INC.



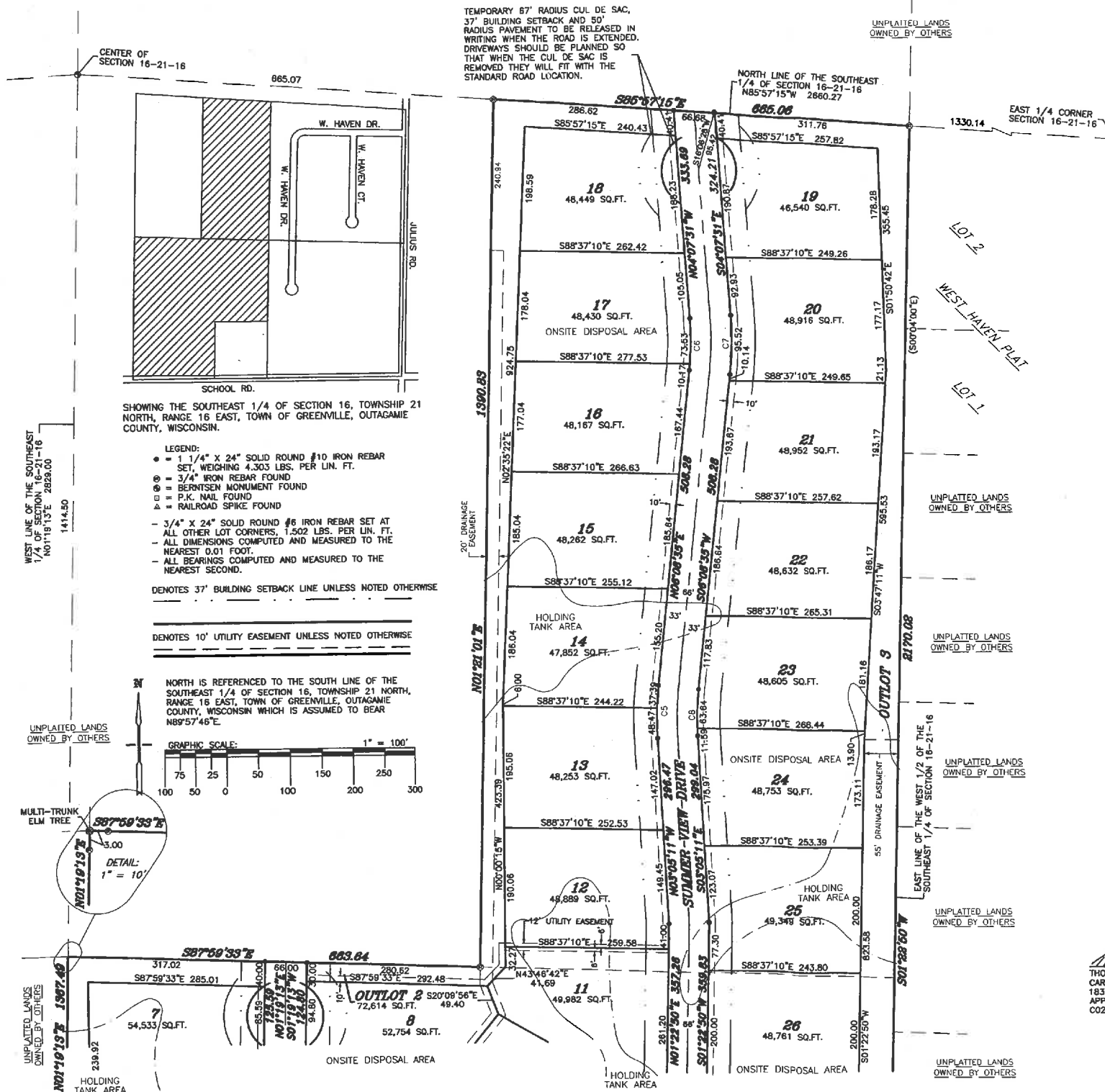
THOMAS F. HALVERSON, RLS-1445 DATED  
CAROW LAND SURVEYING CO., INC.  
1837 W. WISCONSIN AVE., P.O. BOX 1297  
APPLETON, WISCONSIN 54912-1297  
CO210.16FP  
REVISED THIS 17TH DAY OF JUNE, 2003

There are no objections to this plat with respect to  
Secs. 236.15, 236.16, 236.20 and 236.21 (1) and (2),  
Wis. Stats.

Certified JUNE 26, 2003  
*Renée M. Ray*  
Department of Administration

# SEASON FIELDS

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Thomas F. Halverson 4/24/03  
THOMAS F. HALVERSON, RLS-1445 DATED  
CAROW LAND SURVEYING CO., INC.  
1837 W. WISCONSIN AVE., P.O. BOX 1287  
APPLETON, WISCONSIN 54912-1287  
C0210.18FP



THIS INSTRUMENT DRAFTED BY:  
Richard D. Denis  
CAROW LAND SURVEYING CO., INC.

There are no objections to this plat with respect to  
Secs. 236.15, 236.16, 236.20 and 236.21 (1) and (2).  
Wis. Stats.

Certified JUNE 26, 2003  
Rene M. Rany  
Department of Administration

# SEASON FIELDS

BEING ALL OF LOT 2 OF CERTIFIED SURVEY MAP NUMBER 4521 AS RECORDED IN VOLUME 25 OF CERTIFIED SURVEY MAPS ON PAGE 4521, BEING PART OF THE NORTHWEST 1/4 OF THE SOUTHEAST 1/4 AND THE SOUTHWEST 1/4 OF THE SOUTHEAST 1/4 OF SECTION 16, TOWNSHIP 21 NORTH, RANGE 16 EAST, TOWN OF GREENVILLE, OUTAGAMIE COUNTY, WISCONSIN.

## SURVEYOR'S CERTIFICATE:

I, THOMAS F. HALVERSON, REGISTERED WISCONSIN LAND SURVEYOR NO. 1445, HEREBY CERTIFY THAT I HAVE SURVEYED, DIVIDED AND MAPPED ALL OF LOT 2 OF CERTIFIED SURVEY MAP NUMBER 4521 AS RECORDED IN VOLUME 25 OF CERTIFIED SURVEY MAPS ON PAGE 4521, BEING PART OF THE NORTHWEST 1/4 OF THE SOUTHEAST 1/4 AND THE SOUTHWEST 1/4 OF THE SOUTHEAST 1/4 OF SECTION 16, TOWN 21 NORTH, RANGE 16 EAST, TOWN OF GREENVILLE, OUTAGAMIE COUNTY, WISCONSIN.

THAT I HAVE MADE SUCH SURVEY, LAND-DIVISION AND PLAT BY THE DIRECTION OF MARK T. AND SUSAN A. JUNGLEN, OWNERS OF SAID LAND, CONTAINING 2,431,178 SQUARE FEET (55.812 2ARES) ACRES OF LAND MORE OR LESS AND DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTH 1/4 CORNER OF SAID SECTION 16; THENCE N01°19'13"E, 47.01 FEET ALONG THE WEST LINE OF THE SOUTHEAST 1/4 OF SECTION 16 TO A POINT ON THE NORTH RIGHT OF WAY LINE OF SCHOOL ROAD AND THE POINT OF BEGINNING; THENCE CONTINUING N01°19'13"E, 1367.49 FEET ALONG SAID WEST LINE TO A POINT ON THE NORTH LINE OF THE SOUTHWEST 1/4 OF THE SOUTHEAST 1/4 OF SECTION 16; THENCE S87°59'33"E, 663.64 FEET ALONG SAID NORTH LINE; THENCE N01°21'01"E, 1380.83 FEET TO A POINT ON THE NORTH LINE OF THE SOUTHEAST 1/4 OF SECTION 16; THENCE S85°57'15"E, 665.06 FEET ALONG SAID NORTH LINE TO A POINT ON THE EAST LINE OF THE WEST 1/2 OF THE SOUTHEAST 1/4 OF SECTION 16; THENCE S01°22'50"W (RECORDED AS S00°04'00"E), 2170.02 FEET ALONG SAID EAST LINE TO A POINT ON THE NORTH LINE OF LOT 1 OF SAID CERTIFIED SURVEY MAP NUMBER 4521; THENCE S89°57'46"W, 516.31 FEET ALONG SAID NORTH LINE TO A POINT ON THE WEST LINE OF SAID LOT 1; THENCE S01°22'50"W, 517.31 FEET ALONG SAID WEST LINE TO A POINT ON THE NORTH RIGHT OF WAY LINE OF SAID SCHOOL ROAD; THENCE S89°57'46"W, 809.87 FEET ALONG SAID NORTH RIGHT OF WAY LINE TO THE POINT OF BEGINNING.

THAT THIS PLAT IS A CORRECT REPRESENTATION OF ALL OF THE EXTERIOR BOUNDARIES OF THE LAND SURVEYED AND THE SUBDIVISION THEREOF MADE.

THAT I HAVE FULLY COMPLIED WITH THE PROVISIONS OF CHAPTER 236 OF THE WISCONSIN STATUTES AND THE SUBDIVISION REGULATIONS OF THE TOWN OF GREENVILLE, OUTAGAMIE COUNTY IN SURVEYING, DIVIDING, AND MAPPING THE SAME.

DATED THIS 24<sup>TH</sup> DAY OF APRIL, 2003.

Thomas F. Halverson  
THOMAS F. HALVERSON, RLS-1445  
CO210.18FP



## OWNER'S CERTIFICATE OF DEDICATION:

AS OWNERS, WE HEREBY CERTIFY THAT WE CAUSED THE LAND DESCRIBED ON THIS PLAT TO BE SURVEYED, DIVIDED, MAPPED AND DEDICATED AS REPRESENTED ON THE PLAT. WE ALSO CERTIFY THAT THIS PLAT IS REQUIRED BY S.238.10 OR S.236.12 TO BE SUBMITTED TO THE FOLLOWING FOR APPROVAL OR OBJECTION:

DEPARTMENT OF ADMINISTRATION  
OUTAGAMIE COUNTY  
TOWN OF GREENVILLE

WITNESS THE HAND AND SEAL OF SAID OWNERS THIS 11<sup>TH</sup> DAY OF November, 2003. IN THE PRESENCE OF:

Mark T. Jungen  
MARK T. JUNGLEN, OWNER

Susan A. Jungen  
SUSAN A. JUNGLEN, OWNER

WITNESS:

STATE OF WISCONSIN)  
OUTAGAMIE COUNTY)

PERSONALLY CAME BEFORE ME THIS 11<sup>TH</sup> DAY OF November, 2003, THE ABOVE NAMED TO ME KNOWN TO BE THE SAME PERSONS WHO EXECUTED THE FOREGOING INSTRUMENT AND ACKNOWLEDGED THE SAME.

Thomas F. Halverson  
NOTARY PUBLIC  
OUTAGAMIE COUNTY, WI.  
MY COMMISSION EXPIRES: 1-16-05



## CERTIFICATE OF TOWN TREASURER:

STATE OF WISCONSIN)  
OUTAGAMIE COUNTY)

I, DEBBIE WAGNER, BEING THE DULY APPOINTED QUALIFIED AND ACTING TOWN TREASURER OF THE TOWN OF GREENVILLE, DO HEREBY CERTIFY THAT IN ACCORDANCE WITH THE RECORDS IN MY OFFICE, THERE ARE NO UNPAID TAXES OR UNPAID SPECIAL ASSESSMENTS AS OF 8-21-03 ON ANY OF THE LAND INCLUDED IN THE PLAT OF "SEASON FIELDS".

Debbie Wagner 8-21-03  
DEBBIE WAGNER, TOWN-TREASURER, DATED

## CERTIFICATE OF COUNTY TREASURER:

STATE OF WISCONSIN)  
OUTAGAMIE COUNTY)

I, DINA MUMFORD, BEING THE DULY ELECTED QUALIFIED AND ACTING TREASURER OF THE COUNTY OF OUTAGAMIE, DO HEREBY CERTIFY THAT THE RECORDS IN MY OFFICE SHOW NO UNREDEEMED TAX SALES AND NO UNPAID TAXES OR SPECIAL ASSESSMENT AS OF 2-12-04 AFFECTING THE LANDS INCLUDED IN THE PLAT OF "SEASON FIELDS".

Dina Mumford 2-12-04  
DINA MUMFORD, COUNTY TREASURER, DATED

## TOWN BOARD APPROVAL CERTIFICATE:

RESOLVED, THAT THE PLAT OF "SEASON FIELDS" IN THE TOWN OF GREENVILLE, OUTAGAMIE COUNTY, IS HEREBY APPROVED BY THE TOWN BOARD OF THE TOWN OF GREENVILLE.

APPROVED: Dean Culbertson 8-21-03  
DEAN CULBERTSON, CHAIRPERSON, DATED

SIGNED: Dean Culbertson 8-21-03  
DEAN CULBERTSON, CHAIRPERSON, DATED

I HEREBY CERTIFY THAT THE FOREGOING IS A COPY OF A RESOLUTION ADOPTED BY THE TOWN BOARD OF THE TOWN OF GREENVILLE.

Deborah Wagner 8-21-03  
CLERK, DATED

## OUTAGAMIE COUNTY APPROVAL:

I HEREBY CERTIFY THAT THIS PLAT KNOWN AS "SEASON FIELDS" WAS APPROVED BY THE OUTAGAMIE COUNTY AGRICULTURE, EXTENSION EDUCATION, ZONING AND LAND CONSERVATION COMMITTEE ON THIS 16<sup>TH</sup> DAY OF May, 2003.

Anthony P. Roach 2-13-04  
OUTAGAMIE COUNTY ZONING ADMINISTRATOR, DATED

RECEIVED FOR RECORDING THIS 16 DAY OF February, 2004, AT 9:10 A.M.,  
AND FILED IN CABINET F OF PLATS IN FILE NUMBER 107-108-109  
DOCUMENT NUMBER 1598735

Janice Flynn  
REGISTER OF DEEDS, OUTAGAMIE COUNTY, pd 50.00

## UTILITY EASEMENT PROVISION:

AN EASEMENT FOR ELECTRIC AND COMMUNICATION SERVICE IS HEREBY GRANTED BY MARK T. & SUSAN A. JUNGLEN, GRANTORS, TO WE ENERGIES, SBC WISCONSIN, INC., AND TIME WARNER CABLE, GRANTEEES, THEIR RESPECTIVE SUCCESSORS AND ASSIGNS, TO CONSTRUCT, INSTALL, OPERATE, REPAIR, MAINTAIN AND REPLACE FROM TIME TO TIME, FACILITIES USED IN CONNECTION WITH OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION OF ELECTRICITY AND ELECTRIC ENERGY FOR SUCH PURPOSES AS THE SAME IS NOW OR MAY HEREAFTER BE USED AND FOR SOUNDS AND SIGNALS, ALL IN, OVER, UNDER, ACROSS, ALONG AND UPON THE PROPERTY SHOWN WITHIN THOSE AREAS ON THE PLAT DESIGNATED AS "UTILITY EASEMENT AREAS" AND THE PROPERTY DESIGNATED ON THE PLAT FOR STREETS AND ALLEYS, WHETHER PUBLIC OR PRIVATE, TOGETHER WITH THE RIGHT TO INSTALL SERVICE CONNECTIONS UPON, ACROSS, WITHIN AND BENEATH THE SURFACE OF EACH LOT TO SERVE IMPROVEMENTS THEREON, OR ON ADJACENT LOTS; ALSO THE RIGHT TO TRIM AND CUT DOWN TREES, BRUSH AND ROOTS AS MAY BE REASONABLY REQUIRED INCIDENT TO THE RIGHTS HEREIN GIVEN. THE GRANTEEES AGREE TO RESTORE OR CAUSE TO HAVE RESTORED, THE PROPERTY, AS NEARLY AS IS REASONABLY POSSIBLE, TO THE CONDITION EXISTING PRIOR TO SUCH ENTRY BY THE GRANTEEES OR THEIR AGENTS. THIS RESTORATION, HOWEVER, DOES NOT APPLY TO THE INITIAL INSTALLATION OF SAID UNDERGROUND AND/OR ABOVE GROUND ELECTRICAL FACILITIES OR COMMUNICATION FACILITIES OR TO ANY TREES, BRUSH OR ROOTS WHICH MAY BE REMOVED AT ANY TIME PURSUANT TO THE RIGHTS HEREIN GRANTED. BUILDINGS SHALL NOT BE PLACED WITHIN THE LINES MARKED "UTILITY EASEMENT AREAS" WITHOUT THE PRIOR WRITTEN CONSENT OF GRANTEEES. AFTER INSTALLATION OF ANY SUCH FACILITIES, THE GRADE OF THE SUBDIVIDED PROPERTY SHALL NOT BE ALTERED BY MORE THAN FOUR INCHES WITHOUT WRITTEN CONSENT OF GRANTEEES.

THE GRANT OF EASEMENT SHALL BE BINDING UPON AND INURE TO THE BENEFIT OF THE HEIRS, SUCCESSORS AND ASSIGNS OF ALL PARTIES HERETO.

There are no objections to this plat with respect to  
Secs. 236.15, 236.16, 236.20 and 236.21 (1) and (2),  
Wis. Stats.

