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Mitigation Plan

January 21, 2021

Sullivan Wetland Bank

Tyrone Township,
Le Sueur County, Minnesota

Submitted by:
Bolton & Menk, Inc.
1960 Premier Drive
Mankato, MN 56001
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Wetland Mitigation Proposal
Mitigation Plan (Full Application)

BWSR

Submit this document to the Corps of Engineers and Wetland Conservation Act (WCA) Local Government Unit (LGU).

PROJECT NAME	Project Type
Sullivan Wetland Bank	☒ **Wetland Bank** ☐ In Lieu Fee Site ☐ Project Specific (PRM)

SPONSOR INFORMATION **Agent Information**

Sponsor's Full Name			Authorized Agent's Name and Title (if applicable)		
Todd Sullivan			**Dan Donayre & Eva Douma**		
Company			Company		
			Bolton & Menk, Inc.		
Street Address			Street Address		
33244 245th Ave			**1960 Premier Drive**		
City	State	Zip Code	City	State	Zip Code
Le Center	**MN**	**56057**	**Mankato**	**MN**	**56001**
Phone (Primary)	Phone (Secondary)	Phone (Other)	Phone (Primary)	Phone (Secondary)	Phone (Other)
(612) 756-2551			**(507) 625-4171**		
E-mail Address			E-mail Address		
Click to enter text.			**dan.donayre@bolton-menk.com & eva.douma@bolton-menk.com**		

Sponsor's Relationship to Property

☒ **Fee Title Owner** ☐ Contract for Deed ☐ Contract or agreement with fee owner ☐ Other: (describe)

STATEMENT OF AUTHORIZATION (required if agent is authorized to represent, and sign for, sponsor)

I hereby authorize, **Bolton & Menk, Inc.** to act on my behalf as my agent in the processing of this document and to furnish, upon request, supplemental information in support of this document.

Signature of Sponsor

21JAN 21

Date

PROJECT LOCATION (Include a Site Location Map)

County	Est. Easement Size (acres)	Watershed Name/No. or HUC 8		Bank Service Area
Le Sueur	**39**	**33 - Minnesota River - Shakopee**		**BSA 9**
Latitude:	Longitude:	Section No.	Township No.	Range No.
°N	°W	**24**	**112**	**25**

☐ Check this box if you are only requesting review under WCA.

☐ Check this box if this is a Minnesota *Agricultural* Wetland Bank proposal.

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SECTIONS

Do not leave any of the following sections or subsections blank. If a section does not apply to your project, then enter "not applicable" for that section and explain why.

1. Regulatory Review Status and Project History

Identify and discuss the extent of review and comments received on this pending wetland banking project to date. Reference and include review letters and findings related to previous scrutiny of the proposed project by local, state, and federal review entities.

The Prospectus was submitted on April 9, 2020. BWSR comments were received on July 1, 2020, Corps comments were received on October 22, 2020, and EPA comments were received on June 22, 2020. The BWSR, Corps, and EPA comments have been addressed as follows:

BWSR Comments:

1. The main tile line shown to flow southeast has been corrected in Exhibit H to reflect that it does indeed flow north to the lift station across CR 28.
2. Refer to Section 9.1 for a discussion of the east ditch.
3. The Corps approved the Wetland Delineation on June 17, 2020 (MVP-2019-01879-DAS).
4. See flow chart (Exhibit N-2b) and cropping history.
5. The paragraph just before the credit allocation table has been updated to clarify that "upland" buffer is required by WCA whenever feasible (8420.0522, Subpart 6).
6. Calculation in the credit tables have been adjusted and sum to 100%.
7. Adjustments to the proposed wetland and upland areas have been made to equal 1:1, as well as a 25% buffer credit category (Exhibit K).

BWSR Engineering Comments:

1. **The Sponsor is aware a conservation easement will be put into place on the property. See Corps Comment 4.**
2. **See EPA comment 2.c.**
3. **See section 5.**
4. **Hydrology and Performance Standards Comments:**
    a. **Hydrology performance standards have been updated.**
    b. **Deep marsh hydrology performance standards have been updated as suggested.**
    c. **Shallow marsh performance standards have been updated.**
    d. **The Sponsor prefers to leave the proposed releases as they are.**
    e. **Because the shrub-carr monitoring period will be longer than the remainder of the wetland and upland buffer, separate tables are proposed to ease in credit release requests and performance standard monitoring.**
    f. **The proposed credit releases have been updated.**
5. **See Section 8 for 2019 and 2020 herbicide application details.**
6. **See Section 8 for a proposed vegetative management plan.**
7. **The Sponsor's preference is to seed in spring following approval of the Mitigation Plan.**
8. **Seed specifications from the specified PDF are being used. Seeding details can be seen in Section 8.**

EPA Comments:

1. **A project design plan set and hydrologic analysis are attached. Discussion of the ditch in the northeast part of the easement can be found in Section 9.1. Proposed conditions and impacts on adjacent property are discussed in the attached hydraulics report.**
    a. **See BWSR comment 2.**
    b. **According to the Minnesota Wetland Restoration Guide, tile blocks are the preferred methodology for restoring wetlands drained by subsurface drainage tiles. This method is less invasive and removal or plugging of the full length of existing tile can be expensive and requires extra consideration for backfilling and stabilizing areas that are excavated.**

c. An easement land swap was made with the landowner to the northwest. Attached is the documented land swap and the new conservation easement boundary can be seen in Exhibit H.

2. According to the historic survey map (Exhibit O2) the surrounding area was prevalent with prairie potholes and the presence of a prairie pothole in shown in the northeast corner of the conservation easement, extending off-site to the east. See section 4.
3. The western portion of the property was not included in the conservation easement due to that area containing no historic wetlands (Exhibit N-1). See section 5.
4. A Notice of Decision was issued by the LGU on August 7, 2019 confirming the wetland delineation boundaries. No on-site TEP meeting was held and no comments were submitted.
5. Due to the existing wetland complex to the east, the project will not be able to provide the required 25 foot buffer. Instead, the project will be using that area as a 25% buffer credit category (Exhibit K). The upland buffer to the north end does meet the 25 foot buffer requirement.
6. Due to the monoculture of reed canary grass in the existing wetland complex to east, the proposed Invasive Non-Native is listed as being 30%. The site will address this potential for invasives on-site by applying an aggressive seed mix (see plan set), as well as aggressive management practices when mowing and applying herbicide (see section 8).
7. See BWSR comment 4.
8. The shrub-carr credit release schedule has been updated to reflect a final release total of 100%.

Corps Comments:

1. Credit allocations have been adjusted.
2. See EPA comment 6.
3. Engineering issues identified by the IRT:
    a. Through conversations with the regulatory engineer, the design was changed to a fixed RCP outlet at the north end of Wetland 1 (C3.04). See EPA comment 2.
    b. The proposed embankment includes a rodent guard to protect it from burrowing animals (C1.03). All structural aspects of the restoration will be inspected on an annual basis during the monitoring period an any necessary corrections will be made. This will also extend into long term management as well.
    c. See EPA comment 1.
    d. See EPA comment 3.
4. The conservation easement acquisition will be conducted after this document is submitted.
5. Baseline Information about this site:
    a. See BWSR comment 4.
    b. See EPA comment 2.
    c. See BWSR comment 1.
6. See EPA comment 1c.
7. See the DMBI.
8. Performance Standards and Credit Release Schedules:
    a. The credit release schedule has been corrected to show sums of 100%.
    b. Comments provided by BWSR and the EPA have been addressed.
    c. Joint Guidance for Developing Mitigation Plan Performance Standards and Credit Release Schedules area being followed.
    d. The performance standards have been corrected.
9. Buffer:
    a. The buffer area was brought down to meet the 1:1 ratio by excluding upland areas with low topography. The area to the west of the conservation easement will remain as farmland, providing additional buffer to the wetlands.
    b. See EPA comment 5.
    c. See BWSR comment 7.
10. The Bolton & Menk, Inc. Cultural Resources Team is conducting a Phase I Archeological Survey. Results from this survey will be shared as soon as they are available.

2. Project Sponsor - Landowner

Identify who will be the official project proposer that is ultimately responsible for completing the project and owning the result wetland credits. Discuss any agreements between the sponsor and landowner (if different) or other legal circumstances related to project ownership.

The Sponsor, Todd Sullivan, is the fee title owner. The Sponsor is aware that areas within the conservation easement must stay in a natural state for perpetuity and that access to state and federal inspectors must be provided. The Sponsor is planning to retain ownership of the property and be responsible for the long-term management of the restoration. This may include spot spraying and/or spot mowing invasive species.

3. Proposed Easement Description

Discuss the proposed easement boundary (a required figure) in terms of its location (e.g. coincides with property line, follows road or ditch right-of-way boundary, etc.) and the reasons for including or excluding certain areas (e.g. excludes field road to allow access to adjacent property, etc.).

The majority of the conservation easement is the eastern half of the combined Sullivan Property. The north end of the conservation easement follows the St. Thomas Road ROW from east to west, beginning at the intersection of St. Thomas Road and 251st Avenue and ending at the Phillip Hansen Property. At this point, the easement turns 90-degrees to the southeast corner of the Phillip Hansen Property. The easement then turns 90-degrees to the west and just slightly follows the property line before it turns 90-degrees to the south, following south until the DNR Property line. The conservation easement then continues along the entire south and east edges of the Sullivan Property.

One location will provide access to the easement. An existing farm access at the intersection of St. Thomas Road and 251st Avenue will be removed and an access to the easement will be constructed along St. Thomas Road, immediately before the easement boundary turns 90-degrees south at the Phillip Hansen property boundary (Exhibit B).

4. Historical Conditions

Provide an assessment of historical site conditions from pre-settlement to current condition. Utilize historical air photos, soils information, and other available information sources to estimate historical conditions based on available evidence. Discuss the extent of restoration proposed and describe any constraints that prevent full restoration (such as access to other lands, need to maintain drainage from other properties, etc.). If the project is a wetland creation, discuss historic watershed conditions, changes over time, and how the project will replace or enhance important wetland functions. Attach and reference supporting documents as necessary.

This restoration lies within the Eastern Broadleaf Forest ecological province. According to the MnDNR website, the pre-settlement vegetation was primarily eastern deciduous forest, dominated by a maple-basswood forest (elm, basswood, sugar maple, red oak, and white oak) landscape. The Minnesota Early Settlement Vegetation, as compiled by Marschner (Exhibit F), echoes the pre-settlement description described by the MnDNR, showing the conservation easement dominated by big woods (hardwoods) and surrounded by swaths of wet prairie and open water. The earliest normal climatic imagery found is from 1937 (Exhibit O-1), which shows a majority of the easement area in crop rotation, with wetland signatures visible in the southeast corner. The next available normal climatic imagery is from 1951 and wetland signatures are visible in the northern portion of the easement area as well. Both areas of wetland signatures appear to be extensions of the St. Thomas State Wildlife Management Area to the east.

The restoration lies within the northern portion of minor watershed HUC No. 33036 (Exhibit C). This watershed was once dominated by wetland basins that have been drained and placed in agricultural production. Excluding open water portions of lakes, ponds and rivers, the Lower Minnesota River Watershed has approximately 124,812 acres of wetlands, which is equivalent to 10.61% of the watershed area. Wetlands with herbaceous emergent vegetation are the most common wetland class in this watershed comprising 8.37% of the total wetland area (Figure 13). Shallow open water habitat wetlands are the second most common (1.12%) wetland class. Forested and scrub-shrub wetlands each make up less than 1% of the wetland area in the Lower Minnesota Watershed. Ninety percent of historic wetlands in the watershed have been removed

from the landscape to improve agricultural productivity. Of what remains, 80% of wetlands in the watershed are in poor to fair condition. Using LiDAR, soils data, and historical imagery an estimated 226 acres of wetland have been drained in this minor watershed (Exhibit O-1). Many of these wetlands would be classified as either shallow marsh, deep marsh, or open water. According to the original public land survey, a deep marsh was present in the northeast corner of the proposed conservation easement ensuring wetland hydrology was present prior to agricultural activities (Exhibit O-2).

The fields have been in agricultural crop rotation for over 80 years. Throughout these years the fields have been extensively tiled.

LiDAR (Exhibit H) and soils data (Exhibit G) indicate that hydric soils lie at the bottom of landscape positions in the area, mostly consisting of clay loams and depressional complexes. This indicates that prior to agricultural drainage, the low-lying areas were most likely wetland, surrounded by upland prairie. Judging by the elevations associated with the depressional complexes, historic aerial photographs, and the existing adjacent St. Thomas State Wildlife Management Area, the Basin 1 area in the northeast corner likely supported a deep marsh habitat up to 2.5-feet deep and was surrounded by shallow marsh and fresh (wet) meadow habitats. The Basin 2 area, located in southeast corner of the proposed easement, however appears to have been a scrub shrub wetland, based on the 1937 aerial photograph. This area likely supported a shrub marsh habitat up to 6-inches deep and was surrounded by mesic prairie. The historic wetland boundaries were determined by overlaying hydric soils data and elevation data on the 1937 and 1951 historic aerial photographs (Exhibit O1). The historic wetland boundary of the northeast Basin 1 looks to extend along the 996-foot contour rising to the southeast along a swale to an elevation of 999-feet.

5. Existing Conditions

Provide a description of existing physical conditions of the bank site and surrounding area including current land use, vegetation, roads, structures, wells, utility lines, hydrology, etc. For hydrology describe water flow sources and flow directions and identify tiles, ditches and any other drainage components on or near the site. Also include a discussion of existing wetlands on the site including reference to any wetland delineations or determinations previously conducted and approved. Include and reference figures to supplement the narrative.

The restoration site lies directly adjacent to the St. Thomas State Wildlife Management Area, which is mainly comprised of a restored oak savanna, wetland complex with forest upland and forest wetland components, along with an agricultural food plot. The north boundary of the conservation easement abuts the ROW of St. Thomas Road (CR 28), a paved two-lane roadway. There is a homestead located along the northwest edge of the site as well that will be excluded from the conservation easement. Access to the site will be from the north, along St. Thomas Road (Exhibit B). The access is also located near the proposed northern embankment site, which will ensure the access to the easement remains dry.

The majority of the surrounding land is the St. Thomas State Wildlife Management Area, owned and operated by the MnDNR and the St. Thomas Sportsman Association. There is an adjacent homestead located along the northwest portion of the easement, and farmed agricultural land is located across St. Thomas Road to the north of the easement.

The agricultural fields are extensively tiled (Exhibit H) having been farmed for over 80 years. An agricultural ditch system also runs along the northern and northeastern edges of the site and flows north off-site.

The site is in agricultural production, row cropping. The majority of the site was planted with soybeans in 2020. The site was delineated in 2019, which was the first year that Mr. Sullivan had not planted crops in the northeast and southeast sections of site because of heavy rains. The surrounding land use/land cover consists of shrubland, woodland, wetlands, and row crop agriculture. The western portion of the property was not included in the conservation easement due to that area containing no historic wetlands (Exhibit N-1). That area will continue to be farmed.

The adjacent St. Thomas State Wildlife Management Area consists of approximately 130 acres of wetland area. The vegetation within this wetland complex is dominated by reed canary grass and hybrid cattails. This factor was taken into consideration when designing the invasive species monitoring plan for the site.

The proposed easement consists of low depressional areas and ridges. The location of the easement boundary takes into consideration the natural drainage present and the historic connection to the adjacent St. Thomas State Wildlife Management Area to the east. This ensures that the proposed site is capturing as much overland flow as possible.

The original drainage connection between the proposed easement and the adjacent St. Thomas State Wildlife Management Area has been disconnected due to agricultural ditching between the properties intended to allow agricultural production on the Sullivan property.

The proposed easement site and adjacent farmland has been extensively tiled. Tile lines drain Wetland 1 across CSAH 28 and on to the north, eventually flowing to a lift station that pumps water into an existing wetland that drains into the Forest Prairie Creek (which eventually drains into the Minnesota River). Two tile lines drain Wetland 2 into the restored St. Thomas State Wildlife Management Area to the east.

Wetland hydrology has been removed almost entirely throughout the extent of the Sullivan Bank site through the use of tiling and ditch systems. Restoring hydrology to the site is the key component of this restoration, which will act as the catalyst for a successful vegetation restoration.

The Le Sueur County Soil survey (Exhibit G) has hydric and non-hydric soils mapped throughout the site. The areas mapped as non-hydric are elevated and are not proposed to be restored as wetland. The majority of hydric soils consist of clay loam and depressional complexes with hydric classifications between 90-100%. Scattered throughout the site are small pockets of loamy soil units that are not considered hydric. The wetland delineation that was conducted on July 31, 2019 supports the mapped soils. The delineation found a combination of loamy and clay soils that met the hydric soil indicators for depleted below dark surface, thick dark surface, and redox dark surface.

One seasonally flooded wetland basin (5.00 ac) and two fresh (wet) meadow wetland basins (2.95 ac) were identified in the 2019 wetland delineation (Exhibit K). All three of the wetlands were located within a farmed agricultural field and have been greatly degraded due to cropping and tile lines. Crops have altered the natural hydrophytic vegetation associated with the historic wetland basins that used to be present on-site. The seasonally flooded basin was not cropped in 2019 and nearly void of any hydrophytic vegetation. In addition, drown out has caused the lack of any vegetation in wet years. The two fresh (wet) meadow basins have been cropped in recent years, but were not cropped in 2019, and contained some hydrophytic vegetation, along with many species found in disturbed areas. In addition, tile lines have drawn down the natural hydrology that also used to be associated with all three of the historic wetlands. The seasonally flooded basin is proposed to be restored to shallow and deep marsh hydrology, with a fringed fresh (wet) meadow wetland. The two fresh (wet) meadow basins, that presumably coincide off-site, are proposed to be restored to a shrub-carr wetland. All three of the wetland basin restorations will complete the previous restoration of the adjacent St. Thomas State Wildlife Management Area wetland complex.

A NOD was issued by the LGU on August 30th, 2019. The Corps letter of approval was received on June 17, 2020.

6. Project Goals, Expected Outcomes and Crediting

Identify overall project goals and discuss the anticipated project outcomes in terms of hydrology, vegetation, and wetland functions. Identify credit areas on a Credit Area Map and complete the following Wetland Bank Credit Allocation and Proposed Credit Release Tables. Discuss the rationale for the credit release and any possible modifications to credit releases related to project conditions (such as reduced crediting for partial outcome conditions).

Goals & Outcomes

This project will restore hydrology and native vegetation to 4.9-acres of fresh (wet) meadow, 1.9-acres of shallow marsh, 4.7-acres of deep marsh, 8.0-acres of shrub-carr, and 19.5-acres of mesic prairie. These wetlands have been effectively drained through the use of drain tile, while vegetation has been significantly altered by agricultural practices. By using a fixed outlet set at the NWL elevation of 994.5, wetland hydrology will be returned and maintained. With a 372-acre watershed feeding the site and the presence of depressional soils, hydrology can be preserved by the outlet control structure. All areas above the designed Normal Water Level (NWL) (Exhibit K) will be seeded with native seed mixes, while areas below the NWL up to 3 feet will be seeded with a marsh seed mix.

This restoration will restore 4.9-acres of fresh (wet) meadow, 1.9-acres of shallow marsh, and 4.7-acres of deep marsh, and 8.0-acres of shrub-carr in Bank Service Area (BSA) 9. At this time there is only one other wetland bank found in Le Sueur County. This bank will fill a need for wetland credits in Le Sueur County. BSA 9 serves the southwest metro and growing communities such as Jordan, Shakopee, Waconia, and Carver. With the increasing population pressures in these areas, the need for wetland credits will continue.

The minor watershed (Exhibit C), approximately 4,896-acres, drains to the west, feeding the Minnesota River. Using LiDAR and soils data, it has been estimated that 709-acres of wetland existed within the minor watershed prior to agricultural production (Exhibit O-1). The need to restore shallow marsh and deep marsh habitat is apparent when reviewing the Minnesota Public Land Survey (Exhibit O-2). The presence of deep marsh and open water throughout the minor watershed was well documented. The areas being proposed for restoration have signs that indicate the areas were once flooded basins that were an extension of the adjacent St. Thomas State Wildlife Management Area to the east (Exhibit N1). The ability to store and treat water on this landscape after rain events will therefore be restored.

Through an extensive tile and ditch network documented throughout the minor watershed, it has been estimated that only 483-acres of wetland still exist (excluding Type 1 wetlands) within the minor watershed. It will also restore important ecological habitat for migrating birds, amphibians and reptiles.

Crediting

Credit allocation was determined using the Wetland Mitigation Credit Potential for Restorations in Cultivated fields in Minnesota guidance presented jointly by BWSR and Corps at the April 4, 2019 bank training. This method uses a flow chart (Exhibit N-2b) to determine the wetland crediting for restorations within agricultural fields. The Sullivan Wetland Bank qualifies for 100 percent credit potential as it has been a cultivated field for at least 6 of the past 10 years (Cropping History).

The fields have been in agricultural crop rotation for over 80 years. Throughout these years the field has been tiled connecting the private tile to field tile to the north. In turn, wetland hydrology has been removed almost entirely throughout the extent of the Sullivan Bank site. Therefore, meeting the requirements of wetland re-establishment, which involves a more significant lift in hydrology functions and acreage than rehabilitation. Re-establishing hydrology to the site is the key component of this restoration, which will act as the catalyst for a successful vegetation restoration.

The historic wetland boundaries were estimated by overlaying hydric soils data and elevation data on the 1951 historic aerial photograph (Exhibit N1). The historic wetland boundary looks to extend along the 999-foot contour throughout the northern portion of site. The southern portion of the conservation easement that is to be Wetland 2 lies approximately 1-foot above the lowest basins to the north. It is evident through aerial imagery (Exhibit N1) that wetland hydrology is present based on cropping history showing saturation and drown out conditions.

According to the Wetland Conservation Act and Section 404 of the Clean Water Act, in wetlands greater than 2-acres a buffer must be established with a minimum width of 25 feet and an average width of 50 feet. The majority of the proposed wetland boundary borders mesic prairie, which is to function as natural

buffer and is greater than 50-feet. However, there are locations along the east side of the easement where the proposed easement lies against existing wetland and where an existing ditch is found and will remain. The requirement was achieved by incorporating a 25-foot buffer through restored wetlands and the ditch at these locations which will only receive 25% credit.

Because the shrub-carr plant community will have a different monitoring period (5 years vs 10 years), there are separate credit allocation and performance standards tables for that plant community. This will ease in credit releases and monitoring performance standards.

Credit Allocation Table				
Credit Action[1]	**Wetland Type (Plant Community)**	**Acres[2] (x.x acres)**	**% Credit**	**Credit Amount (x.xxxx)**
Subp. 3 - Reestablishment	Type 2 - Fresh (wet) Meadow	4.5	100%	4.5000
Subp. 3 - Reestablishment	Type 3 - Shallow Marsh	1.9	100%	1.9000
Subp. 4a - Rehabilitation	Type 4 - Deep Marsh	4.7	100%	4.7000
Subp. 4a - Rehabilitation	Type 6 – Shrub-Carr	6.8	100%	6.8000
Subp. 3 - Reestablishment	Type 2 – Fresh (wet) Meadow	0.4	25%	0.1000
Subp. 3 - Reestablishment	Type 6 – Shrub-Carr	1.2	25%	0.3000
Subp. 2 - Buffer	Type 2 – Fresh (wet) Meadow	8.3070	25%	2.0768
	Type 3 – Shallow Marsh	3.2175	25%	0.8044
	Type 4 – Deep Marsh	7.9755	25%	1.9939
	TOTAL EASEMENT SIZE:	39.0000	**TOTAL:**	23.1751

[1]As identified by MN Rules Chapter 8420.0526 and St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota.

- **Subp. 2:** *Buffer* — **Buffer**
- **Subp. 3:** *Restoration of Completely Drained or Filled* — **Restoration via Reestablishment**
- **Subp. 4:** *Restoration of Partially Drained or Filled* — **Restoration via Rehabilitation**
- **Subp. 5:** *Vegetative Restoration of Farmed Wetlands* — **Enhancement**
- **Subp. 6:** *Protection of Wetlands Previously Restored via Conservation Easements* — **Extended Restoration**
- **Subp. 7:** *Wetland Creations* — **Establishment**
- **Subp. 8:** *Restoration and Protection of Exceptional Natural Resource Value* — **Restoration or Enhancement**
- **Subp. 9:** *Preservation of Wetlands* — **Preservation**
- **No Credit:** *Portions of easement area not receiving credit* — **No Credit**

[2]Acres within the bank easement corresponding to the identified credit action and wetland type (round to nearest tenth-acre). The sum total of these acres must equal the bank easement area. WCA/CWA Credit Release Summary

[3]Buffer credits will be distributed among wetland credits based on credit area. See WCA/CWA Credit Release Schedule Table.

Emergent Wetland & Upland Performance Standards				
Initial Release	Execution of MBI, completion of CE monumenting, approval of as-built plan and seeding, recording of conservation easement and delivery of the title insurance policy accepted by the State of Minnesota.			15%
Hydrology Standard	Fresh (wet) Meadow	Depth of Water Table: Within 12 inches of the surface for 28 days or two periods of 14 or more consecutive days during the growing season under normal and wetter than normal conditions. Inundation: Shall not occur except: (1) at the start of the growing season (due to snowmelt/precipitation); and (2) following the 10-year, 24-hour (or greater) precipitation events. Depth of inundation during the growing season shall be 6 inches or less with a duration of less than 14 consecutive days. An exception can be made for sites with hummocky microtopography—hollows between hummocks can have standing water depths up to 6 inches for extended duration.	2nd year[2]	20%
	Shallow Marsh	Inundation: Up to 12 inches for a period of 28 consecutive days during the growing season under normal or wetter than normal hydrological conditions. Inundation allowable up to 18 inches following 2-year, 24-hour or greater storm event provided the inundation does not occur for more than 28 consecutive days. Water table within 12-inches of the surface throughout the majority (more than 5 of 10 years) of the growing season during normal to wetter than normal years.		
	Deep Marsh	Inundation: Up to 48 inches in depth throughout the growing season, with the exception of drought conditions, per U.S. Drought Monitor		
Vegetation Standard Interim 1[3] *(NNI – native, non-invasive species, I – non-native/invasive species)*	Fresh (wet) Meadow	Relative Cover by NNI vs I: 50% or more cover of NNI; Less than 50% I Relative Cover by Hydrophytes: 50% or more cover Species Richness: 5 or more NNI Absolute Cover of Bare Ground: No unvegetated areas greater than 400 sf	2 years[3]	20%
	Shallow Marsh	Relative Cover by NNI vs I: 50% or more cover of NNI; Less than 50% I, including non-native cattail[1] Relative Cover by Hydrophytes: 50% or more cover Species Richness: 5 or more NNI Absolute Cover of Open Water (acreage): 30% or less		
	Deep Marsh	Relative Cover by NNI vs I: 50% or more cover of NNI; Less than 50% I, including non-native cattail[1] Relative Cover by Hydrophytes: 50% or more cover Species Richness: 1 or more species NNI Absolute Cover of Open Water (acreage): Less than 50%		
	Upland Buffer	Relative Cover by NNI vs I: 50% or more cover of NNI, Less than 50% I Species Richness: 5 or more NNI Absolute Cover of Bare Ground: No unvegetated areas greater than 400 sf		
Vegetation Standard Interim 2 *(NNI – native, non-invasive species, I – non-native/invasive species)*	Fresh (wet) Meadow	Relative Cover by NNI vs I: 70% or more cover of NNI; Less than 30% I Relative Cover by Hydrophytes: 65% or more cover Species Richness: 15 or more NNI Absolute Cover of Bare Ground: No unvegetated areas greater than 200 sf	1 Year[4]	20%
	Shallow Marsh	Relative Cover by NNI vs I: 60% or more cover of NNI; Less than 40% I, including non-native cattail[1] Relative Cover by Hydrophytes: 70% or more cover Species Richness: 15 or more NNI Absolute Cover of Open Water (acreage): 20% or less		
	Deep Marsh	Relative Cover by NNI vs I: 60% or more cover of NNI; Less than 40% I, including non-native cattail[1] Relative Cover by Hydrophytes: 10% or more cover Species Richness: 3 or more species NNI Absolute Cover of Open Water (acreage): 40% or less		
	Upland Buffer	Relative Cover by NNI vs I: 70% or more cover of NNI; Less than 30% I Species Richness: 15 or more NNI Absolute Cover of Bare Ground: No unvegetated areas greater than 200 sf		
Final Vegetation Standard *(NNI – native, non-invasive species, I – non-native/invasive species)*	Fresh (wet) Meadow	Relative Cover by NNI vs I: 80% or more cover of NNI; Less than 20% I Relative Cover by Hydrophytes: 75% or more cover Species Richness: 25 or more NNI Absolute Cover of Bare Ground: No unvegetated areas greater than 10 sf	1 year[4]	25%
	Shallow Marsh	Relative Cover by NNI vs I: 70% or more cover of NNI; Less than 30% I, including non-native cattail[1] Relative Cover by Hydrophytes: 80% or more cover Species Richness: 15 or more NNI Absolute Cover of Open Water (acreage): 10% or less		
	Deep Marsh	Relative Cover by NNI vs I: 70% or more cover of NNI; Less than 30% I, including non-native cattail[1] Relative Cover by Hydrophytes: 95% or more cover Species Richness: 6 or more species NNI Absolute Cover of Open Water (acreage): 30% or less		
	Upland Buffer	Relative Cover by NNI vs I: 80% or greater cover of NNI, Less than 20% I Species Richness: 24 or more NNI Absolute Cover of Bare Ground: No unvegetated areas greater than 10 sf		

[1]Non-native cattail refers to Typha angustifolia and Typha x glauca

[2]PS shall be met for a minimum of 2 years; years do not need to be consecutive

[3] Hydrology PS must be met prior to release of vegetation PS; years must be consecutive

[4] Previous vegetation interims must be met prior to release

Shrub-Carr Performance Standards				
Initial Release	Execution of MBI, completion of CE monumenting, approval of as-built plan and seeding, recording of conservation easement and delivery of the title insurance policy accepted by the State of Minnesota.			15%
Shrub-Carr Hydrology Standard	Shrub-Carr	Depth of Water Table: Within 12 inches of the surface for 28 days or two periods of 14 or more consecutive days during the growing season under normal and wetter than normal conditions. Inundation: Shall not occur except: (1) at the start of the growing season (due to snowmelt/precipitation); and (2) following the 10-year, 24-hour (or greater) precipitation events. Depth of inundation during the growing season shall be 6 inches or less with a duration of less than 14 consecutive days. An exception can be made for sites with hummocky microtopography—hollows between hummocks can have standing water depths up to 6 inches for extended duration.	2 years[1]	20%
Shrub-Carr Interim 1	Shrub-Carr	Survival of Planted Woody Stock: 70% Relative Cover by NNI vs I: 50% or greater cover of NNI, Less than 50% I Relative Cover by Hydrophytes: 65% or more cover Shrub Species Richness: 2 or more NNI Herbaceous Species Richness: 5 or more NNI Absolute Cover of Bare Ground: No unvegetated areas greater than 400 sf	2 years[2]	20%
Shrub-Carr Interim 2	Shrub-Carr	Live Stems/Acre: 300 or more NNI shrub seedlings per acre Relative Cover by NNI vs I: 65% or greater cover of NNI, Less than 35% I Relative Cover by Hydrophytes: 75% or more cover Shrub Species Richness: 4 or more NNI Herbaceous Species Richness: 15 or more NNI Absolute Cover of Bare Ground: No unvegetated areas greater than 200 sf	3 years[3]	20%
Final Shrub-Carr Standard	Shrub-Carr	Areal Coverage: 50% cover or greater of NNI shrub species Relative Cover by NNI vs I: 80% or greater cover of NNI, Less than 20% I Relative Cover by Hydrophytes: 85% or more cover Shrub Species Richness: 6 NNI Herbaceous Species Richness: 20 or more NNI Absolute Cover of Bare Ground: No unvegetated areas greater than 10 sf	2 years[3]	25%

[1]PS shall be met for a minimum of 2 years; years do not need to be consecutive

[2] Interim Hydrology PS must be met prior to release of vegetation PS

[3] Previous vegetation interim must be met prior to release

WCA/CWA Emergent Wetland & Upland Credit Release Schedule

**Credit releases shall occur as the specific performance standard is met.*

Performance Standard	Percent of Release	Wetland Release			Upland Release			Total Credits
		Fresh (wet) Meadow	Shallow Marsh	Deep Marsh	Fresh (wet) Meadow	Shallow Marsh	Deep Marsh	
Initial Release	15%	0.6900	0.2850	0.7050	0.3115	0.1207	0.2991	2.4113
Hydrology	20%	0.9200	0.3800	0.9400	0.4154	0.1609	0.3988	3.2151
Veg Interim 1	20%	0.9200	0.3800	0.9400	0.4154	0.1609	0.3988	3.2151
Veg Interim 2	20%	0.9200	0.3800	0.9400	0.4154	0.1609	0.3988	3.2151
Final Veg	25%	1.1500	0.4750	1.1750	0.5191	0.2010	0.4984	4.0185
Total:	**100%**	**4.6000**	**1.9000**	**4.7000**	**2.0768**	**0.8044**	**1.9939**	**16.0751**

WCA/CWA Shrub-Carr Credit Release Schedule

**Credit releases shall occur as the specific performance standard is met.*

Performance Standard	Percent of Release	Shrub-Carr
Initial Release	15%	1.0650
Shrub-Carr Hydrology	20%	1.4200
Shrub-Car Interim 1	20%	1.4200
Shrub-Car Interim 2	20%	1.4200
Shrub-Car Final	25%	1.7750
Total:	**100%**	**7.1000**

7. Ecological Suitability and Sustainability

Specifically address the compatibility of the project with surrounding land uses, habitat types, and ecological communities. Discuss the long-term sustainability of the project in terms of hydrology and vegetation. Specifically address the ability of the project to continue to provide important wetland functions in the context of reasonably foreseeable land use and landscape changes.

The areas being proposed for restoration have signs that indicate the areas once maintained wetland hydrology and were an extension of the adjacent St. Thomas State Wildlife Management Area to the east (Exhibit N1). The Le Sueur County soil survey has hydric soils mapped in the area, including depressional complex soils at the lowest elevations. According to the original public land survey, a large deep marsh was present in the northeast corner of the proposed conservation easement ensuring wetland hydrology was present prior to agricultural activities (Exhibit O-2). Additionally, aerial imagery taken during wet seasons show ponding in the areas mapped with depressional soils. The entire area has a functioning drain tile network (Exhibit H) as well as drainage ditches constructed to divert hydrology from the St. Thomas State Wildlife Management Area from entering the farmland. By disabling this tile system, it is expected that shallow and deep marsh hydrology, as well as fresh (wet) meadow and shrub-carr hydrology, will extend to the limits of the depressional soils.

The proposed restoration is surrounded by cropland with the closest town, Le Sueur, 9 miles away. This is a rural area with no signs that development will ever occur. The stability of the surrounding area remaining the same, with limited or no changes in its immediate watershed make this an exceptional site for restoration.

8. Vegetation Plan

Identify and discuss planned actions to restore vegetation including (but not limited to) seeding, planting, invasive species control, and anticipated maintenance/management activities. Include a seeding/planting zone map (a required figure) and correspondingly identify seed mixes, planting materials, planting rates, and installation methods (hand planted, native seed drill, etc.). Include a schedule of anticipated maintenance and aftercare activities for the initial 5 years of the project and beyond as applicable. Identify and discuss any potential issues (invasive species, sedimentation, drown-out, etc.) and potential corrective actions. Attach and reference supporting documents as necessary.

The goal of this project is to restore the wetland bank site to a native habitat and ecological communities based on MSB data, soil data, survey data, and historical imagery. The upland buffer will be restored to a mesic prairie by using the 35-241 (Mesic Prairie General) seed mix which will include species that are typical of this type of natural community. The wetland areas will be restored to fresh (wet) meadow, shallow marsh, deep marsh, and shrub-carr basins. The fresh (wet) meadow and shallow marsh will be seeded with aggressive custom mixes designed to outcompete reed canary grass. The deep marsh will be seeded with a pilot seed mix and planted with plant plugs on a 20 x 20 grid. These species were selected because of their aggressive nature that will aid in the development of a restoration dominated by native species. The shrub-carr basin will be planted with a combination of the 34-171 (Wetland Rehabilitation) seed mix and native plantings consisting of native shrubs. Pages C1.01 and C5.01 of the attached plan set details the planting plan.

The native vegetation of these communities will be established using proven vegetative management techniques until the performance standards are met. These techniques include periodic burning, herbicide treatments, along with mowing and interseeding. The vegetation will be closely monitored to ensure that a native plant community flourishes and invasive and weedy species are controlled. Once the native plant community is established, spot mows and herbicide treatments, as well as periodic burns will still take place in order to sustain the native plant community.

Certain invasive species can be expected to be present in wetland restorations, while others that are present before the restoration can become an issue. Species that may be present during the monitoring period of this restoration project are reed canary grass, smooth brome, Canada thistle and hybrid cattail.

Constant monitoring of reed canary grass will take place throughout the monitoring period, as this species reproduces prolifically through high seed volumes and rhizomes and is present in surrounding wetlands. A treatment regime of mowing the species in the spring to prevent seed production and herbicide treatments in the fall for rhizome treatment will continue throughout the monitoring period.