Certified JUNE 26, 2003  
Paul M. Poiry  
Department of Administration



## **Appendix C**

### **PASER Information**



**STATE OF WISCONSIN  
DEPARTMENT OF TRANSPORTATION  
WISCONSIN INFORMATION SYSTEM FOR LOCAL ROADS**

Inventory Listing With Maintenance (R-20)  
1-1-2019 Certification

**TOWN OF GREENVILLE (022)**

Rd/St Name		Certified Miles																												
West Meadows Ln		0.25																												
AT RD/ST OFFSET MILES	TO ROAD NAME OFFSET MILES	LENGTH MILES (FEET)	OW L	SURFACE		MAINT		P	CURB SHOULDER		MEDIAN		ADT		ROW		FC	RC	SC	O	U/A	NHS	H	AC	ALN	INV	PVT		SW	
				Type	WD	YR	Type	YR		LT	RT	LT	RT	RT	WD	I	CNT	YR	I	W								R	YR	
Fox Springs Dr	Julius Dr	0.25 (1320)	N 2	70	22	1990	5	2008	4	0	0	203	203			E	000030		A	66	97	5	4	012	NON			2018	5	2017
Wiekert Ct		0.07																												
AT RD/ST OFFSET MILES	TO ROAD NAME OFFSET MILES	LENGTH MILES (FEET)	OW L	SURFACE		MAINT		P	CURB SHOULDER		MEDIAN		ADT		ROW		FC	RC	SC	O	U/A	NHS	H	AC	ALN	INV	PVT		SW	
				Type	WD	YR	Type	YR		LT	RT	LT	RT	RT	WD	I	CNT	YR	I	W								R	YR	
Rimrock Ln	Termini	0.07 (370)	N 2	70	30	2004	7	2016	3	2	2	00	00				000000		A	66	97	5	4	012	NON			2018	8	2017
Wildwood Dr		0.24																												
AT RD/ST OFFSET MILES	TO ROAD NAME OFFSET MILES	LENGTH MILES (FEET)	OW L	SURFACE		MAINT		P	CURB SHOULDER		MEDIAN		ADT		ROW		FC	RC	SC	O	U/A	NHS	H	AC	ALN	INV	PVT		SW	
				Type	WD	YR	Type	YR		LT	RT	LT	RT	RT	WD	I	CNT	YR	I	W								R	YR	
Fairwinds Dr	Sunnyvale Ln	0.24 (1267)	N 2	70	22	1994			4	0	0	202	202				000000		A	66	97	5	4	012	NON			2018	5	2017
Winds End Ln		0.13																												
AT RD/ST OFFSET MILES	TO ROAD NAME OFFSET MILES	LENGTH MILES (FEET)	OW L	SURFACE		MAINT		P	CURB SHOULDER		MEDIAN		ADT		ROW		FC	RC	SC	O	U/A	NHS	H	AC	ALN	INV	PVT		SW	
				Type	WD	YR	Type	YR		LT	RT	LT	RT	RT	WD	I	CNT	YR	I	W								R	YR	
Termini	Summer View Dr	0.13 (686)	N 2	70	24	2003			4			202	202				000000		A	66	97	5	4	012	NON			2018	7	2017
Windward Dr		0.42																												
AT RD/ST OFFSET MILES	TO ROAD NAME OFFSET MILES	LENGTH MILES (FEET)	OW L	SURFACE		MAINT		P	CURB SHOULDER		MEDIAN		ADT		ROW		FC	RC	SC	O	U/A	NHS	H	AC	ALN	INV	PVT		SW	
				Type	WD	YR	Type	YR		LT	RT	LT	RT	RT	WD	I	CNT	YR	I	W								R	YR	
Fawn Ridge Ct	Woodland Dr	0.11 (580)	N 2	65	24	2004	1	2011	4	0	0	202	202			E	000015	1995	A	66	97	5	4	012	NON			2019	7	2017
Woodland Dr	Blustery Dr	0.10 (528)	N 2	70	22	1996	1	2011	4	0	0	202	202			E	000015	1995	A	66	97	5	4	012	NON			2018	7	2017
Blustery Dr	Fairwinds Dr	0.05 (264)	N 2	70	22	1996	5	2007	4	0	0	202	202			E	000015	1995	A	66	97	5	4	012	NON			2018	6	2017
Fairwinds Dr	Windyhill Rd	0.11 (581)	N 2	70	22	1996	5	2007	4	0	0	202	202			E	000015	1995	A	66	97	5	4	012	NON			2018	6	2017
Windyhill Rd	Termini	0.05 (264)	N 2	70	22	1996	5	2007	4	0	0	202	202			E	000015	1995	A	66	97	5	4	012	NON			2018	6	2017



STATE OF WISCONSIN  
DEPARTMENT OF TRANSPORTATION  
WISCONSIN INFORMATION SYSTEM FOR LOCAL ROADS  
Inventory Listing With Maintenance (R-20)  
1-1-2019 Certification

## TOWN OF GREENVILLE (022)

Rd/St Name		Certified Miles																														
Summer View Dr		0.58																														
AT RD/ST OFFSET MILES	TO ROAD NAME OFFSET MILES	LENGTH MILES (FEET)	OW L	SURFACE		MAINT		P	CURB		SHOULDER		MEDIAN		ADT		ROW		FC	RC	SC	O	U/A	NHS	H	AC	ALN H V	INV YR	PVT		SW	
				Type	WD	YR	Type		YR	LT	RT	LT	RT	Type	WD	I	CNT	YR											I	W		R
Termini	Winds End Ln	0.40 (2112)	N 2	70	24	2012					203	203			000000		A	66	97	5		4	012	NON		00		2018	7	2017		
Winds End Ln	School Rd	0.18 (950)	N 2	70	24	2012						203	203			000000		A	66	97	5		4	012	NON		00		2018	7	2017	
Summer Wind Ln		0.12																														
AT RD/ST OFFSET MILES	TO ROAD NAME OFFSET MILES	LENGTH MILES (FEET)	OW L	SURFACE		MAINT		P	CURB		SHOULDER		MEDIAN		ADT		ROW		FC	RC	SC	O	U/A	NHS	H	AC	ALN H V	INV YR	PVT		SW	
				Type	WD	YR	Type		YR	LT	RT	LT	RT	Type	WD	I	CNT	YR											I	W		R
Evening Star Dr	Star Dust Dr	0.12 (634)	N 2	70	24	2003	1	2013	4	0	0	202	202		E 000015		A	66	97	5		4	012	NON		00		2018	7	2017		
Sunfield Dr		0.27																														
AT RD/ST OFFSET MILES	TO ROAD NAME OFFSET MILES	LENGTH MILES (FEET)	OW L	SURFACE		MAINT		P	CURB		SHOULDER		MEDIAN		ADT		ROW		FC	RC	SC	O	U/A	NHS	H	AC	ALN H V	INV YR	PVT		SW	
				Type	WD	YR	Type		YR	LT	RT	LT	RT	Type	WD	I	CNT	YR											I	W		R
Brookhill Dr	Shadybrook Ln	0.06 (317)	N 2	70	31	2009	1	2017	3	2	2	000	000		000000		A	66	97	5		4	012	NON		00		2018	7	2017		
Shadybrook Ln	Fox Hollow Ln	0.07 (370)	N 2	70	31	2009	1	2017	3	2	2	000	000		000000		A	66	97	5		4	012	NON		00		2018	7	2017		
Fox Hollow Ln	Fox Hollow Ln	0.14 (739)	N 2	70	31	2009	1	2017	3	2	2	000	000		000000		A	66	97	5		4	012	NON		00		2018	7	2017		

**Appendix D**

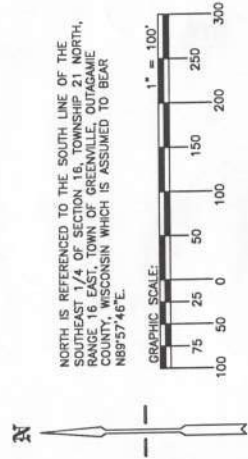
**Season Fields Subdivision**

**Original Drainage Plans**

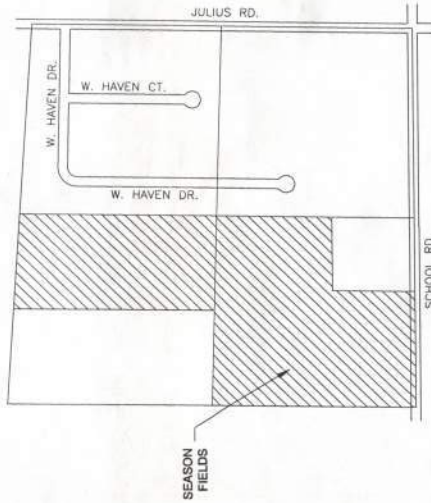


SEASON FIELDS

BEING PART OF THE NORTHWEST 1/4 OF THE SOUTHWEST 1/4 AND THE SOUTHWEST 1/4 OF SECTION 16, TOWNSHIP 21 NORTH, RANGE 16 EAST, TOWN OF GREENVILLE, OUTAGAMIE COUNTY, WISCONSIN.

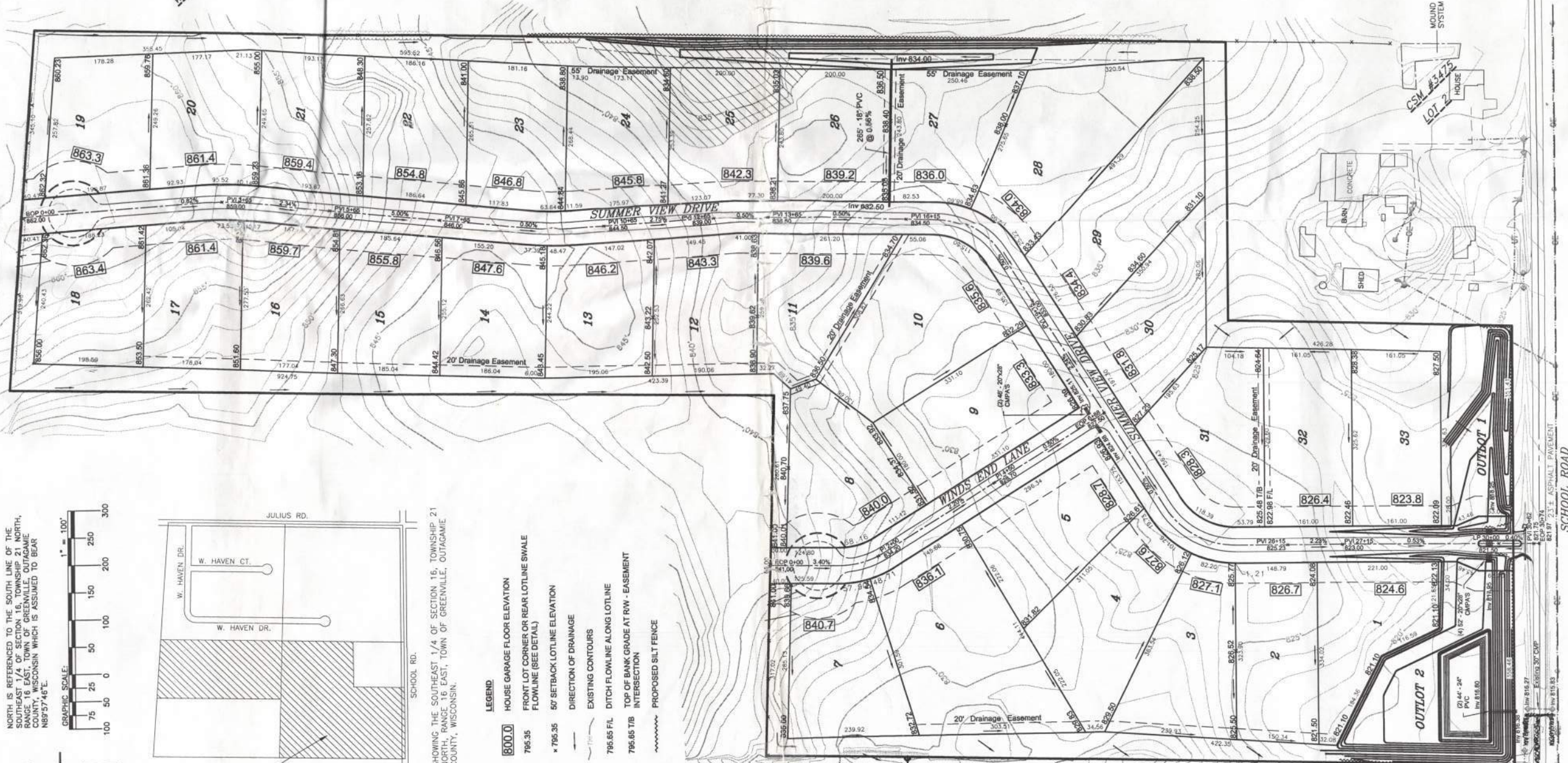


NORTH IS REFERENCED TO THE SOUTH LINE OF THE SOUTHWEST 1/4 OF SECTION 16, TOWNSHIP 21 NORTH, RANGE 16 EAST, TOWN OF GREENVILLE, OUTAGAMIE COUNTY, WISCONSIN WHICH IS ASSUMED TO BEAR N89°37'46"E.

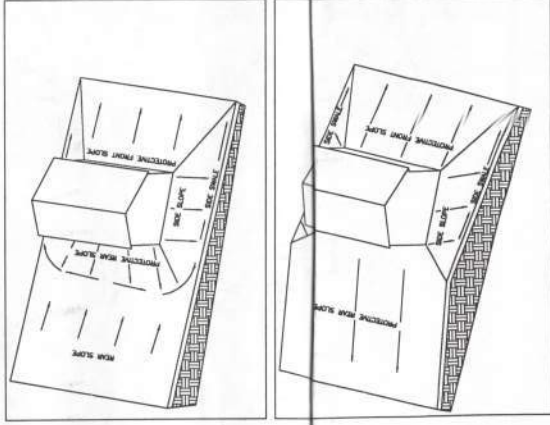


SHOWING THE SOUTHWEST 1/4 OF SECTION 16, TOWNSHIP 21 NORTH, RANGE 16 EAST, TOWN OF GREENVILLE, OUTAGAMIE COUNTY, WISCONSIN.

- LEGEND**
- HOUSE GARAGE FLOOR ELEVATION
  - FRONT LOT CORNER OR REAR LOTLINE SWALE FLOWLINE (SEE DETAIL)
  - 50' SETBACK LOTLINE ELEVATION
  - DIRECTION OF DRAINAGE
  - EXISTING CONTOURS
  - DITCH FLOWLINE ALONG LOTLINE
  - TOP OF BANK GRADE AT RW - EASEMENT INTERSECTION
  - PROPOSED SILT FENCE



LOT 2  
WEST HAVEN PLAT  
LOT 1



HOUSE ELEVATIONS:

The house elevations shall be set to provide positive drainage away from the building in all directions as shown in the above details.

NOTES:

- Existing utilities shown are indicated in accordance with available records and field measurements. The contractor shall be responsible for obtaining exact locations & elevations of all utilities, including sewer and water from the owners of the respective utilities. All utility owners shall be notified by the contractor 72 hours prior to excavation. Contact Digger's Hotline (1-800-242-8511) for exact utility locations.
  - Silt fence shall be installed at the toe of all newly constructed fill slopes and shall be maintained until slope vegetation is established. Silt fence shall be installed prior to site grading.
  - Silt fence inlet protection shall be installed around the upstream end of new culvert pipes.
  - Gravel access shall be provided to homes under construction.
  - Tracking of mud on existing streets shall be cleaned up daily.
  - Vegetation beyond slopes shall remain intact.
  - Total impact of erosion control devices after each rainfall event and repair or maintain as necessary.
  - Total area to be disturbed shall not be less than 5 acres. Contractor shall minimize area disturbed by construction as the project is constructed. Disturbed areas shall be seeded as soon as final grade is established. Contractor shall replace topsoil and then seed, fertilize and mulch all lawn areas within 1 week of topsoil placement.
  - Contractor shall remove all excess materials from the site.
  - Earthwork contractors shall be required to install in the newly graded road ditches to control erosion.
  - Final erosion control devices shall be installed in the newly graded road ditches to control erosion.
  - All sediment and erosion control devices and methods shall be in accordance with the Wisconsin Construction Site Handbook.
  - The contractor shall make weekly inspections and reports within 1 day of any rainfall exceeding 0.1 inches of the sediment and erosion control devices throughout construction. The inspection reports shall be made available to the owner at the end of the construction or upon demand during construction.
  - This plan provides for a controlled release of storm water from this project at a rate from up to a 100 year storm at full developed conditions which will not exceed the rate of runoff from the meadow conditions existing prior to construction. The release rate shall be controlled by the use of the storm water conveyance capability of the existing Town Road, however, since runoff is controlled to a less than existing conditions rate on any single storm frequency, there should be no adverse impact on drainage downstream of this site over conditions that exist prior to development.
- BENCHMARKS:**
- Mag nail in power pole number 99-07705 located southeast of plat along the south right of way. Elevation = 830.43
  - Nail in 18" tree 20' west of northeast corner of plat. Elevation = 863.16
  - Nail in 10" tree along east line of plat by Lot 26. Elevation = 837.46
  - Nail in power pole #65-97 south of shed by farm buildings. Elevation = 834.13
- CULVERT SIZING:**
- Lots 1 - 5 shall be (2) 20" x 28" CMPAS  
Lots 6 - 9 and Lots 12 - 26 shall be 18" CMPAS  
Lots 10 - 11 and Lots 27 - 33 shall be 18" CMPAS  
Lots 31 - 33 shall be 24" CMPAS
- RUNOFF SUMMARY:**
- Table 1 Input Parameters

Subwatershed	Existing CN	Proposed CN	Existing Tc, hr	Proposed Tc, hr	Existing Tributary Area, Acres	Proposed Tributary Area, Acres
Season Fields	71	78	.66	.47	55.7	55.7

Table 2 Summary of Flow Rates

Storm Frequency	Allowable Release on the Existing Conditions CFS (peak rate for existing conditions)	Proposed Discharge into Detention Ponds, CFS (peak rate for proposed conditions)	Actual Release Rate from Detention Ponds, CFS (proposed conditions)
Season Fields 25-25 yr storm	78.6	122	52.8
Season Fields 10-100 yr storm	58.3	167	60.9

Table 3 Storage Requirements

Storm Frequency	Estimate Storage Required, Ac-Ft	Storage Provided, Ac-Ft
25 year	2.5	2.8
100 year	5.1	5.2

DRAINAGE PLAN CERTIFICATION:

I, John R. Davel, Professional Engineer, hereby certify that this Drainage Plan will meet or exceed the requirements of the Outagamie County Subdivision Ordinance and the requirements of the Town of Greenville.

John R. Davel, P.E. E-25512

Date

final



1811 Racine Street  
Menasha, WI 54952  
Phone 920-830-1811  
Fax 920-830-9595

DRAINAGE PLAN  
SEASON FIELDS  
TOWN OF GREENVILLE  
OUTAGAMIE COUNTY, WISCONSIN

SCALE  
1" = 100'  
DATE  
03-07-03  
PROJECT NO.  
C0210.1BPP

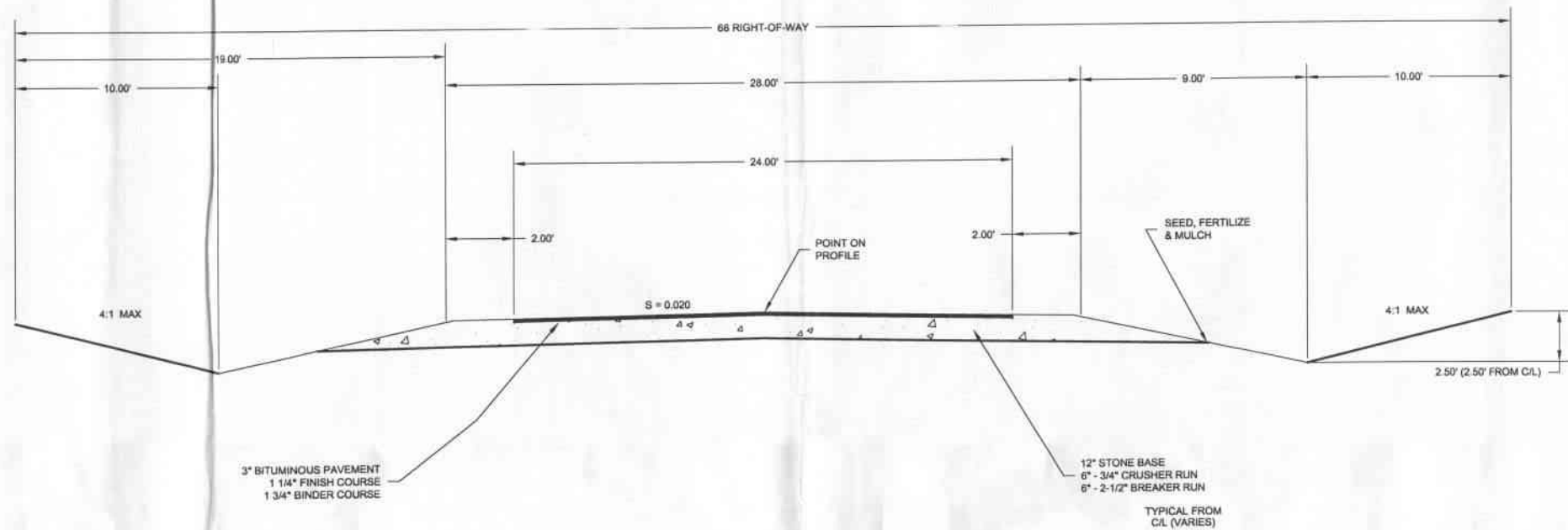
DESIGNED  
TTH  
DRAWN  
ROD  
CHECKED  
TTH

CAROW LAND SURVEYING CO., INC.  
1837 W. WISCONSIN AVE., P.O. BOX 1297  
APPLETON, WISCONSIN 54912-1297  
PHONE 920-731-4168 FAX 731-5673

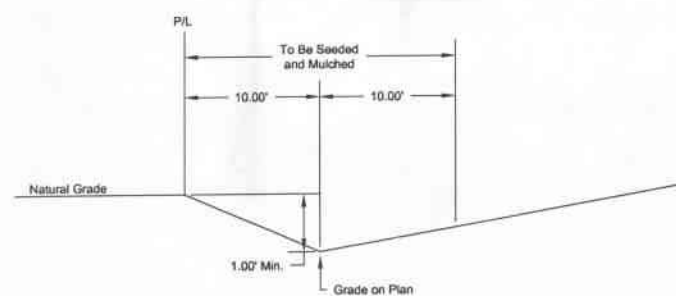
INT. DATE

REVISIONS

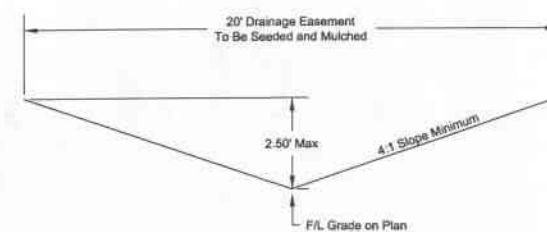




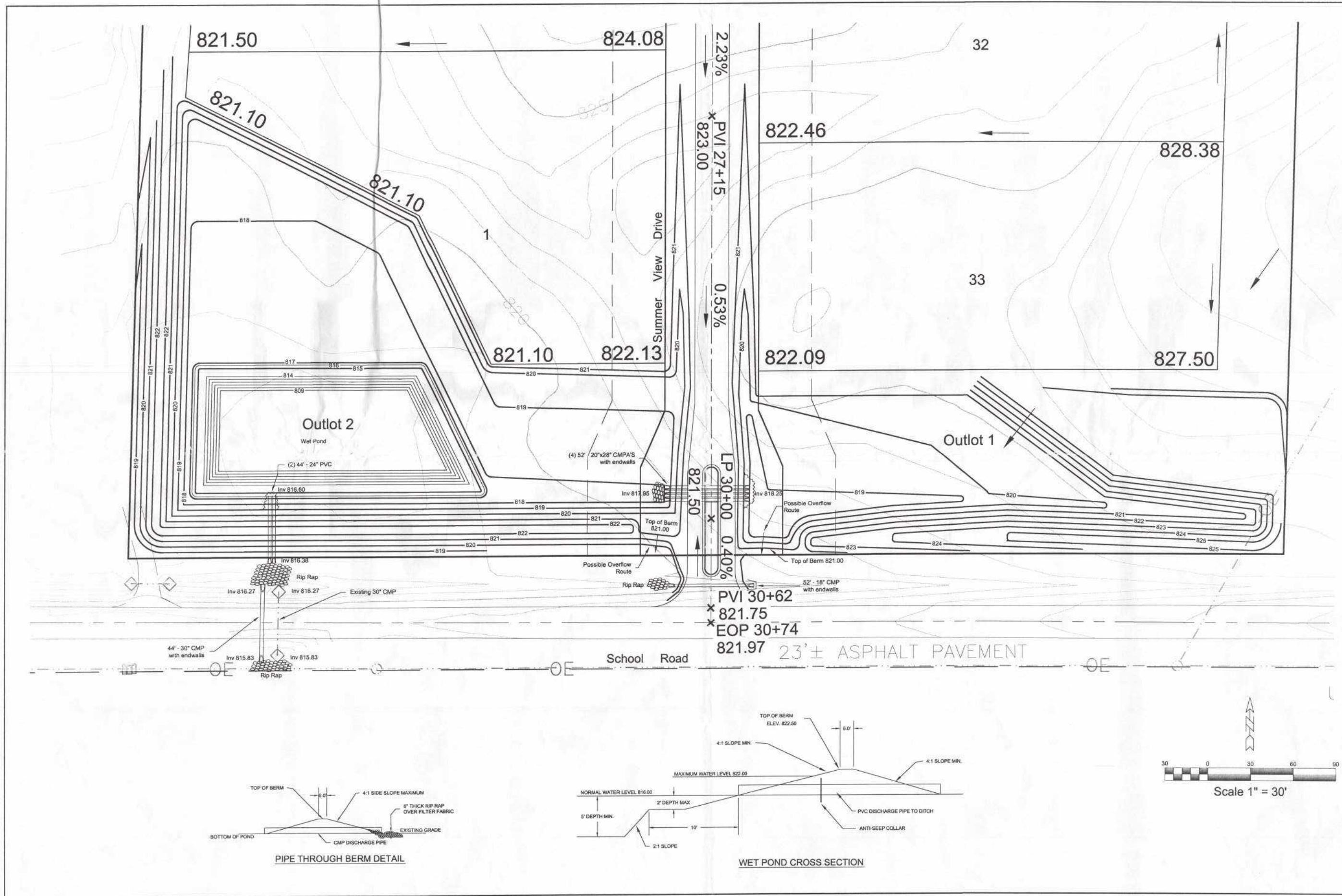
TYPICAL STREET CROSS SECTION



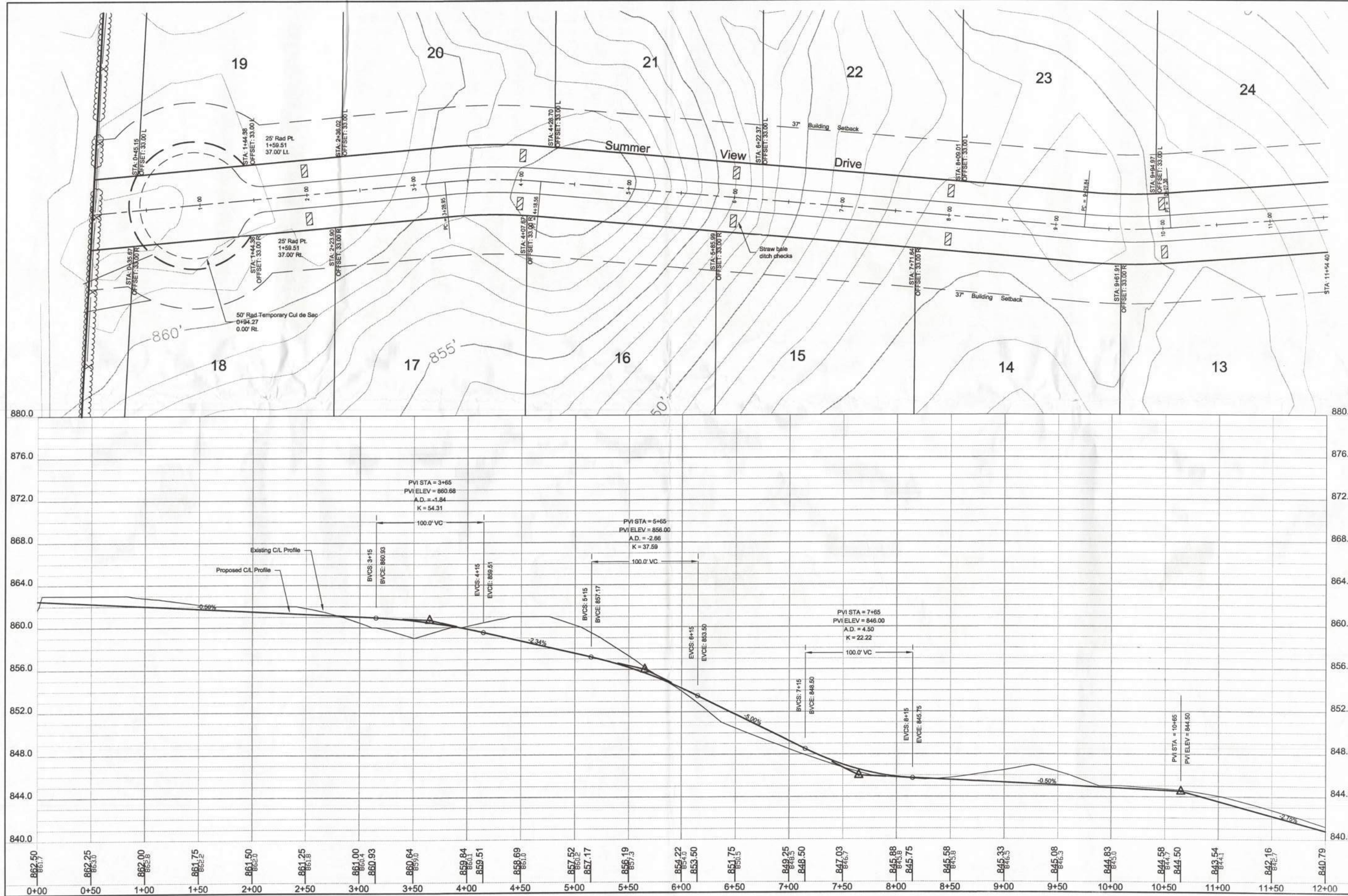
REAR LOTLINE SWALE



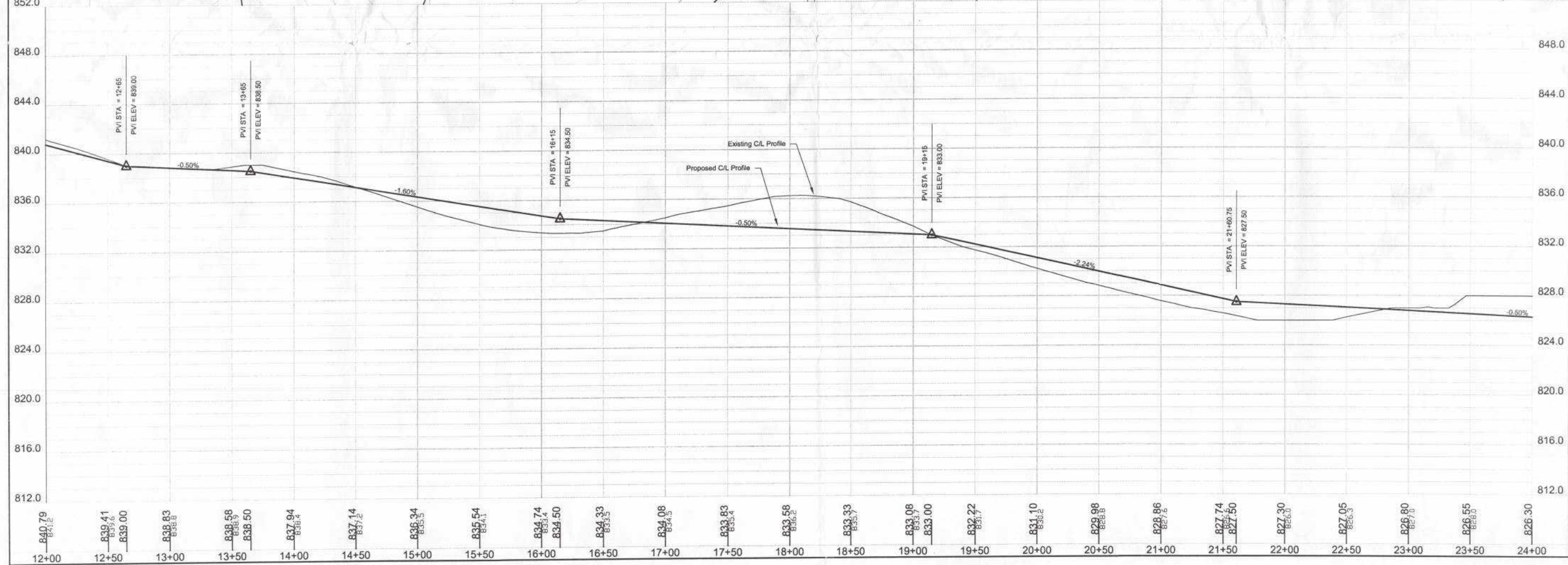
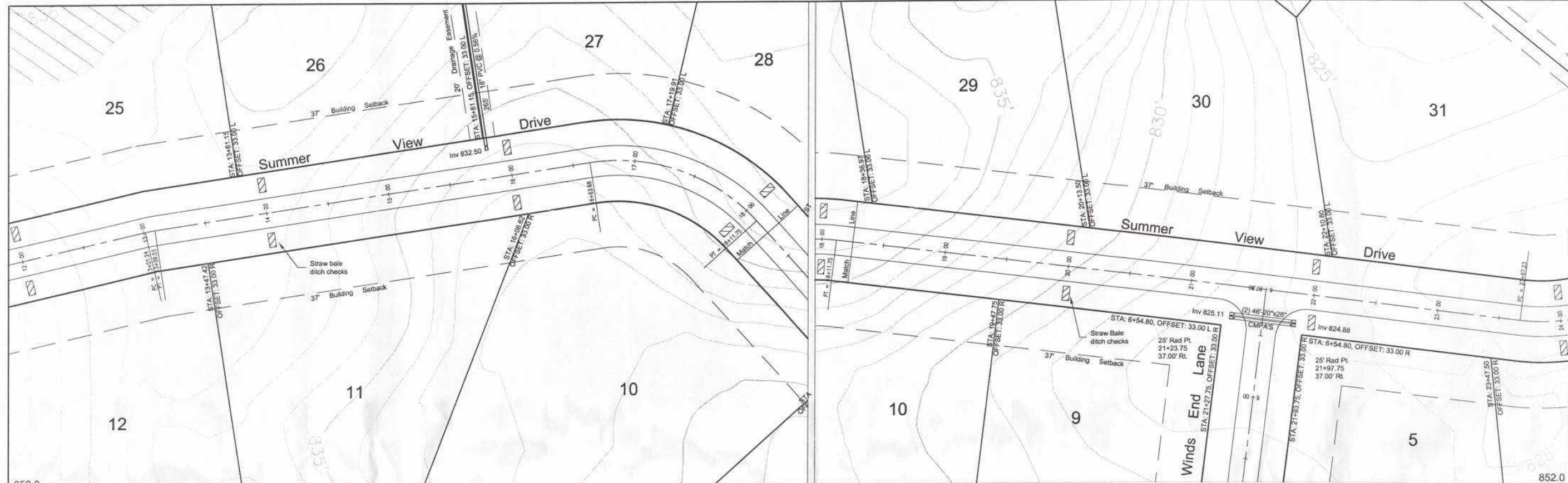
20' DRAINAGE EASEMENT SWALE