Smooth brome is present on the proposed conservation easement. As with reed canary grass, this species reproduces prolifically through high seed volumes and rhizomes. Spring herbicide treatments will be used to eradicate the species.

Canada thistle can develop in bare areas that have been affected by flooding or herbicide overspray, forming large colonies. Where identified, the colonies will be mowed in the spring and an herbicide treatment will be conducted in the fall.

Hybrid cattail is an invasive species that easily migrates through wind born seeds. This species may become a nuisance at this site. As part of the vegetative management, hybrid cattail will be identified and treated using an aquatic approved glyphosate chemical application. For large populations, the application will be applied using backpack sprayers and for sparse populations a more controlled approach of wicking individual plants will be employed.

The sponsor is considering having the vegetative management being taken care of by a professional contractor that has experience in restoration of native vegetation.

To ensure the native seed germination won't be hindered by pre-emergent and post-emergent herbicides; the bank Sponsor provided a list of herbicide applications used over the last two planting seasons:

- **2019**
  - **Surestart II – half-life of 20 days**
  - **Incinerate – half-life of 32 days**
  - **Roundup PowerMax – half-life of 47 days**
- **2020**
  - **Sonic – half-life of 70 days**
  - **Fusilade – half-life of 38 days**
  - **Flexstar GT – half-life of 47 days**

This treatment should not leave any residual herbicides in the soils at the time of planting that would inhibit growth of native species.

The seed bed will be prepared by first disking the site to decompact surface soils and break large chucks of soil down. A harrow will then be implemented to further pulverize the soils and smooth the surface of the restoration site. Finally, the entire area will be finished with a cultipacker or roll to give a smooth planting surface. Once the seed bed preparation has been completed, the seed and planting zones will be staked in the field (C5.01). Seed mixes and plantings will be used for the project as follows:

- **State Seed Mix 35-241 – Mesic Prairie General drilled @ 36.5 lb/ac**
- **Custom Wet Meadow Mix– Fresh (wet) Meadow broadcast @ 3.3 lbs/ac**
- **Custom Emergent Mix– Shallow Marsh broadcast @ 5.2 lbs/ac**
- **Deep Marsh Pilot Mix – Deep Marsh broadcast @ 3.1 lbs/ac**
- **Wetland Rehab Mix 34-171 – Shrub-Carr broadcast @ 5.3 lbs/ac**
- **Deep Marsh Plug Plantings in a 20' x 20' grid below 994.0 feet**
- **Shrub Plantings (856) planted in a 20' x 20' grid below 1000.00 feet**

All seed mixes and plant stock must be harvested or grown within 150 miles of the site. Seed tags will be collected and kept on file. Site preparation will be completed after the tile system has been disabled. The seeding plan and specifications is found on page C5.01 of the attached plan set.

The following vegetative management schedule is an estimate of maintenance activities. It is recognized that actual maintenance of the site is a fluid and revolving process. The following schedule is submitted as a general outline for maintenance activities for the required monitoring period, with the understanding that as situations arise, this timeline and/or activities may change. All maintenance activities shall be documented to show due-diligence in vegetative management.

Short Term Maintenance Schedule	
DATE	**ACTIVITY**
Site Establishment Spring - 2021	
Late April	-Complete on-site grading -Construct site embankment -Construct outlet structure
May	-Begin blocking and daylighting drain tiles, seed bed preparation and planting.
Year 1 - 2021	
May	-Seed and plant entire site.
August	-Mow entire area, wetland and buffer, to a height of 6-8 inches. It is recommended that slow tractor speeds and a flail type mower be used. This is to prevent the creation of dense mulch from smothering smaller plants. Avoiding the disturbance and rutting the soils is important. Therefore, only conduct mowing in areas that are dry enough to sustain the weight of the equipment. If there are areas that the equipment cannot enter due to soil disturbance, use smaller equipment such as a brush saw with a scythe attachment. -Fourteen days after mowing, spot spray patches of reed canary grass, thistle, smooth brome and any other non-native, invasive species with glyphosate-based herbicide. Be careful not to create any overspray that may destroy desirable species.
October	-Mow per specifications. -Fourteen days after mowing, spot spray patches of reed canary grass, thistle, smooth brome and any other non-native, invasive species with glyphosate-based herbicide. Be careful not to create any overspray that may destroy desirable species.
Year 2 - 2022	
May	-Spot spray patches of reed canary grass, thistle, smooth brome and any other non-native, invasive species with glyphosate-based herbicide. Be careful not to create any overspray that may destroy desirable species.
Early June	-Mow patches of reed canary grass, thistle, smooth brome or other non-native, invasive species.
Late October	-Spot spray patches of reed canary grass, thistle, smooth brome and any other non-native, invasive species with glyphosate-based herbicide. Be careful not to create any overspray that may destroy desirable species.
Winter	-Conduct a winter mow throughout the entire site including wetland basins and uplands. Mow fire breaks around any heat or fire sensitive receptors such as tile outlets, outlet control structure, etc.
Year 3 - 2023	
Late April	-Perform prescribed burn throughout the entirety of the site. The goal of this burn is to eliminate thatch and herbaceous areas and to kill shrubs and woody species.
May	-Spot spray patches of reed canary grass, thistle, smooth brome and any other non-native, invasive species with glyphosate-based herbicide. Be careful not to create any overspray that may destroy desirable species.

Short Term Maintenance Schedule	
DATE	**ACTIVITY**
Early June	-Mow patches of reed canary grass, thistle, smooth brome or other non-native, invasive species.
Late October	-Spot spray patches of reed canary grass, thistle, smooth brome and any other non-native, invasive species with glyphosate-based herbicide. Be careful not to create any overspray that may destroy desirable species.
Winter	-Mow fire breaks around any heat or fire sensitive receptors such as, tile outlets, outlet control structures, EOF, etc. The width of fire breaks should be approximately three times the height of the surrounding vegetation for fire sensitive receptors (e.g., wooden nest boxes), and six times the height of the surrounding vegetation for heat sensitive receptors (e.g., plastic structures).
Year 4 - 2024	
Late April	- Burn entire area, wetland and buffer. The goal of this burn is to eliminate thatch in herbaceous areas.
Early June	-Mow patches of reed canary grass, thistle, smooth brome or other non-native, invasive species.
Late October	-Spot spray patches of reed canary grass, thistle, smooth brome and any other non-native, invasive species with glyphosate-based herbicide. Be careful not to create any overspray that may destroy desirable species.
Year 5 - 2025	
Early June	-Mow patches of reed canary grass, thistle, smooth brome or other non-native, invasive species.
Late October	-Spot spray patches of reed canary grass, thistle, smooth brome and any other non-native, invasive species with glyphosate-based herbicide. Be careful not to create any overspray that may destroy desirable species.
Winter	-Conduct a winter mow throughout the entire site including wetland basins and uplands.

(Glyphosate based herbicides include RoundUp, Rodeo, Accord, AquaMaster, AquaPro)

Long Term Management:

The Sponsor is responsible for long-term management of the Bank Site such that it achieves and maintains the functional performance level described; the success criteria contained are indicators of expected function based on implementation. The Sponsor shall maintain the Bank Site in accordance with the provisions of the recorded conservation easement. Consistent with the recorded easement, the Sponsor will adaptively manage the site to control pest, weed, or invasive species as required by state and federal law.

In order to maintain a native plant community and ensure that the structures (embankment, outlet structures, inlets, and outlets) are maintained, the Sponsor will conduct annual site inspections. If these inspections find deficiencies, the appropriate measures will be taken to correct the deficiencies. It is foreseen that these corrective actions could include invasive species control through herbicide treatments, spot mowing and/or winter mows, inlet and outlet maintenance and outlet structure maintenance. Inspection of the site and any corrective actions will be conducted by a contractor of the Sponsor's choice.

The following long-term management schedule is flexible and can be modified if conditions warrant. Conditions that may cause a more intense maintenance schedule would be an outbreak of an invasive species due to native species dying off because of drought or flooding. Reseeding any infected areas may be warranted. Issues that may arise will be handled on a case-by-case basis, as each incident may require different techniques to remedy and new management techniques may develop over the years.

Long Term Maintenance Schedule	
DATE	**ACTIVITY**
June	-Inspect outlet structures and inlets for any blockages or structural issues -Inspect embankments for signs of settling, erosion and rodent damage. - Spot spray patches of reed canary grass, thistle, smooth brome and any other non-native, invasive species with glyphosate-based herbicide.
Late October	-Identify and record any areas of invasive and undesired plant species. -Spot spray invasive species.
Every 3 Years	-Conduct a winter mow throughout the entire site including wetland basins and uplands.

Adaptive Management Plan

Hydrology:
If the water level of the basin is higher than expected, the outlet will be resized and replaced.
Invasive Species Control:
If flooding and/or drought causes native species to die off and an outbreak of invasive species has occurred which exceeds the performance standards, treatment of invasive species and reseeding of any infected areas will occur.
Vegetation:
If native vegetation has not reached the Vegetation Interim 1 standard by the end of year 2, reseeding of bare areas and plantings, or removal of excess vegetation in open water areas will take place.

9. Construction Plan

Address the following subparts and attach and reference supporting documents as necessary:

9.1 Design Approach

Discuss the general design approach proposed to achieve the planned restoration goals for hydrology such as disable drainage system, divert water, impound water, etc. Provide a detailed description of the proposed construction work to be performed for each wetland area to be restored or created.

Tile blocks will be utilized on tiles leaving proposed wetlands, either at the wetland boundaries or at the property boundary. According to the Minnesota Wetland Restoration Guide, tile blocks are the preferred methodology for restoring wetlands drained by subsurface drainage tiles. This method is less invasive than removal or plugging of the full length of existing tile which can be expensive and requires extra consideration for backfilling and stabilizing areas that are excavated. Tile blocks will consist of a predetermined length of tile being removed, with the ends of the tiles sealed with concrete blocks. The lengths will be dependent on the types of soils the block is located in and the estimated lateral effect of the soil. Being that most of the blocks will be within depressional soils, the blocks are expected to be approximately 100-feet in length. The trench is to be backfilled with compacted soils to an elevation above the remaining tile and then capped with the soils existing on site. This technique of blocking tiles in depressions has been used extensively to great success. Tiles will also be daylighted at the wetland boundary, if elevations allow. Three daylights are being proposed, all associated with Wetland 1. Two of the daylighted tiles will be brought to the surface at a slope that will allow for continued drainage of surrounding properties but not be prone to soil erosion. The outlet will be armored with a concrete headwall which will include a rodent barrier. The third tile daylight is located at the north end of the CSAH 28 road ditch. This tile serves the Hansen property, but it is unknown if it is a functioning tile. This will be verified during construction. One earthen embankment is being proposed along the north side of the conservation easement to protect the CSAH 28 road ditch and maintain surrounding drainage. The earthen embankment will be constructed with a clay core trench to prevent seepage (Plan Set C3.02). Capillary rise

is assumed to be at two feet for this project because of the drawdown periods of the pool. The pool drawdown is restricted by a trapezoidal weir for the two-year event in order to maintain the functions of the private drainage ditch. This will cause the NWL to float at a half foot higher, allowing for a higher capillary rise. The ground elevations on the Hansen property will experience surface inundation as a result of creating a pool elevation in the restored wetland basins for rainfall events that exceed the 100-year event. Therefore, an easement land swap has been secured on the Hansen property (attached). An outlet structure will be placed on the northwest portion of Wetland 1. It will consist of a concrete precast structure, with a precast weir containing a trapezoidal weir. The elevation of this weir at 994.5 feet is based on the two-year storm event. An armored emergency overflow at an elevation of 996.5 feet will be constructed within the embankment to ensure surrounding properties do not experience hydrology issues. The outlet elevation of 994-feet is one foot below the MnDNR NWL for the St. Thomas wetland. This elevation is the approximate outlet of the wetland to the north. Hydrologic modeling shows that any outlet elevation above 994-feet will result in flooding issues on the properties to the south. The ditch that runs along the northeast side of the easement will be maintained within the easement and will function as it currently does. This ditch will be within the wetland boundary but is receiving 25% credit as it will continue to function as a drainage feature. It is proposed that the ditch will remove reed canary grass seeds as the ditch flows off-site, rather than allowing the seeds to remain on the site; this will help in establishing native vegetation. The ditch overflowing would be a 100-year event and it is not anticipated to occur frequently based on hydraulic modeling. Attached in the appendix of this document is a final plan set and hydraulic report.

9.2 Site Capability

Discuss the capability of the site to produce and maintain wetland characteristics related to drainage area, wetland area, soils, and topography.

Historical imagery, soils mapping and topography all indicate that the area being restored once maintained wetland hydrology. Although extensively drained, a level 1 wetland delineation identified three seasonally flooded basins through the use of an off-site hydrology assessment. This indicates that the remnant wetlands have the capability to be hydrologically restored.

The restoration will be achieved through an embankment maintaining hydrology in Wetland 1 with a fixed outlet consisting of a 18-inch RCP pipe. Hydrology will be restored to Wetland 2 by breaking field tiles and allowing historical saturation to be restored. The Sullivan Wetland Bank will restore hydrology and native vegetation to 4.9 acres of fresh (wet) meadow, 1.9 acres of shallow marsh, 4.7 acres of deep marsh, 8.0 acres of shrub-carr, and 19.5 acres of mesic prairie.

The upland buffer serves as protection to the wetland from erosion, herbicide over spray and encroachment from farming practices, such as equipment turn around rutting wetland areas. This area also provides habitat for mammal species and nesting habitat for migratory and native bird species. This project lies within the Northern Plaines Migratory Bird corridor. The corridor sees thousands of migratory birds passing and nesting throughout the Prairie Pot Hole Region, making the restoration of both wetland and prairie habitat extremely valuable to the environment. The additional upland buffer acreage will recover important breeding grounds and foraging sites that have been lost to agriculture and development.

9.3 Site Investigations

Discuss and provide information about the locations, methods, and results of any subsurface investigations and analysis performed for the project site.

A Level 1 & 2 Wetland Delineation (see appendix) was completed and submitted for review on August 7, 2019.

9.4 Hydrologic and Hydraulic Analysis

Discuss the hydrologic and hydraulic analyses conducted to define existing site conditions and to design the proposed wetland bank project. Report the following related to hydrology/hydraulics report:

- *Method of analysis, values used for pertinent variable and computed peak flows and water surface elevations for the 2-year, 10-year, 25-year, and 100-year, 24-hour events and associated wetland storage volumes.*
- *Hydraulic design of existing and proposed water control structures.*
- *Discussion of both upstream and downstream impacts.*

See attached Hydraulics Report

10.Supplemental Information

If the project involves protection of wetlands previously restored via conservation, restoration and protection of exceptional natural resource value, or preservation credit actions (WCA rule subparts 6, 8, and 9 respectively), provide a narrative discussion of how the project meets the requirements of actions. Discuss and reference applicable guidance documents and support materials. If necessary, discuss any other information that is relevant to the plan and not discussed in the other sections of the document.

N/A

11. Monitoring Plan

Describe a plan to annually monitor vegetation and hydrology as it relates to the identified credit release criteria. The plan should include anticipated transects and sampling point locations, and a description of the methodology to estimate important measures such as vegetation areal coverage, species diversity, and water table elevations. Plans should identify the proposed frequency and timing of annual monitoring efforts.

Monitoring will be conducted by a Minnesota certified wetland delineator. Site visits to identify plant species will take place a minimum of two times a year. These site visits will be based on bloom time of plant species to aid in identification. Native plant species surveys will be conducted along seven predetermined transects, extending through all plant communities. Each sampling transect will have a five-foot radius plot within each plant community the transect crosses. These plots have been predetermined using soils and survey data. At each sampling plot, plants species will be identified and the percent cover of each species will be determined. This information will be compiled to give an accurate representation of species diversity throughout the restoration. These surveys will occur once a year.

Invasive and weedy species will be identified twice a year using a meander survey and located using a GPS unit. This information will be shared with the sponsor to aid in invasive control and tracked in the monitoring reports.

Plant community boundary surveys will occur in Year 3 and final year of monitoring. This will give plant species time to germinate and for the hydrology of the site to stabilize. Waiting until year three will give an accurate representation of the plant community sizes within the bank.

Hydrology will be monitored using data loggers that will take daily readings throughout the growing season. The data loggers will be installed within shallow depth monitoring wells placed at predetermined locations. Data will be gathered daily and presented in the annual monitoring report. The wells will be installed when the ground is free of frost, this usually happens in April. The data loggers will be removed at the end of the growing season, usually late October, every year until it is evident that wetland hydrology has been established. Monitoring wells will not be established in upland buffer areas. Ground elevations are shot at each monitoring well location. The ground elevation acts as the baseline and is measured against the depth of the water table. Depending on the relation between the ground elevation and the depth of water table, the wetland edge can be established.

Attached in the appendix is Exhibit M: Monitoring Plan which shows the planned monitoring plots, well locations, and photo reference points.

The monitoring well locations were chosen as follows (Exhibit M):

- **W-1: Located along the Le Sueur-Lester complex and Klossner muck soils, at an elevation along the proposed fresh (wet) meadow and shallow marsh of Wetland 1. This location will represent the northwest side of Wetland 1.**
- **W-2: Located within Cordova clay loam soils at an elevation within the fresh (wet) meadow. This well will provide insight into the connection between the mesic prairie and the fresh (wet) meadow of Wetland 1.**
- **W-3: Located within Cordova clay loam soils at an elevation within the southern portion of the fresh (wet) meadow and shallow marsh of Wetland 1. This well will provide insight into the connection between the fresh (wet) meadow and shallow marsh of Wetland 1 for this soil type.**
- **W-4: Located within Le Sueur loam soils at an elevation within the shrub-carr. This well will provide insight into the connection between the mesic prairie and the shrub-carr of Wetland 2 for the far northern end of Wetland 2 and this soil type.**
- **W-5: Located within Cordova clay loam soils at an elevation within the shrub-carr. This well will provide insight into the connection between the mesic prairie and the shrub-carr of Wetland 2 for this soil type.**
- **W-6: Located within Glencoe clay loam soils at an elevation within the shrub-carr. This well will provide insight into the connection between the mesic prairie and the shrub-carr of Wetland 2 for this soil type.**

The following monitoring schedule is a general outline of monitoring activities. This schedule may be modified depending on the success of the restoration site.

ANNUAL MONITORING SCHEDULE	
Late April	-Set data loggers when frost is gone (after construction in 2021).
May	-Conduct invasive species survey.
June	-Conduct native plant species survey. -Conduct plant community boundary survey, in Year 3 and final year.
July	-Conduct final delineation, last year only.
August	-Conduct native plant species survey.
September	-Conduct invasive species survey.
October	-Remove data loggers.

All findings for each year will be presented to the reviewing agencies through an annual monitoring report. The report will be submitted to reviewing agencies by December 31st of each monitoring year. The report will include the following items:

1. **A project location map with legal description.**
2. **A description of restoration goals in terms of size, proposed credits, wetland types, hydrology and wetland functions.**
3. **A description of the performance standards achieved, with a comparison to the final goals that have been set for the restoration.**
4. **A description of activities completed during the past year and activities planned for the following year.**
5. **Hydrology measurements acquired from the data logger and a map accurately showing the location of the data logger.**

6. **A list of plant species along with percent cover for each species for each plant community type.**
7. **Color photographs taken from fixed reference points between July 1st and September 30th of each year.**

A final wetland delineation will be completed at the end of the final growing season of the monitoring period and will be included with the final monitoring report. This delineation will give an accurate measurement of credits for the final credit release.

Attached in the appendix is Exhibit M: Monitoring Plots which shows the planned monitoring plots, well locations, and photo reference points.

12. Special Considerations

WCA rules (8420.0515) identify nine factors that must be considered when submitting a wetland replacement/banking plan. Identify and discuss any and all of these factors that are applicable or potentially applicable to the project and site.

- ***Endangered or threatened species*** **– No threatened or endangered species are known to exist within the conservation easement.**
- ***Rare Natural Communities*** **– No rare natural communities are known to exist within the conservation easement.**
- ***Special Fish and Wildlife Resources*** **- No special fish and wildlife resources are known to exist within the conservation easement.**
- ***Archaeological, historic or Cultural Resource Sites*** **– A Phase I Archaeological Survey was conducted by Bolton & Menk, Inc. in December of 2020 and no archeological, historic or cultural resources were encountered within the conservation easement.**
- ***Groundwater Sensitivity*** **– No adverse effects to groundwater are foreseen as a result of this project.**
- ***Sensitive Surface Waters*** **– This project will not adversely affect any outstanding resource value waters found on the list in MN Rule part 7050.0180.**
- ***Education and Research Use*** **– No impacts to wetlands known to be used for educational or research purposes are foreseen as a result of this project.**
- ***Waste Disposal Sites*** **– No known waste disposal sites exist within the within the conservation easement.**
- ***Consistency with Other Plans*** **– A wetland restoration such as this one, is consistent with the overall watershed management plan to improve water quality.**

Signature

By signing this form I acknowledge that:

A. I am authorizing the review of my Mitigation Plan by the appropriate regulatory authorities as part of establishing a compensatory wetland mitigation project.

B. I am familiar with the information contained in this submittal and, to the best of my knowledge and belief, all information is true, complete, and accurate.

C. No areas proposed to receive wetland bank credit were previously restored or created under a prior approved WCA wetland replacement or banking plan.

D. No areas proposed to receive wetland bank credit were impacted under a WCA exemption during the previous 10 years.

E. No areas proposed to receive wetland bank credit will be restored, created, or preserved with financial assistance from public conservation programs or for other unrelated regulatory purposes.

F. All individuals and entities providing funding for this project are aware that this project will provide credits to offset regulatory wetland impacts.

G. The project will be monitored in accordance with the approved monitoring plan.

H. I understand that Mitigation Plan review may require regulatory agency staff to inspect my project site, that agency staff will contact me in advance to schedule a site visit, and I agree (or am authorized) to allow agency staff reasonable access to the property when prior notification is given.

   If I am not the fee title owner of property, I have obtained permission from the fee title owner to allow agency staff reasonable access to the property when prior notification is given.

Signature of Project Sponsor

21 JAN 21

Date

Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit A: Site Location Map

December 2020

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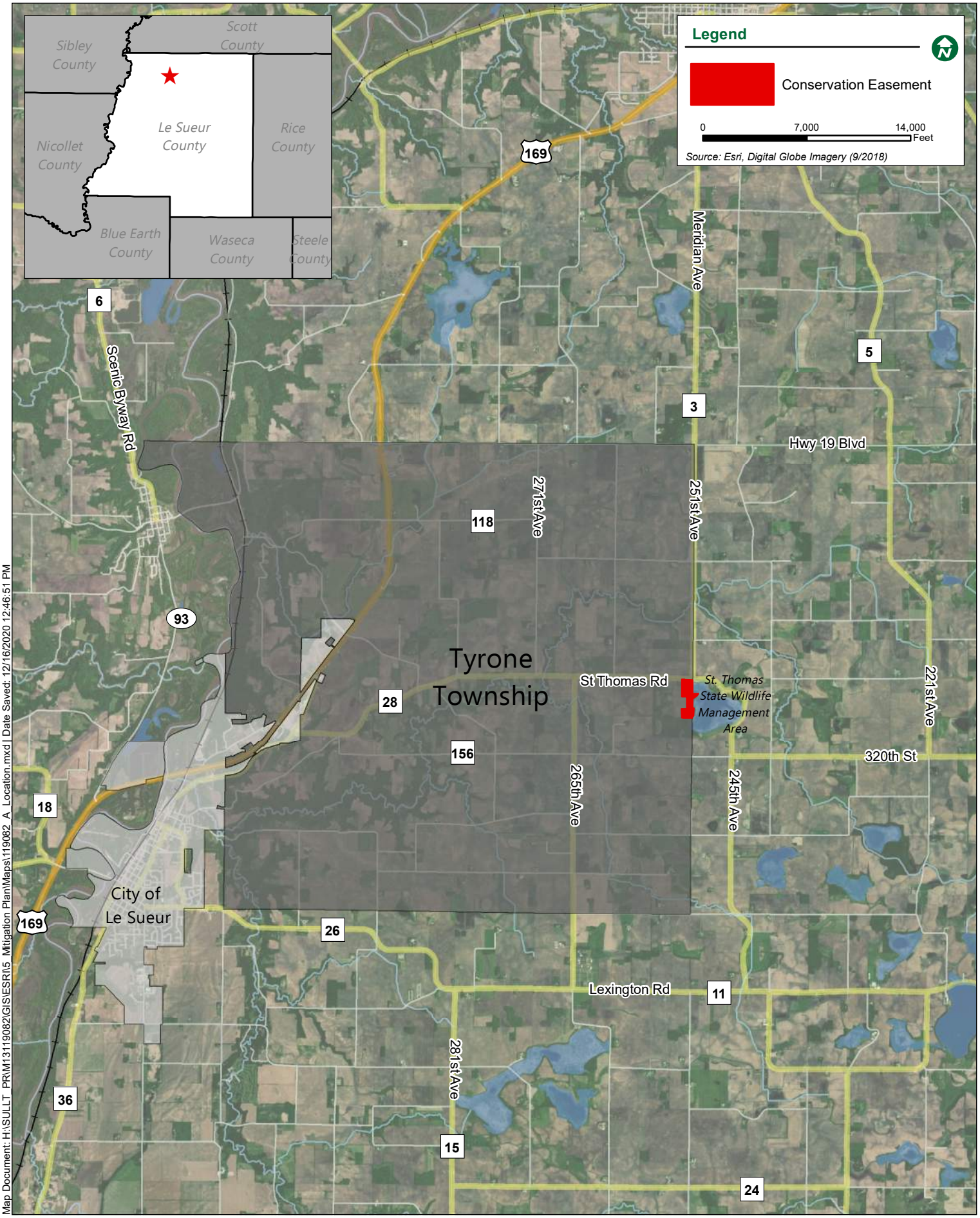

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Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit B: Proposed Conservation Easement

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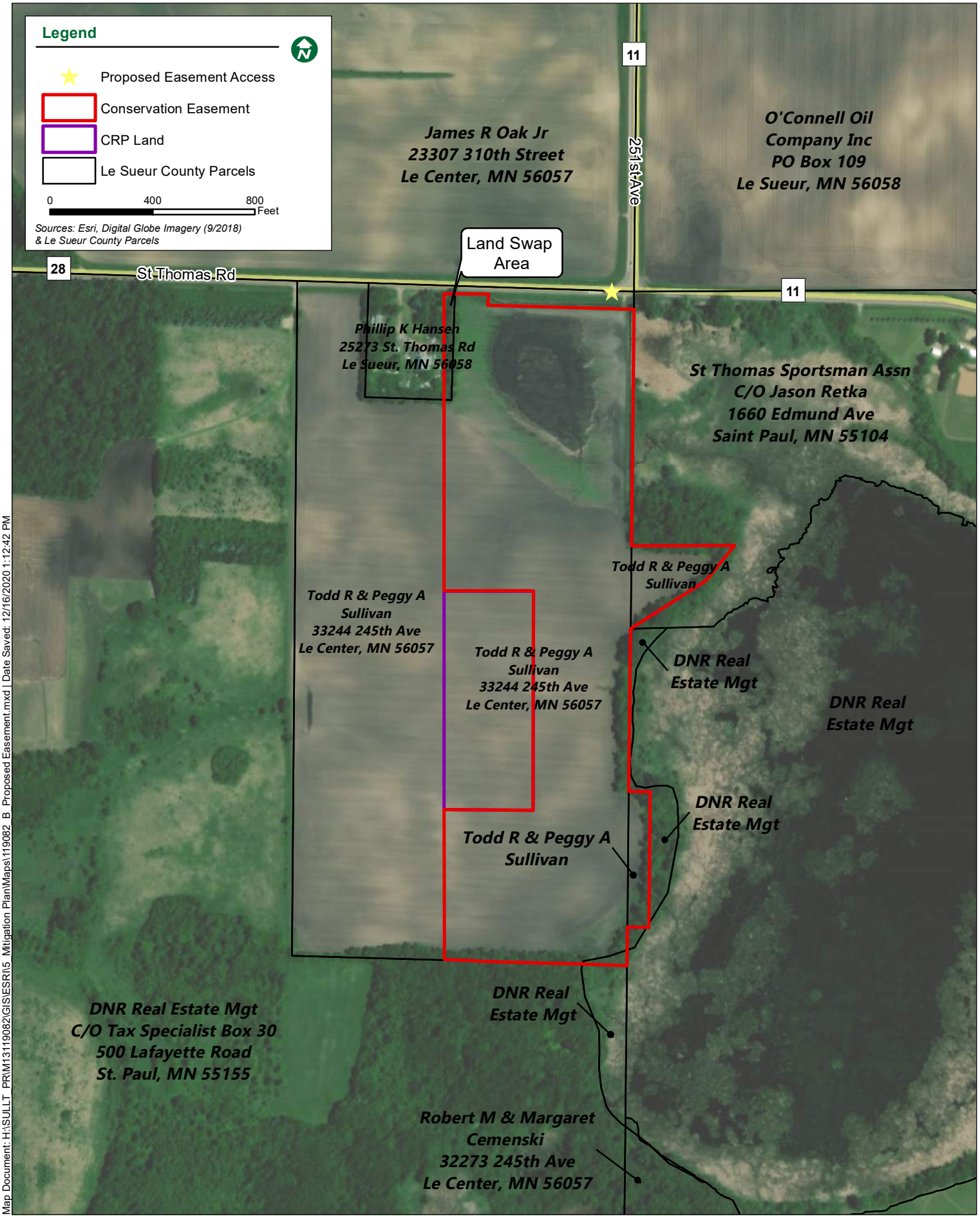

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Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit C: Minor Watershed 5-Digit HUC

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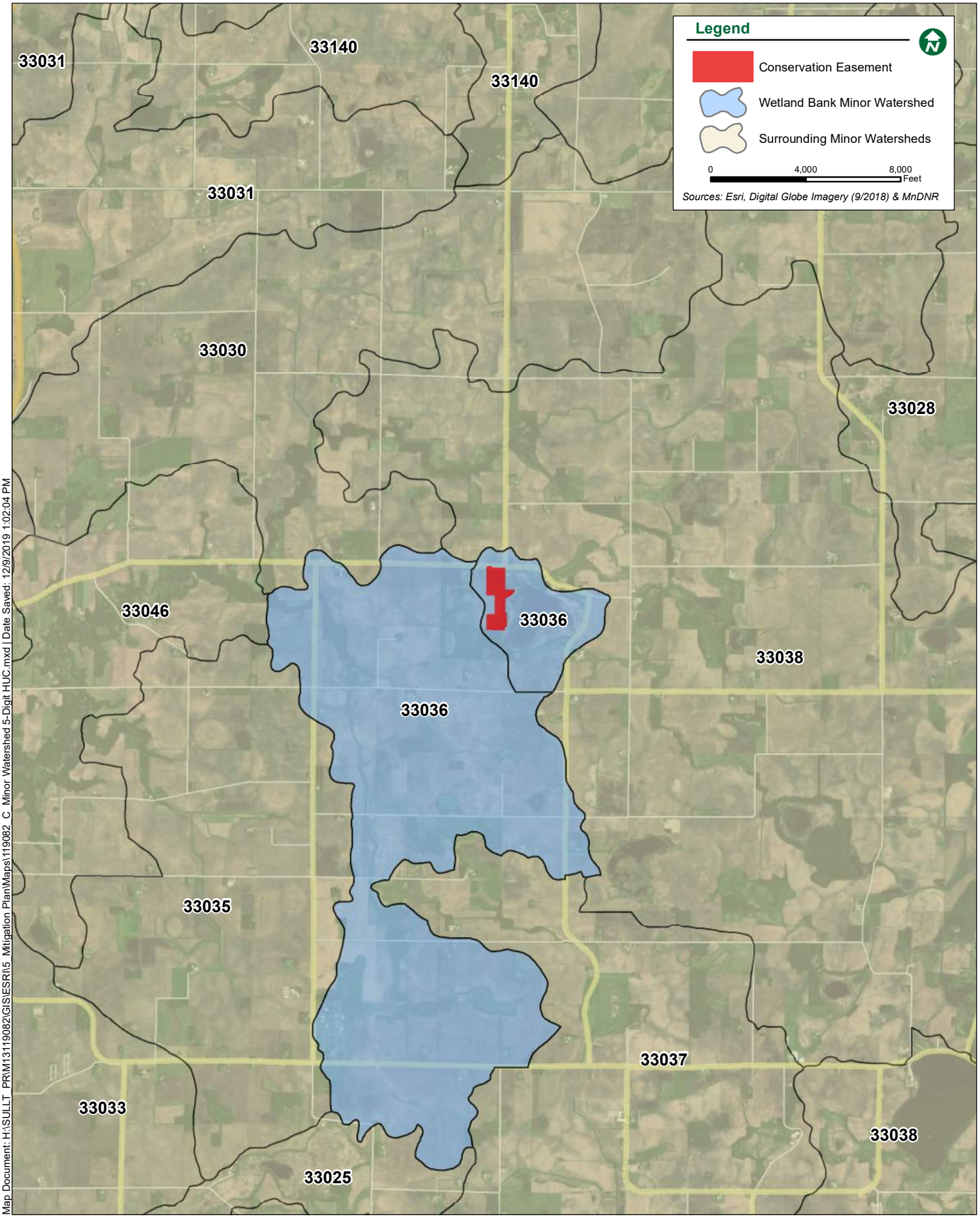

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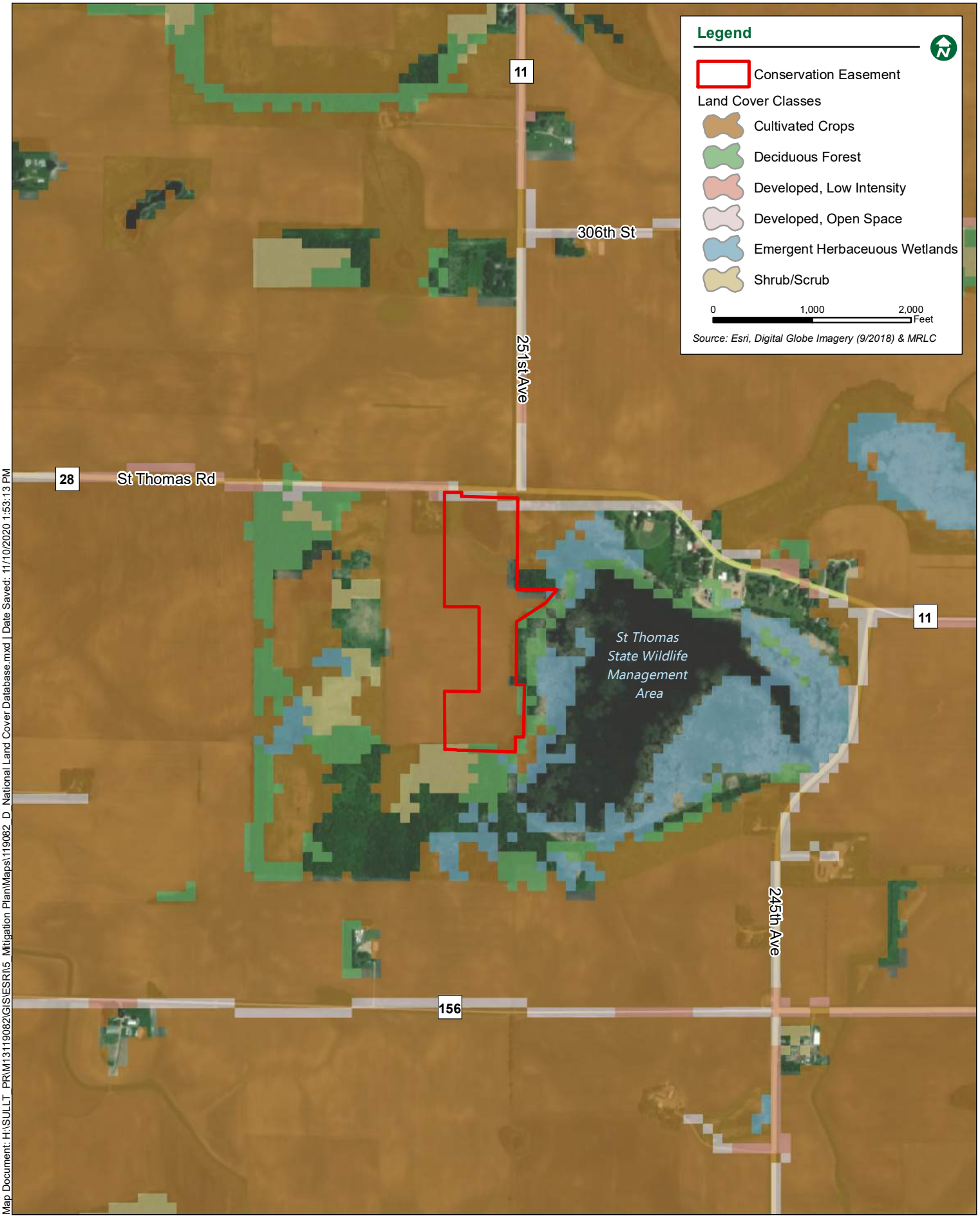

Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit E: Minnesota Early Settlement Vegetation