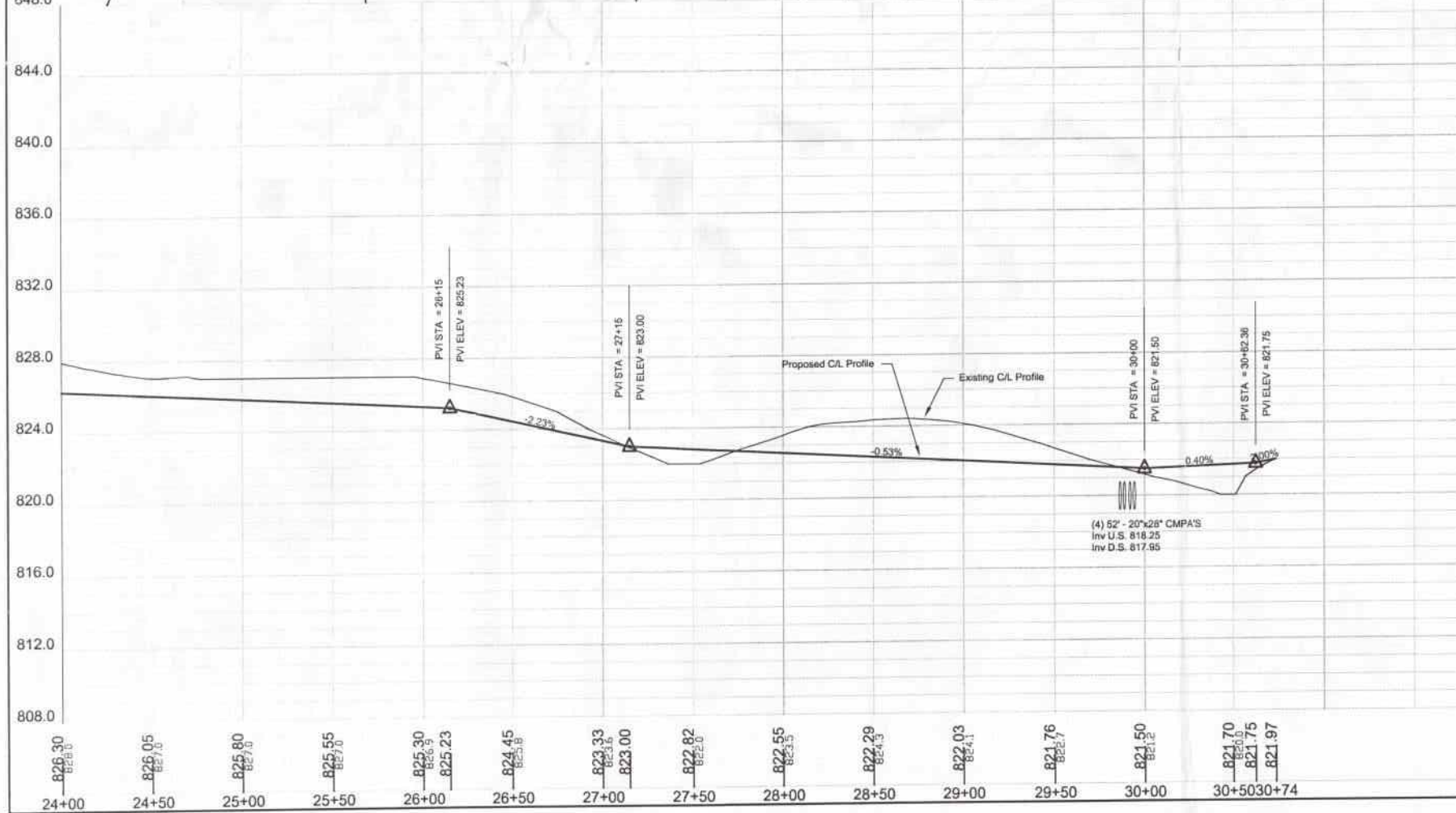




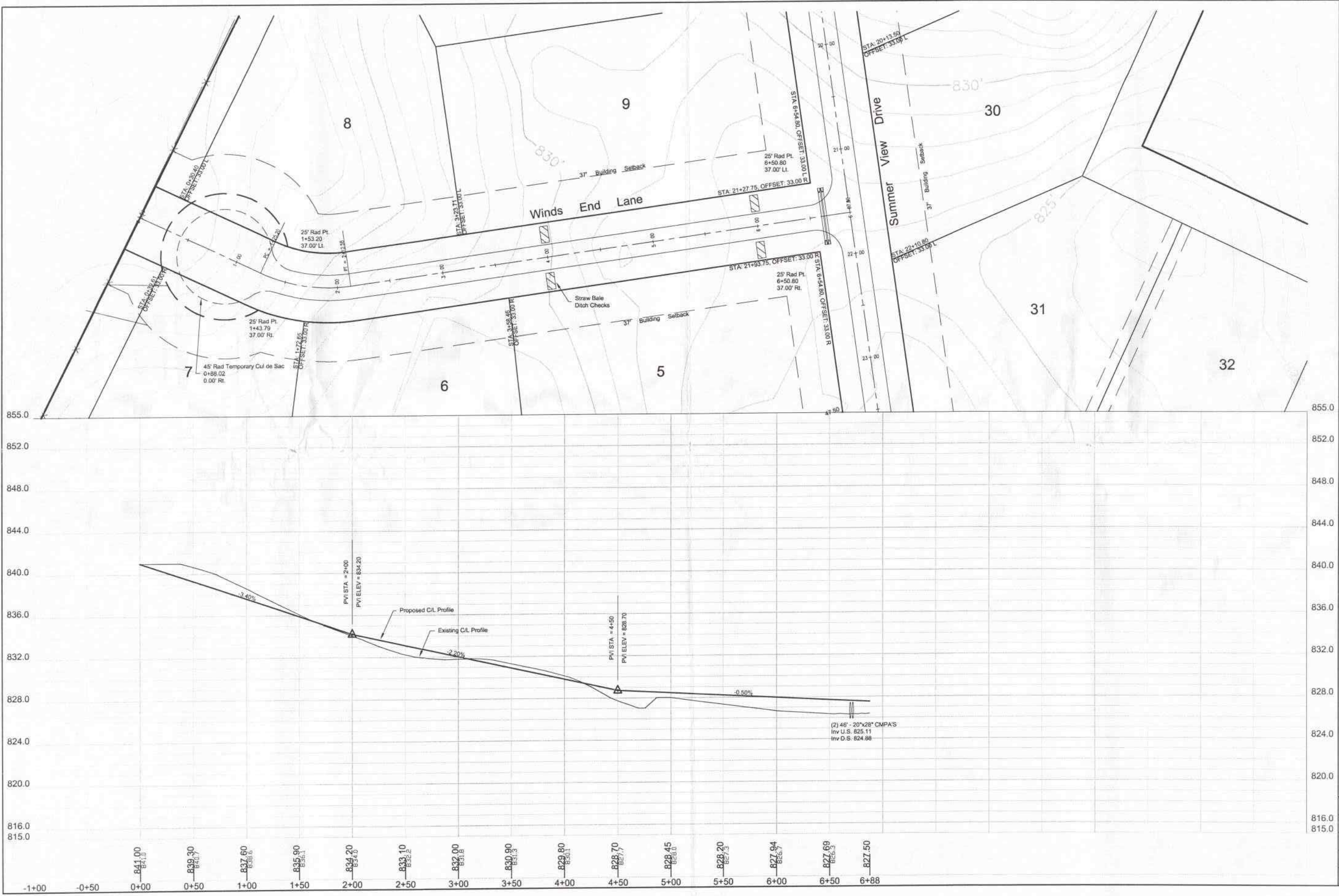








848.0  
844.0  
840.0  
836.0  
832.0  
828.0  
824.0  
820.0  
816.0  
812.0  
808.0



**DAVEL ENGINEERING, INC.**  
CIVIL ENGINEERING CONSULTANTS  
1811 Racine Street Menasha, WI 54952  
Ph: 920-991-1866 Fax: 920-830-9595

Street Plans  
Winds End Lane  
0+00 to 6+87.80

**SEASON FIELDS**  
Town of Greenville, Outagamie County, WI  
For: Carow Land Surveying

Date: 03/07/2003  
Filename: 2418  
Drawn by: EDS  
Project No: 2418  
Page: 3.4

## **Appendix E**

### **Site Photos**



**Client's Name:**  
Town of Greenville

**Project Name:**  
Season Fields Subdivision

**Project No.**  
G5992-009

**Photo No.**  
1

**Date:**  
12-14-18

**Direction Photo Taken:**  
South

**Photo Taken By:**  
Cedar Corp

**Description:**  
Standing water in ditch on the north side of the driveway at N1312 Summer View Drive.



**Photo No.**  
2

**Date:**  
12-14-18

**Direction Photo Taken:**  
Northeast

**Photo Taken By:**  
Cedar Corp

**Description:**  
Standing water in ditch on the northeast side of the driveway at N1356 Summer View Drive.



**Client's Name:**  
Town of Greenville

**Project Name:**  
Season Fields Subdivision

**Project No.**  
G5992-009

**Photo No.**  
3

**Date:**  
12-14-18

**Direction Photo Taken:**  
North

**Photo Taken By:**  
Cedar Corp

**Description:**  
Drainage easement  
between N1386 and  
N1398 Summer View  
Drive.



**Photo No.**  
4

**Date:**  
12-14-18

**Direction Photo Taken:**  
North

**Photo Taken By:**  
Cedar Corp

**Description:**  
Standing water in ditch  
on the south side of the  
driveway at N1494  
Summer View Drive.





**Client's Name:**  
Town of Greenville

**Project Name:**  
Season Fields Subdivision

**Project No.**  
G5992-009

**Photo No.**  
5

**Date:**  
12-14-18

**Direction Photo Taken:**  
South

**Photo Taken By:**  
Cedar Corp

**Description:**  
Retaining wall on north side of driveway at N1469 Summer View Drive.



**Photo No.**  
6

**Date:**  
12-14-18

**Direction Photo Taken:**  
South

**Photo Taken By:**  
Cedar Corp

**Description:**  
Ditch on the north side of the driveway at N1441 Summer View Drive.



**Client's Name:**  
Town of Greenville

**Project Name:**  
Season Fields Subdivision

**Project No.**  
G5992-009

<b>Photo No.</b> 7	<b>Date:</b> 12-14-18
<b>Direction Photo Taken:</b> South	
<b>Photo Taken By:</b> Cedar Corp	
<b>Description:</b> Ditch on the south side of the driveway at N1441 Summer View Drive.	



<b>Photo No.</b> 8	<b>Date:</b> 12-14-18
<b>Direction Photo Taken:</b> Southwest	
<b>Photo Taken By:</b> Cedar Corp	
<b>Description:</b> Ditch along Summer View Drive south of N1399.	





**Client's Name:**  
Town of Greenville

**Project Name:**  
Season Fields Subdivision

**Project No.**  
G5992-009

**Photo No.**  
9

**Date:**  
12-14-18

**Direction Photo Taken:**  
Southwest

**Photo Taken By:**  
Cedar Corp

**Description:**  
Ditch along Summer View Drive at the intersection of Winds End Lane.



**Photo No.**  
10

**Date:**  
12-14-18

**Direction Photo Taken:**  
Northwest

**Photo Taken By:**  
Cedar Corp

**Description:**  
Ditch along Winds End Lane at the intersection of Summer View Drive.





**Client's Name:**  
Town of Greenville

**Project Name:**  
Season Fields Subdivision

**Project No.**  
G5992-009

**Photo No.**  
11

**Date:**  
12-14-18

**Direction Photo Taken:**  
Northwest

**Photo Taken By:**  
Cedar Corp

**Description:**  
Ditch along Winds End Lane, south of N1396.



**Photo No.**  
12

**Date:**  
12-14-18

**Direction Photo Taken:**  
Southeast

**Photo Taken By:**  
Cedar Corp

**Description:**  
Ditch along Winds End Lane, north of the driveway at N1371.





## Photographic Log

**Client's Name:**  
Town of Greenville

**Project Name:**  
Season Fields Subdivision

**Project No.**  
G5992-009

**Photo No.**  
13

**Date:**  
12-14-18

**Direction Photo Taken:**  
West

**Photo Taken By:**  
Cedar Corp

**Description:**  
Sump outfall at N1371  
Winds End Lane.



**Photo No.**  
14

**Date:**  
12-14-18

**Direction Photo Taken:**  
South

**Photo Taken By:**  
Cedar Corp

**Description:**  
Ditch along Summer  
View Drive north of the  
intersection at School  
Road.

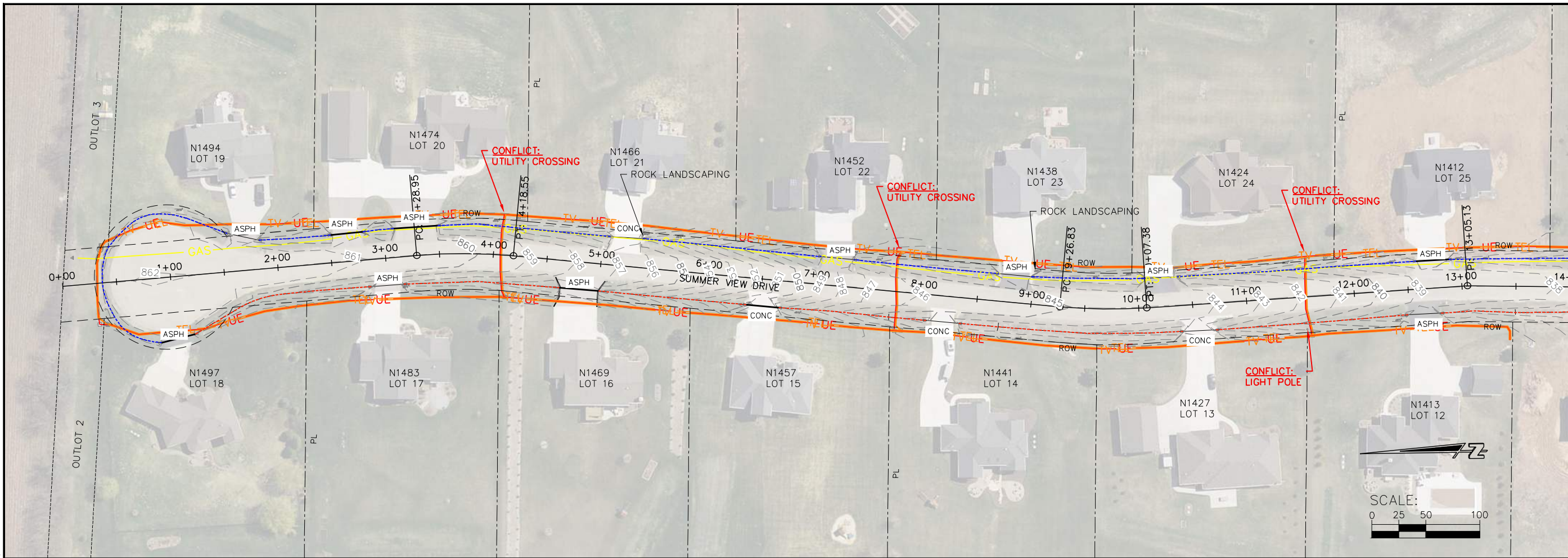


## **Appendix F**

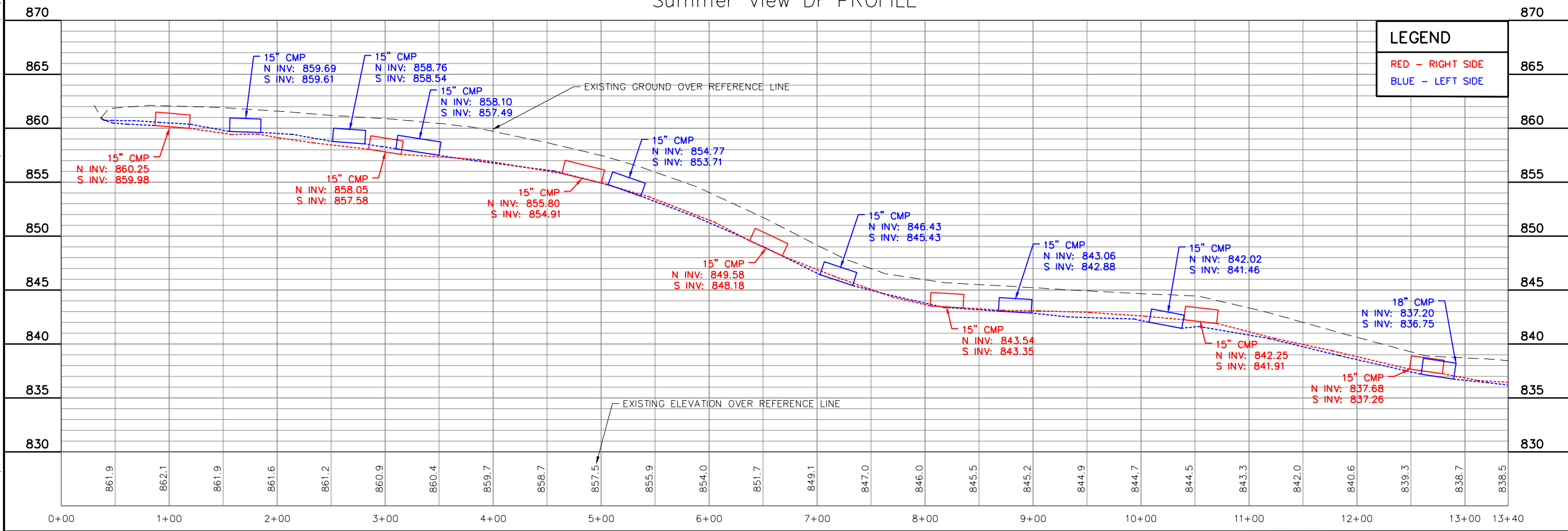
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Summer View Dr PROFILE



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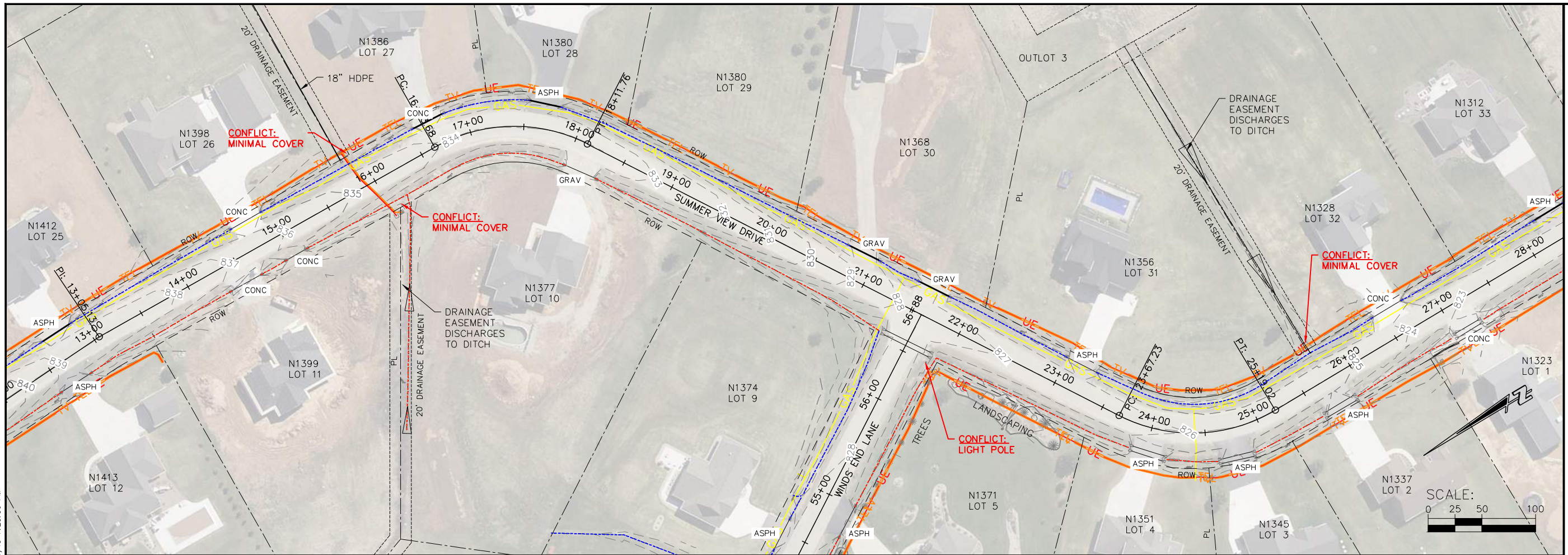
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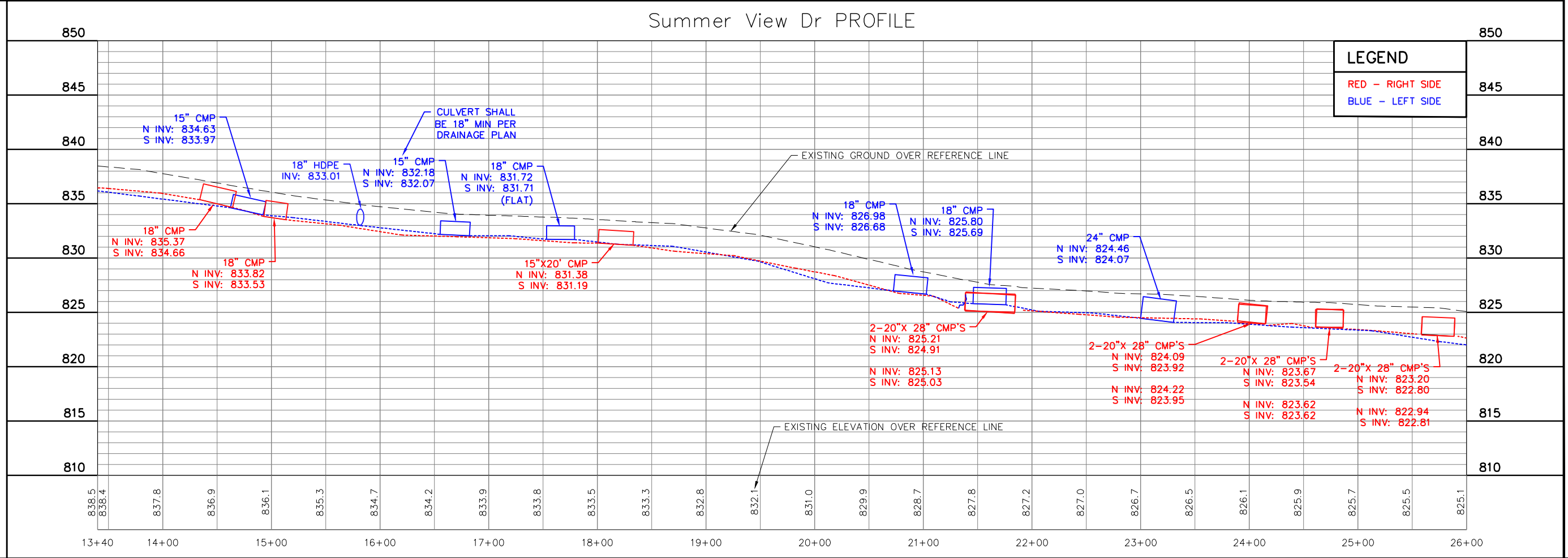
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SEASON FIELDS STORM WATER STUDY  
PRELIMINARY MINI STORM SEWER DESIGN  
SUMMER VIEW DRIVE