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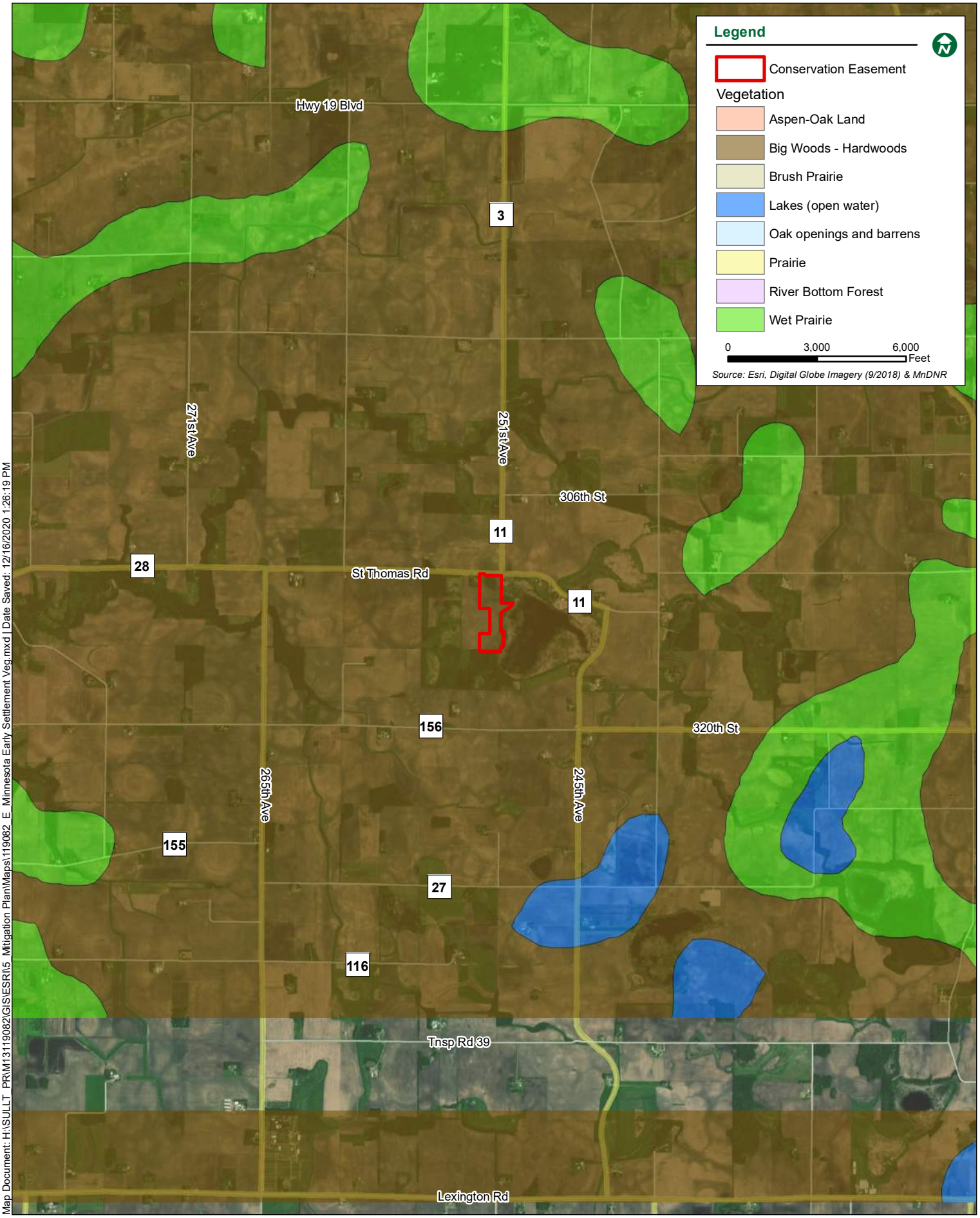

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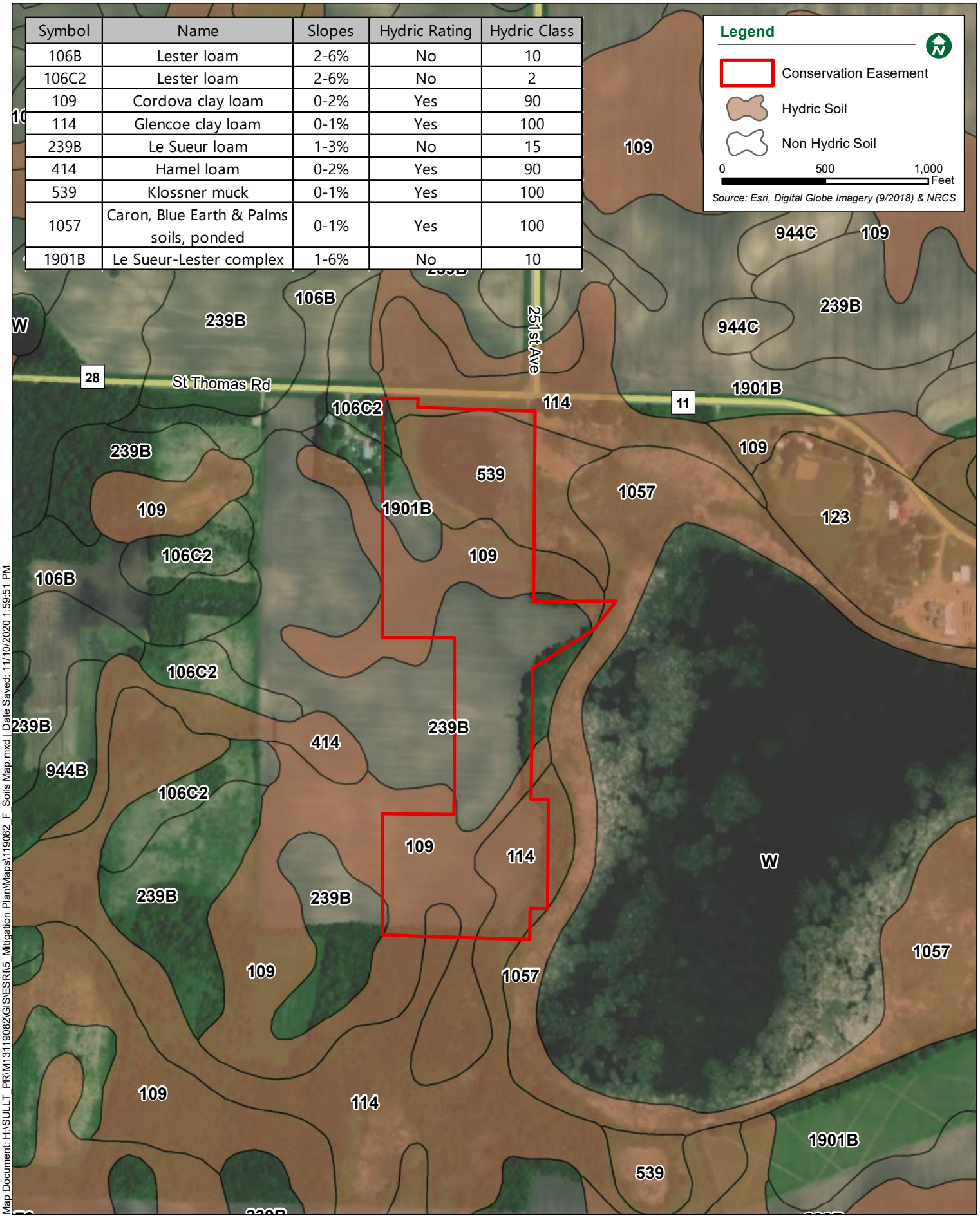
Symbol	Name	Slopes	Hydric Rating	Hydric Class
106B	Lester loam	2-6%	No	10
106C2	Lester loam	2-6%	No	2
109	Cordova clay loam	0-2%	Yes	90
114	Glencoe clay loam	0-1%	Yes	100
239B	Le Sueur loam	1-3%	No	15
414	Hamel loam	0-2%	Yes	90
539	Klossner muck	0-1%	Yes	100
1057	Caron, Blue Earth & Palms soils, ponded	0-1%	Yes	100
1901B	Le Sueur-Lester complex	1-6%	No	10



Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit G: 2 Foot LiDAR Contours

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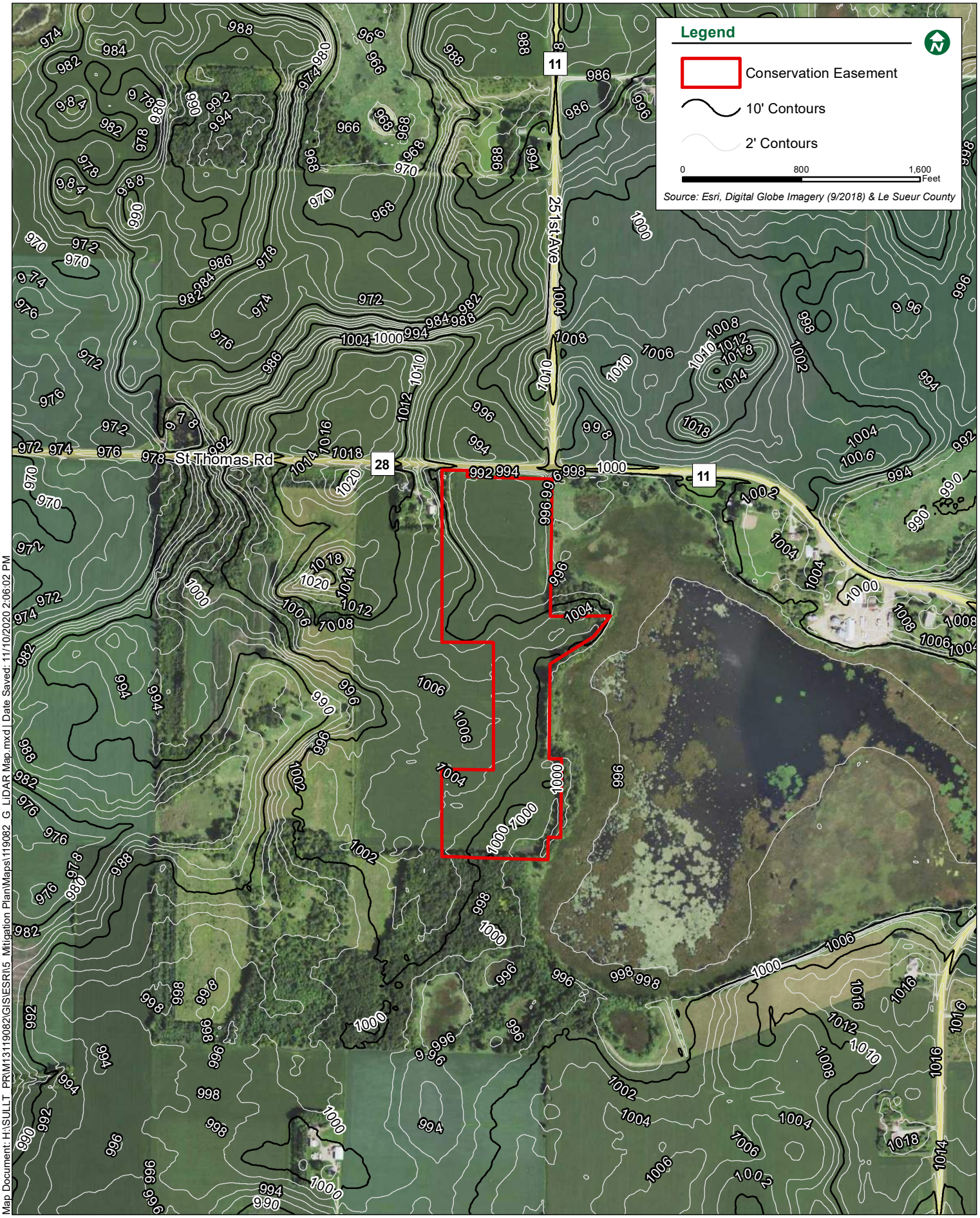

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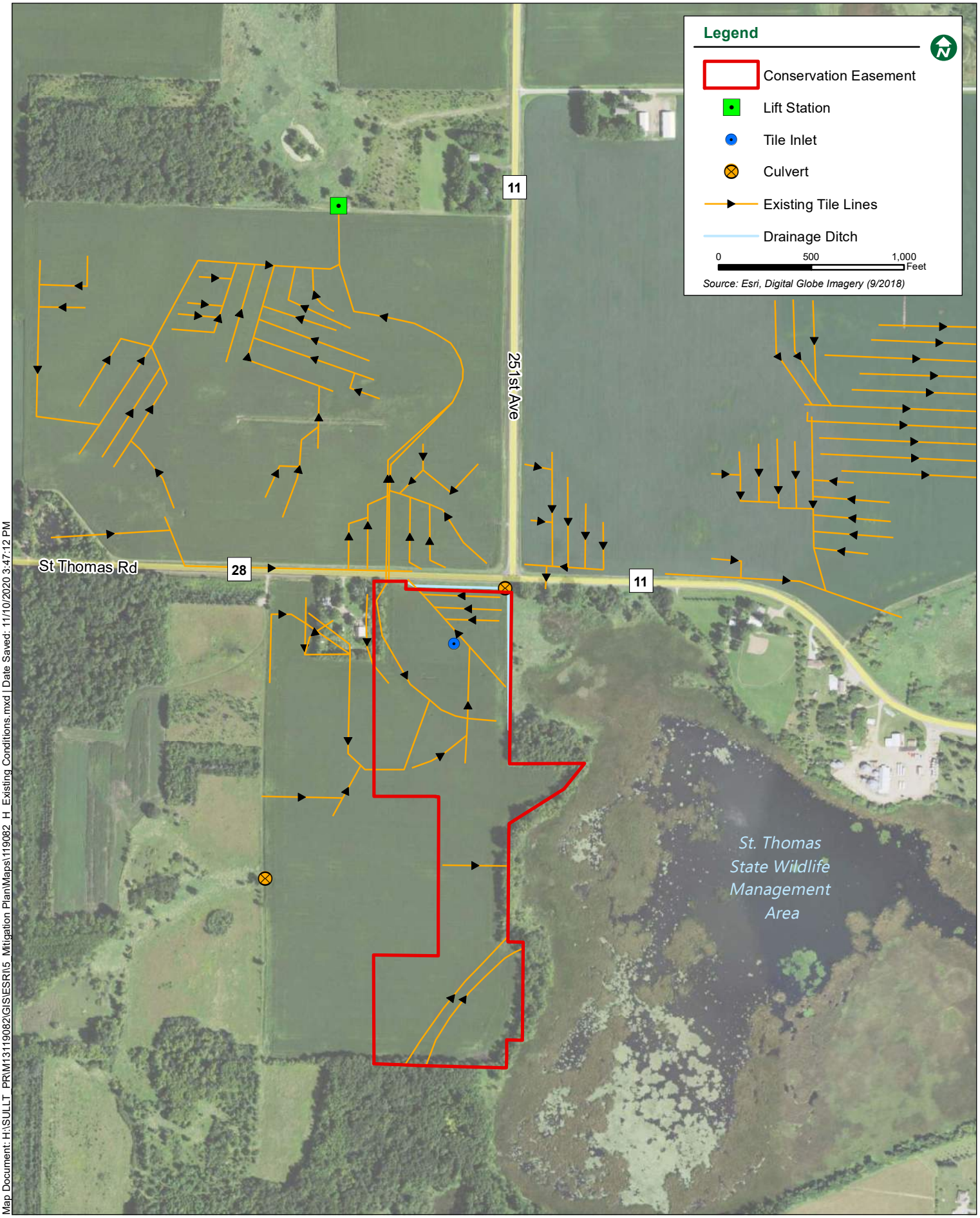

Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit I: Existing Plant Communities

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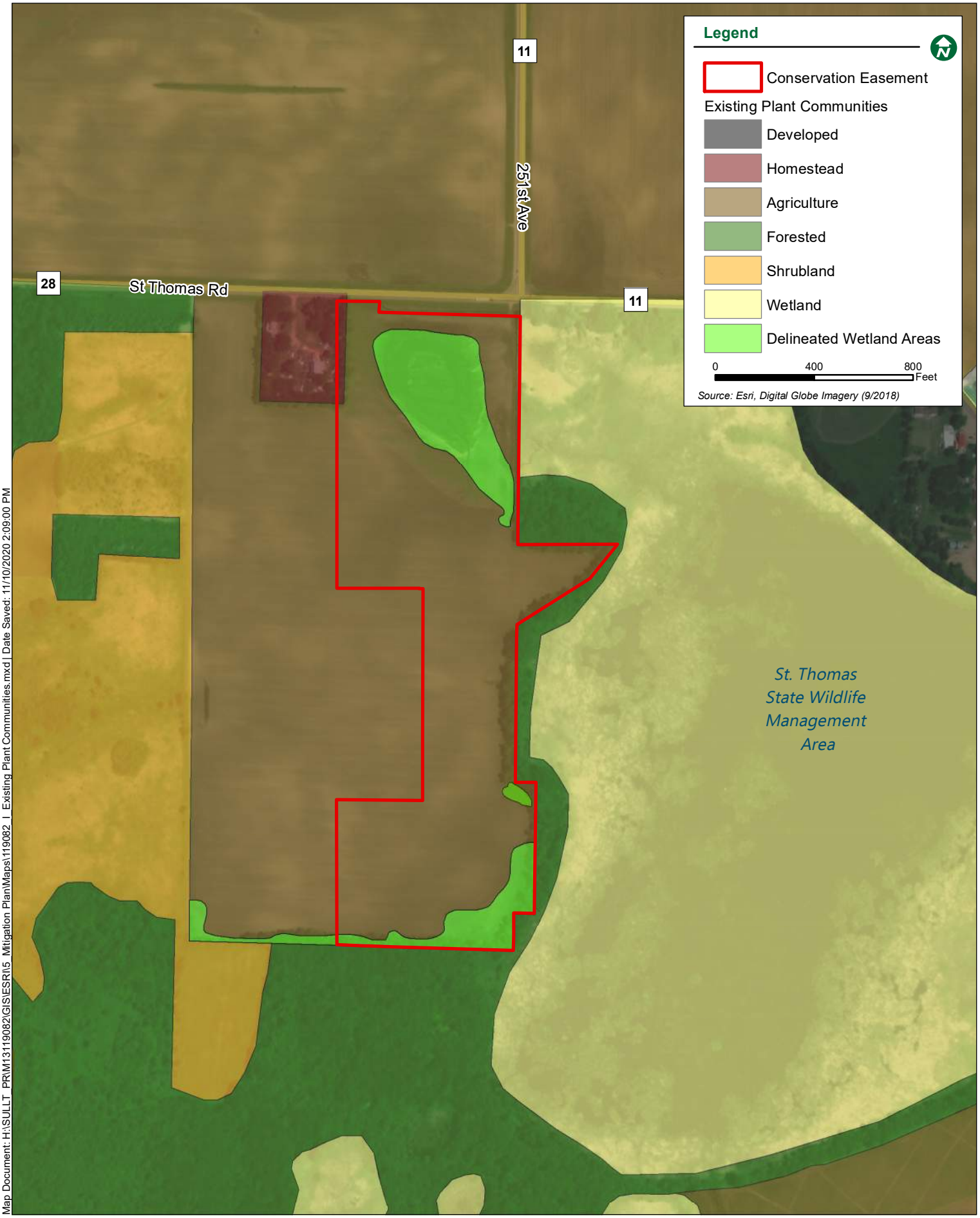

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Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit J: Existing Wetland Boundaries (2019)

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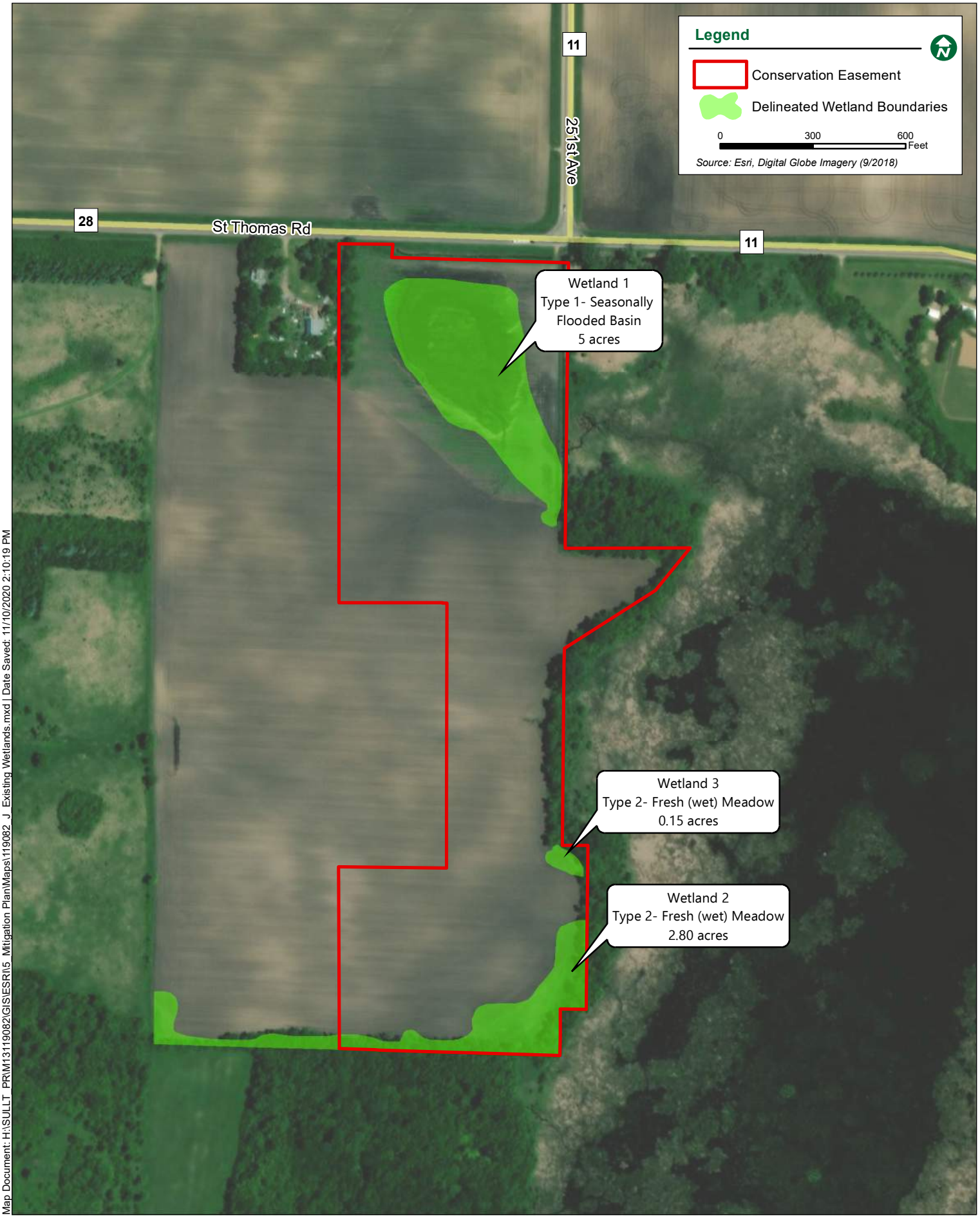

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Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit K: Proposed Plant Communities

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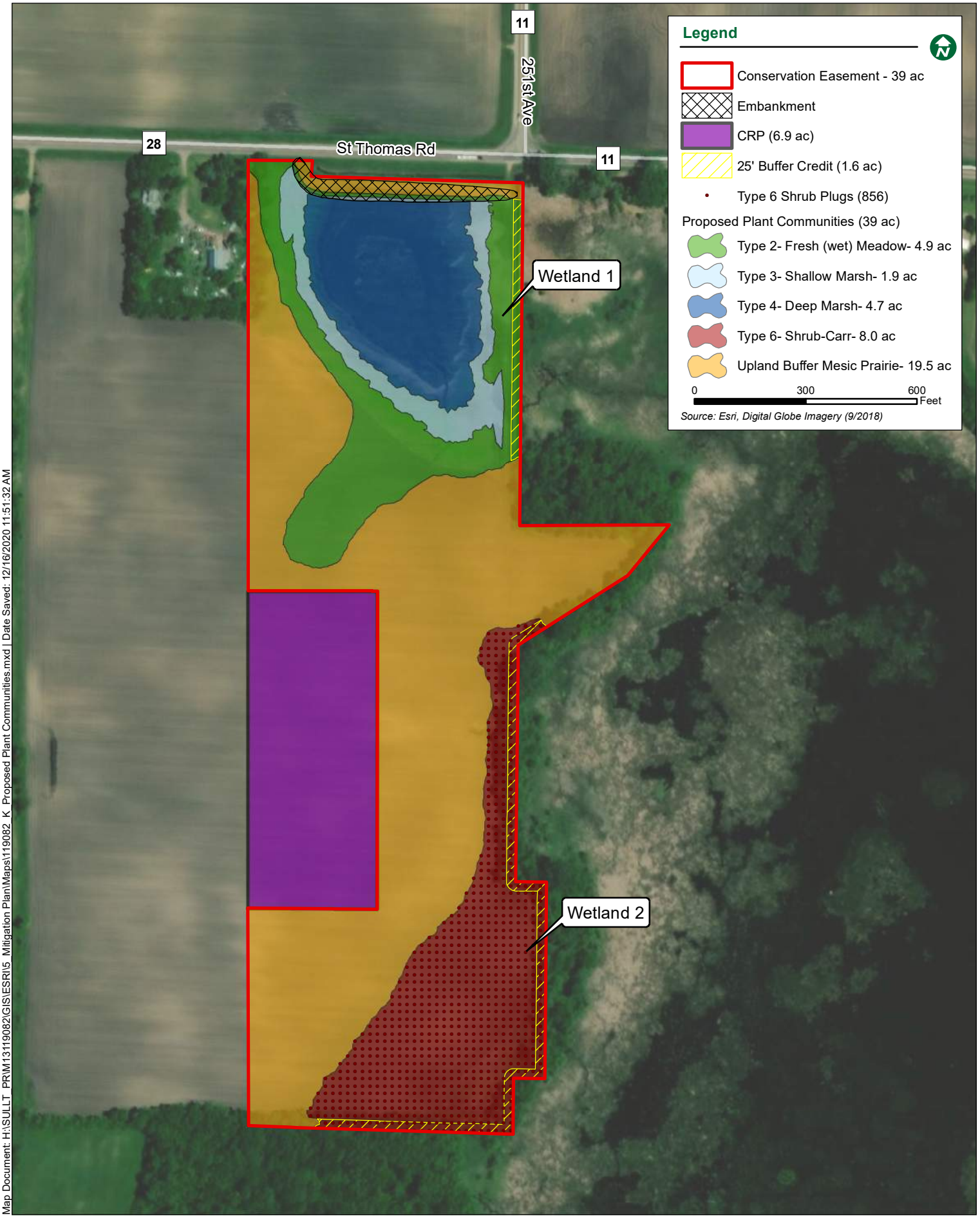

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Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit L: CWA & WCA Credit Allocation
23.1751 Credits

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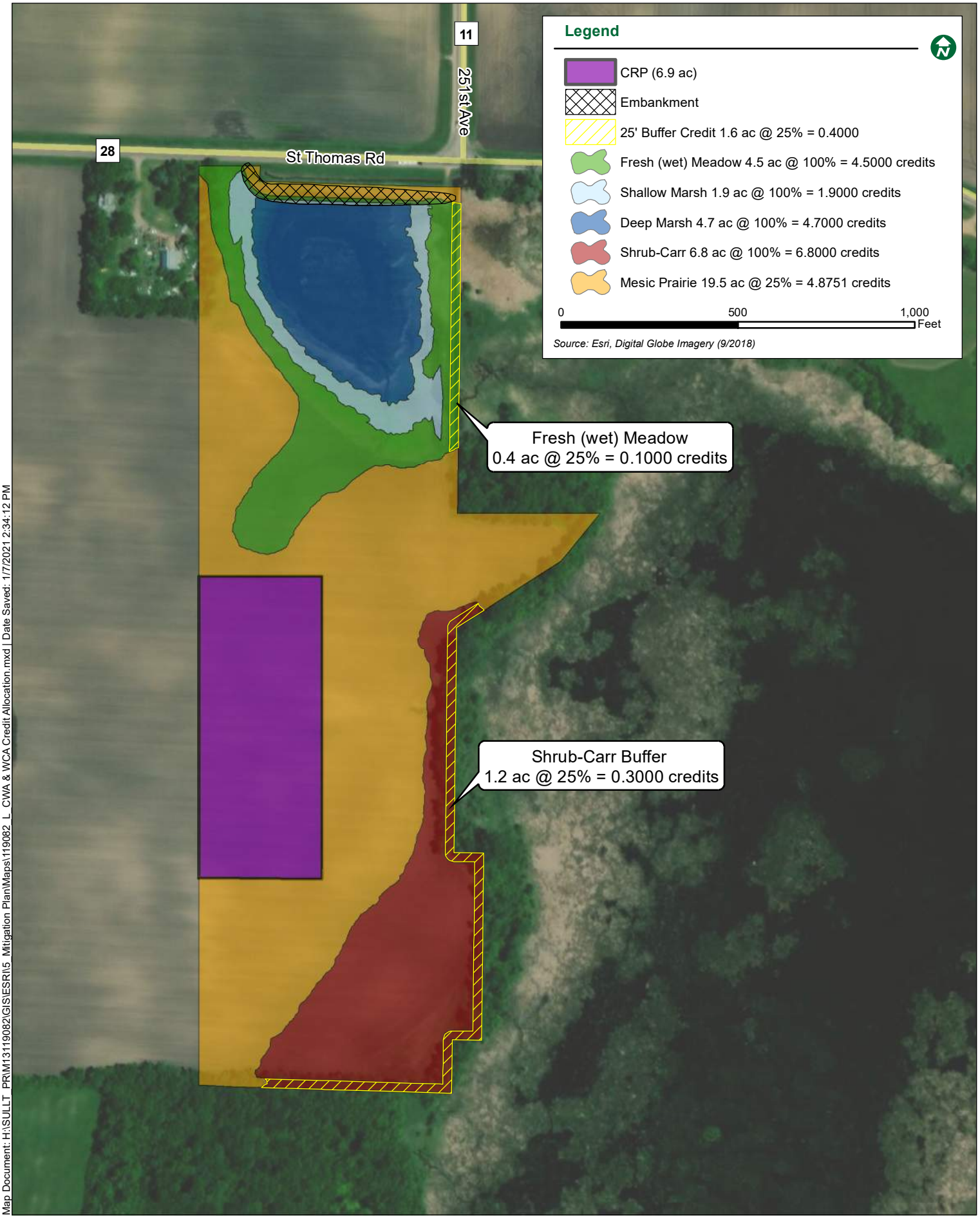

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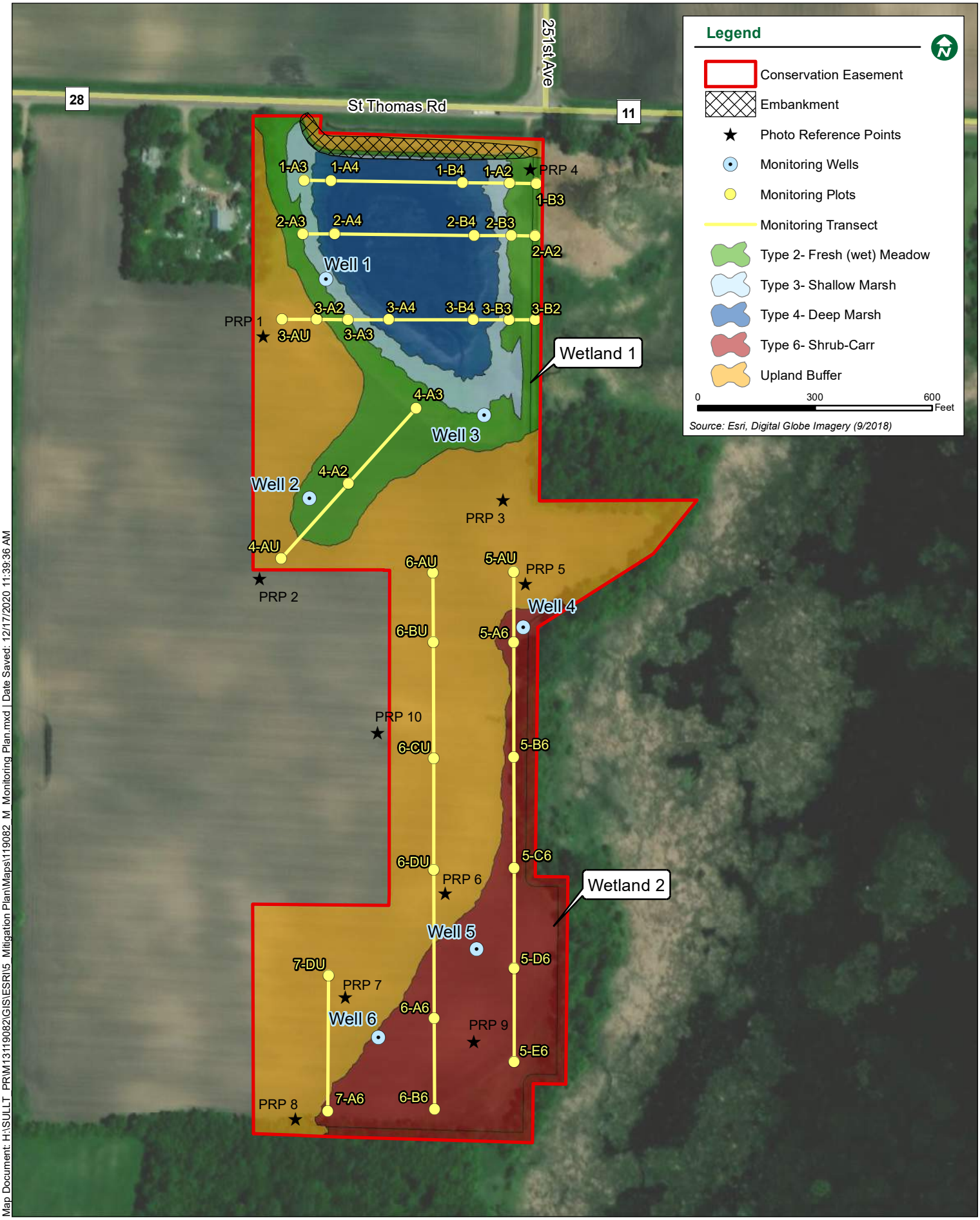

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Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit N-1: Historical Imagery 1937 & 1951

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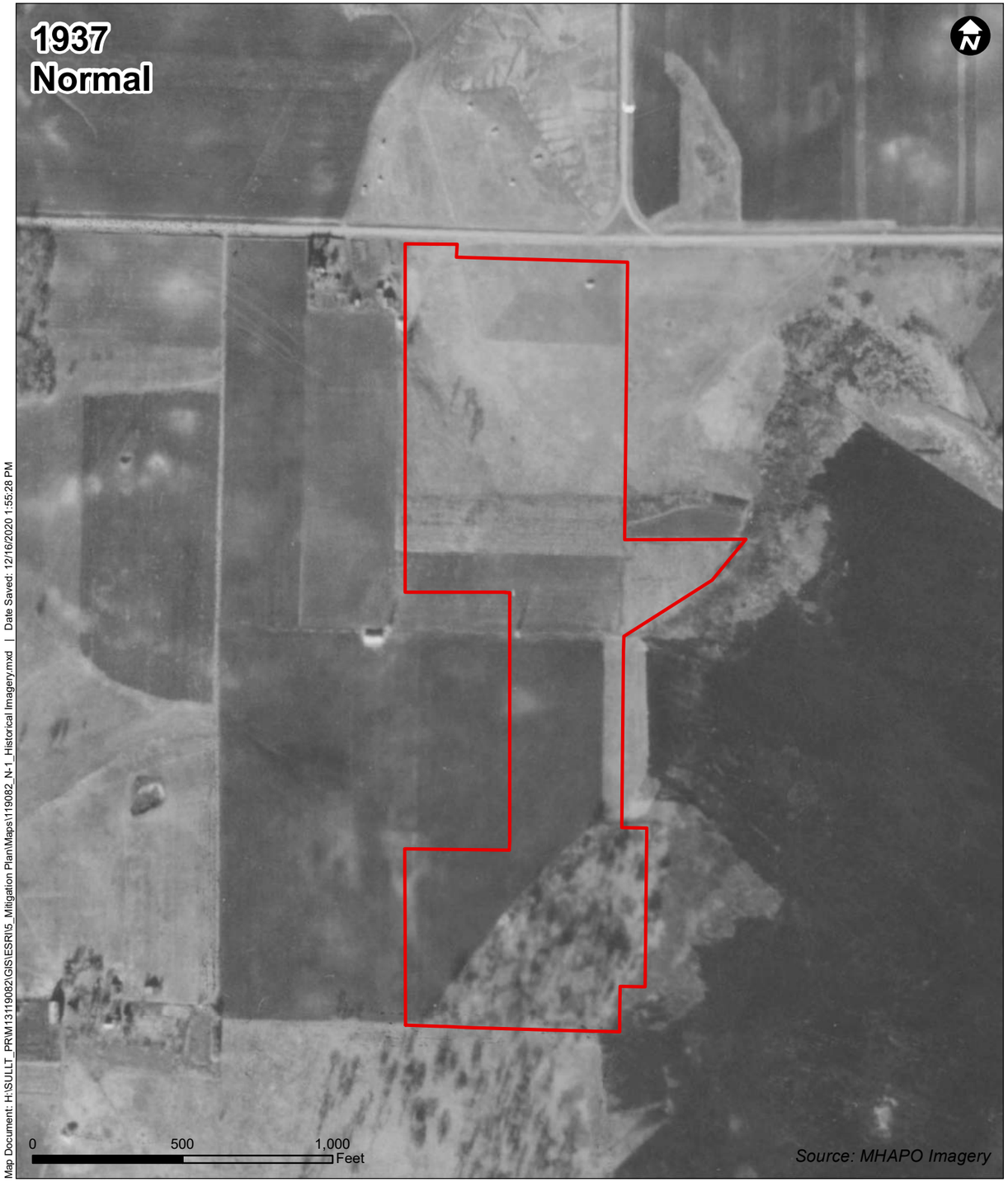