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Summer View Dr PROFILE



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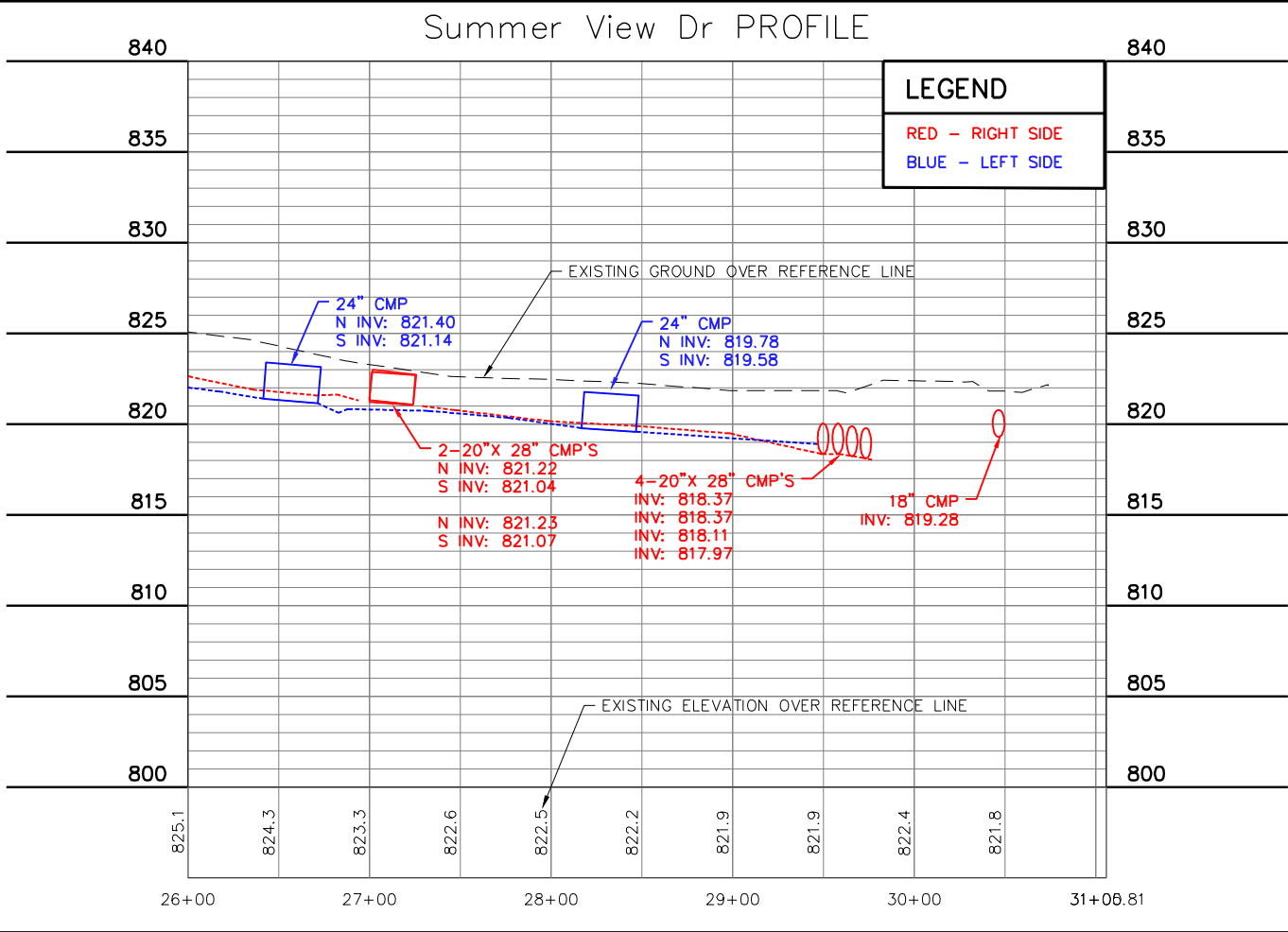
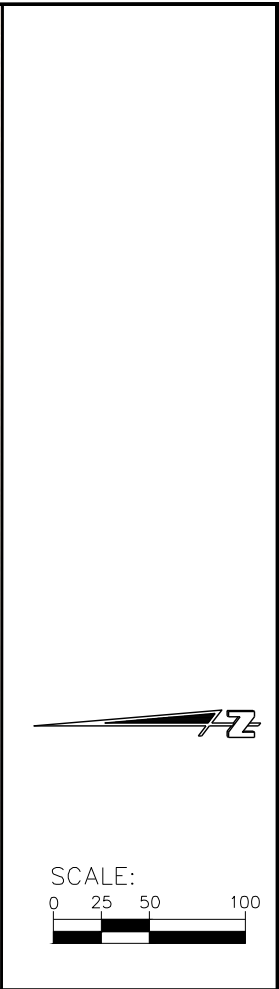
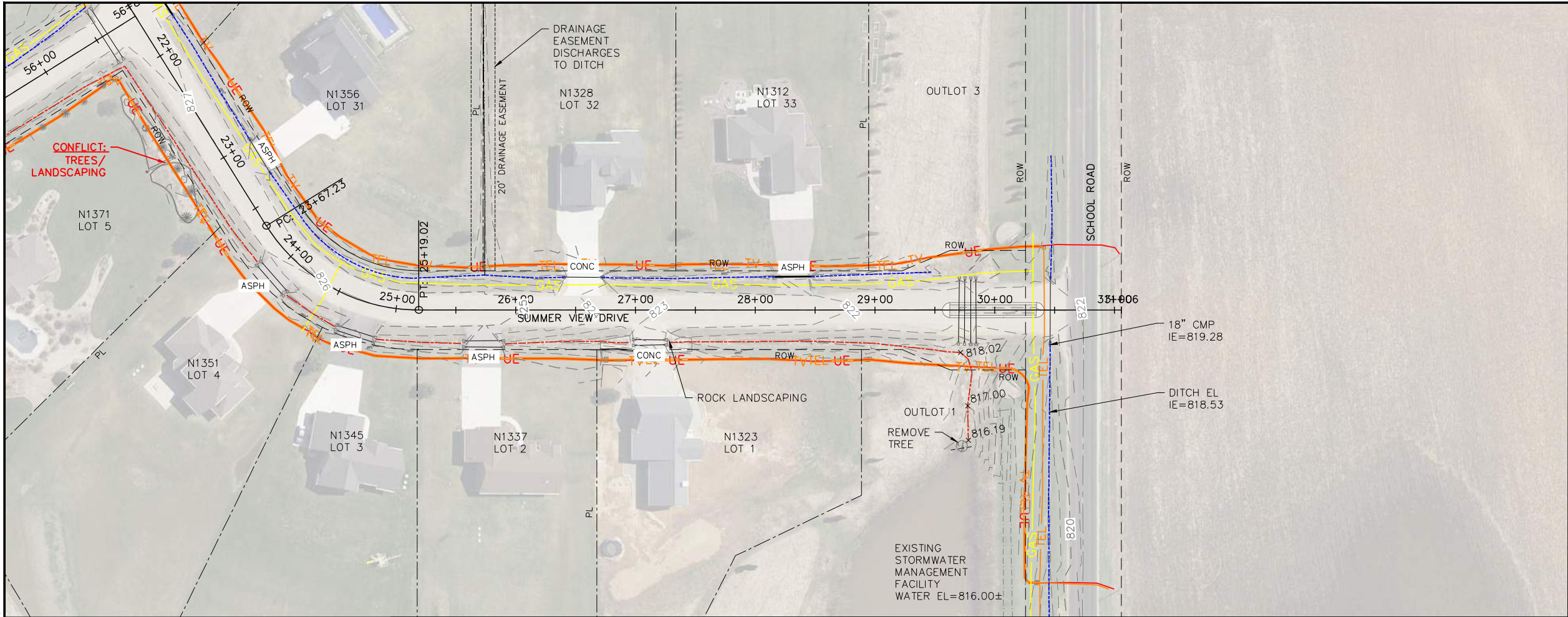
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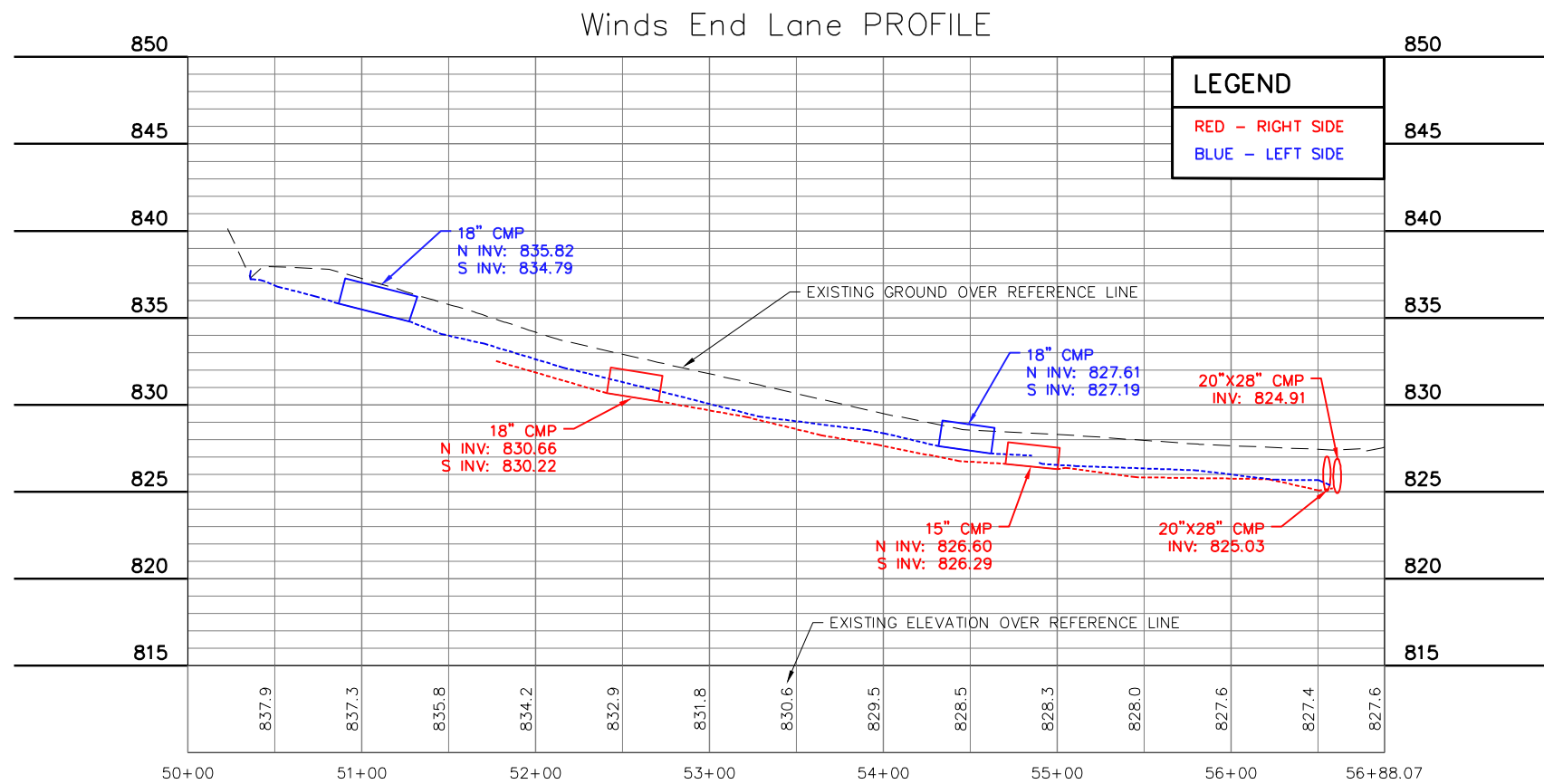
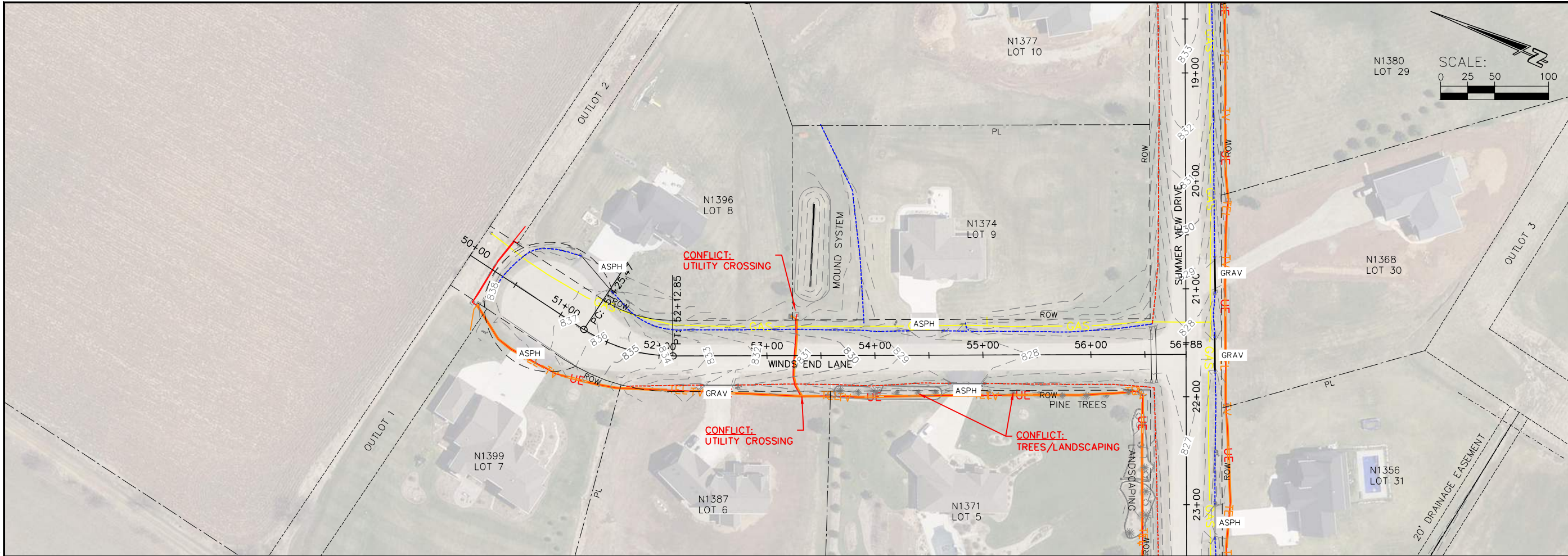
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PRELIMINARY MINI STORM SEWER DESIGN  
SUMMER VIEW DRIVE



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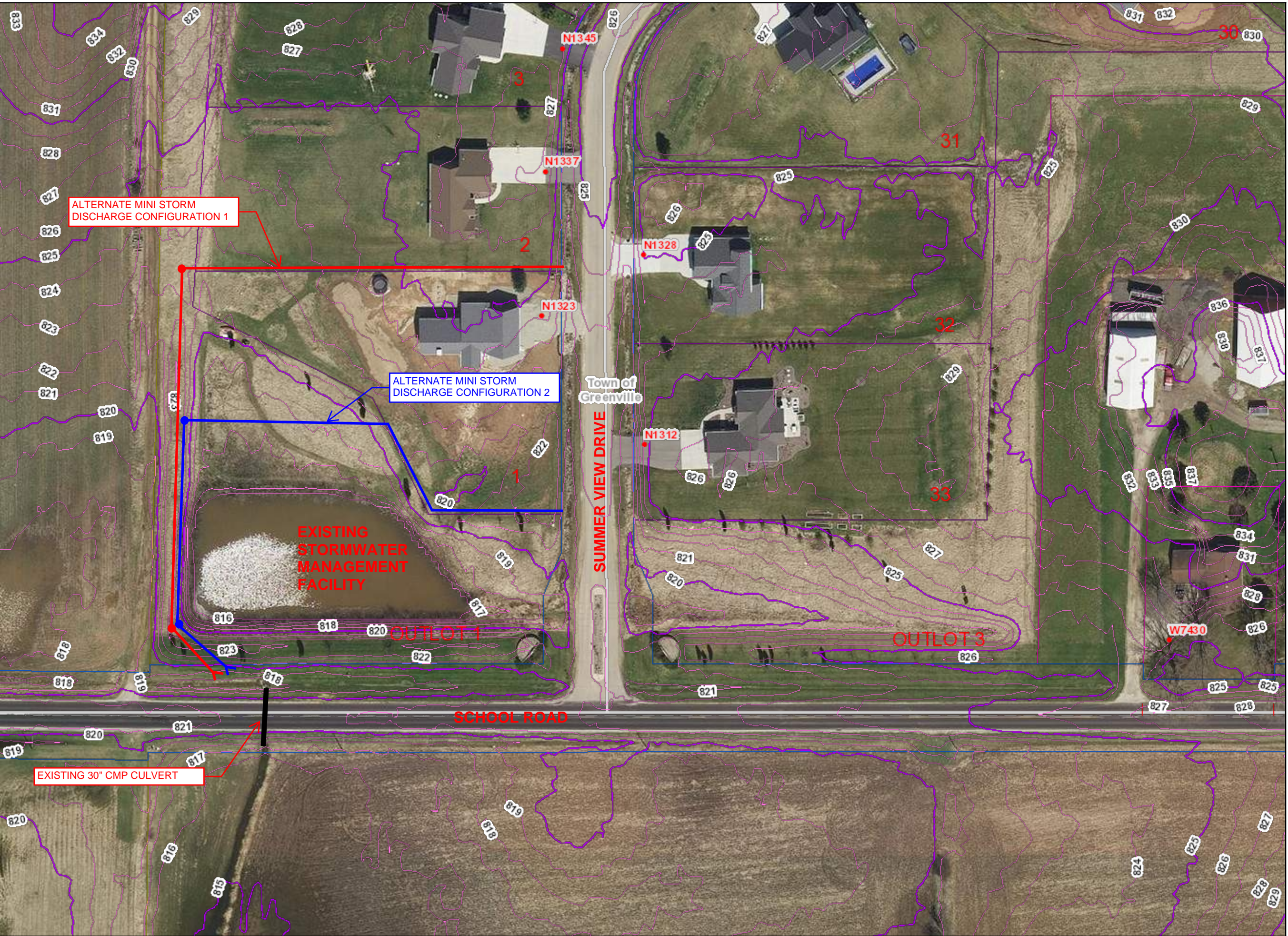
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SEASON FIELDS STORM WATER STUDY  
PRELIMINARY MINI STORM SEWER DESIGN  
WINDS END LANE

## **Appendix G**

### **Mini-Storm Sewer Alternate Discharge Options**





Season Fields Subdivision

Legend

- Property Address
- Parcel Lines
- Parcel Polygons
- Display Parcel Lines
- PLSS Sections
- Highway Labels
- Streets
- Airports
- Wisconsin Water
- County Boundaries
- Fox River
- Fox River Buffer
- Outagamie Water
  - Apple Creek
  - Bear Creek
  - Bear Creek
  - Black Creek
  - Black Otter Creek
  - Black Otter Lake
  - Duck Creek
  - Embarrass River
  - Garners Creek
  - Mackville Creek
  - Maple River
  - Oneida Creek
  - Rat River
  - Shaky Lake
  - Shioc River
  - Squaw Lake
  - Toad Creek
  - Wolf River
- Municipality Boundary
  - Outagamie County, City
  - Outagamie County, Town
  - Outagamie County, Village
- Contours 1 Ft
  - Intermediate 1 ft
  - Index 5 ft
- 2018 Orthophotography
  - Red: Band\_1
  - Green: Band\_2
  - Blue: Band\_3



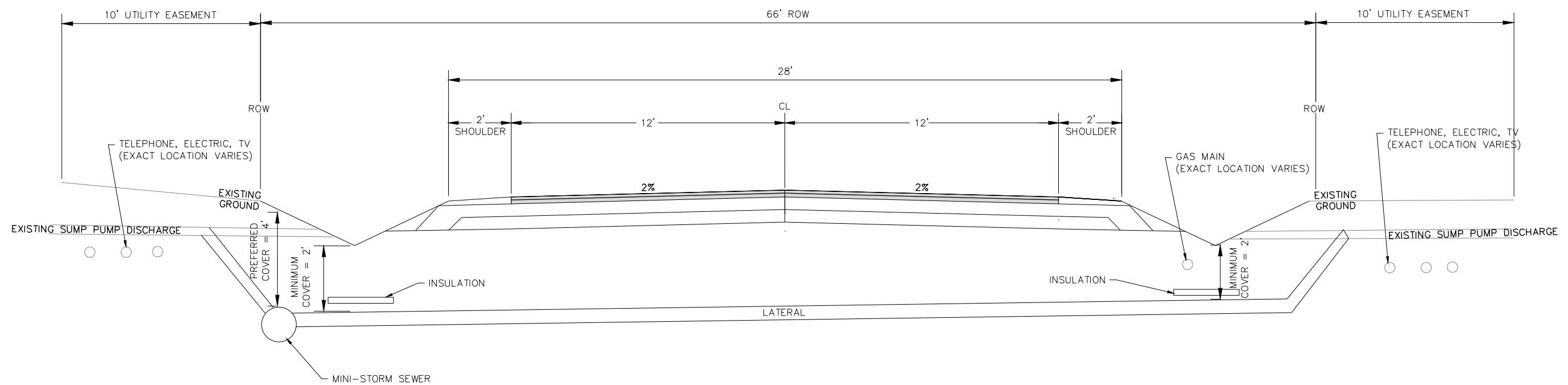
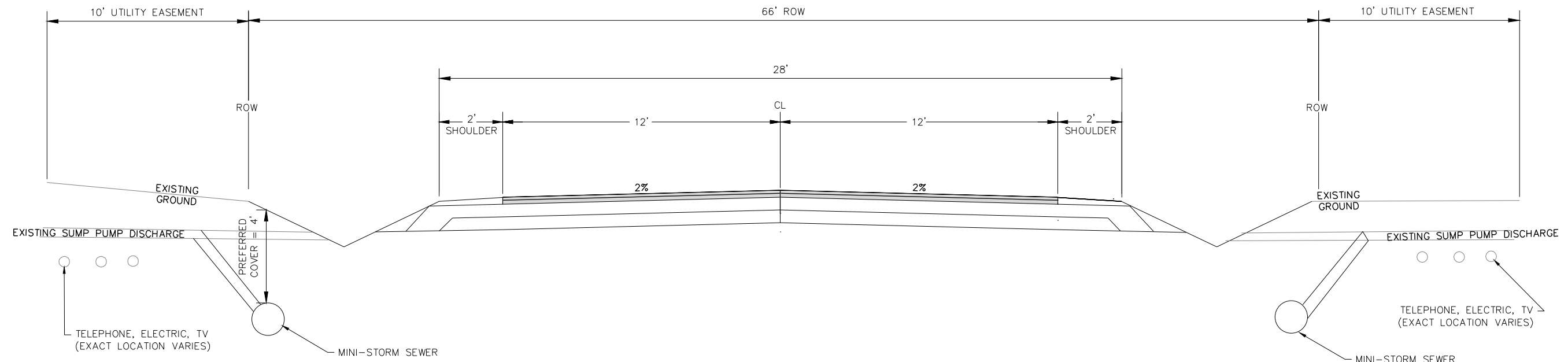
DISCLAIMER: This map is not guaranteed to be accurate, correct, current, or complete and conclusions drawn are the responsibility of the user.

Author:	
Date Printed:	
Sources:	



## **Appendix H**

**Typical Section/Cross section of Mini-Storm Location and Laterals**



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TYPICAL SECTION

SHEET NO.

5 OF 5

## **Appendix I**

### **Culvert Modeling Hydraulic Analysis and Evaluation**

# 1 SEASON FIELDS CULVERT HYDROLOGIC ANALYSIS

## 1.1 Model Notes

A topographic survey of Summer View Drive and Winds End Lane in the Season Fields subdivision was completed in the fall of 2018. A surface model was created in AutoCAD Civil 3D with County LiDAR data supplementing the area not surveyed. The drainage area to several key culverts was delineated for this analysis. It was assumed that front yards will drain toward the road side ditches.

NOAA's Atlas 14 Point Precipitation Frequency Estimates (Atlas 14) was used to determine the 24-hour precipitation depth for the 1, 2, 5, 10, 25, 50 and the 100-year storm events. The precipitation depths were used by HydroCAD to calculate the peak flows for the storm events.

# 2 HYDRAULIC ANALYSIS

## 2.1 Model Notes

The attached Drainage Plan completed by others for the Seasons Field subdivision documents the required minimum culvert sizes for each lot. Culvert sizing according to the plan is as follows:

**Table 2-1**  
**2003 Drainage Plan Culvert Sizing**

LOT	CULVERT SIZE	NOTES
LOTS 1-5	(2) 20"x28" CMPAs	
LOTS 5-9 LOTS 12-26	15" CMP	IT IS ASSUMED THAT LOT 5 UNDER THIS SECTION IS INTENDED FOR A CULVERT ON SUMMER VIEW DRIVE
LOTS 9-11 LOTS 27-30	18" CMP	IT IS ASSUMED THAT LOT 9 UNDER THIS SECTION IS INTENDED FOR A CULVERT ON SUMMER VIEW DRIVE
LOTS 31-33	24" CMP	

A hydraulic model was created using the Federal Highway Administration (FHWA) HY-8 version 7.50. The purpose of this model was to confirm the culvert sizing. A number of variables affects the culvert capacity. One such variable is the allowable head up stream of the culvert. The shoulder elevation at the upstream culvert invert was used as the overtopping elevation in the program. Culvert capacity is as follows:

**Table 2-2**  
**Current Site Culvert Sizing Results**

LOT	CULVERT SIZE	CAPACITY	5 YEAR STORM EVENT (CFS)	10 YEAR STORM EVENT (CFS)	
LOT 5	(2) 20"x28" CMPA	21.6	18.3	23.8	PASSES 5 YR
LOT 11	18" CMP	11.3	3.8	5.1	PASSES 10 YR
LOT 12	15" CMP	4.0	3.3	4.4	PASSES 5 YR
LOT 26	15" CMP	5.4	3.6	4.8	PASSES 10 YR
LOT 27	18" CMP * (MINIMUM SIZE PER PLAN)	6.0	6.9	9.0	DOES NOT PASS 5 YR
LOT 27	15" CMP * (INSTALLED)	4.4	6.9	9.0	DOES NOT PASS 5 YR
LOT 31	24" CMP	10.3	9.8	13.1	PASSES 5YR

\* A 15" CMP driveway culvert was installed for lot 27 and the drainage plan requires a minimum 18" CMP for the lot.

\* There is an existing detention basin in the backyard easement behind Lot 27. A preliminary analysis was completed for this study regarding the stormwater detention. The stormwater discharge from the detention basin is an estimated flow based on approximate data. The estimated flow will need to be verified in the design phase of the project. The sizing results above indicate that Lots 27-30 cannot pass a 5-year storm event with an 18" driveway culvert. A more detailed survey of the detention basin shall be completed prior to recommending any culvert replacements in Lots 27-30.

## **Appendix J**

### **Rain Garden Evaluation**



**WISCONSIN DEPARTMENT OF NATURAL RESOURCES**  
**CONSERVATION PRACTICE STANDARD**  
**RAIN GARDEN**  
**1009**

**DEFINITION**

A rain garden is a storm water management practice consisting of a shallow depression planted with a dense cover of vegetation, designed to capture storm water *runoff*<sup>1</sup> from a small *drainage area* and infiltrate it into the underlying soil.

**PURPOSE**

A rain garden may be used individually or as part of a system of storm water management practices to support one or more of the following purposes:

- (1) Enhance storm water *infiltration*,
- (2) Reduce discharge of pollutants from storm water to surface water,
- (3) Increase groundwater recharge,
- (4) Decrease runoff peak flow rates and volumes,
- (5) Preserve lake levels and base flows in streams,
- (6) Reduce temperature impacts of storm water runoff,
- (7) Reduce downstream erosion or *adverse drainage*,
- (8) Promote mitigation of runoff closer to its origin, such as a roof downspout.

**CONDITIONS WHERE PRACTICE APPLIES**

Rain gardens apply to small drainage areas where storm water discharges are a concern, and the soil, site and runoff conditions are suitable for infiltration. Rain gardens are best suited for providing on-site storm water management in landscaped areas that receive runoff from small rooftops which are considered low pollutant risks.

Rain gardens are not suitable for controlling sediment from construction site erosion or treating large areas of impervious surfaces. Rain gardens also have limited applicability where there are clay soils, shallow bedrock, or *high groundwater conditions*.

This standard contains design limitations for the size of contributing *drainage areas* (watersheds) and excludes applicability to watersheds where significant sources of sediment or salt-based deicers are present or anticipated. If site conditions or applicable regulations present significant challenges, applying this standard may require the assistance of a professional or the use of other technical standards, such as those designated for storm water infiltration or bioretention.

---

<sup>1</sup> Words in the standard that are shown in italics are described in the Definitions section. The words are italicized the first time they are used in the text.

## COMPLIANCE WITH LAW

Users of this standard must comply with applicable federal, state and local laws, rules, regulations or permit requirements governing rain gardens. This standard does not contain the text of federal, state or local laws. The criteria contained in this document may help a user meet the storm water infiltration performance standard under s. NR 151.124, Wisconsin Administrative Code, or as may be required in local storm water ordinances. However, the applicable governing authority makes the final determination of compliance with any regulation.

## CRITERIA

### Site Criteria

Conduct a site assessment to determine compliance with the following criteria:

- (1) **Setbacks.** Do not *hydraulically connect* rain gardens with any feature in Table 1. Setbacks are measured from the edge of the ponding area. Confirm minimum setback distances are maintained. If the rain garden is upslope, setbacks may need to be extended depending on site conditions.

**Table 1. Minimum Rain Garden Setback Distances**

Feature	Minimum Setback (feet)
Building foundations (full basement)	10
Building foundation (frost footing) or pavement	5
Wells	8 <sup>Note 1</sup>
Septic System	5

<sup>Note 1</sup> If the proposed rain garden is within 25 feet of a well, a regulatory agent should be consulted regarding potential for well contamination (and to avoid being “hydraulically connected”).

- (2) **Soil limitations.** Confirm a minimum 1-foot vertical separation distance from the *bottom of the rain garden to bedrock or high groundwater level*. When considering constructing a rain garden in clay soils consider deep rooted plants to enhance infiltration rates (see Table 2). If the *Soil Survey* shows bedrock is 1-3 feet below the proposed bottom of the rain garden, consult with a professional to determine if there is risk of sinkhole development.
- (3) **Slopes.** Locate rain gardens on slopes no steeper than 8:1 (horizontal:vertical). Cut and fill slopes on the perimeter of rain gardens must be 2:1 (horizontal:vertical) or flatter, unless the slope is supported with stone, landscape block, or other retention device.
- (4) **Drainage area (watershed).** Evaluate the area draining to the rain garden based on the rain garden’s proposed location, including rooftops and adjacent landscaped areas. Confirm the total watershed drainage area does not exceed the maximums specified in the Design Criteria, and that significant sources of sediment or salt-based deicers are not present or anticipated.
- (5) **Trees.** Avoid or minimize damage to roots of desirable trees (generally within dripline).
- (6) **Erosion/adverse drainage.** Direct the outflow/discharge from the rain garden to a stable outlet that does not cause soil erosion or adverse drainage conditions for other properties.
- (7) **Utilities.** Do not locate rain gardens above buried utilities or within a utility easement without approval from the applicable authority.
- (8) **Septic system.** Do not hydraulically connect rain gardens to a POWTS dispersal cell or cause negative impacts such as cross contamination.

### Design Criteria

**Size of Ponding Area.** The minimum size of the rain garden ponding area (bottom of the rain garden, which is called the *effective infiltration area*, not including the side slopes or *berm*) depends on the

selected depth of the ponding area, the infiltration rate of the soil, and the percent runoff volume control. The volume of runoff depends on the size of the contributing watershed drainage area, the land use or surface characteristics or both, and the design percentage of runoff to be infiltrated. Use Table 2 to find the appropriate sizing factor used to calculate the rain garden ponding area.

For each *ponding depth*, the table includes sizing factors for each soil type and corresponding design infiltration rates. It also provides modified sizing factors for three levels of desired runoff volume control: 75%, 90%, and 100% of the average annual rainfall volumes. Selecting the appropriate runoff volume control depends on the goal of the project and applicable regulatory or cost-sharing requirements. Contact local storm water experts for assistance in determining which level to use.

**Procedure for design.** Determine the minimum ponding surface area (effective infiltration area) of the rain garden by multiplying the drainage area to the rain garden (in square feet) by the appropriate sizing factor from Table 2 (based on the percent runoff volume control, soil type, and ponding depth). The rain garden ponding area includes the bottom of the rain garden, not the side slopes or berm (see Figure 1 and 2).

Rain Garden Design Ponding Area (sq.ft.) = Drainage Area (sq.ft.) x Sizing Factor (from Table 2)

Use the 75% sizing factors for all pervious drainage areas and where runoff from impervious drainage areas travel more than 30 lineal feet on a pervious surface before entering the rain garden.

**Table 2. Rain Garden Sizing Factors for Various  
Runoff Volume Control Goals, Soil Types and Ponding Depths** <sup>Note 1</sup>

Rain Garden Ponding Depth (inches)	Sizing Factor Based on Soil Type/Design Infiltration Rate and Runoff Volume Control Goal				
	Clay Loam (0.15 in/hr)	Silt Loam (0.30 in/hr)	Loam <sup>Note 2</sup> (0.50 in/hr)	Loamy Sand (1.0 in/hr)	Sand (2.0 in/hr)
Sizing Factors for Goal of <b>75 Percent</b> Runoff Volume Control <sup>Note 3</sup>					
3-5	0.15	0.11	0.08	0.07	0.04
6-7	0.12 <sup>Note 4</sup>	0.09	0.07	0.05	0.03
8	0.10 <sup>Note 4</sup>	0.08	0.06	0.04	0.03
Sizing Factors for Goal of <b>90 Percent</b> Runoff Volume Control <sup>Note 5</sup>					
3-5	0.23	0.19	0.15	0.12	0.07
6-7	0.18 <sup>Note 4</sup>	0.14	0.12	0.09	0.06
8	0.15 <sup>Note 4</sup>	0.12	0.10	0.07	0.05
Sizing Factors for Goal of <b>100 Percent</b> Runoff Volume Control					
3-5	0.44	0.35	0.30	0.23	0.17
6-7	0.35 <sup>Note 4</sup>	0.30	0.23	0.18	0.13
8	0.25 <sup>Note 4</sup>	0.23	0.18	0.13	0.11

<sup>Note 1</sup> The soil infiltration rates shown in Table 2 only apply to this standard and may not be used for the design of any other stormwater best management practice. Soil infiltration rates in Table 2 were developed from Rawls et.al., 1982 and averages from DNR Technical Standard 1002.

<sup>Note 2</sup> This soil category may only be used if an infiltration test is conducted and the soil supports this infiltration rate, or if a soil texture test is conducted by a professional.



Note <sup>3</sup> Designed to meet infiltration performance standards under s. NR 151.124, Wis. Adm. Code for “Moderate imperviousness” land uses (40% to 80% connected impervious surfaces), such as medium and high density residential. The local storm water regulatory authority may have other requirements.