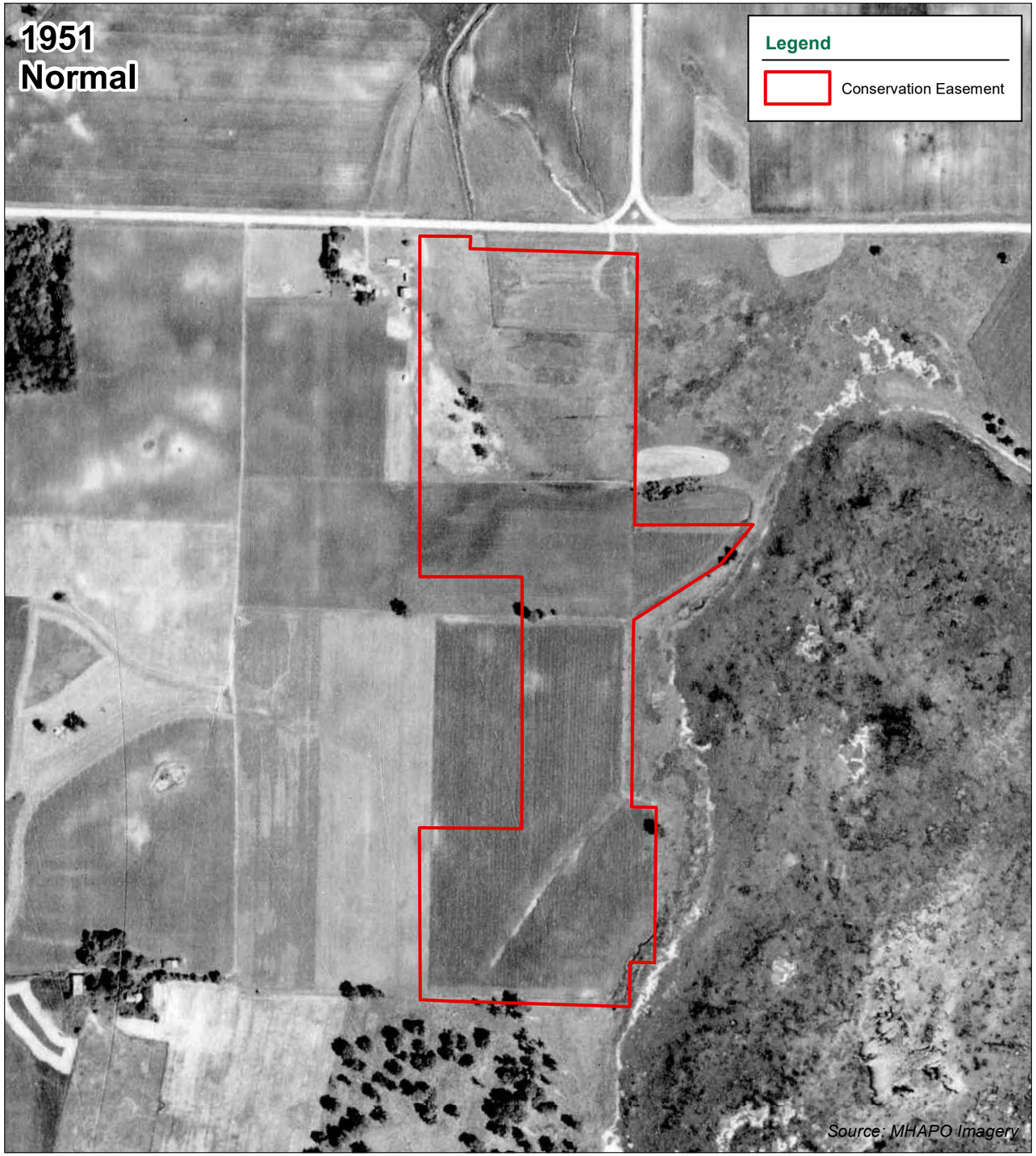

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Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit N-2a: Proposed Restoration Area

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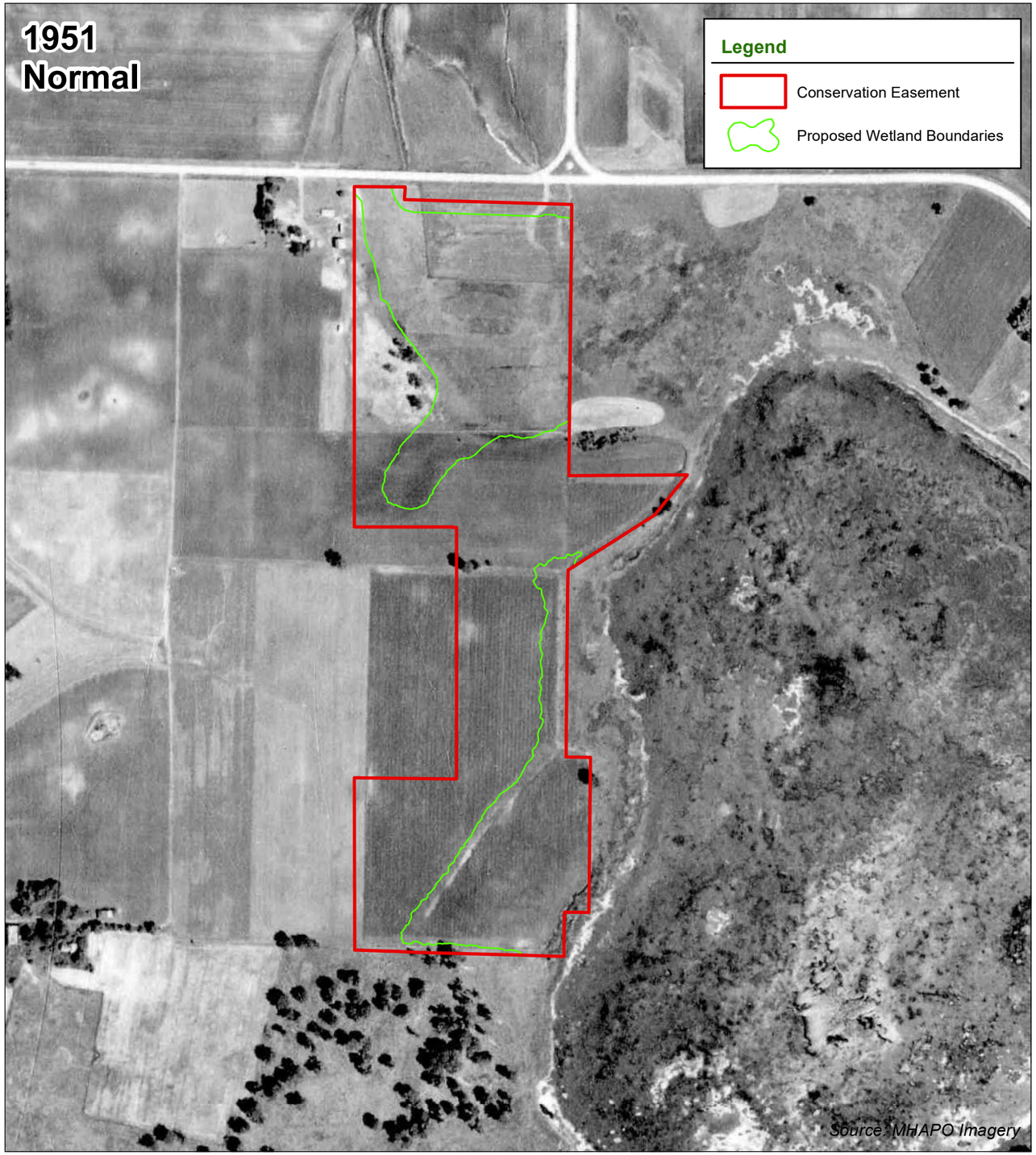

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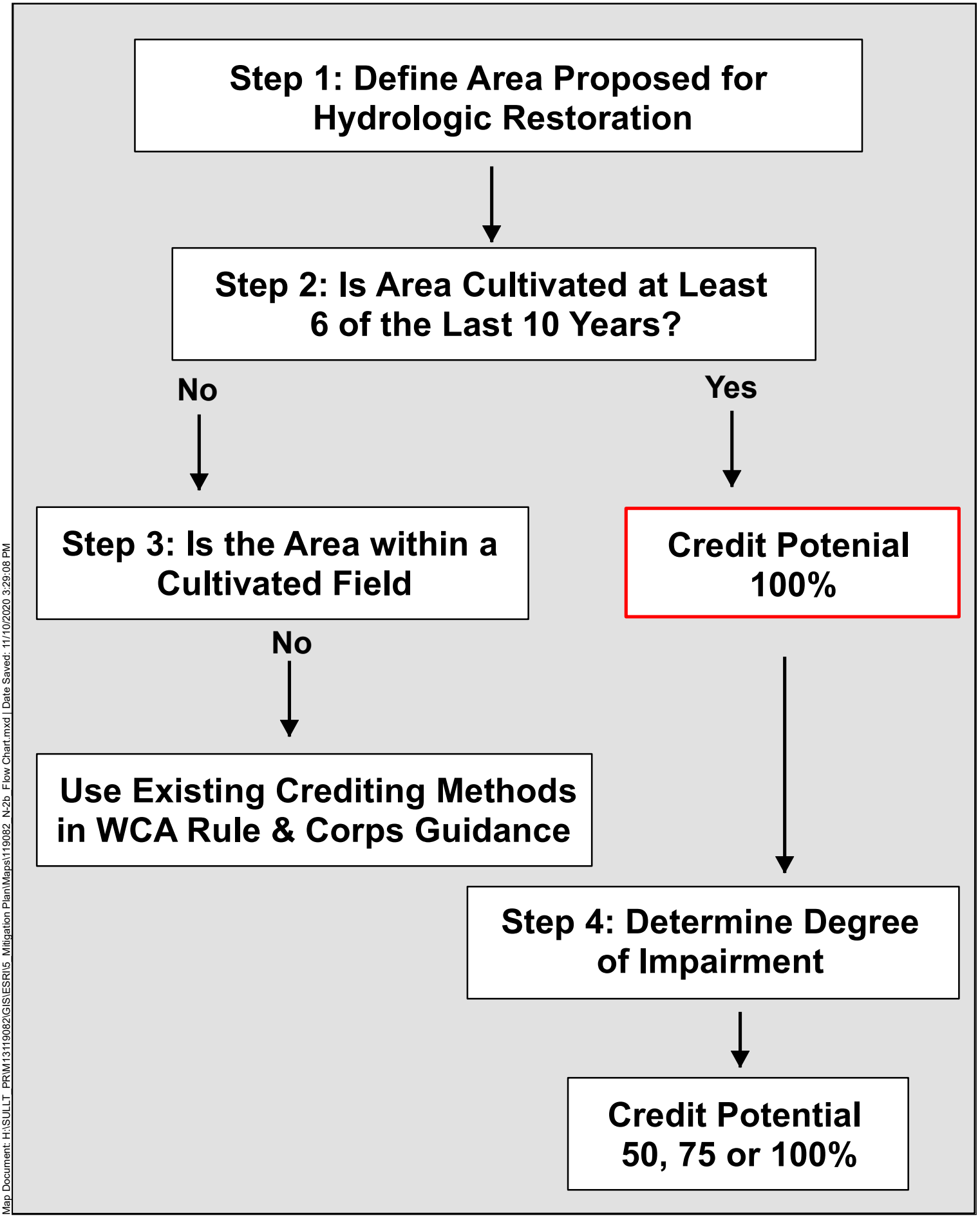

Sullivan Wetland Bank

Tyrone Twp, Le Sueur County, MN

Exhibit O-1: Historic Wetland Analysis
HUC No. 33036

December 2020

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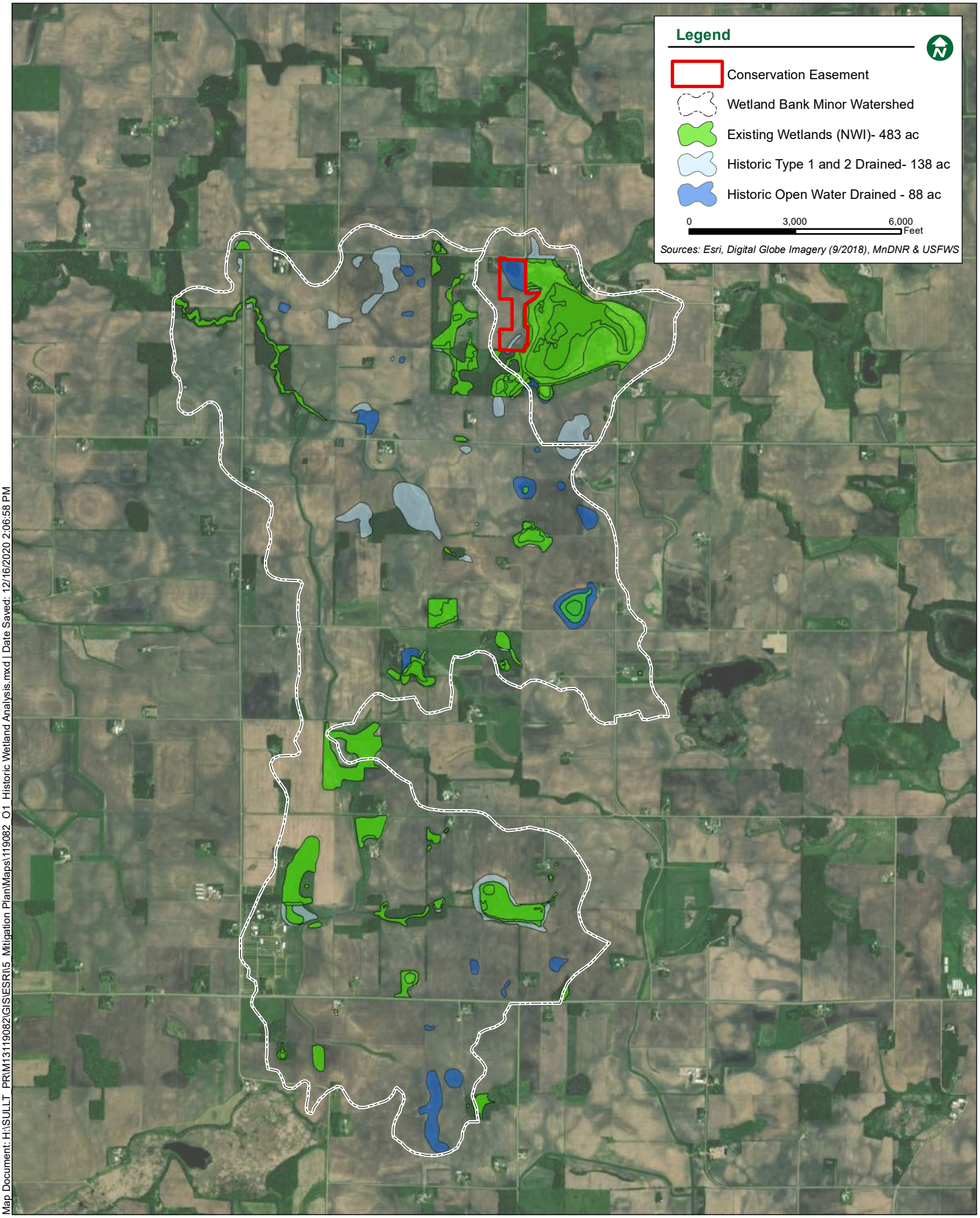

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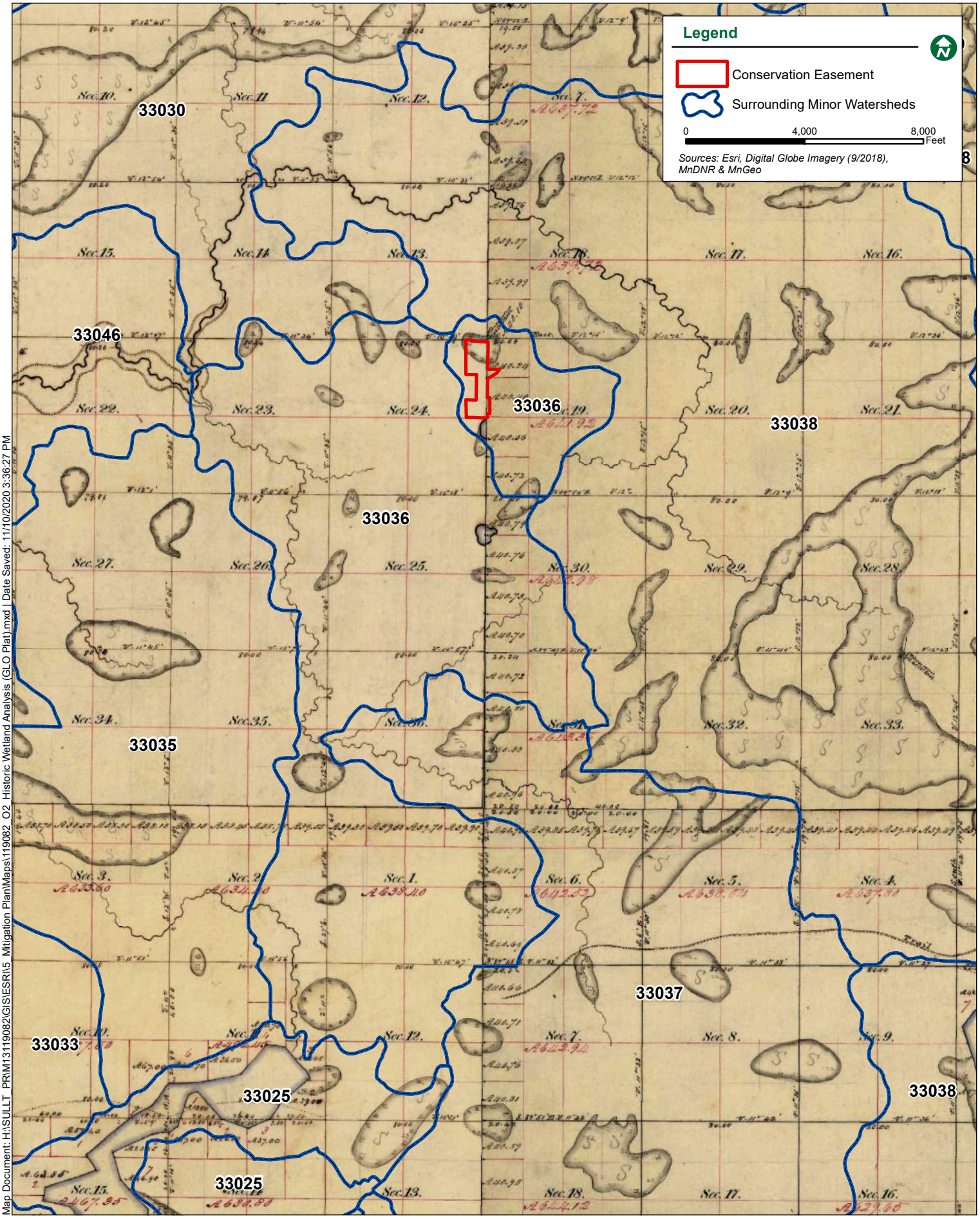

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DRAINAGE
MEMO

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1960 Premier Drive
Mankato, MN 56001-5900

Ph: (507) 625-4171
Fax: (507) 625-4177
Bolton-Menk.com

MEMORANDUM

Date: April 2nd, 2020
To: Thomas A Wenzel, P.E., BWSR

From: Joshua G. Stier, P.E.

Subject: Sullivan Farms Wetland Bank

Introduction

The proposed Sullivan Wetland Bank is located in Tyrone Township in Le Sueur County, approximately 10 miles northeast of the City of Le Sueur. The 76.5-acre property is in a rural area south of the intersection of St. Thomas Rd (CSAH 28) and 251st Ave (CSAH 11). It is directly adjacent to the western edge of the St. Thomas State Wildlife Management Area. The proposed bank will restore wetland hydrology to an area that has been tiled and used for row crop production for 80+ years, while also maintaining drainage capacity to ensure no hydraulic impacts to adjacent properties

Existing Conditions

The Sullivan Wetland Bank is located in a generally low-lying area that experiences frequent inundation following rainfall events. There is a private drainage ditch on the north side of the site that parallels CSAH 28. This ditch serves over 475 acres to the south, including approximately 200 acres of farmland. The ditch is served by a private 36-inch tile that drains north across the Oak property. Historically the lowland areas of the Sullivan property have been tiled and the north tile systems outlet to the private drainage ditch. There is also a known private tile flowing through the Sullivan Property that serves the Hansen property.

East of the Sullivan property is a drainage ditch that serves St. Thomas Lake, southeast of the site. This ditch is restricted by an field entrance culvert, from CSAH 28, which is an 18-inch metal culvert that has a slide gate to further restrict flowrates. The general operation procedure for this gate is unknown and is currently in a partially to fully closed position. This culvert is a substantial hydraulic restriction that causes the east ditch to back up onto the Sullivan Property and overflow to the north ditch, essentially bypassing the 18-inch culvert. Also, the slide gate mechanism creates extended drawdown times, east of the driveway for small rainfall events, resulting in unnecessary impacts to vegetation and farming practices to upstream landowners.

Hydraulic Modeling

To analyze the existing and proposed conditions, a hydrologic and hydraulic model was created using Autodesk's Storm & Sanitary Analysis (SSA) 2019. SSA uses the Soil Conservation Service's (SCS) Technical Release No. 20 (TR-20) methodology to route watershed runoff through the system using a rainfall hydrograph. The Atlas 14 rainfall depths for the site were used along with the MSE 3 rainfall distribution. The rainfall depths used for the 2-, 10-, 25-, and 100-year, 24-hour events are 2.86", 4.24", 5.28" and 7.14", respectively.

The existing drainage areas are shown on Figure 1 in Appendix A, along with several labeled ponding locations. Table 1 summarizes the existing high-water levels for the 2-, 10-, 25-, and 100-year events for the ponding locations labeled in Figure 1. Table 2 reports the existing flowrates through the 36" pipe that serves as an exit for water from the property.

Table 1: Existing High-Water Levels

SITE	High Water Level (ft.)				
	BOTTOM/ NWL	2 - YEAR	10 - YEAR	25 - YEAR	100 - YEAR
P-01	992.07	993.38	993.67	993.93	994.64
P-02	992.45	994.39	995.03	995.45	996.08
P-03	988.19	990.39	993.41	993.92	994.64
P-04	988.96	993.26	996.40	996.64	996.83
P-05	995.40	996.48	997.02	997.39	997.93
P-06	995.86	996.25	996.48	996.69	996.99

Table 2: Existing Flowrates through 36" Pipe Crossing

EVENT	FLOWRATE (CFS)
2-YEAR	16.4
10-YEAR	29.9
25-YEAR	32.2
100-YEAR	33.3

Proposed Conditions

The proposed design focuses on maintaining existing or improving drainage conditions for neighboring property owners and creating negligible downstream impacts, while also adding storage to the watershed by restoring a wetland to its historical conditions.

Hydrology will be restored primarily by the construction of a berm running parallel to CSASH 28, directly adjacent to the existing ditch and along the eastern side of the Hansen property which will allow runoff to pool in low lying area. The earthen embankment will be constructed with a clay core to prevent seepage and an emergency overflow will be provided to serve all events that exceed the 100-year event (996.50'). The existing tile system on the Sullivan Property will be removed in select locations to ensure that subsurface flow patterns are disrupted. A precast concrete outlet structure is proposed to regulate flow rates for up to the 100-year event. A normal water level (NWL) of 994.50 is proposed to restore wetland hydrology to a condition that historically matches the prehistoric site. There are two private drain tile systems that will be daylighted to the restored wetland while a third will be daylighted to the private ditch on the north side of the site.

As part of the restoration, it is proposed to remove the existing 18" metal culvert and slide gate mechanism and replace it with a 24" CMP culvert and no slide gate. This will provide an improved drainage condition for the O'Connell property and St. Thomas Lake outlet ditch while also reducing backup onto the Sullivan property. The increased culvert capacity will make restoration dependent on the immediate 31-acre drainage area for up to the 10-year event. For events that exceed the 10-year, the east ditch will still back up onto the Sullivan wetland property. The sponsor is currently considering adding a ditch, to the west of the restoration, that would divert an additional nine acres of farmland to the restoration site.

It should be noted that a scenario was considered where the design would maintain the back-flow condition onto the Sullivan property by maintaining an undersized entrance culvert. This scenario was quickly eliminated as it ultimately would not benefit any of the neighboring properties by maintaining the reduced drainage capacity.

A summary highwater levels and flowrates to the 36-inch private culvert are listed in Tables 3 & 4 below, respectively.

Table 3: Proposed High Water Levels

SITE	High Water Level (ft.)				
	BOTTOM/ NWL	2 - YEAR	10 - YEAR	25 - YEAR	100 - YEAR
Wetland 01	994.50	994.78	995.04	995.24	996.45
P-02	992.45	994.39	995.03	995.44	996.08
P-03	988.19	990.61	993.22	993.85	994.53
P-04	988.96	993.64	994.14	996.56	996.83
P-05	995.40	996.48	997.02	997.36	997.93
P-06	995.86	996.26	996.48	996.67	996.98

Table 4: Proposed Flowrates through 36" Pipe Crossing

EVENT	FLOWRATE (CFS)	FLOW RATE REDUCTION
2-YEAR	18.6	-13.2%
10-YEAR	30.2	-0.8%
25-YEAR	31.2	3.3%
100-YEAR	33.1	0.8%

The flow rates at the private 36-inch tile will be increased for the 2- and 10-year events as the hydraulic slide gate restriction is removed. Ponding capacities on the Oak Property (P-03) were considered and are not expected to be impacted substantially from a high-water level and ponding duration standpoint. This is due to non-coincidental peaks associated with the immediate watershed on the Oak Property relative to the overall watershed to the 36-inch private tile.

The Sullivan Wetland Restoration will restore hydrology to an area that historically was part of the larger St. Thomas Lake wetland complex. The proposed improvements will ultimately provide a net benefit to neighboring properties through hydraulic and vegetation improvements. Please feel free to contact me with any questions at (952) 217-2287 or Joshua.Stier@bolton-menk.com.

Sullivan Wetland Bank

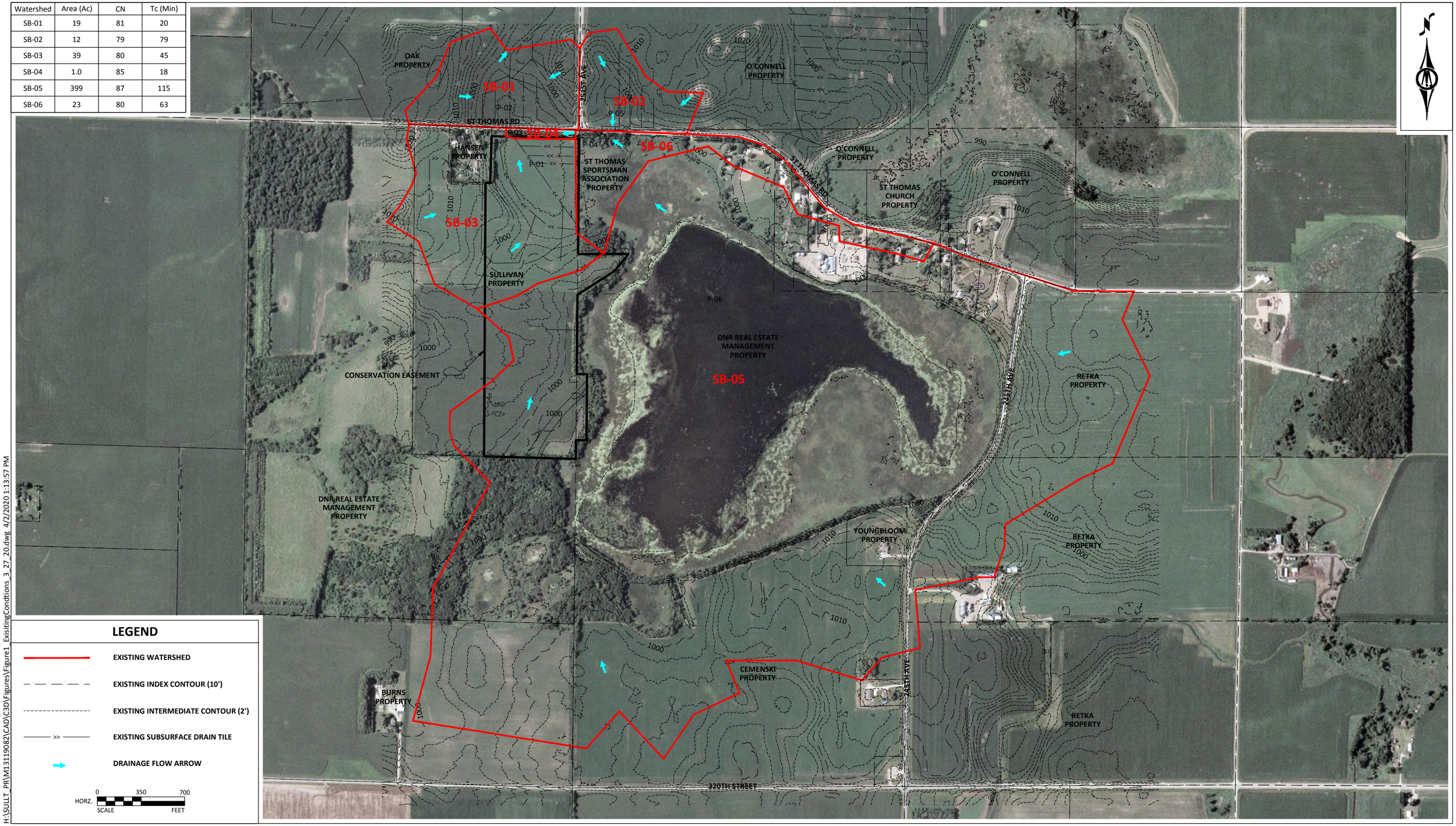
Todd Sullivan

Figure 1: Existing Conditions

April 2020

BOLTON & MENK

Watershed	Area (Ac)	CN	Tc (Min)
SB-01	19	81	20
SB-02	12	79	79
SB-03	39	80	45
SB-04	1.0	85	18
SB-05	399	87	115
SB-06	23	80	63



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Sullivan Wetland Bank

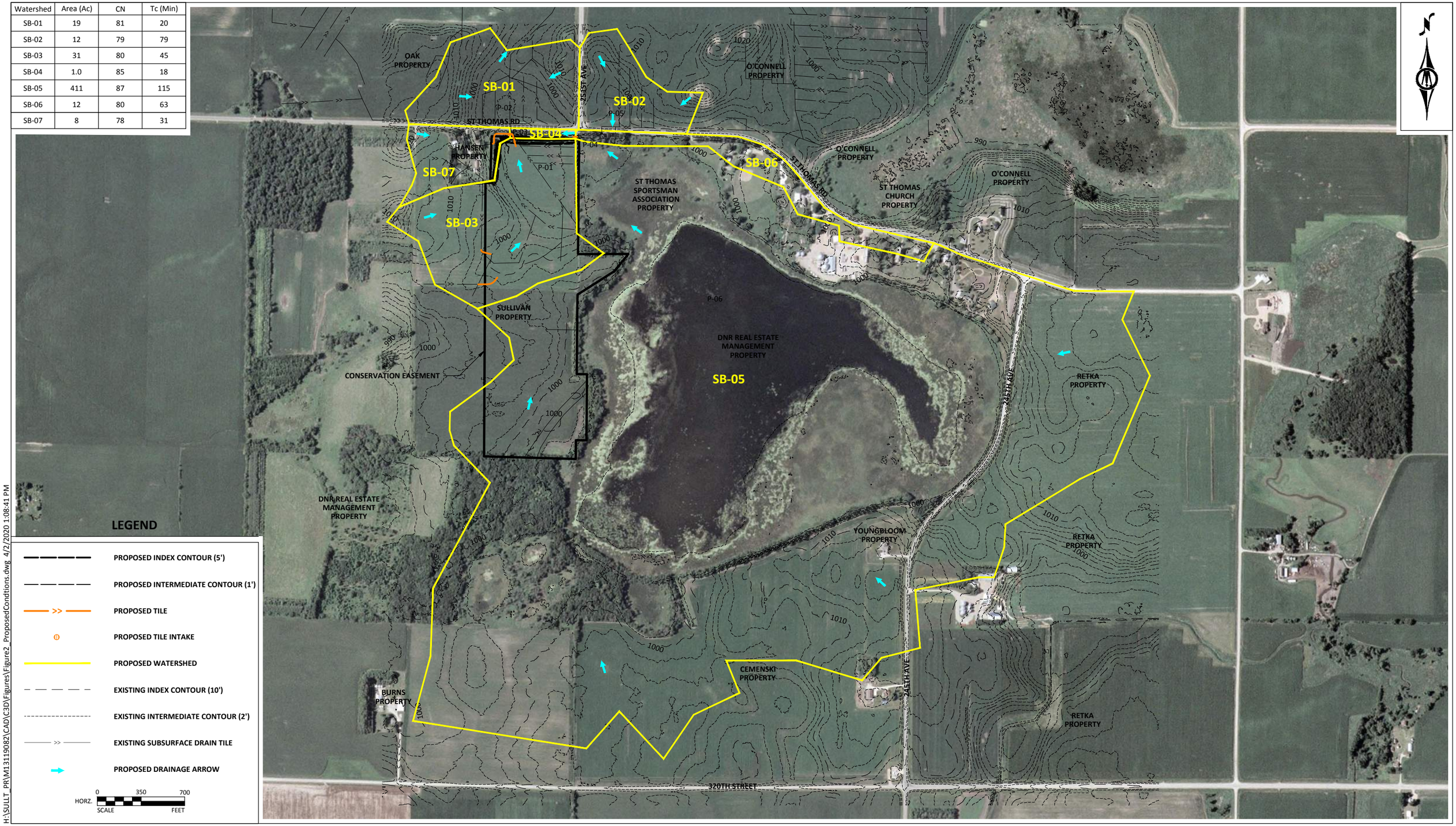
Todd Sullivan

Figure 2: Proposed Conditions

April 2020

BOLTON & MENK

Watershed	Area (Ac)	CN	Tc (Min)
SB-01	19	81	20
SB-02	12	79	79
SB-03	31	80	45
SB-04	1.0	85	18
SB-05	411	87	115
SB-06	12	80	63
SB-07	8	78	31



LEGEND

- PROPOSED INDEX CONTOUR (5')
- PROPOSED INTERMEDIATE CONTOUR (1')
- PROPOSED TILE
- PROPOSED TILE INTAKE
- PROPOSED WATERSHED
- EXISTING INDEX CONTOUR (10')
- EXISTING INTERMEDIATE CONTOUR (2')
- EXISTING SUBSURFACE DRAIN TILE
- PROPOSED DRAINAGE ARROW

HORZ. SCALE 0 350 700 FEET

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Phase I Archaeological Survey for

Proposed Conservation Easement and Wetland Bank

Tyrone Township, Le Sueur County, Minnesota

By:
Jammi Ladwig, Principal Investigator

Prepared for:
Todd Sullivan

Prepared by:
Bolton & Menk, Inc.
12224 Nicollet Ave
Burnsville, MN 55337
P: (952) 890-0509

December 2020

Phase I Archaeological Survey for Proposed Conservation Easement and Wetland Bank
Tyrone Township, Le Sueur County, Minnesota

Prepared for Todd Sullivan

Principal Investigator & Author

Jammi Ladwig, MA

Prepared by:
Bolton & Menk, Inc.
12224 Nicollet Avenue
Burnsville, MN 55337

December 2020

ABSTRACT

The following report contains the results of a Phase I Archaeological Survey conducted on behalf of Todd Sullivan for proposed wetland restoration and conservation easement through federal and state wetland bank programs on land that is currently in agricultural use in Tyrone Township, Le Sueur County, Minnesota. The proposed project area is approximately 46 acres in size. The proposed conservation easement is south of County Road (CR) 28 (St. Thomas Road) near the intersection with CR 11 (251st Avenue). The project is bordered to the south and east by the St. Thomas Lake Wildlife Management Area (WMA). The proposed conservation easement and wetland bank restoration are in the E ½ of the NE ¼ of T112N, R25W, Le Sueur County, Minnesota. Setting is generally agricultural with scattered residential and wildlife management areas. The City of Le Sueur is approximately 4.5 miles west of the project area. The project is within State Historic Preservation Office (SHPO) Archaeological Region 2e.

The Bolton & Menk, Inc. Cultural Resources Team conducted an archaeological reconnaissance survey on December 8, 2020. The survey follows the guidelines set forth in the SHPO and OSA *Manual for Archaeological Projects in Minnesota*. Phase I fieldwork included pedestrian survey. There is one previously recorded archaeological site within one mile of the recommended Area of Potential Effects (APE).

No archaeological sites nor cultural materials were encountered in the course of the pedestrian survey. Bolton & Menk, Inc. recommends no further archaeological investigations for the project, as described herein.

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INTRODUCTION

PROJECT INFORMATION

A private landowner, Todd Sullivan, proposes a conservation easement and wetland restoration within approximately 46 acres of an agricultural parcel in Tyrone Township, Le Sueur County, Minnesota (**Figure 1** & **Appendix**). The parcel is in the E ½ of the NE ¼ of Section 24, T112N, R25W (**Figure 2**). The site of the conservation easement and wetland restoration is in private ownership.

The project requires permitting by the United States Army Corps of Engineers (Corps) and requires review pursuant to Section 106 of the National Historic Preservation Act (NHPA). The Corps indicated an archaeological survey was needed for the project due to the potential presence of cultural resources and the effect the proposed undertaking might have on such resources (Regulatory File No. MVP-2019-01879-DAS).

SETTING

The proposed project is located south of CR 28 (St. Thomas Road) near the intersection with CR 11 (251st Avenue) (**Figure 1**). The Project Area is bordered to the south and east by the St. Thomas Lake WMA. Thomas Lake and an associated wetland complex is present within the eastern portion of the WMA. Land cover in the vicinity of the Project Area is largely cultivated, with scattered rural residential and restored habitat within the WMA. The Project Area is mostly flat but contains a rise through the central portion that is higher in elevation than areas to the north and far south.

GEOLOGICAL & ENVIRONMENTAL CONTEXTS

The recommended Area of Potential Effects (APE) is within a Plain in a landscape of Stagnant Ice within the central portion of the APE, with a Depression in the same landscape in the northern and southeasternmost portions, according to the MnModel Phase 4 Landform layer (MM4) (Hobbs 2019). The Prehistoric Hydrography layer of MM4 shows the northern and southern portions of the APE were previously wetland. According to the Web Soil Survey, soils in the area are comprised of Le Sueur loam, Cordova clay loam, and Klossner muck, with smaller contributions of Glencoe clay loam and Le Sueur-Lester complex. The C horizon of present soil types is recorded to vary from 27 to 52 inches in depth. Majority soil types are found in ground moraines and parent material is fine loamy till to alluvium over till. Klossner muck is associated with depressions and low-lying areas, with organic material over alluvium as parent material.

Bedrock outcrops in this region are rare. The terrain of the APE is somewhat flat, with a few rolling hills and associated rises in the west-central portion of the APE. Thomas Lake is approximately 200 feet east of the APE at the nearest point.

The APE is in SHPO Region 2e Prairie Lakes east. According to the MnModel Phase 4 Historic Vegetation Model (MM4) that draws from digitized GLO map data, historic vegetation for the APE would have been Deciduous Forest in the central portion of the APE, with Permanently Wet areas (wetlands) in the northern and southeasternmost portions (Hobbs 2019). Late Holocene period subsistence resources would have included small herds of large ungulates (namely bison) terrestrially, along with other aquatic resources near the water (fish, waterfowl, cattails, and lilies) (Gibbon et al 2002).

LANDSCAPE HISTORY

Referring to aerial photography, the Project Area appears to have been largely in agricultural use since at least 1937. The 1937 and 1951 aerial images of the Project Area reveal the northern portion formerly contained a few scattered trees, the southeastern corner was forested, and a quarry area existed to the north of the CR 28 roadway (**Figures 3** & **4**). By 1964 an unfarmed swath of land extended south from the farmstead, but is gone by at least the 1990s (**Figure 5**). The Project Area is at least moderately disturbed by past and present agricultural activity.

Sullivan Wetland Bank

Tyrone Township, Le Sueur County, Minnesota

Figure 1: Aerial Location

December 2020

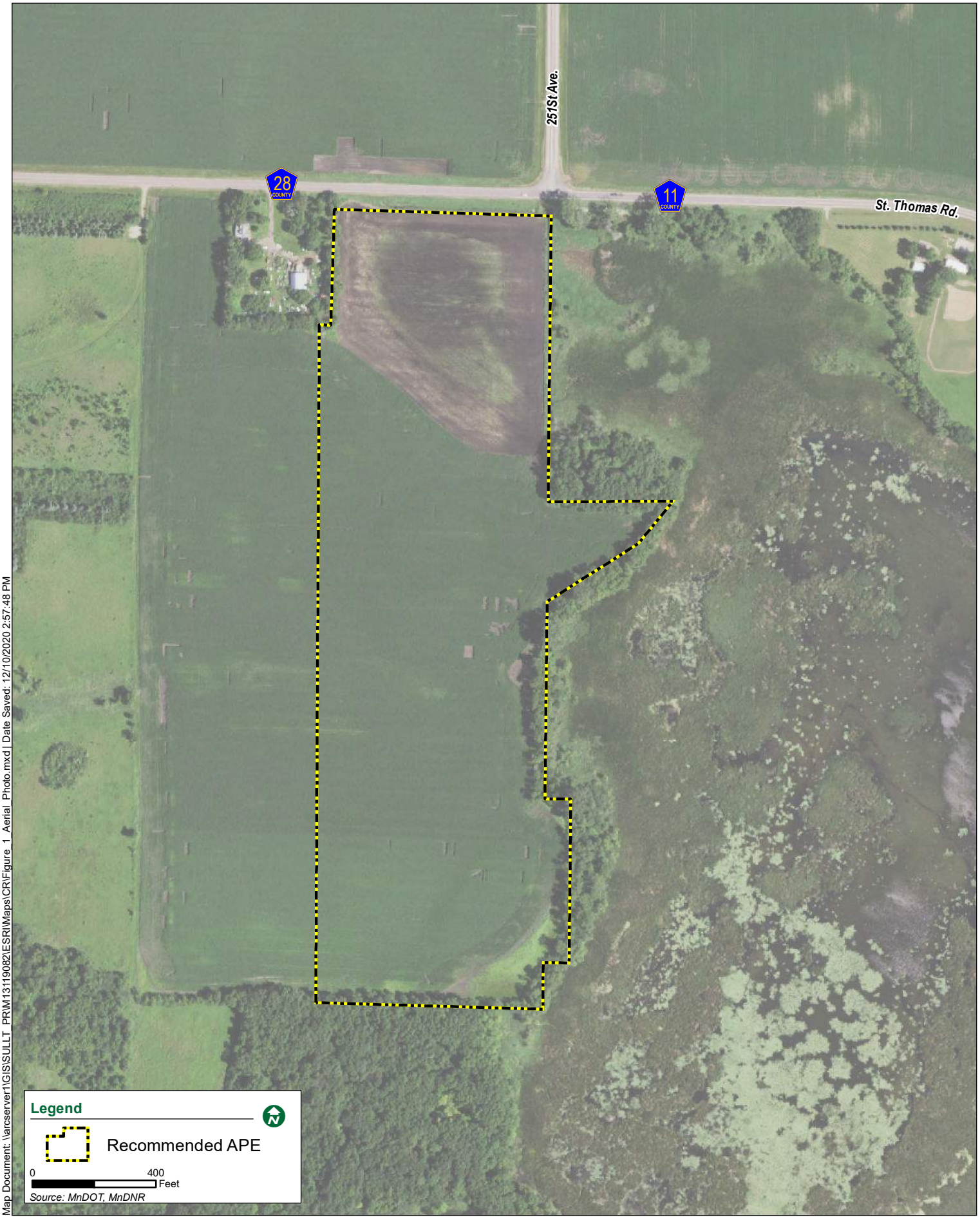

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Figure 3: 1937 Historical Aerial Image

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Figure 4: 1951 Historical Aerial Image

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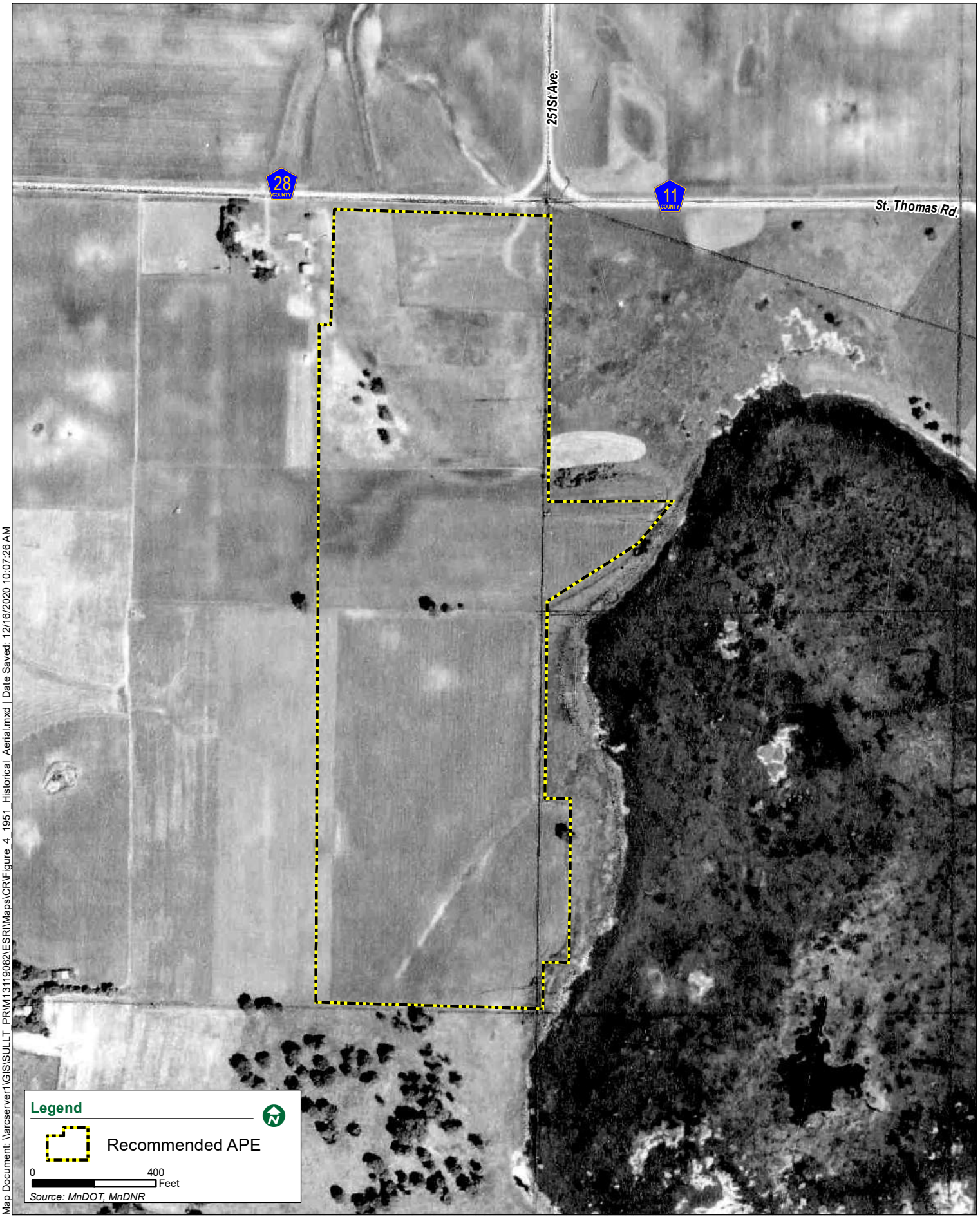

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Figure 5: 1964 Historical Aerial Image

December 2020

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METHODOLOGY

RECOMMENDED AREA OF POTENTIAL EFFECTS (APE)

The recommended Area of Potential Effects (APE) includes the entire approximately 46-acre property for the proposed wetland restoration and conservation easement (**Figure 1** & **Appendix**). The property is currently in agricultural use (**Figures 6** – **8**). Ground disturbance will be limited to wetland restoration activities, the creation of an embankment, and wetland taxa plantings. No subsurface disturbance beyond these natural enhancement activities is anticipated.

LITERATURE SEARCH

Background research was completed to identify archaeological and historical sites documented through December 2020. The OSA Portal was an integral tool in this search. Additional archaeological reports and documentation pertinent to the APE were also reviewed. A request was made to SHPO for recorded historic properties within one mile of the APE.

ARCHAEOLOGICAL FIELD SURVEY & TESTING

The survey follows the guidelines set forth in the SHPO and OSA *Manual for Archaeological Projects in Minnesota* and is responsive to the archaeological probability and geomorphology of the area. Ground surface visibility in the APE varied from moderate (50%) to fair (25%) to poor (5%) due to the presence of soy chaff following harvest. Pedestrian survey was employed at a 7.5-meter interval within the APE to ensure adequate coverage given more limited visibility (25%) within some portions of the APE. According to the MnModel Phase 4 Survey Implementation Model (MM4) the APE is Unknown Site Potential/Poorly Surveyed within the majority of the APE, with High Site Potential/Poorly Surveyed in the east-central portion (Landrum et al 2019). In terms of precontact potential the APE appears to have low probability in those areas that were formerly wetlands, in the north and southeasternmost APE, and high site potential in the areas that were not formerly permanently wet areas, namely in the central portion of the APE in upland areas.

Figure 6: APE General Overview

View south from northern portion of APE, demonstrating wet ditch present in northern portion of APE.

Figure 7: APE General Overview

View west from northern portion of APE.

Figure 8: APE General Overview

View south from eastern APE edge.

ARCHAEOLOGICAL CONTEXTS

PALEOINDIAN TRADITION

The Paleoindian Tradition occurred from approximately 13,500 to 9,000 years before present (BP, present defined as 1950 upon the development of radiocarbon dating methods). The Paleoindian Tradition in Minnesota is primarily known based on isolated finds of projectile points found in the course of uncontrolled surface collection, primarily by non-professional archaeologists (Buhta et al 2011: 15). As Buhta *et al*. (2011: 10) write, very little progress in our understanding of the Paleoindian occupation in Minnesota has taken place since documentation of the Browns Valley burial. This dearth of information is largely due to the fact that systematic sampling has failed to yield single component Paleoindian assemblages of any size (Buhta et al 2011:15).

The Paleoindian Tradition in Minnesota is further divided into two cultural groups which are based primarily on their point typology (Higginbottom 1996). It is divided into early, Llano, and late, Plano. Llano points are fluted, with Clovis being the earliest documented complex (Gibbon 2012). Folsom is the most commonly occurring Paleoindian complex. Many other Paleoindian projectile point types are reported (Buhta et al 2011: 15). Toolkits would have minimally included spear points, scrapers, drills, gravers, and hammerstones. It may have also included bone and wooden tools (Mississippi Valley Archaeology Center 2004A).

With little more reported than isolated artifact find spots, the Paleoindian contexts in Minnesota are understood through paleoecological reconstructions and by extending what is known about Paleoindian lifeways elsewhere in North America to the Upper Midwest (Buhta et al 2011: 91-99). Paleoindian subsistence appears to have been reliant upon a combination of large game hunting, including caribou, bison, deer, moose, mammoth, and fish and floral resources (Buhta et al 2011: 91-99). Buhta et al (2011: 80-88) demonstrate that floral resources returned to previously glaciated regions shortly after ice retreated, possibly attracting large grazing animals.

Paleoindian settlement pattern is poorly understood, although it is hypothesized that the hunters and gatherers may have lived in small family groups, traveling to find food and resources for sustenance (Office of the State Archaeologist 2010; Mississippi Valley Archaeology Center 2004B).

There are no excavated archaeological materials that can be definitely attributed to the makers of Clovis or Folsom projectile points in Minnesota. Although there have been a number of finds of wooly mammoth skeletal parts and teeth at Minnesota localities; none has ever been indisputably associated with human activity (Johnson 1988:6). Although parts of Minnesota would have been inhabitable throughout the Wisconsinan glaciation, SHPO Region 4s would have been ice free by 12,000 and inhabitable very soon after (Buhta et al. 2011: 32).

ARCHAIC TRADITION

The time span between the Paleoindian and Woodland encompasses several thousand years which has all been attributed to the Archaic. The Archaic (ca. 9,500 – 2,500 BP) was originally defined based on the lack of distinct materials from the preceding Paleoindian Tradition and the subsequent Woodland Tradition. As the Archaic became better understood, it was also defined in terms of a tradition, based on subsistence and settlement patterns, technological and cultural practices, and other factors that differed from the traditions before and after (McElrath et al. 2009; Emerson & McElrath 2009).

The Archaic occurred during pronounced post-glacial environmental changes, which included the extinction of the large Pleistocene mammals. In Minnesota this period was marked by drastic climatic shifts and corresponding change in vegetation and resources for its occupants. During the early Archaic, forest dominated the landscape and forest resources were utilized by the landscape's occupants. The mid-Holocene saw the expansion of drier conditions and prairie environments expanded to cover even the northernmost extents of Minnesota, eventually giving way to deciduous, and finally conifer, forests (Buhta et al. 2017). The prairie and oak savannas reached their maximum during the mid-Holocene, concurrent and likely intensified by the catastrophic drainage of Lake Agassiz.

The makeup of forests also shifted before and after the prairie period. Before the prairie expansion less fire-resistant forests dominated, while after the prairie's retreat more fire-resistant woodland species dominated (such as oaks and oak savannahs). While deer have been and continued to be an important resource, the spreading of grassland environments also made the utilization of bison possible, though the extent to which they were utilized as a resource is not well understood. In addition to climate, fire may have been one of the primary controls on vegetation during the period. Given that humans use fire for hunting and other activities, it is possible that they had considerable influence over vegetation change (Clark et al. 2001; Grimm 1984; Nelson et al. 2006). By the late Archaic, the stabilization of the climate and vegetation to modern conditions (the three distinct biomes of prairie, deciduous

forest, and coniferous forest) allowed for the intensified utilization of particular resources, and the development of distinctive lifeways based on these adaptations (Gibbon 2012). Environmental changes and the resultant geographic shifts in biomes have caused changes in the territories between the different Archaic adaptations – and thus overlapping and commingled archaeological deposits.

Known technological changes to occur during the Archaic time period include the development of ground stone and copper tools, as well as early horticulture of plants such as squash. The Archaic also marks a technological shift from larger hafted, bifacially-worked lanceolate artifacts to smaller lithic specimens, namely stemmed and notched points. This shift in lithic usage is thought to be indicative of a technological shift: the application of atlatl technology (Buhta et al. 2017). In aquatic settings throughout the Midwest, the use of seine weights has been observed (Struever and Holton 2000).

Other information regarding changes in subsistence, settlement patterns, demographics, social hierarchy, economic structure, political relationships, and religious practices are largely unknown. Most sites that are affiliated with the Archaic time period are often multi-component, and most of these sites have experienced considerable amounts of mixing due to rodent and agricultural activity. Some of the known Archaic sites are deeply buried, with some even found below the present water table. Few datable and/or diagnostic artifacts have been found within discrete Archaic horizons (Board 2016). Only three single-component Archaic sites that have been excavated in Minnesota have associated radiocarbon dates, and only five sites include both diagnostic artifacts and radiocarbon dates (Buhta et al. 2017).

WOODLAND TRADITION

The Woodland Tradition in Minnesota spans from 1000 BC to AD 1650 (Arzigian 2008; Gibbon 2012). The beginning of this period does not represent a sudden nor drastic change from the preceding Archaic period, but rather intensification of local resource bases and regionalization of peoples on the landscape. The Woodland in Minnesota was once thought to represent the simultaneous adoption of ceramic technology, mound interment, and plant cultivation (Anfinson 1979; Buhta et al. 2014); however, the transition from Archaic to Woodland was more complicated, with societies selectively accepting these practices and technologies at different times (Theler & Boszhardt 2005). Still, the presence of pottery is generally used to identify Woodland and later contexts (Arzigian 2008).

Also during this period, the use of new resource bases (i.e. cultivation of domesticated crops) led to greater sedentism (Gibbon 2012). Thus, while implements were similar to those of the preceding Archaic complexes, material culture types found in Woodland contexts shifted due to cultural change and regionalization -- modes of resource exploitation specialized for local environments, a trend attributed at least in part to the continued stabilization of local environments.

Projectile points varied more in form than those seen in the Archaic, with stemmed points becoming rare and side- and corner-notched points of several varieties supplanting them. Scrapers, knives, drills, awls, and punches of chipped stone persisted, and as well as ground-stone implements. Ceramics varied in their composition and decoration by complex, but some of the earliest examples in the state come from thick-walled and conical vessels; through time these generally become thinner and more globular. Shell tempering eventually would allow for a more water-tight/less permeable vessel (Arzigian 2008). Copper continued to be used for awls or piercing tools and ornaments, although the frequency of copper articles is lower than in the Archaic.

At the same time this regionalization was taking place on the landscape, contact with peoples from far-removed societies also occurred. This expanded interaction sphere is visible through the occurrence of exotic items such as galena, obsidian, and shark teeth, to name a few, along with changes in ceramic stylistic attributes.

During the late (Terminal) Woodland, after AD 500 or so, the continued intensification of local resources through time led to further regionalization. During the Terminal Woodland, population size increased, as did the size and number of habitation sites. Agricultural societies focused on maize horticulture and residing in associated palisaded villages in southern and western Minnesota (Plains Village cultures). The Effigy Mound complex in the Upper Mississippi River valley, and semi-sedentary villages focused on intensive wild rice harvesting in northern Minnesota (Psinomani Complex).

CONTACT PERIOD

While the territory now known as Minnesota was legally under the control of Spain from 1763 to 1800, French and British presence predated the United States' acquisition of the territory with the Louisiana Purchase in 1803. The French presence in Minnesota began with the exploration of the Great Lakes in the early 1600's (Dobbs 1988). The

fur trade served as the major catalyst of the French interest in Minnesota. The French influence in Minnesota essentially ended with the French and Indian War (1760), which is when the presence of the British intensified. The founding of the major fur trade companies (Hudson's Bay and the North West Company) solidified the British interest in Minnesota (Dobbs 1988).

While the United States' political presence in the territory that would become Minnesota began in 1803, it more appropriately began with the first permanent US military presence: the founding of Fort Snelling in 1819 (Dobbs 1988). Zebulon Pike claimed to have secured 100,000 acres from the Dakota in 1805 for the erection of a US fort, and the confluence of the Minnesota and Mississippi Rivers was selected for this purpose. The function of the Fort initially was to secure the control of US interests in the fur trade and to quell hostilities between indigenous groups and the encroaching settlers moving westward (Cassady and DeCarlo 2018).

HISTORIC LE SUEUR

The first known European visitor to the area, and the county's namesake, was the explorer Pierre Charles Le Sueur in 1700. He had arrived in Minnesota in 1683. During his explorations, Le Sueur discovered blue clay- which he thought was non-metallic copper. He sent a sample of the blue clay back to France to be assayed by Farmer General Remy-Francois l'Huillier (Birk 1987). It was pronounced to be copper so Le Sueur secured a commission to work the Blue Earth mines. Le Sueur and a crew traveled north on the Mississippi River from Louisiana to the mouth of the Blue Earth River and erected Fort Lu Huillier, named in honor of the assayer (Birk 1987). Le Sueur had over 200,000 pounds of blue clay dug out of the mines and selected 4000 pounds to be sent to the fort. As it turned out, the clay was bluish green in color from a tincture of iron, not copper (Hughes 1909). Le Sueur left to bring the blue clay and other trade goods back to France and in 1702 the fort was evacuated due to poor relations between the crew members and the Fox-Mascouten/Maskonten people (Hughes 1909, Wedel 1974).

By the early 1850s the Treaty of Traverse des Sioux was signed, opening millions of acres of land to settlers and speculators. The first Euro American settlers to this area arrived in 1851. One year later the City of Le Sueur was established as the county seat with a post office, and in 1853 Le Sueur County was created by territorial legislation. By 1867 the first railroad arrived in the county. It was the St. Paul and Sioux City line, today the Chicago, St. Paul, Minneapolis and Omaha. Originally, nearly all the land in this area was covered by timber with three principle streams originating from the Minnesota River, running through the county. These were the Le Sueur, the Cherry, and the Shankaska. Many natural resources and products came from Le Sueur County including timber, stone, and clays. There was an abundance of limestone and sandstone in the area, and the clay from along the Minnesota River was an excellent source for making bricks. Because of these resources, the city of Kasota became the headquarters for extensive quarrying. There was also an abundance of naturally occurring ginseng in the area that was harvested and sold by the early settlers. In 1876 the county seat was moved out of the City of Le Sueur to Le Sueur Center, now called Le Center. Farms were established in Le Sueur County, producing wheat, corn, and sugar beets. Hogs, cattle and chickens were also raised, and apple orchards and dairy farms were common (Gresham 1916).

RESULTS

LITERATURE REVIEW

The OSA Portal was searched for archaeological sites recorded through December 2020, within one mile of the APE. There is one previously documented archaeological site within the search area. The archaeological site within the search area is located approximately 700 feet to the west of the APE. The Regan site (21LE0146) is defined as a historic artifact scatter on an upland hill overlooking a wetland (21LE0146 Site Form). The site is a former gravel pit and historic dump, likely associated with a former farmstead that used to exist to the south. The site is an approximately 40 by 45-meter depression associated with former gravel extraction and subsequent farmstead refuse deposit site, with debris including household items, personal articles, machinery and vehicle parts, farm equipment, construction debris, and field cobbles (21LE0146 Site Form). The site was recorded in 2014 during a Minnesota Department of Natural Resources (MnDNR) survey for wetland restoration at the St. Thomas Lake WMA.

A SHPO database request search revealed eight previously inventoried historic structures within one mile of the APE (**Table 1**). No previously inventoried properties exist within the APE nor the same section as the APE (T112N R25W Section 24).

Table 1: Previously Inventoried Properties Within 1 Mile of APE

Inventory Number	Property Name	City/Township	Location
LE-TYR-007	German Evangelical Salem Church	Tyrone Township	Off County Road 156; T112N R25W S25
LE-TYR-008	School	Tyrone Township	Off County Road 156; T112N R25W S25 & 26
LE-TYR-011	Bridge No. 7308	Tyrone Township	Carries an unpaved County Road across Forest Prairie Creek; T112N R25W, S13
LE-DRN-003	Patrick Roynane House	Derrynane Township	Off County Road 28; T112N R24W S19
LE-DRN-004	Commercial Building	Derrynane Township	T112N R24W S19
LE-DRN-005	Derrynane Township Hall	Derrynane Township	T112N R24W S19
LE-DRN-006	Catholic Church of St. Thomas	Derrynane Township	T112N R24W S19
LE-DRN-009	Bridge 40502	Derrynane Township	T112N R24W S18

Prior Archaeological Surveys

The MnDNR conducted a survey in 2014 for proposed wetland restoration at the St. Thomas Lake WMA (Magner and Allen 2015). Pedestrian survey was employed on the perimeter of the wetland, forested areas, and grassy upland overlooking the drainage. The highest area on the upland crest west of the lake and wetland and within the WMA was considered to have moderate archaeological potential and shovel testing was undertaking. Testing in a potential borrow area located the former gravel pit and dump site, recorded as 21LE0146. The authors note that this site was recommended as not eligible to the National Register of Historic Places (NRHP) and SHPO concurred with this recommendation. Recent aerial imagery reveals this area to still be forested and the site appears to remain unaffected. No impact to site 21LE 0146 is anticipated as a result of the proposed project.

ARCHAEOLOGICAL FIELD SURVEY

Jammi Ladwig conducted the field survey on December 8, 2020. Given variable ground surface visibility from moderate (50%) to fair (25%) to poor (5%) within the APE due to the present of soy chaff following harvest, pedestrian survey transects were spaced at a 7.5-meter interval to ensure adequate coverage.

Former wetland areas in the northern and southern portions of the APE evidenced standing water in south and wetter humic (wetland) soils in these areas relative to other portions of the APE. These low and wet areas are unlikely to contain archaeological resources given their previous permanently wet status. Those areas of higher archaeological probability, namely hilltops in upland areas, demonstrated erosion.

No cultural materials were encountered in the course of the pedestrian survey.

Figure 9: Surface Visibility

Representative surface visibility in APE.

Figure 10: Surface Visibility

Representative surface visibility in APE.

SUMMARY & RECOMMENDATIONS

An archaeological reconnaissance survey was completed on December 8, 2020, for proposed conservation easement and wetland restoration on an approximately 46-acre agricultural parcel in Tyrone Township, Le Sueur County, Minnesota. No cultural materials nor archaeological sites were recovered in the course of the survey. No adverse effect to previously recorded archaeological properties is anticipated as a result of the proposed project. Bolton & Menk, Inc. recommends no further archaeological investigations for the project as proposed.

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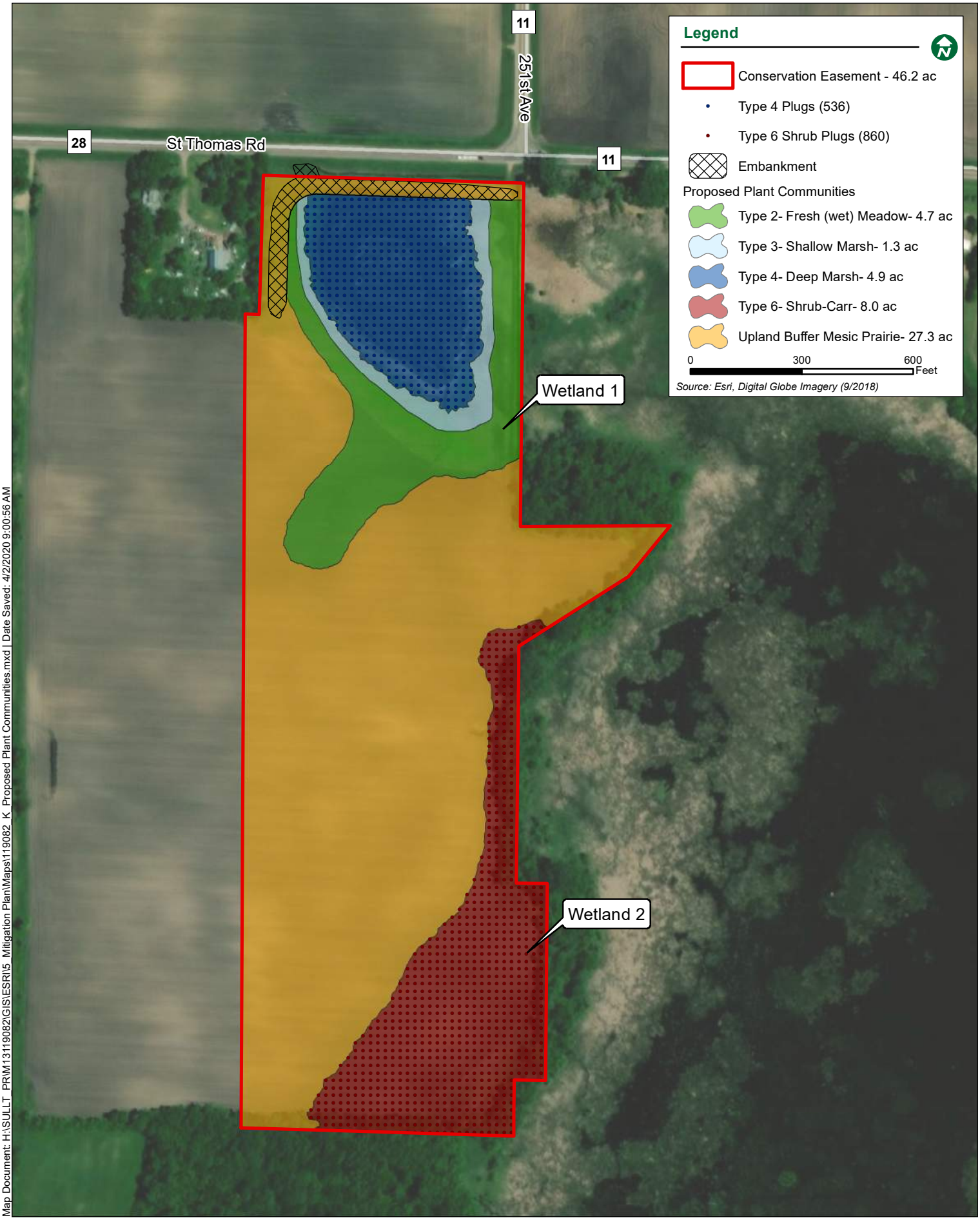
Appendix: Proposed Plant Communities Figure



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MEMORANDUM

Date: January 10th, 2021
To: Thomas A Wenzel, P.E., BWSR

From: Joshua G. Stier, P.E.

Subject: Sullivan Farms Wetland Bank

Introduction

The proposed Sullivan Wetland Bank is located in Tyrone Township in Le Sueur County, approximately 10 miles northeast of the City of Le Sueur. The 76.5-acre property is in a rural area south of the intersection of St. Thomas Rd (CSAH 28) and 251st Ave (CSAH 11). It is directly adjacent to the western edge of the St. Thomas State Wildlife Management Area. The proposed bank will restore wetland hydrology to an area that has been tiled and used for row crop production for 80+ years, while also maintaining drainage capacity to ensure no hydraulic impacts to adjacent properties

Existing Conditions

The Sullivan Wetland Bank is located in a generally low-lying area that experiences frequent inundation following rainfall events. There is a private drainage ditch on the north side of the site that parallels CSAH 28. This ditch serves over 475 acres to the south, including approximately 200 acres of farmland. The ditch is served by a private 36-inch tile that drains north across the Oak property. Historically the lowland areas of the Sullivan property have been tiled and the north tile systems outlet to the private drainage ditch. There is also a known private tile flowing through the Sullivan Property that serves the Hansen property.

East of the Sullivan property is a drainage ditch that serves St. Thomas Lake, southeast of the site. This ditch is restricted by a field entrance culvert, from CSAH 28, which is an 18-inch metal culvert that has a slide gate to further restrict flowrates. The general operation procedure for this gate is unknown and is currently in a partially to fully closed position. This culvert is a substantial hydraulic restriction that causes the east ditch to back up onto the Sullivan Property and overflow to the north ditch, essentially bypassing the 18-inch culvert. Also, the slide gate mechanism creates extended drawdown times, east of the driveway for small rainfall events, resulting in unnecessary impacts to vegetation and farming practices to upstream landowners.

Hydraulic Modeling

To analyze the existing and proposed conditions, a hydrologic and hydraulic model was created using Autodesk's Storm & Sanitary Analysis (SSA) 2019. SSA uses the Soil Conservation Service's (SCS) Technical Release No. 20 (TR-20) methodology to route watershed runoff through the system using a rainfall hydrograph. The Atlas 14 rainfall depths for the site were used along with the MSE 3 rainfall distribution. The rainfall depths used for the 2-, 10-, 25-, and 100-year, 24-hour events are 2.86", 4.24", 5.28" and 7.14", respectively.

The existing drainage areas are shown on Figure 1 in Appendix A, along with several labeled ponding locations. Table 1 summarizes the existing high-water levels for the 2-, 10-, 25-, and 100-year events for the ponding locations labeled in Figure 1. Table 2 reports the existing flowrates through the 36" pipe that serves as an exit for water from the property.

Table 1: Existing High-Water Levels

SITE	High Water Level (ft.)				
	BOTTOM/ NWL	2 - YEAR	10 - YEAR	25 - YEAR	100 - YEAR
P-01	992.07	993.38	993.67	993.93	994.64
P-02	992.45	994.39	995.03	995.45	996.08
P-03	988.19	990.39	993.41	993.92	994.64
P-04	988.96	993.26	996.40	996.64	996.83
P-05	995.40	996.48	997.02	997.39	997.93
P-06	995.86	996.25	996.48	996.69	996.99

Table 2: Existing Flowrates through 36" Pipe Crossing

EVENT	FLOWRATE (CFS)
2-YEAR	16.4
10-YEAR	29.9
25-YEAR	32.2
100-YEAR	33.3

Proposed Conditions

The proposed design focuses on maintaining existing or improving drainage conditions for neighboring property owners and creating negligible downstream impacts, while also adding storage to the watershed by restoring a wetland to its historical conditions.

Hydrology will be restored primarily by the construction of a berm running parallel to CSASH 28, directly adjacent to the existing ditch. The earthen embankment will be constructed with a clay core to prevent seepage and an emergency overflow will be provided to serve all events that exceed the 100-year event (996.50'). The existing tile system on the Sullivan Property will be removed in select locations to ensure that subsurface flow patterns are disrupted. A normal water level (NWL) of 994.50 is proposed to restore wetland hydrology to a condition that historically matches the prehistoric site. An 18" RCP Culvert with an upstream invert set at the NWL will serve as the outlet structure. There are three private drain tile systems that will be daylighted to the restored wetland.

As part of the restoration, it is proposed to remove the existing 18" metal field entrance culvert and slide gate mechanism and replace it with a 24" RCP culvert and no slide gate. This will provide an improved drainage condition for the O'Connell property and St. Thomas Lake outlet ditch while also reducing backup onto the Sullivan property. The increased culvert capacity will make restoration dependent on the immediate 38-acre drainage area for up to the 10-year event. For events that exceed the 10-year, the east ditch will still back up onto the Sullivan wetland property.

A summary highwater levels and flowrates to the 36-inch private culvert are listed in Tables 3 & 4 below, respectively.