Note <sup>4</sup> Due to drawdown times exceeding 48 hours, turf grass is not appropriate vegetation for rain gardens within this category.

Note <sup>5</sup> Designed to meet infiltration performance standards under s. NR 151.124, Wis. Adm. Code for “Low imperviousness” land uses (less than 40% connected imperviousness), such as parks and low density residential development. The local storm water regulatory authority may have other requirements.

Note <sup>6</sup> Other factors can be used in the design, including evapotranspiration and deep rooted vegetation.

### Example 1

Calculate the design ponding area of a rain garden (note the effective infiltration area is equal to the bottom of the pond, and does not include the side slopes) given a pervious drainage area of 5000 sq. ft., 75% runoff control volume (runoff flows 100 ft on a pervious surface before entering the rain garden), 8 inches of ponding, and a loam soil (tested by a professional). The proposed bottom of the rain garden is 12 inches above groundwater. All of the setbacks noted in Table 1 are met.

### Solution

The design ponding area of the rain garden (effective infiltration area) = the drainage area x the Table 2 sizing factor for a given soil and pond depth.

Design ponding area = 5000 sq. ft. x 0.06 (Table 2 sizing factor for loam soil, 75% runoff, and 8” of ponding) = 300 sq. ft. Note the design ponding area is equal to the bottom of the rain garden (side slopes are not included).

**Drainage Area (watershed).** A drainage area contributing runoff to the rain garden may include impervious areas, such as roofs, or pervious areas, such as lawns, or some combination of both. As the size of the drainage area increases, so does the minimum ponding area of the rain garden. The location of the rain garden and nearby grading will determine the size and make-up of the drainage area. The following drainage area limits apply:

- (1) The maximum drainage area for impervious surfaces is 3,000 square feet.
- (2) The maximum drainage area for all types of surfaces is 5,000 square feet.

Measure roof size using the dimensions of the building plus the overhang for that portion of the roof draining to the rain garden. If the drainage area includes runoff from nearby landscapes, measure the area of contributing landscape and include it in sizing calculations (see criteria above), or divert the runoff from entering the rain garden.

### Ponding Depth.

The maximum ponding depth is 8 inches. The design ponding depth is a function of site slope and rain garden dimensions (Table 2). Generally, more steeply-sloped sites or smaller rain gardens will require more depth.

### Soil Type/Infiltration Rates.

Conduct an on-site *infiltration test* or determine soil texture to select the design infiltration rate. Regardless of method, the design infiltration rate may not exceed 2.0 inches/hour.

For on-site infiltration testing, a sample procedure for conducting the test is described in Attachment 1. Professionals may also provide this service using *double ring infiltrometers* or similar devices.

To establish soil texture, conduct an on-site *soil texture analysis* or send a soil sample to a lab for texture classification. A sample procedure for conducting an on-site soil texture analysis is contained in Attachment 2. Professionals may also help determine soil textures.

### Configuration.

Rain garden components include: ponding area, ponding depth, *berm* (optional), downslope edge, *planting bed*, design overflow (optional), and vegetation. (See Figures 1.1 - 1.3).

FIGURE 1.1

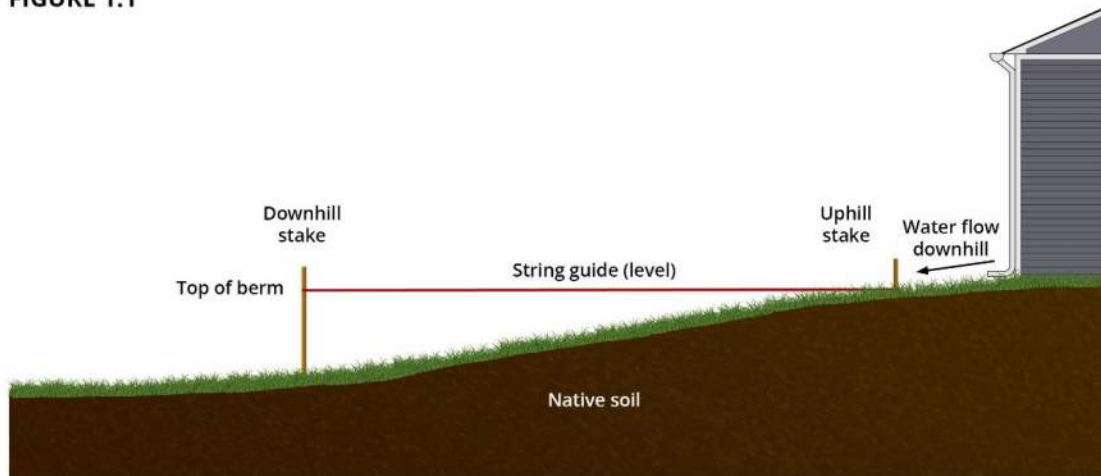


FIGURE 1.2



FIGURE 1.3

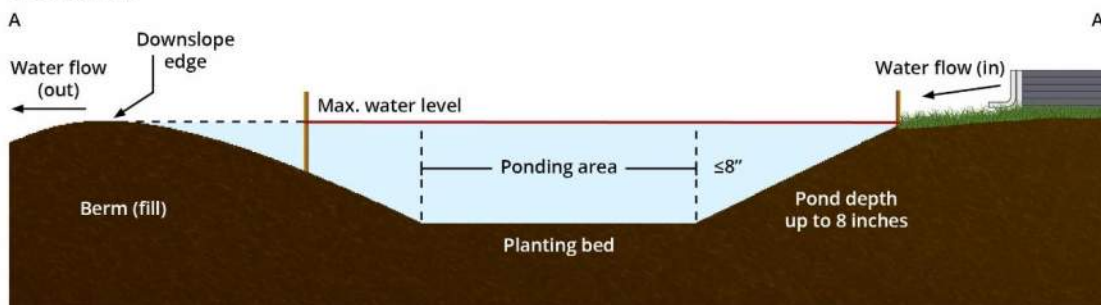


FIGURE 1 - THE PROCESS OF DIGGING A RAIN GARDEN

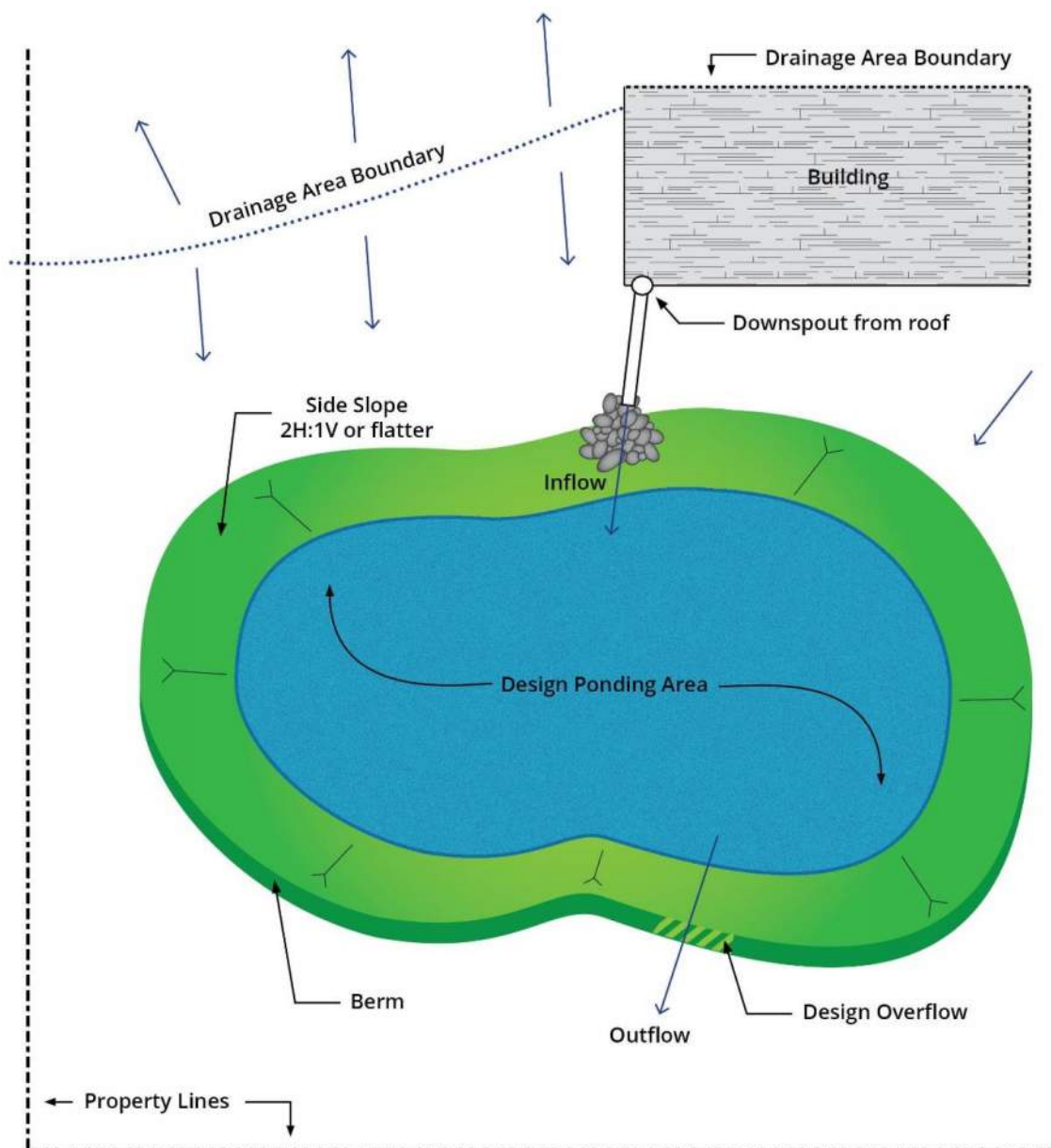
Not to Scale

Preparing site layout (Figure 1.1), digging basin (Figure 1.2), and completing the berm (Figure 1.3).  
Note – the effective infiltration area equals the ponding area noted which equals the planting bed area (side slopes are not included).

**Berms.** On sloped sites or sites with limited soil depth, a small earthen berm may be constructed on the downslope side of the ponding area. This is usually constructed with soils excavated to create the

ponding area (Figure 2), but for shallow soils, clean fill material may be needed for berm construction. Set topsoil aside during the excavation and/or fill process and reuse it on the planting bed and the surface of the berm as a growing medium.

Construct the top width of the berm to be at least 12 inches, and the side slopes to be 2:1 (horizontal:vertical) or flatter, unless the edge of the berm is supported with stone, landscape block, or other retention device. For maintenance purposes, flatter slopes are recommended. Compact the soil in the berm to minimize settling after construction and prevent berm failure. Apply final layer of topsoil, seed and soil stabilizer after compaction.



**FIGURE 2 - RAIN GARDEN PLAN VIEW**

Not to Scale

**Downslope Edge.** Construct the top of the downslope edge at an elevation needed to retain the design ponding depth for the entire ponding area (a maximum depth of 8 inches). The downslope edge may be the top of a berm or existing grade (Note: Using the existing grade may require exporting the soil excavated for the rain garden ponding area). The downslope edge must direct discharges to a stable outlet that will not create adverse drainage conditions to structures and other properties. If a certain flow path is critical to meet this requirement, design the overflow to meet the requirements listed below.

Protect the downslope edge from erosion before grass is established using soil surface stabilizers such as straw, mulch or erosion control matting.

**Design Overflow.** For most rain gardens, a small berm can serve as the overflow for large rainfall events. However, it may be desirable to confine the overflow to a particular flow path for proper drainage. For example, the overflow might need to be directed toward a constructed grass swale between properties. To confine the overflow, build the top of the entire berm 3 inches higher than the design ponding depth, leaving a small, level overflow section at the design ponding depth near the desired discharge point. Provide erosion controls at the discharge point as needed. The width of the level overflow section must meet the minimums shown in Table 3.

**Table 3. Minimum Width for a Design Overflow in a Rain Garden Berm**

Impervious Drainage Area (square feet)	Minimum Overflow Width (feet) <sup>Note 1</sup>
0 – 1000	1.0
1001 – 1600	1.5
1601 – 2100	2.0
2101 – 2700	2.5
2701 – 3000	3.0

<sup>Note 1</sup> Overflow widths estimated using the Rational Method and peak flows produced by a 100-year/3-minute storm, assuming a runoff coefficient of 0.95 and applying a broad-crested weir outflow to a full rain garden.

**Planting Bed.** The slope of the planting bed must be as flat as possible, with a maximum slope of 1%. Use original soils for the planting bed. If the excavation exposes subsoils that are difficult to use for planting, over-excavate the area by 2 inches and apply the original topsoil to the new surface.

Soil amendments such as compost may be applied to enhance plant establishment.

**Vegetation Plan.** Plants are key to stabilizing the rain garden ponding area and encouraging infiltration. To maximize plant growth and survival, develop and implement a vegetation plan, including planting method, timing, sequencing, fertilization, watering and maintenance during the plant establishment period.

Select plants that are hardy for Wisconsin growing conditions. Ensure they are capable of withstanding the site's soil, sunlight and shade conditions, as well as water inundation and drought cycles associated with rain gardens. Native species, non-native perennials, or cool season turf grasses may be used. The deep roots of many native species will enhance soil infiltration and can better withstand the challenging growing environment inherent to rain gardens. Maximum rain garden depths are more limited for turf grass due to the potential negative impacts of extended draw down times, as shown in Table 2, note 3. Confirm a source of water is available during plant establishment or seed germination.



The following minimum standards apply:

#### Native Plants and Non-native Perennials

May be planted using plant plugs, prairie sod or seed.

- (1) Plant plugs. The minimum planting density is 1 plant per square foot. It is easier to apply mulch to the planting bed before the plant plugs. Watering and weeding between the plant plugs is critical during the establishment phase. Weeding helps prevent the growth of exotic or invasive species. See References for additional recommendations to maximize success rate of plant plugs.
- (2) *Prairie sod*. Follow grower recommendations for plant selection, placement, watering and maintenance. To secure until its root establishment, anchor sod with 6-inch stakes in a minimum 2-foot grid pattern. Compared to seeding and plant plugs, prairie sod requires less maintenance during the establishment period.
- (3) Seed. When a rain garden is adjacent to a downspout, seeding is the most difficult method due to potential seed damage and/or loss during heavy rains, and the length of time it takes for native plants to become established (1-2 years). Therefore, downspout discharges must be redirected outside of the rain garden until plants are fully established. The minimum seeding rate depends on the species being planted and must be based on recommendations from the providing nursery based on the rain garden size. For native species, a cover crop such as annual rye grass or oats is required to stabilize the soil while the plants establish their root system.

Water daily until the cover crop is well established. Weeding is critical during the establishment phase to prevent the growth of exotic or invasive species. See References for additional recommendations to maximize success rate of the seed.

**Note: To improve planting success, aesthetics, and wildlife habitat, a diverse assortment of native species is recommended.**

#### Turf Grass

Rain gardens may be planted with turf grass (except as noted in Table 2 for clay loam soils), using seed or sod as noted below:

- (1) Seed. The minimum seeding rates and procedures for establishment and maintenance are described in UWEX publication A3434 Lawn Establishment & Renovation (2000).
- (2) Sod. Generally sold in 2-foot by 4-foot sections. Sod must be tamped into place with edges tight and lightly watered daily for 2 weeks.

#### Woody Vegetation

Rain gardens may also be planted with limited woody vegetation. Do not plant woody vegetation near inflow locations or allow woody species to shade out grasses and forbs. Avoid trees and shrubs where they could obstruct utilities or the line-of-sight triangles at intersections.

#### Invasive Species

Installing any plant species listed in ch. NR 40.04 Prohibited Category, Wis. Adm. Code (Invasive Species Identification, Classification and Control) is prohibited. Of those, common invaders of rain gardens to be removed immediately include Canada thistle (*Cirsium arvense*), plumeless thistle (*Carduus acanthoides*), crown vetch (*Coronilla varia*), white mulberry (*Morus alba*), wild parsnip (*Pastinaca sativa*), and phragmites (*Phragmites australis*). See Consideration (3) for additional plant species to avoid.

**Soil Treatment/Erosion Control.** To prevent scour near downspout discharges, install downspout splash pads or line the soil surface with stone or other stable material.

For all design overflows, apply staked erosion matting, stone or other stable material, wrapping up the sides of the flow path. For the remainder of any rain garden that is not sodded, apply one of the following to minimize soil erosion, suppress weed growth, reduce soil compaction during planting and preserve soil moisture until plant growth is established:

- (1) Mulch (for plant plugs only). Apply 1 to 2 inches of shredded mulch before planting. The mulch

must be free of foreign material, including other plant material. Push mulch aside to install the plant plugs.

Avoid applying too much mulch, which may negatively affect plant growth. Shredded mulch is more stable than other mulch types, which may be more prone to floating and smothering plants after rain events. Newspaper may be applied to the soil surface prior to the mulch to further suppress weed growth. Mulch can be discontinued at plant maturity provided that the soil surface is fully covered with dense vegetation.

- (2) **Staked erosion control mat (biodegradable blanket).** For plant plugs, apply mat on the surface of the soil prior to planting, and cut through it to install plants. For seeded rain gardens, apply the mat after the seeding and fertilizing is complete. Stake erosion mat to the soil with 6-inch biodegradable staples in a minimum 2-foot grid pattern. Overlap and anchor any joints in the matting in the direction of flow.

Erosion control matting comes in many types and can last 6 months to several years. If the rain garden will be regularly mowed, Class I Urban is recommended as it will degrade more quickly. For native plantings, Class II Type C is recommended since it may stay in place longer.

### **Construction.**

**Compaction avoidance.** Avoid construction on wet soil as it increases compaction and smear, and reduces infiltration and seed establishment. Avoid excessive foot traffic on the planting bed prior to the application of soil surface stabilizers. Avoid use of heavy construction equipment on the planting bed, especially high-pressure rubber-tired equipment. If possible, cordon off the rain garden area during construction.

**Compaction remediation.** If compaction is known to have occurred during construction, apply compost to the soil surface and rototill it into the soil as deep as possible to improve infiltration before planting. If after planting, the rain garden does not drain or drains too slowly, allow deep-rooted species time to break through the compacted soil, which may take two to three years. If this does not work, remove all plants and complete the compost and rototill steps. If compaction is deeper than a rototiller can reach, specially-designed deep tillage equipment may also be used to lift and fracture the subsoils without turning over the topsoil.