Table 3: Proposed High Water Levels

SITE	High Water Level (ft.)				
	BOTTOM/ NWL	2 - YEAR	10 - YEAR	25 - YEAR	100 - YEAR
Wetland 01	994.50	994.89	995.21	995.48	996.49
P-02	992.45	994.39	995.03	995.44	996.08
P-03	988.19	990.65	993.52	994.18	994.89
P-04	988.96	993.64	996.21	996.57	996.84
P-05	995.40	996.48	997.02	997.36	997.93
P-06	995.86	996.26	996.48	996.67	996.98

Table 4: Proposed Flowrates through 36" Pipe Crossing

EVENT	FLOWRATE (CFS)	FLOW RATE CHANGE
2-YEAR	18.9	-15.48%
10-YEAR	30.4	-1.7%
25-YEAR	32.2	0.0%
100-YEAR	34.1	-2.4%

The flow rates at the private 36-inch tile will be increased as the hydraulic slide gate restriction is removed. Ponding capacities on the Oak Property (P-02) were considered and are not expected to be impacted substantially from a high-water level and ponding duration standpoint. This is due to non-coincidental peaks associated with the immediate watershed on the Oak Property relative to the overall watershed to the 36-inch private tile.

The Sullivan Wetland Restoration will restore hydrology to an area that historically was part of the larger St. Thomas Lake wetland complex. The proposed improvements will ultimately provide a net benefit to neighboring properties through hydraulic and vegetation improvements. Please feel free to contact me with any questions at (952) 217-2287 or Joshua.Stier@bolton-menk.com.

Sullivan Wetland Bank

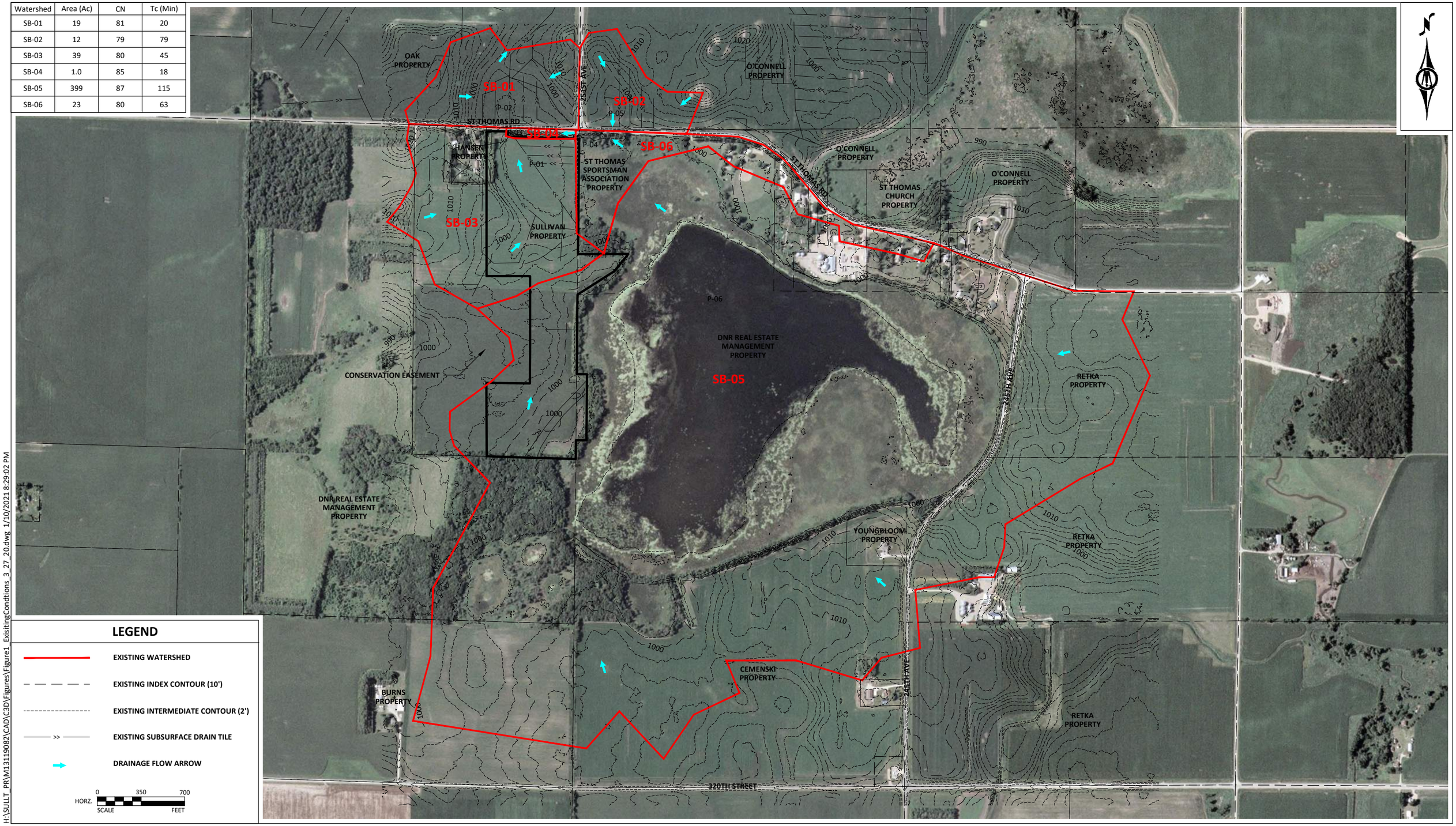
Todd Sullivan

Figure 1: Existing Conditions

January 2021

BOLTON & MENK

Watershed	Area (Ac)	CN	Tc (Min)
SB-01	19	81	20
SB-02	12	79	79
SB-03	39	80	45
SB-04	1.0	85	18
SB-05	399	87	115
SB-06	23	80	63



LEGEND

- EXISTING WATERSHED
- EXISTING INDEX CONTOUR (10')
- EXISTING INTERMEDIATE CONTOUR (2')
- EXISTING SUBSURFACE DRAIN TILE
- DRAINAGE FLOW ARROW

HORZ. SCALE 0 350 700 FEET

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Sullivan Wetland Bank

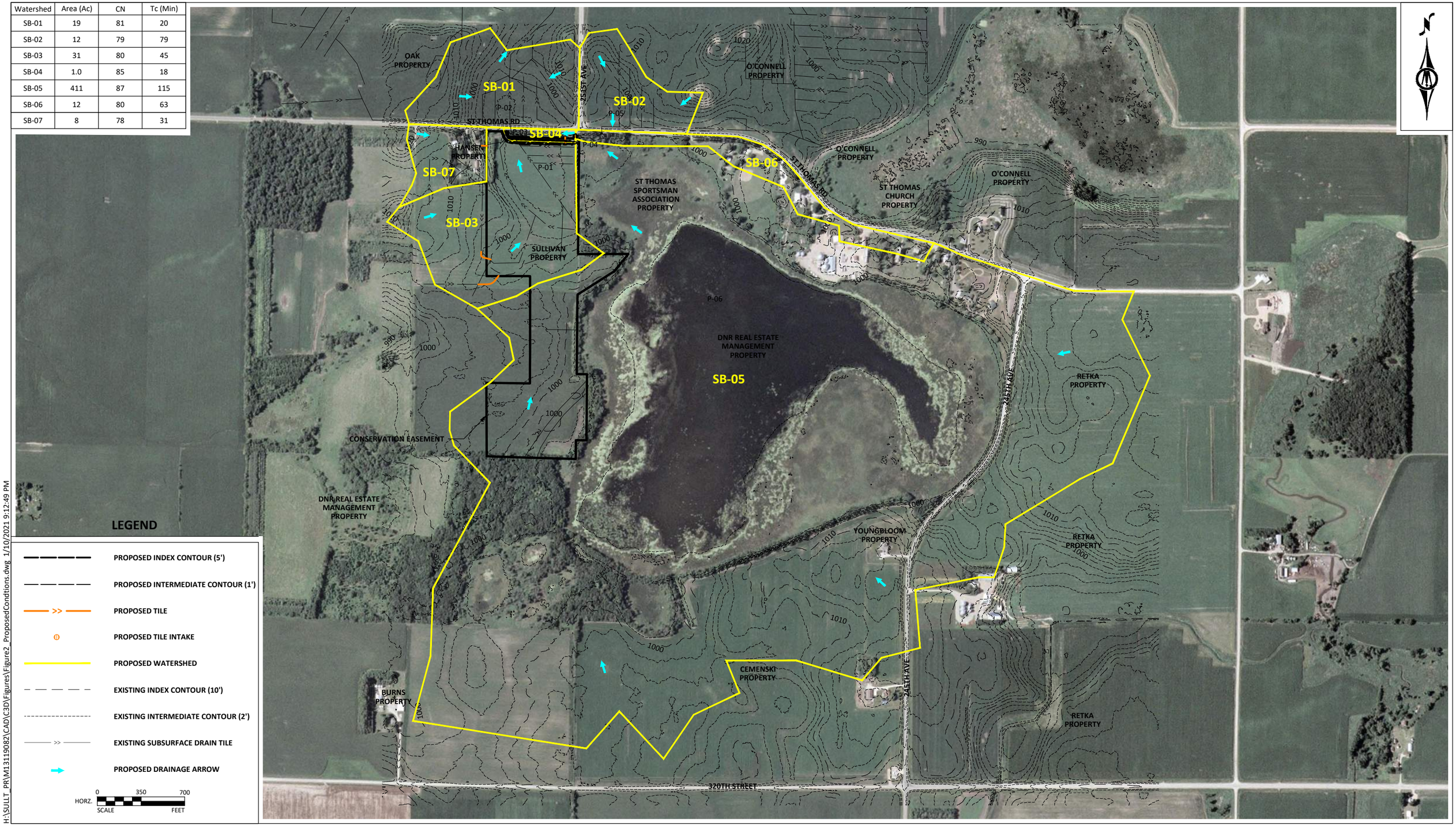
Todd Sullivan

Figure 2: Proposed Conditions

January 2021

BOLTON & MENK

Watershed	Area (Ac)	CN	Tc (Min)
SB-01	19	81	20
SB-02	12	79	79
SB-03	31	80	45
SB-04	1.0	85	18
SB-05	411	87	115
SB-06	12	80	63
SB-07	8	78	31



LEGEND

- PROPOSED INDEX CONTOUR (5')
- PROPOSED INTERMEDIATE CONTOUR (1')
- PROPOSED TILE
- PROPOSED TILE INTAKE
- PROPOSED WATERSHED
- EXISTING INDEX CONTOUR (10')
- EXISTING INTERMEDIATE CONTOUR (2')
- EXISTING SUBSURFACE DRAIN TILE
- PROPOSED DRAINAGE ARROW

HORZ. SCALE 0 350 700 FEET

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0 100 200

SCALE IN FEET

LEGEND

- ○ 3/4" IRON PIPE MONUMENT SET MARKED BY LIC. NO. 19789
- ● MONUMENT FOUND

PROPOSED DESCRIPTION

That part of the Northeast Quarter (NE 1/4) of the Northeast Quarter (NE 1/4) in Section 24, Township 112 North, Range 25 West.

PARCEL 1

Beginning at the Northeast Corner of said Section 24, thence North 88 degrees 09 minutes 23 seconds West along the North line of the Northeast Quarter, a distance of 700.00 feet to the point of beginning; thence South 01 degrees 50 minutes 37 seconds West, a distance of 446.00 feet; thence North 88 degrees 09 minutes 23 seconds West, a distance of 29.64 feet; thence North 00 degrees 01 minutes 06 seconds East, a distance of 446.23 feet to the said North line of the Northeast Quarter; thence South 88 degrees 09 minutes 23 seconds East along the said North line of the Northeast Quarter, a distance of 43.85 feet to the point of beginning.

Said parcel contains 0.38 acres.

PARCEL 2

Beginning at the Northeast Corner of said Section 24, thence North 88 degrees 09 minutes 23 seconds West along the North line of the Northeast Quarter, a distance of 1039.00 feet to the point of beginning; thence South 01 degrees 50 minutes 37 seconds West, a distance of 446.00 feet; thence North 88 degrees 09 minutes 23 seconds West, a distance of 209.36 feet; thence North 00 degrees 31 minutes 51 seconds East, a distance of 446.12 feet to the said North line of the Northeast Quarter; thence South 88 degrees 09 minutes 23 seconds East along the said North line of the Northeast Quarter, a distance of 219.58 feet to the point of beginning.

Said parcel contains 2.20 acres.

Horizontal Datum: NAD83, 1996 Le Sueur County Coordinate System
Vertical Datum: NAVD 1988

SURVEYOR'S CERTIFICATION

I hereby certify that this survey, plan, or report was prepared by me or under my direct supervision and that I am a duly Licensed Land Surveyor under the laws of the State of Minnesota.

Rory Jensen — 11/23/2020
Rory Jensen
License Number 19789
Date

CERTIFICATE OF SURVEY
LE SUEUR COUNTY, MINNESOTA

BOLTON & MENK
1960 PREMIER DRIVE
MANKATO, MINNESOTA 56001
(507) 625-4171

PART OF THE NE 1/4 OF THE NE 1/4 OF SECTION 24, TOWNSHIP 112N, RANGE 25W, LE SUEUR COUNTY, MINNESOTA

FOR: TODD SULLIVAN

Actual Production History (APH) Database

Multiple Peril Crop Insurance

Created By: MN0515DS
Created: 02/19/2020

NAU Country
A QBE Insurance Company

Insured Name: TODD SULLIVAN **Policy #:** MN-942-3037902-20 **Crop Year:** 2020
Agency Code: 22-0515 **Agency Name:** AGQUEST INSURANCE - UFC COOP

Crop Plan	CORN RP	Unit #	0001-0001
County	079 - Le Sueur		
Type	GSG		
Practice	NON IRR		
Options	BUTAYAYC	YC Opt Out ☐	
	Yield Limit	14-Default Yield Limitation	
Farm Name	LIZ AND BOB		

TWP-RGE	Section	FSA Farm #	FSA Tract #	FId#
112N-024W	30	5570, 5571	557, 556	

Other Ident

Crop Year of History	Total Production	Acres	Yields & Desc.	Prod. Rec. Type	YA Yield	TA Yield	YE Opt Out	Prac/Type Tmap Area
2010	9,276.0	52.00	178A			201		T Yield
2011	17,339.0	95.80	181A			202		184
2012	9,643.0	47.50	203A			221		Prior Yield
2013L	*16,449.0*	*95.80*	*172A*			*188*		206
2014L	*6,986.0*	*47.50*	*147A*			*161*		Yld Floor
2015	20,732.0	95.80	216A			228		147
2016	9,982.0	47.50	210A			219		Rate Yld
2017	22,678.0	95.80	237A			244		191
2018	8,913.0	50.63	176A	B		181		Yld Ind
2019	14,050.0	74.30	189A	B		191		Ave. Yield
								*191

Yield Total | # of Years 10 | Prelim Yld

# of Trees/Vines	Processor #/Name	Adj. Yield	Apprv Yld
		191	204

Multi crop year reporting reason

Insurability:

Tenant/Landlord Insuring Other's Share	Name of Other Person(s) Sharing

Insured's Share 1.0000 ◯ Verify ☐,☐☐☐☐☐

Other:

Required: ◯ Field Review ◯ Inspection

◯ New Producer ◯ Added Land/New Crop/P/T/V

Crop Plan	CORN RP	Unit #	0001-0002
County	079 - Le Sueur		
Type	GSG		
Practice	NON IRR		
Options	BUTAYAYC	YC Opt Out ☐	
	Yield Limit	14-Default Yield Limitation	
Farm Name	REGAN		

TWP-RGE	Section	FSA Farm #	FSA Tract #	FId#
112N-024W	19	6197, 1257, 7559	24971	
112N-025W	24			

Other Ident

Crop Year of History	Total Production	Acres	Yields & Desc.	Prod. Rec. Type	YA Yield	TA Yield	YE Opt Out	Prac/Type Tmap Area
2001	5,575.0	40.40	138A			182		T Yield
2003	6,725.0	39.10	172A			211		184
2005	6,411.0	41.90	153A			188		Prior Yield
2007	5,832.0	40.50	144A			174		198
2009	8,963.0	40.50	221A			246		Yld Floor
2011	6,973.0	40.50	172A			193		147
2013L	*12,029.0*	*74.70*	*161A*			*177*		Rate Yld
2015	14,626.0	74.70	196A			208		177
2017	17,735.0	76.09	233A			240		Yld Ind
2019	11,478.0	63.59	181A	B		183		Ave. Yield
								*177

Yield Total | # of Years 10 | Prelim Yld

# of Trees/Vines	Processor #/Name	Adj. Yield	Apprv Yld
		177	200

Multi crop year reporting reason

Insurability:

Tenant/Landlord Insuring Other's Share	Name of Other Person(s) Sharing

Insured's Share 1.0000 ◯ Verify ☐,☐☐☐☐☐

Other:

Required: ◯ Field Review ◯ Inspection

◯ New Producer ◯ Added Land/New Crop/P/T/V

Crop Plan	CORN RP	Unit #	0001-0003
County	079 - Le Sueur		
Type	GSG		
Practice	NON IRR		
Options	BUTAYAYC	YC Opt Out ☐	
	Yield Limit	14-Default Yield Limitation	
Farm Name	SHARKEY		

TWP-RGE	Section	FSA Farm #	FSA Tract #	FId#
112N-024W	9, 10	5570	113	

Other Ident

Crop Year of History	Total Production	Acres	Yields & Desc.	Prod. Rec. Type	YA Yield	TA Yield	YE Opt Out	Prac/Type Tmap Area
2005	6,840.0	45.00	152A			187		T Yield
2006	26,780.0	130.00	206A			238		184
2007	5,760.0	45.00	128A			158		Prior Yield
2008	23,598.0	138.00	171A			199		194
2009	8,630.0	37.30	231A			256		Yld Floor
2010	25,991.0	130.70	199A			222		147
2012	28,928.0	178.10	162A			180		Rate Yld
2014L	*19,760.0*	*178.10*	*111A*			*125*		175
2016	35,607.0	178.10	200A			209		Yld Ind
2018	33,207.0	178.05	187A	B		192		Ave. Yield
								*175

Yield Total | # of Years 10 | Prelim Yld

# of Trees/Vines	Processor #/Name	Adj. Yield	Apprv Yld
		175	197

Multi crop year reporting reason

Insurability:

Tenant/Landlord Insuring Other's Share	Name of Other Person(s) Sharing

Insured's Share 1.0000 ◯ Verify ☐,☐☐☐☐☐

Other:

Required: ◯ Field Review ◯ Inspection

◯ New Producer ◯ Added Land/New Crop/P/T/V

*average yield without trend applied for rating purposes
Year designated for exclusion with selection of YE option L Year has loss data R Year has an APH review V = Verified fresh production

Actual Production History (APH) Database

Multiple Peril Crop Insurance

Created By: MN0515DS
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NAU Country
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Insured Name: TODD SULLIVAN **Policy #:** MN-942-3037902-20 **Crop Year:** 2020

Agency Code: 22-0515 **Agency Name:** AGQUEST INSURANCE - UFC COOP

Crop Plan	SOYBEANS RP	Unit #	0001-0001
County	079 - Le Sueur		
Type	COMM		
Practice	NON IRR		
Options	BUTAYAYC	YC Opt Out	☐
	Yield Limit	14-Default Yield Limitation	
Farm Name	LIZ AND BOB		

TWP-RGE	Section	FSA Farm #	FSA Tract #	Fld#
112N-024W	30	5570, 5571	557, 556	

Other Ident

Crop Year of History	Total Production	Acres	Yields & Desc.	Prod. Rec. Type	YA Yield	TA Yield	YE Opt Out	Prac/Type Tmap Area
2010	5,510.0	91.30	60A			65		T Yield
2011L	*1,956.0*	*47.50*	*41A*			*45*		49
2012	3,776.0	95.80	39A			43		Prior Yield
2013	2,288.0	47.50	48A			51		56
2014L	*5,386.0*	*95.80*	*56A*			*59*		Yld Floor
2015	2,416.0	47.50	51A			53		39
2016	6,223.0	95.80	65A			67		Rate Yld
2017	2,446.0	48.83	50A			51		52
2018	5,678.0	94.00	60A	C		61		Yld Ind
2019	2,288.0	43.33	53A	B		53		Ave. Yield
								*52

Yield Total | # of Years 10 | Prelim Yld

# of Trees/Vines	Processor #/Name	Adj. Yield	Apprv Yld
		52	55

Multi crop year reporting reason

Insurability:

Tenant/Landlord Insuring Other's Share	Name of Other Person(s) Sharing

Insured's Share 1.0000 ◯ Verify ☐,☐☐☐☐☐

Other:

Required: ◯ Field Review ◯ Inspection

◯ New Producer ◯ Added Land/New Crop/P/T/V

Crop Plan	SOYBEANS RP	Unit #	0001-0002
County	079 - Le Sueur		
Type	COMM		
Practice	NON IRR		
Options	BUTAYAYC	YC Opt Out	☐
	Yield Limit	14-Default Yield Limitation	
Farm Name	REGAN		

TWP-RGE	Section	FSA Farm #	FSA Tract #	Fld#
112N-024W	19	6197, 1257	347	
112N-025W	24			

Other Ident

Crop Year of History	Total Production	Acres	Yields & Desc.	Prod. Rec. Type	YA Yield	TA Yield	YE Opt Out	Prac/Type Tmap Area
2000	2,182.0	40.40	54A			64		T Yield
2002	1,720.0	39.10	44A			53		49
2004	1,760.0	41.90	42A			50		Prior Yield
2006	2,263.0	41.90	54A			61		53
2008	1,701.0	40.50	42A			48		Yld Floor
2010	1,742.0	40.50	43A			48		39
2012	3,596.0	74.70	48A			52		Rate Yld
2014L	*3,704.0*	*74.70*	*50A*			*53*		49
2016	4,522.0	76.10	59A			61		Yld Ind
2018	3,783.0	76.09	50A	B		51		Ave. Yield
								*49

Yield Total | # of Years 10 | Prelim Yld

# of Trees/Vines	Processor #/Name	Adj. Yield	Apprv Yld
		49	54

Multi crop year reporting reason

Insurability:

Tenant/Landlord Insuring Other's Share	Name of Other Person(s) Sharing

Insured's Share 1.0000 ◯ Verify ☐,☐☐☐☐☐

Other:

Required: ◯ Field Review ◯ Inspection

◯ New Producer ◯ Added Land/New Crop/P/T/V

Crop Plan	SOYBEANS RP	Unit #	0001-0003
County	079 - Le Sueur		
Type	COMM		
Practice	NON IRR		
Options	BUTAYAYC	YC Opt Out	☐
	Yield Limit	14-Default Yield Limitation	
Farm Name	SHARKEY		

TWP-RGE	Section	FSA Farm #	FSA Tract #	Fld#
112N-024W	9, 10	5570	113	

Other Ident

Crop Year of History	Total Production	Acres	Yields & Desc.	Prod. Rec. Type	YA Yield	TA Yield	YE Opt Out	Prac/Type Tmap Area
2006	2,332.0	47.60	49A			56		T Yield
2007	7,324.0	143.60	51A			57		49
2008	1,569.0	50.60	31A			37		Prior Yield
2009	7,485.0	140.80	53A			58		53
2010	2,282.0	47.40	48A			53		Yld Floor
2011L	*7,382.0*	*178.10*	*41A*			*45*		39
2013	7,679.0	178.10	43A			46		Rate Yld
2015	9,290.0	178.10	52A			54		48
2017	10,367.0	178.05	58A			59		Yld Ind
2019	9,361.0	178.05	53A	B		53		Ave. Yield
								*48

Yield Total | # of Years 10 | Prelim Yld

# of Trees/Vines	Processor #/Name	Adj. Yield	Apprv Yld
		48	52

Multi crop year reporting reason

Insurability:

Tenant/Landlord Insuring Other's Share	Name of Other Person(s) Sharing

Insured's Share 1.0000 ◯ Verify ☐,☐☐☐☐☐

Other:

Required: ◯ Field Review ◯ Inspection

◯ New Producer ◯ Added Land/New Crop/P/T/V

*average yield without trend applied for rating purposes
Year designated for exclusion with selection of YE option L Year has loss data R Year has an APH review V = Verified fresh production

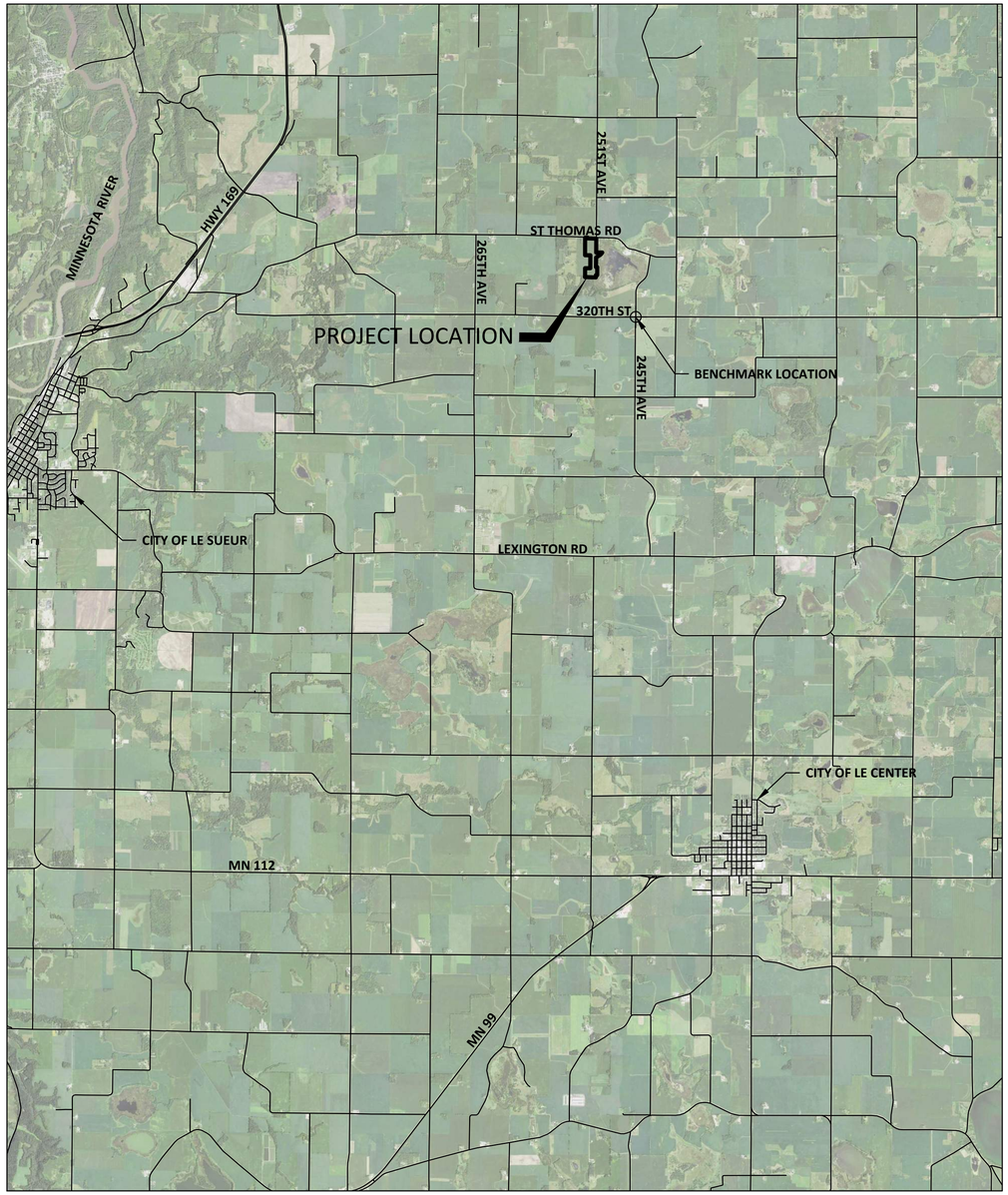
CONSTRUCTION PLANS FOR

SULLIVAN WETLAND BANK

VEGETATION ESTABLISHMENT & WETLAND RESTORATION

LE SUEUR COUNTY, MINNESOTA

JANUARY 2021



MAP OF THE
LE SUEUR COUNTY, MN

MAP LEGEND

PROJECT LIMITS

BENCHMARK

0 5000 10000
SCALE FEET

SHEET NUMBER	SHEET TITLE
G1.01	TITLE SHEET
C1.01-C1.04	CONSTRUCTION DETAILS & SPECIFICATIONS
C2.01	EXISTING SITE PLAN
C2.02	REMOVAL PLAN
C3.01 - C3.04	PROPOSED SITE PLAN
C4.02 - C4.03	BERM CROSS SECTIONS
C5.01	PROPOSED SEEDING PLAN

THIS PLAN SET CONTAINS 15 SHEETS.

STATEMENT OF ESTIMATED QUANTITES			
ITEM #	ITEM	UNIT	QUANTITY
1	MOBILIZATION	LUMP SUM	1
2	TILE INVESTIGATION/EXPLORATION	HRS	10
3	COMMON EXCAVATION (P)	CY	2180
4	COMMON BORROW (CV, P)	CY	1240
5	COMMON BORROW (CLAY CORE) (CV,P)	CY	2613
6	TOPSOIL REMOVAL, SALVAGE, AND SPREADING	CY	2613
7	TILE INLET BULKHEAD	EA	1
8	TILE REMOVAL	LF	1433
9	CULVERT REMOVAL	LF	36
11	BALLAST ROCK	CY	93
12	GEOTEXTILE FABRIC, TYPE IV	SY	626
13	RANDOM RIPRAP, CL III	CY	80
14	8" CPDT	LF	290
15	10" CMP	LF	60
16	18" RC PIPE CULVERT	LF	56
17	18" RC APRON	EA	2
18	24" RC PIPE CULVERT	LF	28
19	24" RC APRON	EA	2
20	MARMAC DISSIMILAR PIPE COUPLER	EA	3
21	10" STAINLESS STEEL RODENT GUARD	EA	3
22	5'x5' HDPE ANTI-SEEPAGE COLLAR	EA	3
23	STATE SEED MIX 35-241	LB	712
24	CUSTOM WET MEADOW MIX	LB	515
25	CUSTOM EMERGENT MIX	LB	10
26	PILOT SEED MIX - DEEP MARSH	LB	15
27	WETLAND REHAB SEED MIX	LB	43
29	NURSERY RAISED SUBMERGENT PLUGS - TYPE 6	EA	856
30	BROADCAST SEEDING	AC	19.5
31	DRILL SEEDING	AC	19.5
32	PLUG INTALLATION	AC	8

NOTE:
EXISTING UTILITY INFORMATION ON THIS PLAN HAS BEEN PROVIDED BY THE OWNER. THE CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION AS REQUIRED BY STATE LAW. NOTIFY GOPHER STATE ONE CALL 1-800-252-1166 OR 651-454-0002

REFERENCE MNDOT 2018 SPECIFICATIONS UNLESS OTHERWISE NOTED WITHIN

CONTACTS

PROJECT ENGINEER: JOSHUA G. STIER, P.E.
507.625.4171 EXT. 2962

PROJECT TECHNICIAN/ WETLAND SPECIALIST: DANIEL DONAYRE,
507.625.4171 EXT. 2646

BM=1007.108
MnDOT GEODETIC MARKER: 95 GJS
NW OF JUNCTION OF CR 28 & CR 30
CONCRETE MONUMENT (NGVD 29)

PROJECT DATUM:
HORIZONTAL: LE SUEUR COUNTY COORDINATE SYSTEM, NAD83 (2011)
VERTICAL: NAVD 1988

RECORD DRAWING INFORMATION
OBSERVER:
CONTRACTOR:
DATE:

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

JOSHUA G. STIER
LIC. NO. 54171 DATE 1/04/2021

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DESIGNED	HEG
DRAWN	HEG
CHECKED	JGS
CLIENT PROJ. NO.	M13.119082

NO.	ISSUED FOR	DATE

TODD SULLIVAN
SULLIVAN WETLAND BANK
TITLE SHEET

SHEET G1.01

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PROPOSED EMBANKMENT

REMOVING, SALVAGING AND SPREADING TOPSOIL
The work shall consist of the removal of topsoil from borrow, embankment and spillway area(s), stockpiling the suitable topsoil material and then spreading it back on those areas as directed after construction is completed. Suitable topsoil material shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, stones or other foreign materials.

Spreading shall not be done when the ground or topsoil is frozen or excessively wet. Surfaces to be covered shall be lightly scarified just prior to the spreading operation. Upon completing construction of the embankment and spillway, blend topsoil against the borrow, embankment and spillway area and trim to blend with the area or slopes. Respread topsoil evenly over the entire crest and side slopes of the embankment, spillway and/or the surface of borrow area(s) in a 4-6 inch layer or as otherwise directed. Where the borrow site is outside the bank boundary area shown on the plan, the topsoil shall be reestablished at its original thickness. The surface of the topsoil shall be finished to a reasonably smooth surface free of low spots, humps, or large stones and ready for seed.

The Topsoil Removal, Salvage & Spreading quantity in borrow areas is estimated using an average depth of borrow of three feet. The contractor shall remove and salvage all friable topsoil material over the borrow area. All slopes in the borrow site shall be graded to drain toward the wetland and shall have a maximum slope of 8:1 (H:V)

EXCAVATION
This work shall include all labor, materials, and equipment required for the excavation, hauling and spreading of materials as required by the drawings or as staked. The work includes the control of water during excavation, the shaping of slopes to the lines and grades shown and the disposal of unsuitable materials.

To the extent they are needed, suitable materials from the specified excavations may be used in the construction of permanent earthfill. Borrow area(s) shall be excavated and finally dressed in a manner to eliminate steep or unstable side slopes or other hazardous or unsightly conditions.

EARTHFILL/EMBANKMENTS
All fill materials for the embankment construction shall be obtained from required excavations and designated borrow areas. Fill materials shall contain no sod, brush, roots or other perishable materials. Topsoil and/or organic material (black) material shall not be used in the embankment, except as specified for topdressing. Rock larger than 4 inches in diameter shall be removed prior to compaction of the fill. Under no circumstances shall frozen materials be used in the construction of earthfills or embankments.

The core trench and subgrade section of the embankment shall be constructed of compacted, relatively impermeable material consisting of inorganic clay. The embankment fill material above the existing ground surface and clay core shall consist of inorganic clay and/or silty material. The proposed berm shall be capped with six inches of topsoil, to allow for stabilization of the embankment.

The top surfaces of embankments shall be maintained approximately level during construction, except that a crown or cross-slope of approximately 5 percent shall be maintained to ensure effective drainage

The moisture content of the fill material shall be maintained within the limits required to: a) allow the soil to form a ball that does not readily separate when kneaded in the hand; b) prevent adherence of the fill material to the equipment treads or tracks; c) prevent rutting by equipment, and; d) ensure that blending of the soil results in a reasonably homogenous mass.

Material that is too wet when deposited on the fill shall either be removed or dried to the specified moisture content prior to compaction. If the top surface of the preceding layer of compacted fill or a foundation or abutment surface in the zone of contact with the fill becomes too dry to permit suitable bond, it shall either be removed or scarified and moistened by sprinkling to an acceptable moisture content prior to placement of the next layer of fill.

RIPRAP, GEOTEXTILE & TURF REINFORCEMENT MAT:

GENERAL
The work shall consist of furnishing and placing loose rock riprap and associated geotextile filter materials and turf reinforcement mats (TRMs) at the locations shown on the drawing, as a protective covering at inlets and outlets where the soil is susceptible to erosion.

MATERIALS

RANDOM RIPRAP (MnDOT 3601)
Unless otherwise stated, quarry stone (angular crushed bedrock) rock riprap shall be used.

1. Stones shall be generally round or cubiorm in shape. Each individual stone shall have at least one fractured face
2. Stone shall be free of soil and/or other debris prior to placement
3. Contain less than 10 percent of the following by weight:
   - 3.1. Stones with defects that could cause rapid or excessive deterioration or degradation during service, such as cracks or seams;
   - 3.2. Stones with a width or thickness less than 30 percent of the length.
4. For carbonate quarry/bedrock material used in total or inpart for riprap, the portion of the insoluble residue passing the #200 sieve is no greater than 10 percent.
5. Use 100% virgin materials for riprap and granular filter.

The approximate gradation (size) of stones for loose rock riprap shall meet MnDOT Specification 3601 for specified class. The stones shall be reasonably well graded within the percentages shown. The Contractor shall provide to the Project Technician documentation that the proposed material meets the gradation requirements, as specified.

GEOTEXTILE FILTER (MnDOT 3733)
Geotextiles shall meet or exceed the requirements of MnDOT Specification 3733. Unless otherwise specified, the Contractor shall furnish and install the geotextile to the quantities shown. The Contractor shall provide to the Project Technician manufacturer's certification that the geotextile used has minimum average roll values, which meet or exceed the requirements specified herein.

The geotextile shall be a non-woven fabric of polymeric filaments or yarns such as polypropylene, polyethylene, polyester, or polyamide formed into a stable network such that the filaments/yarns retain dimensional stability relative to each other. Geotextile shall be resistant to biological and chemical enviroments normally found in soils, and that is free of chemical treatment or coating that may significantly reduce porosity or permeability.

Geotextile shall be uniform in texture, thickness and appearance, and be free of defects, flaws, cuts, punctures or tears that would significantly alter its strength or filtering properties. The geotextile shall conform to the physical requirements specified herein.

Deliver rolls of geotextile with an opaque plastic covering to protect the material from ultraviolet rays or contamination with mud, dirt, dust, or debris. Provide rolled geotextile labeled on the outside wrap and inside the core in accordance with ASTM D 4873 and as follows:

1. Manufacturer,
2. Product Name, and
3. Roll number.

Geotextile shall not be left exposed to the sun for a period in excess of 7 days without being covered by the appropriate protective soil or rock layer. Replace contaminated geotextile or geotextile exposed to the sun for more than seven days, as directed by the engineer.

Provide geotextile meeting the requirements of Table 3733-1.

TURF REINFORCEMENT MAT (MnDOT 3885)
Turf Reinforcement Mats shall be made of a three-dimensional matrix of synthetic material, continuously bonded at filament intersections meeting the requirements of Table 3885-5 .

CONSTRUCTION REQUIREMENTS

SUBGRADE SURFACE PREPARATION
The surface on which the geotextile and rock riprap are to be placed shall be cut or filled to the lines and grades as shown on the drawings. The surface shall be reasonably smooth, free of holes, depressions, mud, running water, stumps, large rocks, or other debris that would tend to tear or puncture the fabric. Compact loose foundation material before placing the riprap or filter material. Rock riprap and the geotextile filter materials shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved.

PLACEMENT OF GEOTEXTILE (MnDOT 2511.3B.2)
Geotextile shall be used beneath all rock riprap. The geotextile shall be uniformly placed on the approved prepared subgrade surface at the locations and in accordance with the details shown on the drawings and as specified.

Place the fabric with the longest dimension parallel to the direction of water flow. If using fabric that is not seamed, overlap splices and joints at least 18 inches, except overlap splices and joints placed under water 36 inches. Provide shingled joint laps in the flow direction and from top to bottom of a slope to direct water flow over the joint without undermining the geotextile filter. The Contractor may sew multiple fabric pieces together, as specified in 3733, "Geotextiles," in lieu of joint overlapping. Bury the upgrade edges of the fabric a minimum of 6 inches to direct water flow over the fabric and prevent undermining. If not seamed, place washed steel pins, edge stakes, stones, or other material at locations and in quantities as approved by the engineer, to prevent movement of the geotextile during placement of riprap.

PLACEMENT OF RIPRAP (MnDOT 2511)
The rock riprap shall be placed on the geotextile material in such a manner that the smaller size material remains evenly distributed throughout. The maximum drop height of rock riprap onto the geotextile shall be 1-foot. Do not dump stones at teh top of the slope and roll stone down the slope. When placing riprap, start at the lowest elevations and work upwards. Do not operate construction equipment directly on top of placed riprap.

Rock riprap shall be carefully placed by hand or machine on the surfaces to a depth equal to twice the d50 of the specified riprap, unless specified otherwise. Stones shall be securely bedded with individual stones firmly in contact one to another. Sufficient handwork shall be performed to produce a neat and uniform surface.

The in-place rock riprap shall be well graded. If necessary, individual stones shall be rearranged by hand to produce a well-graded mass. Spaces between the larger rocks shall be filled with smaller rocks. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge.

PLACEMENT (TURF REINFORCEMENT MAT)
Turf reinforcement mat shall be installed per manufacturer's recommendations including installation procedures, anchors, and fill material.

Turf reinforcement mat to be installed on all disturbed soils down gradient of the emergency overflow.

DRAINAGE PIPE

DESCRIPTION
The work shall include all labor, materials, and equipment required to assemble the pipe sections, excavate and prepare the bed for the pipe and place and compact the backfill to the lines and grades shown on the drawings.

MATERIALS REQUIREMENTS

GENERAL
All materials must be handled and stored in a careful and workmanlike manner. All pipes and fittings must be of the length, size and type specified. Unless otherwise noted, all pipes and fittings must be attached according to manufacturers' recommendations. All materials shall be carefully inspected before they are installed. All materials with physical imperfections or that are damaged, lost, broken or deemed unsuitable due to the Contractor's method of installation, handling, or negligence must be replaced at the Contractor's expense.

CORRUGATED POLYETHYLENE DRAINAGE TUBING (CPDT)
All Corrugated Polyethylene Drainage Tubing (CPDT) and fittings furnished shall be in compliance with material standards ASTM F405 & F667, as appropriate for the type and size specified.

3 - 6" = ASTM-F-405
8"- 24" = ASTM-F-667

Joints shall be minimized to the extent practical. When required and unless otherwise shown on the drawing, coupling bands of the appropriate size and type are to be provided at each pipe joint. The hardware for fastening the coupling bands to the connecting pipes shall be fabricated to permit sufficient tightening to provide the required joint tensile strength and, if required, water-tightness, without failure of the fastening.

DUAL-WALL HDPE PIPE
Unless otherwise specified, the High Density Polyethylene Pipe (HDPE) shall have a smooth interior and annular exterior corrugations. Manning's "n" value for the pipe shall not exceed 0.012.

10-Inches & Smaller
The pipe shall meet the requirements of AASHTO M252 Type S. Pipe and fitting material shall be high-density polyethylene meeting the requirements of ASTM D3350 minimum Cell Classification 324420C. Gasketed couplers shall be provided for each pipe joint and must meet the requirements of ASTM F477. The gaskets shall be those recommended by the manufacturer for use with the coupler, fittings, and pipe to provide watertightness to the joint.

12-Inches & Larger
The pipe shall meet the requirements of AASHTO M294 Type S. Pipe and fitting material shall be high-density polyethylene meeting the requirements of ASTM D3350 Cell Classification 325420C. Where joints are necessary, pipes shall be joined with a bell-and-spigot joint meeting the requirements of AASHTO M252 or M294. The bell shall be an integral part of the pipe and provide a minimum pull-apart strength of 400 lbs. The bell-and-spigot joint shall incorporate a rubber gasket meeting the requirements of ASTM F477 and shall be watertight meeting ASTM D3212. Gaskets shall be installed on the pipe or as recommended by the pipe manufacturer. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.

CORRUGATED METAL PIPE (CMP)
Unless otherwise specified, the pipe corrugations may be either riveted annular or lock-seam helical. Lock-seam helical pipe shall have re-rolled ends with each end having a minimum of four corrugations.

All corrugated metal pipe shall be prefabricated corrugated galvanized steel per MnDOT Specification 3226. When necessary, fittings including coupling bands shall be made from steel conforming to ASTM-A-444, A-742, A-806, and A-885. The fittings shall have an aluminized coating to further prevent corrosion.

CONSTRUCTION REQUIREMENTS

HANDLING THE PIPE
The Contractor shall furnish all equipment necessary to transport and place the pipe without damaging it or its coatings. When handling and placing the pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by equipment or other site materials).

All special handling requirements of the manufacturer shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at temperatures of 40° F or less. The pipe shall be stored on a relatively flat surface so that the full length of the pipe is evenly supported.

CONNECTIONS
Where existing tile lines not shown on the drawings are crossed, they shall be bridged across the new trench or they shall be connected into the new tile lines.

INSTALLATION AND ASSEMBLY OF PIPE
The trench or excavation for the placement of the pipe shall be constructed to elevations and grades as shown.

Unless otherwise noted, excavation for and subsequent installation of pipe sections shall begin at the outlet end and progress upstream. All field cut pipe ends shall have all burrs removed prior to assembling the joints. All pipelines shall be free of foreign material during installation.

Pipe placed during any day shall be blinded by the end of the day.

Trench shields, shoring and bracing, or other methods necessary to safeguard the workers and the work, and to prevent damage to existing improvements, shall be furnished, placed, and subsequently removed by the Contractor.

CPDT
All CPDT shall be installed in compliance with ASTM 449 standard practice, unless otherwise approved by the engineer.

For pipes 6" diameter and smaller, a 90° V-Groove bottom may be used, for all larger pipe a trapezoidal bottom or a circular bottom conforming to the outside diameter of the pipe shall be used. Prior to the installation of CPDT, contractor must prove to the engineer that the installation requirements, including the shape of the trench bottom, will be accomplished.

Where trench bottom is in firm undisturbed soil, shape trench base groove. Where excess cut occurs, overexcavate and place minimum four (4) inch thick, layer of Fine Filter Aggregate (MnDOT 3149.2.J.2).

Native soils may be used as backfill material unless unstable trench conditions prevent the trench bottom holding the shaped groove. If the trench bottom will not hold a groove shape, contractor shall notify engineer immediately. A flat bottom trench installation will then be assumed.

Minimum trench width is the pipe outside diameter plus four (4) inches for plowed installation and pipe outside diameter plus twelve (12) inches for open trench installation.

All lateral connections, elbows, tees, alignment curves, start holes and all portions of the trench not meeting the grooved trench installation requirements shall be filled to a minimum of six (6) inches of cover over the pipe with Coarse Filter Aggregate (MnDOT 3149.2.H). Unless due to contractor error, this bedding material will be paid under the Tile Trench Stabilization item.

With the installation of the first reach of CPDT on the project, contractor is required to work with the engineer to check and confirm that the pipe stretch, if any, does not exceed 5%.

Alignment turns may be made using either a manufactured fitting or curving the line with a 25 foot minimum radius.

DUAL-WALL HDPE /CORRUGATED METAL PIPE
Unless otherwise specified, the proposed pipe shall be placed and bedded in accordance with the requirements of ASTM -D-2321 "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications"

OUTLET LOCATION MARKING
All pipe outlets including concrete headwalls and pipe aprons shall be marked with a guide post.

BACKFILLING
Earth backfill material shall be placed in the trench in a manner to ensure that the pipe does not become displaced. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures that may cause excessive displacements or damage to the pipe. Execute backfill to the lines and grades shown on the plans or as staked.

Automatic backfilling machines may be used only when approved by the Engineer. Backfill shall extend above the ground surface and be well rounded over the trench.

Unless otherwise specified, where the pipe is laid under roads, terraces and other locations as designated on the drawings or by the Engineer, the backfill shall be placed in successive layers of not more than 6 inches and each layer shall be compacted before the next layer is placed.

TILE REMOVAL, INTAKE PLUG & ADJUST TILE INTAKE:

TILE REMOVAL
The work shall include all labor, materials and equipment required to complete the excavation and removal of all identified tile drainage systems.

Drain tile shall be removed in 100 ft. lengths every two feet of vertical rise/fall for all slopes greater than 4%. For slopes 4% or less, 100 foot tile breaks shall be constructed every four feet of vertical rise/fall.

At the end of each tile branch, a 100 ft. length shall be removed, see plan for locations.

Unless otherwise specified, all fragments of the drainage tile shall be removed from the excavated trench and backfill material.

Each end of the exposed drainage tile in the excavated trench shall be plugged with concrete (minimum 2 ft. in length). Concrete shall be cured and plugs shall be water tight prior replacing backfill material.

Backfill and tamp by hand a minimum distance of two feet around each sealed tile end with suitable soil material. Backfill the remaining trench with the most suitable material available and compact to a density equal to or greater than the surrounding undisturbed soil.

INTAKE PLUG
The work shall include all labor, materials and equipment required to complete the excavation and plugging of drainage intakes.

Remove intake grate and excavate to atleast 18 inches below the finish grade elevation. The existing tile riser shall be removed to a depth of at least six inches below the proposed ground surface. A polyethylene pipe plug or cap shall be placed on the end of the existing tile. The existing end of the tile and cap shall be encased in concrete. Concrete shall be cured and water tight prior to replacing backfill material.

Backfill and tamp by hand a minimum distance of two feet around each sealed tile end with suitable soil material.

ADJUST TILE RISER
The work shall include all labor, materials and equipment required to complete the adjustment of existing tile intakes.

Internal snap couplers shall be used for all plastic tile risers. All other tile risers couplers shall be approved by the engineer.

Expose the existing tile riser and verify condition is suitable to install an internal snap coupler. Add specified riser intake and drain guard.

Backfill and tamp by hand a minimum distance of two feet around each tile inlet with suitable soil material.

(A) SEEDING:

GENERAL
Seed bed preparation shall be conducted throughout the entire restoration site, wetland and buffer, and shall include the proposed earthen berm.

SEED BED PREPARATION
The seed bed shall be disked to loosen surface soils and break apart large clumps of soil. A harrow shall then be implemented to further pulverize the soil and smooth the surface of the restoration site. The entire area will be finished with a cultipacker or roller to give a smooth planting surface. Once the seed bed preparation has been completed, the seed zones shall be staked in the field.

NURSERY RAISED SHRUBS
Native shrubs shall be planted below an elevation of 1000.0. Submergent nursery raised plugs shall be planted below the elevation of 994.5. All pots will be planted using a 20' x 20' grid spacing.

SEQUENCING OF SEEDING
1. Plant nursery raised plugs and shrubs in specified locations.
2. Seed the Wetland Rehab Mix in specified location.
3. Seed the Pilot Seed Mix in specified location.
4. Seed the Custom Emergent Mix, followed by Custom Wet Meadow Mix, followed by 35-241.

SEED MIXES
Seed Mixes will be used for the project as follows

- Upland Buffer - State Seed Mix 35-241, Mesic Prairie General
- Type 2 Wetland - Custom Wet Meadow Mix
- Type 3 Wetland - Custom Emergent Mix
- Type 4 Wetland - Pilot Seed Mix - Deep Marsh

SEEDING RATES
The upland seed mix (35-241) shall be planted using a drill seeder at a rate of 36.5 lbs/acre. The Custom Wet Meadow seed mix shall be broadcast seeded at a rate of 105.1 lbs/ acre. The Custom Emergent seed mix shall be broadcast seeded a rate of 5.16 lbs/acre. The Pilot Seed Mix shall be broadcast seeded at a rate of 3.1 lbs/acre. The Wetland Rehabilitation Mix shall be broadcast seeded at a rate of 5.30 lbs/ac.

TYPE FOUR PLUG SPECIES LIST

- 103 - *Bolboschoenus fluvitalis* (River Bulrush)
- 103 - *Alisma triviale* (Water Plantain)
- 103 - *Sagittaria latifolia* (Arrowhead)
- 103 - *Sparganium eurycarpum* (Giant Burweed)
- 103 - *Carex lacustris* (Lake Sedge)

TYPE SIX PLUG SPECIES LIST

- 148 - *Cornus sericea* (Redosier dogwood)
- 148 - *Spirea alba* (Meadowsweet)
- 148 - *Cephalanthus occidentalis* (Buttonbush)
- 148 - *Sambucus canadensis* (American elder)
- 148 - *Viburnum trilobum* (High bush cranberry)
- 148 - *Viburnum lentago* (Nannyberry)

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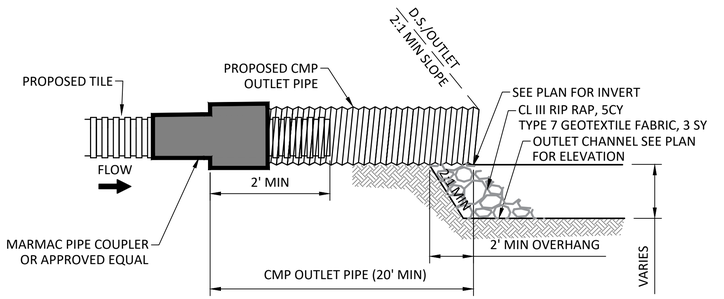
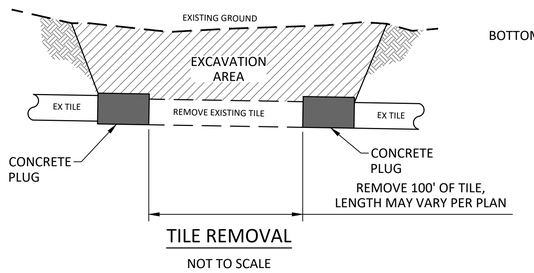
TODD SULLIVAN
SULLIVAN WETLAND BANK
CONSTRUCTION DETAILS & SPECIFICATIONS

SHEET C1.01



TILE OUTLET
NOT TO SCALE



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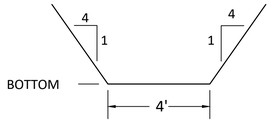


TYPICAL OUTLET DITCH
NOT TO SCALE

Table 3601-1
Random Riprap Gradation Requirements

Weight, lbs	Size, inch*	Approximate Percent of Total Weight Smaller Than Given Weight, Class of Riprap I	II	III	IV	V
2,000	30	-	-	-	-	100
1,000	24	-	-	-	100	-
650	21	-	-	-	-	75
400	18	-	-	100	-	-
250	15	-	-	-	75	50
120	12	-	100	75	50	-
50	9	-	75	50	-	10
15	6	100	50	-	-	-
5	4	-	-	-	10	-
2	3	50	-	10	-	-
-	2	-	10	-	-	-
-	1	10	-	-	-	-

* Weight to size conversion based on a specific gravity of 2.60 and a volume average between a sphere and cube

TABLE 3149-9
COARSE FILTER AGGREGATE GRADATION REQUIREMENTS

Sieve Size	Percent Passing
1 in	100
¾ in	85 - 100
⅜ in	20 - 60
No. 4	0 - 10

TABLE 3149-11
FINE FILTER AGGREGATE GRADATION REQUIREMENTS

Sieve Size	Percent Passing
⅜ in	100
No. 4	90 - 100
No. 10	45 - 90
No. 40	5 - 35
No. 200	0 - 3.5

GRANULAR BEDDING AND MATERIAL ENCASEMENT GRADATION REQUIREMENTS

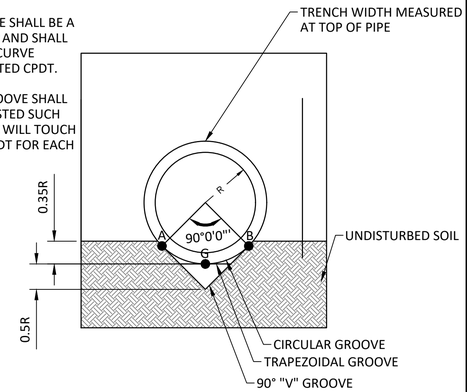
Sieve Size	Percent Passing
1 ½"	100
⅜ in	45-90
No. 4	35-80
No. 10	20-60
No. 40	5-35
No. 200	0-15

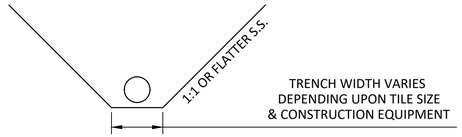
TABLE 1
MAXIMUM ALLOWABLE BURIED DEPTH TO FLOWLINE OF CPDT

Nominal Pipe Diameter, IN.	Pipe Quality (ASTM)	Trench Width at top of the pipe, Ft. 12"	18"	24"	30" or greater
4	Standard	13	7	5.5	5
	Heavy-duty	any	10	7	6
6	Standard	10	7	5.5	5
	Heavy-duty	any	9.5	6.5	6
8	Standard	10	7	5.5	5
	Heavy-duty	any	10	7	6
10	Heavy-duty	...	9	7	6
12	Heavy-duty	...	9	7	6
15	Heavy-duty	...	...	7	6

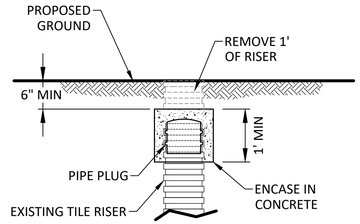
NOTES:
THE CIRCULAR GROOVE SHALL BE A MINIMUM 0.35R DEEP AND SHALL MATCH THE OUTSIDE CURVE SHAPE OF THE DEFLECTED CPDT.

THE TRAPEZOIDAL GROOVE SHALL BE SHAPED AND ADJUSTED SUCH THAT POINTS A, B, & C WILL TOUCH THE UNDEFLECTED CPDT FOR EACH SIZE INSTALLED.

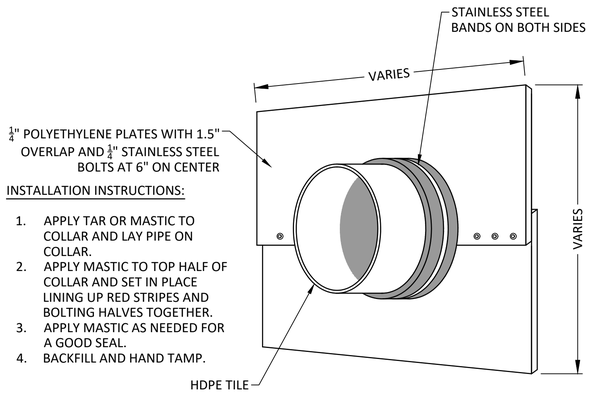




TILE REMOVAL TRENCH (TYPICAL)
NOT TO SCALE



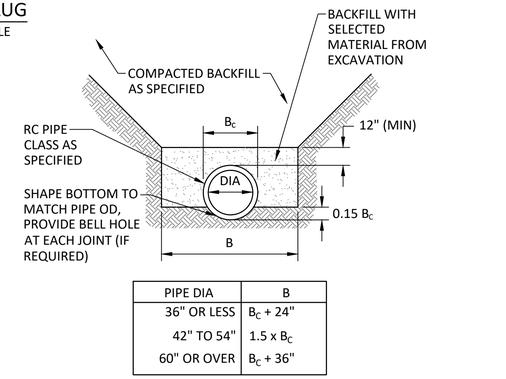
INTAKE PLUG
NOT TO SCALE



INSTALLATION INSTRUCTIONS:

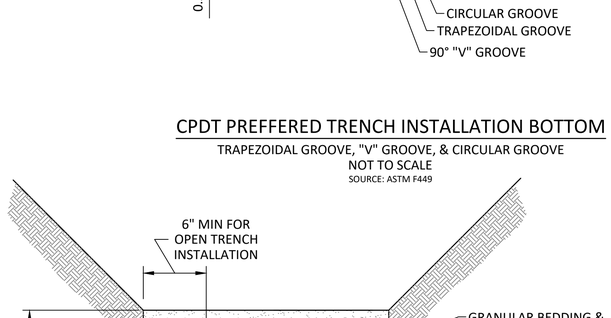
1. APPLY TAR OR MASTIC TO COLLAR AND LAY PIPE ON COLLAR.
2. APPLY MASTIC TO TOP HALF OF COLLAR AND SET IN PLACE LINING UP RED STRIPES AND BOLTING HALVES TOGETHER.
3. APPLY MASTIC AS NEEDED FOR A GOOD SEAL.
4. BACKFILL AND HAND TAMP.

ANTI-SEEP COLLAR DETAIL
NOT TO SCALE



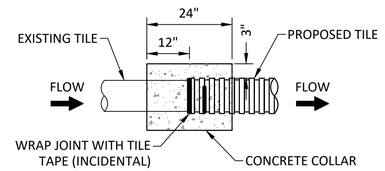
PIPE DIA	B
36" OR LESS	B_C + 24"
42" TO 54"	1.5 x B_C
60" OR OVER	B_C + 36"

RC PIPE CLASS "C" BEDDING
NOT TO SCALE

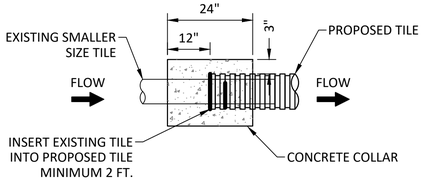


CPDT PREFFERED TRENCH INSTALLATION BOTTOM
TRAPEZOIDAL GROOVE, "V" GROOVE, & CIRCULAR GROOVE
NOT TO SCALE
SOURCE: ASTM F449

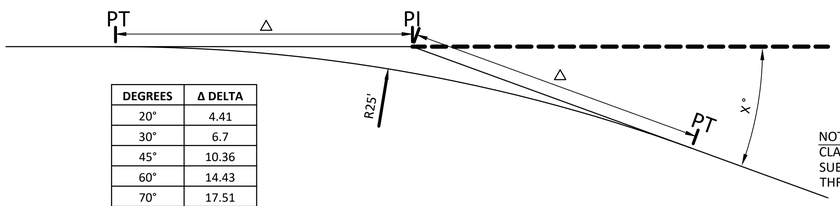
FILL TRENCH TO 6" ABOVE TOP OF PIPE WITH CRUSHED STONE OR GRAVEL MEETING THE REQUIREMENTS IN TABLE 2. BEDDING MATERIAL SHALL BE INCIDENTAL TO THE PIPE INSTALLATION.



TILE JUNCTION - SAME SIZE
NOT TO SCALE

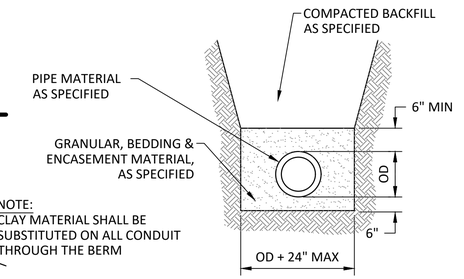


TILE JUNCTION - VARYING SIZE
NOT TO SCALE



DEGREES	Δ DELTA
20°	4.41
30°	6.7
45°	10.36
60°	14.43
70°	17.51
80°	20.98
90°	25

ALIGNMENT TURN REQUIREMENTS
NOT TO SCALE



NOTE:
CLAY MATERIAL SHALL BE SUBSTITUTED ON ALL CONDUIT THROUGH THE BERM

DUAL WALL HDPE/CMP TRENCH DETAIL
NOT TO SCALE

CPDT FLAT BOTTOM TRENCH INSTALLATION
NOT TO SCALE
SOURCE: ASTM F449

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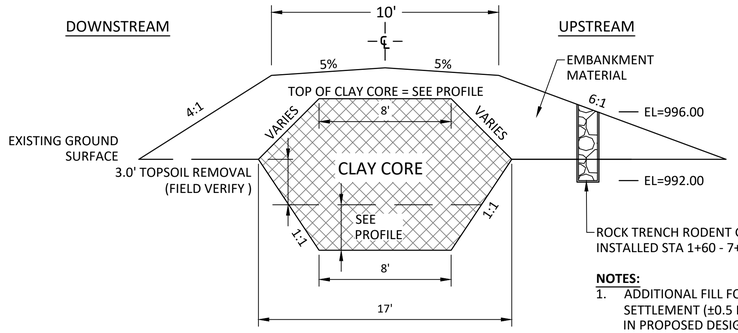
DESIGNED	HEG
DRAWN	HEG
CHECKED	JGS
CLIENT PROJ. NO.	M13.119082

NO.	ISSUED FOR	DATE

TODD SULLIVAN
SULLIVAN WETLAND BANK
CONSTRUCTION DETAILS & SPECIFICATIONS

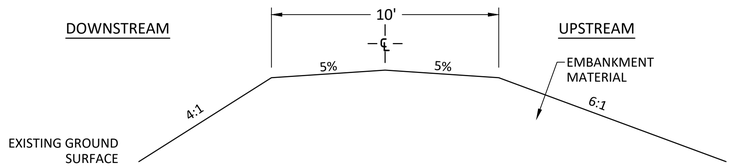
SHEET
C1.02



NOTES:
1. ADDITIONAL FILL FOR EXPECTED SETTLEMENT (±0.5 FT.) INCLUDED IN PROPOSED DESIGN.

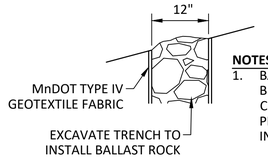
PROPOSED WETLAND BERM TYPICAL SECTION - WITH CLAY CORE

STA 1+65 - 7+86



PROPOSED WETLAND BERM TYPICAL SECTION - WITHOUT CLAY CORE

STA 1+60 - 1+65, 7+86 - 7+97

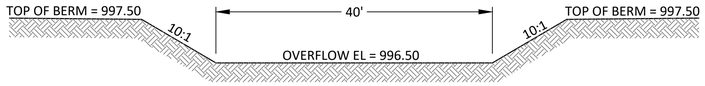


NOTES:
1. BACKFILL AND BUCKET COMPACT PLACED ROCK IN 12" LIFTS

BALLAST ROCK GRADATION	
ROCK DIAMETER (IN)	% OF TOTAL SIZE SMALLER
2-4	100-30
< 2	29-0

ROCK TRENCH RODENT GUARD

NOT TO SCALE



EMERGENCY OVERFLOW TYPICAL SECTION

NOT TO SCALE

EARTH WORK BALANCE					
LOCATION	RAW CUT (CY)		RAW FILL (CY)	FILL FACTOR	BALANCE (CY)
WETLAND BERM	1,755		2,270	1.5	-1,650
CLAY CORE			2,010	1.3	-2,613
TILE DAYLIGHT	425		10	1.5	410

COMMON EXCAVATION - 2,180 CY

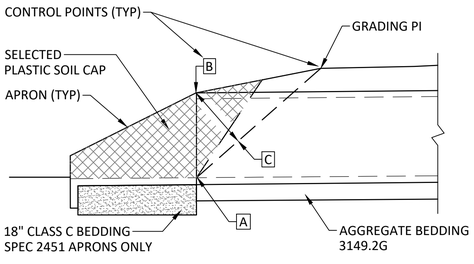
COMMON BORROW - 1,240 CY

COMMON BORROW - CLAY CORE - 2,613 CY

TOPSOIL REMOVAL, SALVAGE, AND SPREADING - 2,613 CY

NOTES:
1. WIDTH OF PLASTIC SOIL CAP IS FULL WIDTH OF GRANULAR TREATMENT PLUS 2' ON EACH END.

2. MINIMUM THICKNESS OF PLASTIC SOIL CAP IS 3', MAXIMUM 6' FOR B-C IF DISTANCE MEASURED FROM A TO GRADING PI EXCEEDS 6'.



PLASTIC SOIL CAP AT CULVERT

NOT TO SCALE

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TODD SULLIVAN
SULLIVAN WETLAND BANK
CONSTRUCTION DETAILS & SPECIFICATIONS

SHEET C1.03

Wet Meadow - Grasses Mix

Common Name	Scientific Name	Rate (lb/ac)	% of Mix (% by wt)
Fringed brome	*Bromus cialatus*	1	55.56%
Virginia Wild Rye	*Elymus virginicus*	0.5	27.78%
Reed Manna Grass	*Glyceria grandis*	0.1	5.56%
Rice Cut Grass	*Leersia oryzoides*	0.2	11.11%
	Total Grasses:	**1.8**	**100.00%**
	Totals:	**1.8**	**100.00%**

Wet Meadow - Forbs and Grasses mix

Common Name	Scientific Name	Rate (lb/ac)	% of Mix (% by wt)
Scarlet Toothcup	*Ammannia cocinea*	0.125	3.81%
Rose milkweed	*Asclepia incarnata*	0.25	7.62%
Swamp Aster	*Aster puniceus*	0.063	1.90%
False aster	*Boltonia asteroides*	0.063	1.90%
Joe Pye Weed	*Eupatorium maculatum*	0.063	1.90%
Boneset	*Eupatorium perfoliatum*	0.031	0.95%
Bottle Gentian	*Gentiana andrewsii*	0.063	1.90%
Northern Blue Flag	*Iris versicolor*	0.125	3.81%
Prairie Blazing Star	*Liatris pycnostachya*	0.188	5.71%
Great Blue Lobelia	*Lobelia siphilitica*	0.063	1.90%
Water Horehound	*Lycopus americanus*	0.063	1.90%
Prairie Loosestrife	*Lysimachia quadriflora*	0.031	0.95%
Wild Mint	*Metha arvensis*	0.063	1.90%
Monkey Flower	*Mimulus ringens*	0.031	0.95%
Pinkweed	*Polygonum pensylvanicum*	0.063	1.90%
Mountain Mint	*Pycnanthemum virginianum*	0.031	0.95%
Black-eyed Susan	*Rudbeckia hirta*	0.188	5.71%
Grass-leaved Goldenrod	*Solidago graminifolia*	0.031	0.95%
Great Bur Reed	*Sparganiam eurycarpum*	0.5	15.24%
Blue Vervain	*Verbena hastata*	0.125	3.81%
Golden Alexanders	*Zizia aurea*	0.188	5.71%
	Total Forbs	**2.343**	**71.43%**
Porcupine sedge	*Carex hystericina*	0.188	5.71%
Common Fox Sedge	*Carex stipata*	0.375	11.43%
Brown Fox Sedge	*Cares vulpinoidea*	0.188	5.71%
Canada Rush	*Juncus canadensis*	0.063	1.90%
Common Rush	*Juncus effusus*	0.063	1.90%
Dark-green Bulrush	*Scirpus atrovirens*	0.063	1.90%
	Total Sedges and Rushes	**0.938**	**28.57%**
	Totals:	**3.281**	**100.00%**

Oats Cover Crop

Common Name	Scientific Name	Rate (lb/ac)	% of Mix (% by wt)
Oats	*Avena sativa*	100	100.00%
	Total:	**100**	**100.00%**

Custom Wet Meadow Mix **105.08** **lbs/ac**

Emergent Wetland - Grasses Mix

Common Name	Scientific Name	Rate (lb/ac)	% of Mix (% by wt)
American Slough Grass	*Beckmannia syzigachne*	0.7	40.00%
Reed Manna Grass	*Glyceria grandis*	0.25	14.29%
Rice Cut Grass	*Leersia oryzoides*	0.3	17.14%
Cord Grass	*Spartina pectinata*	28.57	5.00%
	Total Grasses		**100.00%**
	Totals:	**1.75**	**100.00%**

Emergent Wetland - Forbs and Sedges

Common Name	Scientific Name	Rate (kg/ha)	Rate (lb/ac)
Sweet Flag	*Acorus americanus*	0.31	0.28
Large-flowered Water Plantain	*Alisma trivale*	0.45	0.4
Scarlet Toothcup	*Ammannia coccinea*	0.07	0.06
Rose Milkweed	*Asclepias incarnata*	0.31	0.28
Pinkweed	*Polygonum pensylvanicum*	0.07	0.06
Common Arrowhead	*Sagittaria latifolia*	0.34	0.3
Great Bur Reed	*Sparganium eurycarpum*	0.55	0.49
	Total Forbs	**2.1**	**1.87**
Buttonbush	*Cephalanthus occidentalis*	0.13	0.12
	Total Trees, Shrubs, and Vines	**0.13**	**0.12**
Bristly Sedge	*Carex comosa*	0.2	0.18
Common Lake Sedge	*Carex lacustris*	0.07	0.06
Common Fox Sedge	*Cares stipata*	0.2	0.18
Common Tussock Sedge	*Carex stricta*	0.04	0.04
Spike Rush	*Eleocharis acicularis*	0.1	0.1
Great Spike Rush	*Eleocharis palustris*	0.1	0.1
Torrey's Rush	*Juncus torreyi*	0.04	0.04
Wool Grass	*Scirpus cyperinus*	0.06	0.05
Chairmaker's Rush	*Scirpus pungens*	0.17	0.15
Great Bulrush	*Scirpus validus*	0.17	0.15
	Total Sedges and Rushes	**1.18**	**1.05**
	Totals:	**3.41**	**3.04**

Custom Emergent Wetland Mix **5.16** **lbs/ac**

35-241 **Mesic Prairie General**

Common Name	Scientific Name	Rate (lb/ac)	Rate (kg/ha)	% of Mix (by weight)	Seeds/ sq ft
big bluestem	***Andropogon gerardii***	**2.00**	**2.24**	**5.48%**	**7.35**
Indian grass	***Sorghastrum nutans***	**2.00**	**2.24**	**5.48%**	**8.82**
side-oats grama	***Bouteloua curtipendula***	**1.60**	**1.79**	**4.39%**	**3.53**
little bluestem	***Schizachyrium scoparium***	**1.60**	**1.79**	**4.39%**	**8.82**
nodding wild rye	***Elymus canadensis***	**1.17**	**1.31**	**3.20%**	**2.23**
slender wheatgrass	***Elymus trachycaulus***	**1.00**	**1.12**	**2.73%**	**2.53**
kalm's brome	***Bromus kalmii***	**0.50**	**0.56**	**1.37%**	**1.47**
prairie dropseed	***Sporobolus heterolepis***	**0.07**	**0.08**	**0.18%**	**0.39**
switchgrass	***Panicum virgatum***	**0.06**	**0.07**	**0.17%**	**0.32**
	Grasses Subtotal	**10.00**	**11.21**	**27.39%**	**35.46**
black-eyed susan	***Rudbeckia hirta***	**0.31**	**0.35**	**0.86%**	**10.56**
purple prairie clover	***Dalea purpurea***	**0.19**	**0.21**	**0.51%**	**1.03**
Early Sunflower	***Heliopsis helianthoides***	**0.13**	**0.15**	**0.34%**	**0.29**
blue giant hyssop	***Agastache foeniculum***	**0.06**	**0.07**	**0.15%**	**1.82**
lead plant	***Amorpha canescens***	**0.06**	**0.07**	**0.15%**	**0.25**
Canada milk vetch	***Astragalus canadensis***	**0.06**	**0.07**	**0.17%**	**0.39**
white prairie clover	***Dalea candida***	**0.06**	**0.07**	**0.17%**	**0.44**
Canada tick trefoil	***Desmodium canadense***	**0.06**	**0.07**	**0.18%**	**0.13**
stiff sunflower	***Helianthus pauciflorus***	**0.06**	**0.07**	**0.17%**	**0.09**
wild bergamot	***Monarda fistulosa***	**0.06**	**0.07**	**0.17%**	**1.61**
stiff goldenrod	***Oligoneuron rigidum***	**0.06**	**0.07**	**0.17%**	**0.94**
smooth aster	***Symphyotrichum laeve***	**0.06**	**0.07**	**0.17%**	**1.26**
hoary vervain	***Verbena stricta***	**0.06**	**0.07**	**0.17%**	**0.64**
golden alexanders	***Zizia aurea***	**0.06**	**0.07**	**0.15%**	**0.23**
common milkweed	***Asclepias syriaca***	**0.04**	**0.04**	**0.10%**	**0.06**
butterfly milkweed	***Asclepias tuberosa***	**0.04**	**0.04**	**0.10%**	**0.06**
blue vervain	***Verbena hastata***	**0.04**	**0.04**	**0.12%**	**1.50**
rough blazing star	***Liatris aspera***	**0.03**	**0.03**	**0.08%**	**0.18**
great blazing star	***Liatris pycnostachya***	**0.03**	**0.03**	**0.09%**	**0.13**
heath aster	***Symphyotrichum ericoides***	**0.03**	**0.03**	**0.09%**	**2.30**
	Forbs Subtotal	**1.50**	**1.68**	**4.11%**	**23.89**
Oats	***Avena sativa***	**25.00**	**28.02**	**68.50%**	**11.14**
	Cover Crop Subtotal	**25.00**	**28.02**	**68.50%**	**11.14**
	Total	**36.50**	**40.91**	**100.00%**	**70.49**
Purpose:	**General mesic prairie mix for native roadsides, ecological restoration, or conservation program plantings.**				
Planting Area:	**Tallgrass Aspen Parklands, Prairie Parkland, and Eastern Broadleaf Forest Provinces. Mn/DOT Districts 2(west), 3B, 4, Metro, 6, 7 & 8.**				

Deep Marsh Pilot Seed Mix

Common Name	Scientific Name	Rate (kg/ha)	Rate (lb/ac)	% of Mix (% by wt)	Seeds/sq ft
Sweet Flag	Acorus calamus	0.28	0.25	8.10%	0.6
	Total Forbs	**0.28**	**0.25**	**8.10%**	**0.6**
American Slough Grass	Beckmannia syzigachne	1.21	1.08		20
Tall Manna Grass	Glyceria grandis	0.44	0.39		10
	Total Graminoids	**1.65**	**1.48**	**48.10%**	**30**
River Bulrush	Bolboschoenus fluviatilis	0.85	0.76		1.2
Marsh Spikerush	Eleocharis palustris	0.07	0.06		1.1
Soft Stem Bulrush	Schoenoplectus tabernaemontani	0.59	0.53		6
	Total Sedges	**1.51**	**1.35**	**43.80%**	**8.3**
	Totals:	**3.44**	**3.07**	**100%**	**38.9**
Purpose:	For the stabilization and establishment of deep marsh areas of wetland restoration projects.				
Planting Area:	Statewide				

34-171 **Wetland Rehabilitation**

Common Name	Scientific Name	Rate (kg/ha)	Rate (lb/ac)	% of Mix (% by wt)	Seeds/ sq ft
Virginia wild rye	*Elymus virginicus*	3.36	3.00	56.61%	4.63
fowl bluegrass	*Poa palustris*	1.12	1.00	18.89%	47.80
	Total Grasses	**4.48**	**4.00**	**75.50%**	**52.43**
fox sedge	*Carex vulpinoidea*	0.22	0.20	3.85%	7.50
path rush	*Juncus tenuis*	0.18	0.16	3.03%	59.00
dark green bulrush	*Scirpus atrovirens*	0.40	0.36	6.70%	60.00
woolgrass	*Scirpus cyperinus*	0.09	0.08	1.51%	50.00
	Total Sedges and Rushes	**0.90**	**0.80**	**15.09%**	**176.50**
nodding bur marigold	*Bidens cernua*	0.15	0.13	2.45%	1.00
Water Horehound	*Lycopus americanus*	0.37	0.33	6.29%	23.15
blue monkey flower	*Mimulus ringens*	0.04	0.04	0.67%	30.00
	Total Forbs	**0.56**	**0.50**	**9.41%**	**54.15**
	Totals:	**5.94**	**5.30**	**100.00%**	**283.08**
Purpose:	Interseeding into establishing wetlands after weed control spraying. Also suitable for two to five year short term soil stabilization for areas with saturated soils.				
Planting Area:	Statewide				

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TODD SULLIVAN
SULLIVAN WETLAND BANK
CONSTRUCTION DETAILS & SPECIFICATIONS

SHEET C1.04

NOTES:
1. THE EXISTING TILE DEPTHS AND SIZES ARE BASED ON FIELD INVESTIGATION USING TILE PROBING AND PROPERTY OWNER PROVIDED MAPS. CONTRACTOR TO FIELD VERIFY ALL EXISTING TILE SIZES, ELEVATIONS AND LOCATIONS PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER IMMEDIATELY OF ALL VARIATIONS FROM THE CONSTRUCTION PLAN.