## **CONSIDERATIONS**

- (1) **Benefits.** Rain gardens planted to native species are especially suitable where other benefits are desired such as shade, windbreak, noise absorption, reduction in reflected light, microhabitat for plants and wildlife, and improved aesthetics.
- (2) **Planning/Design.**
  - (a) Balancing cut and fill on site will avoid the disposal of excess soil and constructing larger berms than needed.
  - (b) If outlet pipes or berms larger than those prescribed in this standard are proposed, consult with a professional to consider other designs and additional safety measures.
  - (c) For large rain gardens, it may be difficult to maintain a flat bottom, especially on sloped sites. If water does not spread over the entire bottom, the *effective infiltration area* is reduced and drought conditions may form for some of the plants. Consider breaking the rain garden into smaller cells and/or hiring a professional.
  - (d) Building rain gardens on clay loam soils can be challenging due to the long drain down times. Carefully select plants that can tolerate frequent standing water. Consider using a shallow rain garden option. Deep rooted natives are recommended. If possible, divert inflows away from the rain garden the first year to allow root development, which will improve infiltration over time. Amending the soil with compost, or deep tillage to fracture subsoils may be required. Adding drain tile around the perimeter may also help reduce ponding, but presents

additional challenges for installation, locating an adequate outlet for the tile, and ensuring long-term maintenance of the tile.

- (e) Drain down times of less than 24 hours can be advantageous adjacent to airports (to reduce bird habitat).

### (3) **Plants.**

- (a) Plants can be selected to simulate a variety of plant communities suitable to the soil type (e.g. plants capable of penetrating clayey soils). Native plant communities should contain a mix of deep-rooted, herbaceous plants; shrubs may also be included.
- (b) Consider using plants that offer pollinator habitat, such as the plant list published by the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) for gardens and lawns at <https://datcp.wi.gov/Documents/PPPGardens.pdf>.
- (c) Planting plugs or prairie sod is recommended to establish vegetation more quickly. If planting seed, stabilize the seed to prevent it from washing away, and confirm conditions (e.g., water, sunlight) are appropriate to promote its germination.
- (d) Consider using plant material from a nursery licensed by DATCP as a Nursery Grower or Nursery Dealer under Wisc. Stats. Ch. 94.10 and WI Admin Code Ch. 21.
- (e) Consider the long-term implications of trees within the garden, such as the space it will require when fully grown, possible impacts shade has on ground layer plants, and effects the roots may have on drainage. Avoid planting trees that grow too large or may spread aggressively within or nearby the garden, such as aspens, cottonwood, or boxelder.
- (f) Check outside sources, such as gardening centers or professional landscapers, to select the planting distance between trees and shrubs.
- (g) Leave stems and seed heads for wildlife cover or bird food. If removing undesired dead plant material, doing so in the spring will allow for insects, including pollinators such as moths and butterflies, to overwinter within the material.
- (h) The foliage canopy of plant communities should completely cover the soil planting bed at the end of two growing seasons.
- (i) The References section includes two references for plant selection (Shaw and Schmidt, 2003; Bannerman and Considine, 2003). It is recommended that experienced individuals be consulted to assist with vegetation selection and establishment.
- (j) Avoid installing plant species listed in ch. NR 40.04 Prohibited or Restricted Categories, Wis. Adm. Code (Invasive Species Identification, Classification and Control).
- (k) If the rain garden is intended to maintain plant diversity, avoid installing the following plant species which are common invaders of rain gardens and may overtake or degrade the intended plant diversity. Remove these species if found:
  1. Reed canary grass (*Phalaris arundinacea*)
  2. Quack grass (*Agropyron repens*)
  3. Bull thistle (*Cirsium vulgare*)
  4. Burdock (*Arctium* spp.)
  5. Wild carrot (*Daucus carota*)
  6. Sweet clover (*Melilotus* spp.)
  7. Cattails (*Typha* spp.) not only can outcompete intended native plant diversity, but are also an indicator that the rain garden remains too wet.)
  8. Canada goldenrod (*Solidago canadensis*)
  9. Tall goldenrod (*Solidago altissima*)

10. Orange daylily (*Hemerocallis fulva*)
11. Miscanthus grass (*Miscanthus* spp.)
12. Giant ragweed (*Ambrosia trifida*)
13. Common ragweed (*Ambrosia artemisiifolia*)
14. Boxelder (*Acer negundo*)
15. Cottonwood (*Populus deltoides*)

## PLANS AND SPECIFICATIONS

Prepare plans and specifications for each specific field site in accordance with the criteria of this standard and describe the requirements for applying the rain garden to achieve its intended use.

Specify the materials, construction processes and sequence, location, size, and elevations of all components of the rain garden to allow for certification of construction upon completion in the plan.

Include the following on the plans:

- (1) A vicinity map showing the drainage area, north arrow, rain garden location, and flow paths to and from the rain garden.
- (2) Limits of construction and areas to avoid compaction.
- (3) A plan view of the rain garden showing the existing and proposed elevation contours, shape, dimensions, and flow paths to and from the rain garden.
- (4) A long direction cross-section view of the rain garden showing depth of cut, side slopes, height of the berm and overflow. Set a temporary benchmark from which to measure cuts and fills.
- (5) A short direction cross-section view of the rain garden, showing depth of cut, side slopes, height of the berm and overflow.
- (6) A vegetation plan (including plant names and planting locations).

Include the following with the specifications:

- (1) A description of the contractor's responsibilities (if contracted).
- (2) Additional details relating to vegetation, including:
  - (a) Plant material listing (names, quantities, etc.).
  - (b) Site preparation needed to establish and grow selected species.
  - (c) Planting period, care, and handling of the planting materials to confirm that they have an acceptable rate of survival, including initial weeding and watering responsibilities.
  - (d) Vegetation warranty period.

## OPERATION AND MAINTENANCE

Prepare a maintenance plan with the following elements (see Table 4 example):

- (1) Inspection. A plan to inspect the rain garden a minimum of three times per growing season to remove nuisance or invasive plants and identify problems with excess moisture, soil erosion, berm settling or failure of any other component.
- (2) Plants and weeds. Cut and remove nuisance or invasive species, remove excessive dead plant material annually, and replace desired species that may have died in significant numbers.
- (3) Erosion control and berm settling. Stabilize eroding soil and repair damage or settling that may occur on the berm if it affects the ponding area or discharge flow path.



- (4) Compaction. If the rain garden retains surface water for greater than 72 hours, soil compaction mitigation may be needed. Soil compaction mitigation includes taking action to decrease bulk density of the soil, which might be accomplished by a combination of mechanical, vegetative and/or chemical means. Examples of compaction mitigation include: deep tilling, deep ripping, soil amendment and establishment of deep-rooted vegetation. If turf grass is currently present, switch to deep-rooted native species.

**Note: The local regulatory authority may require the maintenance plan to be recorded on the property deed with provisions for access by the regulatory authority for inspection and enforcement purposes.**

Hire or train individuals who are able to identify all of the plant species that were planted in the rain garden at all stages of life as well as common weeds and invasive plants. These individuals should also be knowledgeable about effective control methods for common weeds.

It is not recommended to use a rain garden for snow storage since snow is often associated with deicers and other sediment and debris, which will damage the plants and soil.

**Table 4. Typical Maintenance Activities for Rain Garden Areas**

ACTIVITY	FREQUENCY
<b>Inspect rain garden</b> to remove nuisance or invasive plants and identify problems with excess moisture, soil erosion, berm settling or failure of any other component	At least three times per growing season
Water plants	As needed for several weeks after planting, and during drought conditions thereafter
Monitor water level after a large rainfall to ensure drainage	As needed, especially during the first year
<b>Remove nuisance or invasive plants</b>	<b>As needed per inspections</b>
Re-plant void areas	As needed per inspections
Treat diseased trees and shrubs	As needed per inspections
Repair eroded areas and any berm damage or settling	As needed per inspections
Remove trash and debris	As needed per inspections
Remove excessive dead plant material	Annually (spring recommended)

## REFERENCES

ASCE, 1992, ASCE Manuals and Reports of Engineering Practice No. 77, Design and Construction of Urban Stormwater Management Systems.

Bannerman, R. and E. Considine. 2003. Rain Gardens: A How-to Manual for Homeowners. University Wisconsin Extension Publication GWQ037 or Wisconsin Department of Natural Resources Publication PUB-WT-776 2003.

Ch. NR 40, Wis. Adm. Code, [https://docs.legis.wisconsin.gov/code/admin\\_code/nr/001/40](https://docs.legis.wisconsin.gov/code/admin_code/nr/001/40)

## **Appendix K**

### **Preliminary Cost Estimates**



## Town of Greenville

### Season Fields Subdivision Stormwater Study

January 21, 2019

#### Estimated Opinion of Probable Cost

#### Preliminary Mini-Storm Sewer System - Option 1 - Mini-Storm Sewer on Both Sides of Roadway

Summer View Drive CL Length = 3,000 LF, Winds End Lane CL Length = 600 LF

33 Total Residential Lots

ITEM	QUANTITY	UNIT COST	TOTAL COST
MINI STORM SEWER	7200 LF	\$30	\$216,000
STORM SEWER STRUCTURES	1 LS	\$10,000	\$10,000
OPEN CUT/DIRECTIONAL BORE UNDER DRIVEWAYS	33 EA	\$2,000	\$66,000
CONNECT TO EXISTING SUMP PUMP DISCHARGE PIPE	33 EA	\$500	\$16,500
LANDSCAPE RESTORATION (10' WIDTH ALONG PIPE)	8000 SY	\$5	\$40,000
TRAFFIC CONTROL	1 LS	\$1,000	\$1,000
EROSION CONTROL	1 LS	\$1,000	<u>\$1,000</u>
SUBTOTAL CONSTRUCTION			\$350,500
CONTINGENCY 10%			\$35,050
ENGINEERING & ADMINISTRATION			\$70,100

**TOTAL OPINION OF PROBABLE COST**

**\$455,650**

**TOTAL OPINION OF PROBABLE COST PER LOT**

**\$13,807.58**

#### NOTES:

This Estimated Opinion of Probable Cost assumes that mini-storm sewer is directional bored in the existing driveway or the driveway is open cut to construct the mini-storm sewer only. The entire driveway replacement cost is not included in this Opinion of Probable Cost.



## Town of Greenville

### Season Fields Subdivision Stormwater Study

January 21, 2019

#### Estimated Opinion of Probable Cost

#### Preliminary Mini-Storm Sewer System - Option 2 - Mini-Storm Sewer on One Side of Roadway

Summer View Drive CL Length = 3,000 LF, Winds End Lane CL Length = 600 LF

33 Total Residential Lots

ITEM	QUANTITY	UNIT COST	TOTAL COST
MINI STORM SEWER	3600 LF	\$30	\$108,000
STORM SEWER STRUCTURES	1 LS	\$10,000	\$10,000
DIRECTIONAL BORE LATERAL CONNECTIONS (17 LOTS)	1200 LF	\$80	\$96,000
OPEN CUT/DIRECTIONAL BORE UNDER DRIVEWAYS	33 EA	\$2,000	\$66,000
CONNECT TO EXISTING SUMP PUMP DISCHARGE PIPE	33 EA	\$500	\$16,500
LANDSCAPE RESTORATION (10' WIDTH ALONG PIPE)	5000 SY	\$5	\$25,000
TRAFFIC CONTROL	1 LS	\$1,000	\$1,000
EROSION CONTROL	1 LS	\$1,000	<u>\$1,000</u>
SUBTOTAL CONSTRUCTION			\$323,500
CONTINGENCY 10%			\$32,350
ENGINEERING & ADMINISTRATION			\$64,700

**TOTAL OPINION OF PROBABLE COST**

**\$420,550**

**TOTAL OPINION OF PROBABLE COST PER LOT**

**\$12,743.94**

#### NOTES:

This Estimated Opinion of Probable Cost assumes that mini-storm sewer is directional bored in the existing driveway or the driveway is open cut to construct the mini-storm sewer only. The entire driveway replacement cost is not included in this Opinion of Probable Cost.



Town of Greenville, Wisconsin  
*Capital Improvement Plan*  
 2019 thru 2023

**PROJECTS BY DEPARTMENT**

Department	Project #	2019	2020	2021	2022	2023	Total
<b>Fire &amp; Rescue</b>							
Fire & Safety Building	FR-19-01	6,500,000					6,500,000
Quint Apparatus	FR-19-02				1,000,000		1,000,000
<b>Fire &amp; Rescue Total</b>		<b>6,500,000</b>			<b>1,000,000</b>		<b>7,500,000</b>
<b>General Government</b>							
Town Hall Chair & Table Replacement	GG-19-01	5,000					5,000
Granicus Software AV Upgrades	GG-19-02	18,082					18,082
<b>General Government Total</b>		<b>23,082</b>					<b>23,082</b>
<b>Parks, Recreation &amp; Forestry</b>							
Toro Groundskeeper - 4110-D	PR-19-02	85,000					85,000
Advance SC1500 20" Floor Scrubber	PR-19-03	7,000					7,000
Bobcat Toolcat 5600	PR-19-04		60,000				60,000
18' Landscape Trailer	PR-19-05		5,000				5,000
Top Dresser	PR-19-06			10,000			10,000
1-Ton Dump Truck	PR-19-07					60,000	60,000
Sports Complex Master Plan	PR-19-10	50,000					50,000
Lions Park Dumpster Enclosure	PR-19-11	6,500					6,500
Community Park Drainage Improvements	PR-19-12	16,000					16,000
Community Park Pickleball Courts	PR-19-13		87,000				87,000
Lions Park Street Lighting	PR-19-14		40,000				40,000
Lions Park Parking Lot	PR-19-15			140,800	116,000		256,800
Lions Park Paving Reclamation	PR-19-16				15,000	505,000	520,000
Z-Turn Mower	PR-19-17					15,000	15,000
<b>Parks, Recreation &amp; Forestry Total</b>		<b>164,500</b>	<b>192,000</b>	<b>150,800</b>	<b>131,000</b>	<b>580,000</b>	<b>1,218,300</b>
<b>Public Works</b>							
1 Ton Single Cab Pickup Truck	PW-19-01	39,900					39,900
1/2 Ton Single Cab Pickup Truck	PW-19-02	38,200					38,200
Single Axle Dump Truck	PW-19-03	231,800					231,800
2019 Plow Attachment	PW-19-04	8,700					8,700
Payload Replacement	PW-19-05		250,000				250,000
Enclosed Utility Trailer	PW-19-06		10,000				10,000
Sedan	PW-19-07			20,000			20,000
Tandem Axle Plow Truck	PW-19-08			230,000			230,000
Rubber Tracked Excavator	PW-19-09			240,000			240,000
Skid Steer Replacement	PW-19-10				95,000		95,000
Service Truck Replacement	PW-19-11				180,000		180,000
Asphalt Hot Box	PW-19-12				45,000		45,000
1/2 Ton Pickup Truck Replacement	PW-19-13					40,000	40,000
1/2 Ton Pickup Truck Replacement	PW-19-14					40,000	40,000
Med Sized Ag Tractor	PW-19-15					100,000	100,000
CB Pedestrian/Bike Trail	PW-19-16	844,500					844,500

Department	Project #	2019	2020	2021	2022	2023	Total
Rapid Flash Beacons - STH 76 & Parkview	PW-19-17	35,000					35,000
Traffic Calming - Glen Valley and Glenview Drives	PW-19-18	6,000	54,000				60,000
Parking Lot Paving - Public Works	PW-19-19		415,000				415,000
Yard Waste Site	PW-19-20	438,000					438,000
Coverall Building Repair	PW-19-21		10,000				10,000
Fleet Scanning Tool	PW-19-22	4,000					4,000
DPW Building Electrical Update	PW-19-23	10,000					10,000
Refridgerant Recovery, Recycling, Recharging Machine	PW-19-24		5,500				5,500
DPW Shop Fan	PW-19-25	20,000					20,000
Julius Dr Reconstruction (Hillview - STH 15)	PW-19-26	25,000	62,923		527,264		615,187
Hillview Dr Reconstruction (Julius - STH 76)	PW-19-27	50,000	174,497		1,234,094		1,458,591
Julius Dr Reconstruction (Spring - School)	PW-19-28	1,156,404					1,156,404
Greenwood Road Urbanization (Parkview - STH 15)	PW-19-29	149,500	191,300	2,517,257			2,858,057
Spring Road Reclamation (Manley - North)	PW-19-30	432,510					432,510
Spring Road Reclamation (North - Julius)	PW-19-31		180,818				180,818
Design Drive Reclamation (Tower View - Technical)	PW-19-32	141,817					141,817
South Creek Dr Reclamation	PW-19-33	8,865	106,358				115,223
School Rd Reconstruction (Betty's Rodeo - STH 76)	PW-19-34	16,755	201,062				217,817
School Road Urbanization (Technical - STH 76)	PW-19-35		105,139	100,000	262,495	3,880,613	4,348,247
Moonshadow (Greenwood to 200' of Star Dust)	PW-19-36		488,161				488,161
CTH CA Reconstruction	PW-19-37	41,316	802,804				844,120
<b>Public Works Total</b>		<b>3,698,267</b>	<b>3,057,562</b>	<b>3,107,257</b>	<b>2,343,853</b>	<b>4,060,613</b>	<b>16,267,552</b>
<b>Stormwater Utility</b>							
Community Park Drainage	SW-19-01	30,000					30,000
Everglade Phase 2	SW-19-02	200,000					200,000
Country Meadows Regional Pond	SW-19-03			60,000			60,000
Pebble Ridge Pond	SW-19-05			80,000			80,000
Pro-Build/Builders Choice Flood Control Basin	SW-19-06		178,000				178,000
Season Fields Mini-Storm	SW-19-07		80,000				80,000
Spring Road Dredging	SW-19-08		20,000				20,000
Towering Pines Regional Pond Prairie	SW-19-09	40,000					40,000
School Rd Stream Restoration	SW-19-10	10,000	40,000		200,000		250,000
Sports Complex Stream Restoration	SW-19-11	25,000	40,000		120,000		185,000
STH 15 Flood Control Basin	SW-19-12	138,400					138,400
Westgreen/School Rd Pond	SW-19-13	62,500	254,284				316,784
<b>Stormwater Utility Total</b>		<b>505,900</b>	<b>612,284</b>	<b>140,000</b>	<b>320,000</b>		<b>1,578,184</b>
<b>Water &amp; Sewer Utilities</b>							
SCADA Hardware	SD-19-01		40,000				40,000
Lift Station Maintenance	SD-19-02	5,000			25,000		30,000
STH 96 - Cleary Ct Loop	SD-19-03		225,000				225,000
Water Meter Collectors	SD-19-04					25,000	25,000
Lift Station #2 Bypass	SD-19-05	170,000	1,750,000				1,920,000
<b>Water &amp; Sewer Utilities Total</b>		<b>175,000</b>	<b>2,015,000</b>		<b>25,000</b>	<b>25,000</b>	<b>2,240,000</b>
<b>GRAND TOTAL</b>		<b>11,066,749</b>	<b>5,876,846</b>	<b>3,398,057</b>	<b>3,819,853</b>	<b>4,665,613</b>	<b>28,827,118</b>