PROPOSED CONSERVATION EASEMENT

DNR REAL ESTATE MGT PROPERTY

SULLIVAN PROPERTY

SULLIVAN PROPERTY

PROPOSED CONSERVATION EASEMENT

SULLIVAN PROPERTY

DNR REAL ESTATE MGT PROPERTY

HANSEN PROPERTY

OAK PROPERTY

ST THOMAS SPORTSMAN ASSOCIATION PROPERTY

O'CONNELL PROPERTY

CSAH 28

CSAH 11

CSAH 28

15" CMP CULVERT
I=997.39 N
I=996.13 S

10" TILE OUTLET
I=989.51

6" TILE OUTLET
I=989.56

36" CONCRETE

INLET
R=992.45
I=987.9

36" APRON
I=988.19

6" PE

6" TILE INLET
R=992.07
I=989.26

18" CMP CULVERT
I=989.43 N
I=988.96 S

6" TILE OUTLET
I=992.63

24" CMP CULVERT
I=995.40 E
I=994.71 W

LEGEND

- EXISTING INDEX CONTOUR (5')
- EXISTING INTERMEDIATE CONTOUR (1')
- EXISTING PRIVATE DRAIN TILE
- EXISTING DRAINAGE INLET
- WETLAND DELINEATION

SCALE 0 100 200
SCALE FEET

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DRAWN	HEG
CHECKED	JGS
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NO.	ISSUED FOR	DATE

TODD SULLIVAN
SULLIVAN WETLAND BANK
EXISTING SITE PLAN

SHEET C2.01

NOTES:
1. THE EXISTING TILE DEPTHS AND SIZES ARE BASED ON FIELD INVESTIGATION USING TILE PROBING AND PROPERTY OWNER PROVIDED MAPS. CONTRACTOR TO FIELD VERIFY ALL EXISTING TILE SIZES, ELEVATIONS AND LOCATIONS PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER IMMEDIATELY OF ALL VARIATIONS FROM THE CONSTRUCTION PLAN.
2. PAID TILE BREAKS SHALL BE PAID BY THE LINEAR FOOT FOR TILE REMOVAL.

SULLIVAN PROPERTY

PROPOSED CONSERVATION EASEMENT

DNR REAL ESTATE MGT PROPERTY

SULLIVAN PROPERTY

HANSEN PROPERTY

CSAH 28

REMOVE FENCING

OAK PROPERTY

SULLIVAN PROPERTY

PROPOSED CONSERVATION EASEMENT

REMOVE CULVERT

CSAH 11

ST THOMAS SPORTSMAN ASSOCIATION PROPERTY

O'CONNELL PROPERTY

CSAH 28

DNR REAL ESTATE MGT PROPERTY

LEGEND

- EXISTING INDEX CONTOUR (5')
- EXISTING INTERMEDIATE CONTOUR (1')
- EXISTING PRIVATE DRAIN TILE
- EXISTING DRAINAGE INLET
- BULKHEAD INLET
- TILE REMOVAL
- PROPOSED NORMAL WATER LEVEL
- PROPOSED WETLAND BOUNDARY

SCALE 0 100 200 SCALE FEET

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MANKATO, MINNESOTA 56001
Phone: (507) 625-4171
Email: Mankato@bolton-menk.com
www.bolton-menk.com

DESIGNED	HEG
DRAWN	HEG
CHECKED	JGS
CLIENT PROJ. NO.	M13.119082

NO.	ISSUED FOR	DATE

TODD SULLIVAN
SULLIVAN WETLAND BANK
REMOVAL PLAN

SHEET C2.02

NOTES:

1. PRIOR TO CONSTRUCTION FIELD VERIFY ALL LOCATIONS AND ELEVATIONS OF EXISTING DRAINAGE INFRASTRUCTURE. CONTACT ENGINEER IF DIFFERENT FROM CONSTRUCTION PLANS.
2. CONTRACTOR TO REMOVE AT LEAST 100 LINEAR FEET OF TILE DOWNSTREAM OF PROPOSED DAYLIGHT LOCATIONS.
3. ALL PROPOSED TILE DAYLIGHT LOCATIONS SHALL HAVE AT LEAST 20 LINEAR FEET OF CORRUGATED METAL PIPE AT OUTLET.
4. GUIDE POSTS SHALL BE INSTALLED AT ALL TILE DAYLIGHT LOCATIONS.
5. ALL TILES DOWNSTREAM OF REROUTED TILES AND OUTSIDE OF THE CONSERVATION EASEMENT SHALL BE REMOVED AND BULKHEADED INSIDE THE CONSERVATION EASEMENT.
6. SEE PROPOSED TILE PROFILES FOR PERFORATED/NON-PERFORATED TILE DESIGNATION. ALL TILE INSIDE THE CONSERVATION EASEMENT SHALL BE NON-PERFORATED UNLESS OTHERWISE SPECIFIED.
7. BORROW & SPOIL AREAS SHALL DRAIN TOWARDS WETLAND FOLLOWING GRADING ACTIVITIES
8. ALL PRIVATE TILE SEVERED DURING CONSTRUCTION MUST BE RECONNECTED.

PROPOSED CONSERVATION EASEMENT

DNR REAL ESTATE MGT PROPERTY

SULLIVAN PROPERTY

HANSEN PROPERTY

OAK PROPERTY

O'CONNELL PROPERTY

ST THOMAS SPORTSMAN ASSOCIATION PROPERTY

TILE DAYLIGHT #1

TILE DAYLIGHT #2

TILE DAYLIGHT #3

TILE DAYLIGHT GRADING EXTENT

PRIMARY BORROW AREA

WETLAND 01
POOL EL=994.50

WETLAND 01 OUTLET

WETLAND 02

PROPOSED WETLAND BERM

CULVERT #1

CSAH 28

CSAH 11

LEGEND

- PROPOSED INDEX CONTOUR (5')
- PROPOSED INTERMEDIATE CONTOUR (1')
- PROPOSED DRAIN TILE
- PROPOSED NORMAL WATER LEVEL
- PROPOSED WETLAND BOUNDARY

SCALE 0 100 200 SCALE FEET

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JOSHUA G. STIER
LIC. NO. 54171 DATE 1/04/2021

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SULLIVAN WETLAND BANK
PROPOSED SITE PLAN

SHEET C3.01

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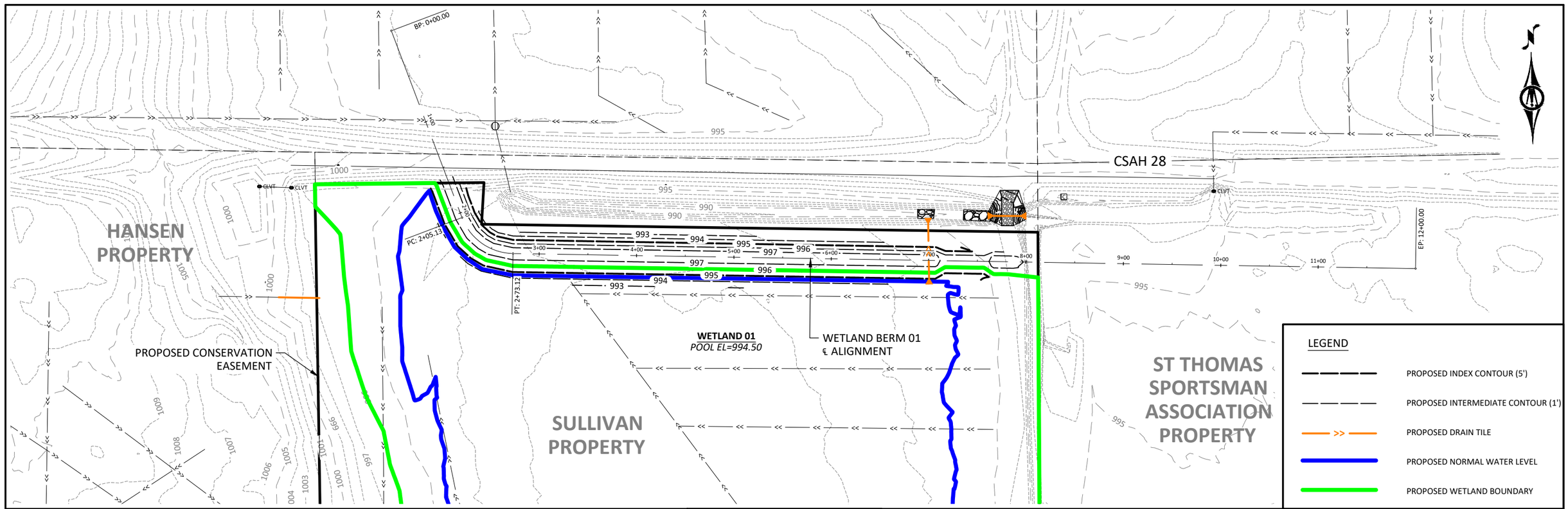
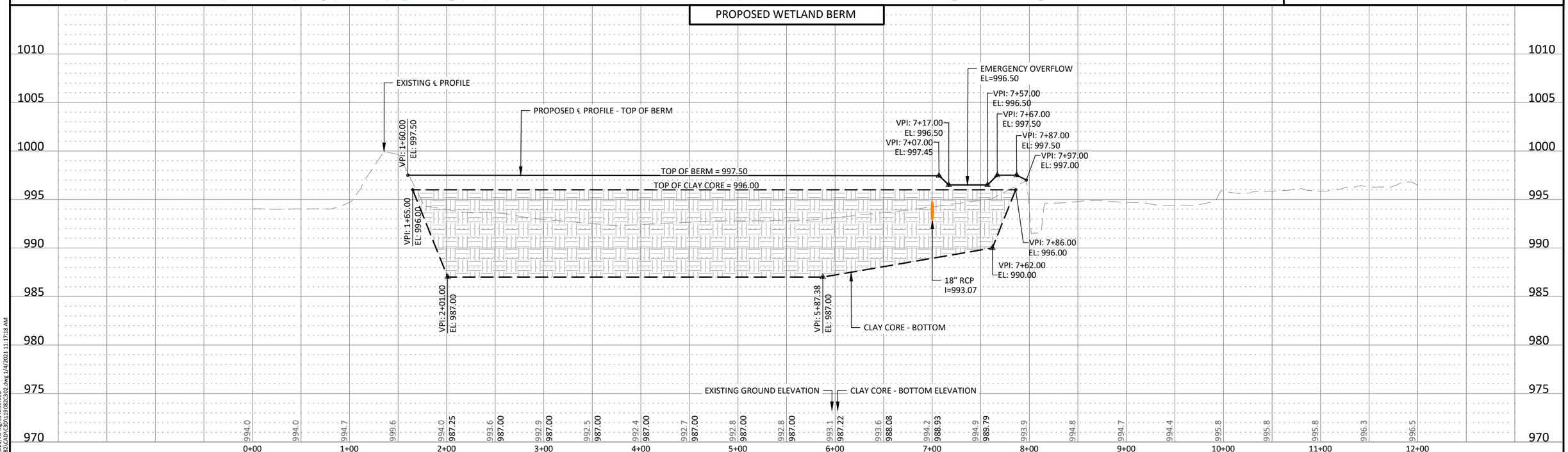


PROPOSED WETLAND BERM



HORZ. 0 50 100 SCALE FEET
VERT. 0 5 10 SCALE FEET

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TODD SULLIVAN
SULLIVAN WETLAND BANK
PROPOSED WETLAND BERM - PLAN & PROFILE
STA 0+00 - 15+00

SHEET C3.02

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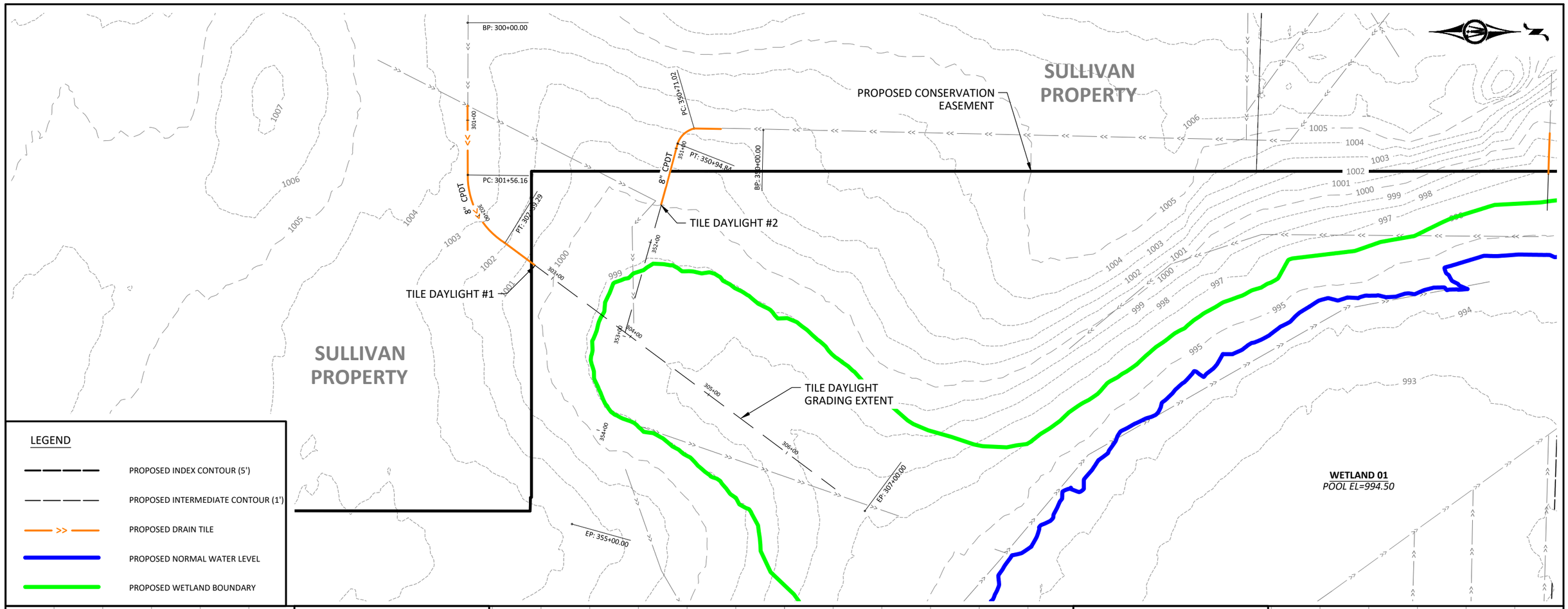

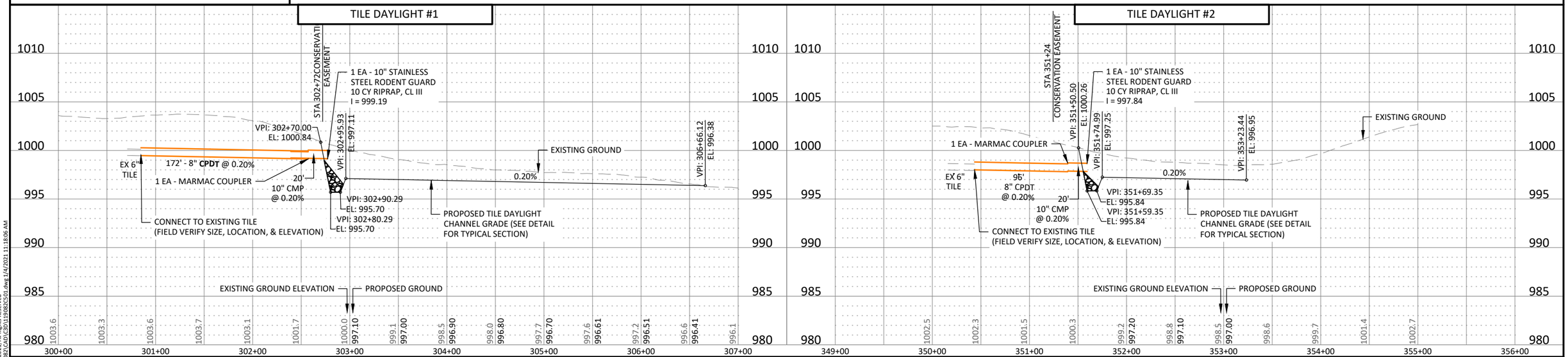

HORZ. SCALE 0 50 100 FEET
VERT. SCALE 0 5 10 FEET

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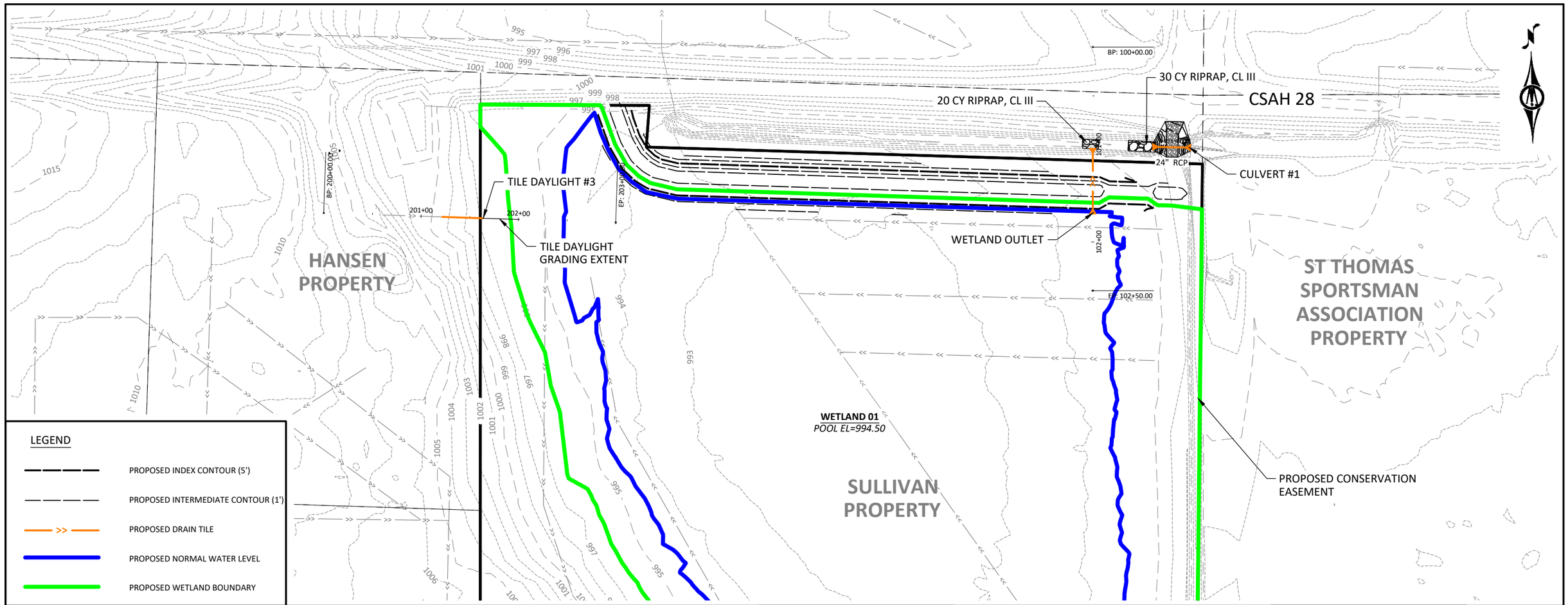
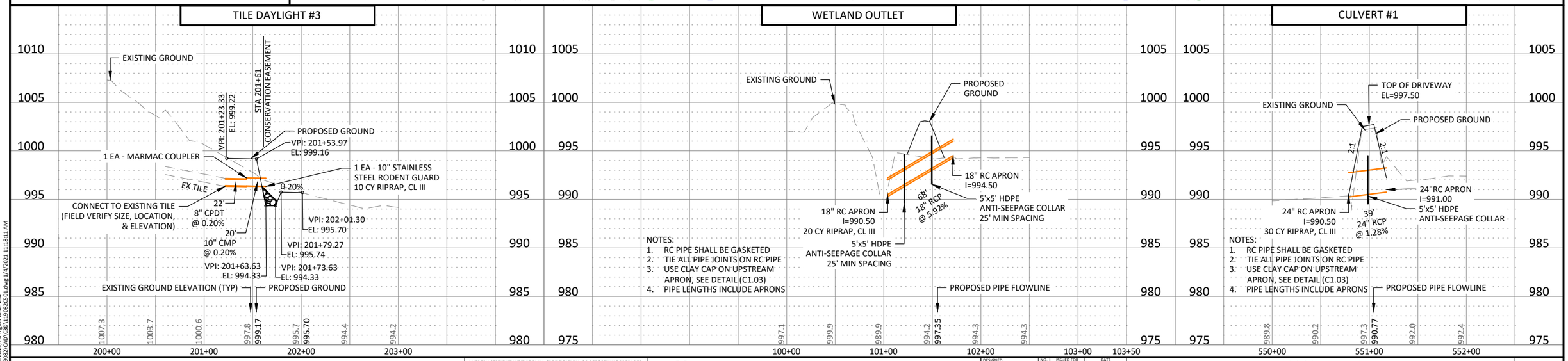
TODD SULLIVAN
SULLIVAN WETLAND BANK
PRIVATE TILE REROUTE & DAYLIGHT PLAN

SHEET C3.03





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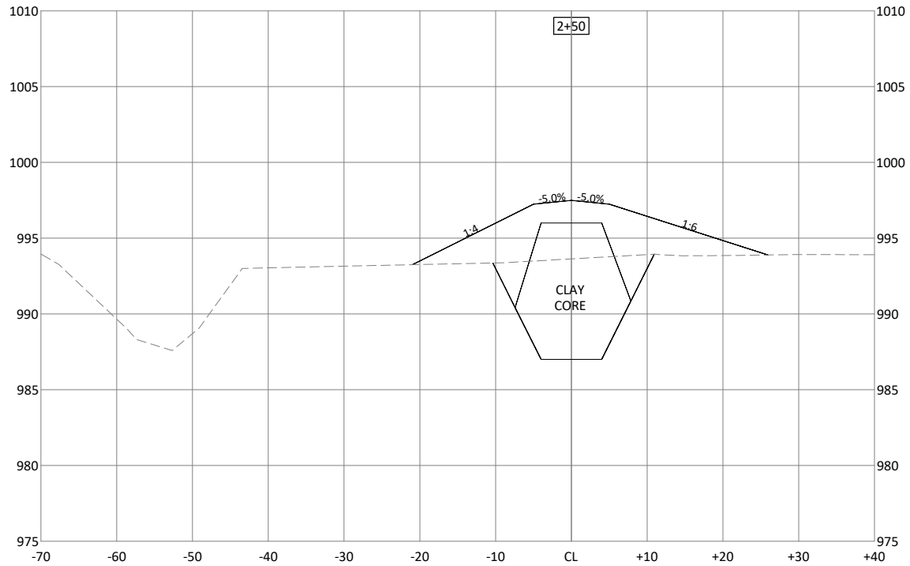
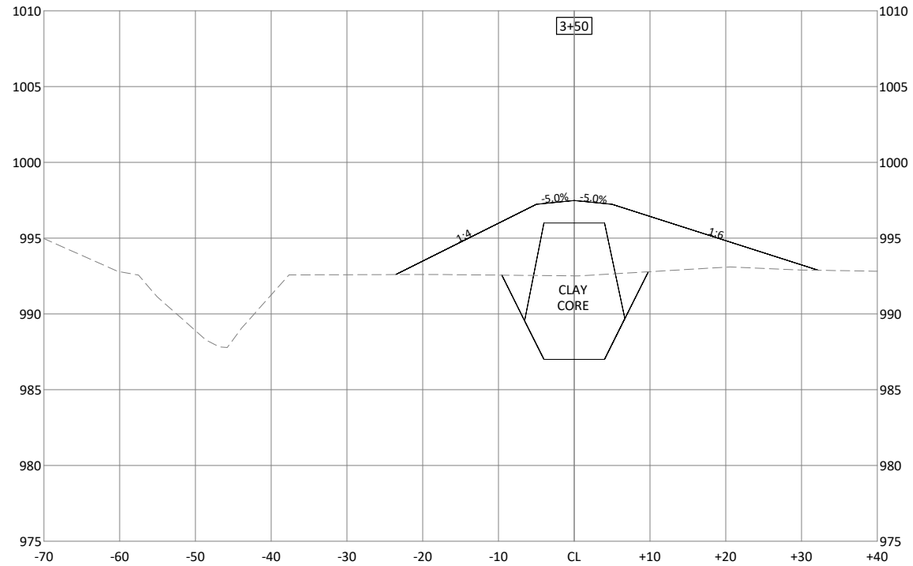
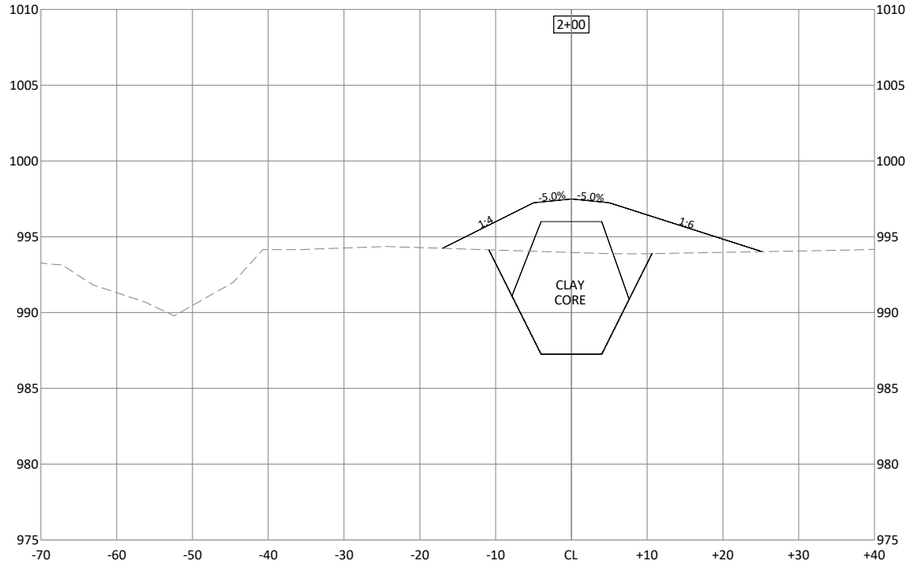
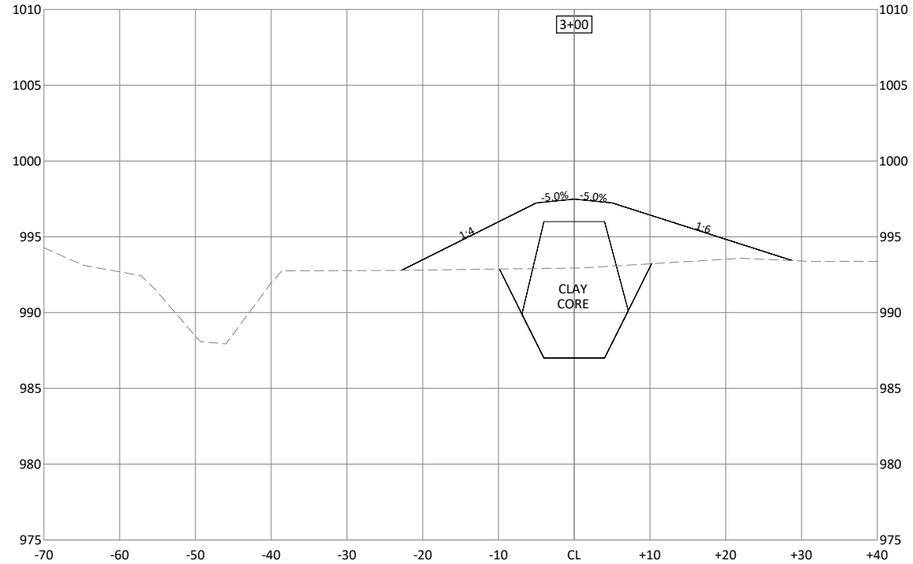
SULLIVAN WETLAND BANK
PRIVATE TILE REROUTE & DAYLIGHT PLAN

SHEET C3.04









HORZ. 0 10 20 SCALE FEET

VERT. 0 5 10 SCALE FEET

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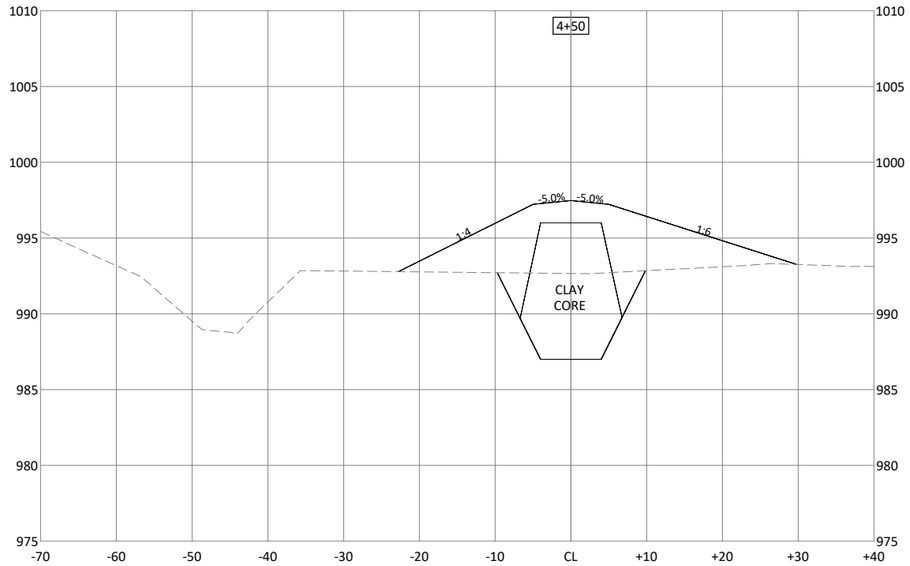
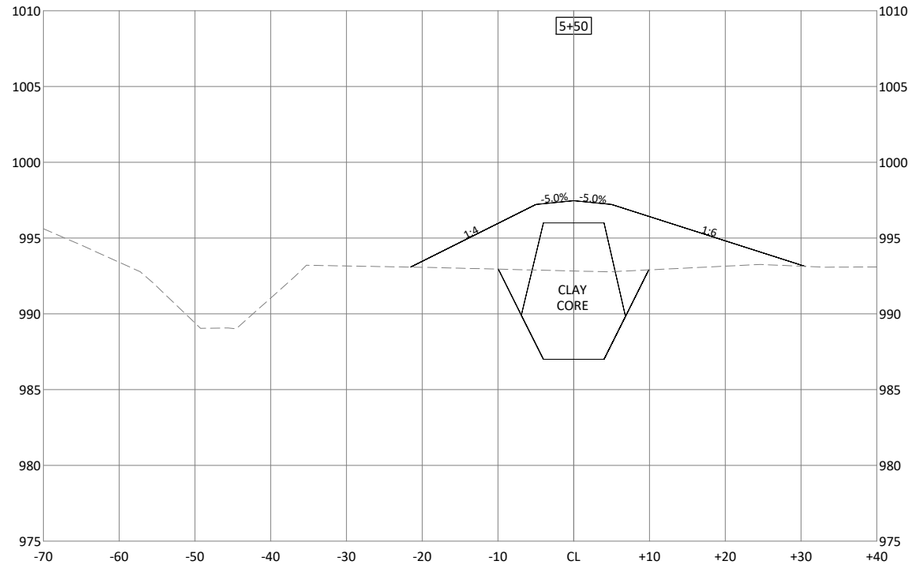
TODD SULLIVAN

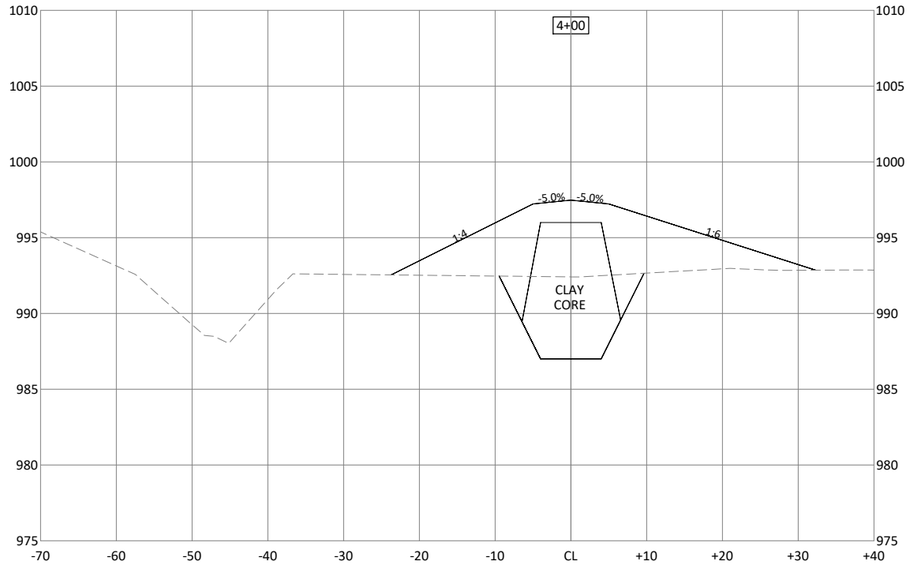
SULLIVAN WETLAND BANK

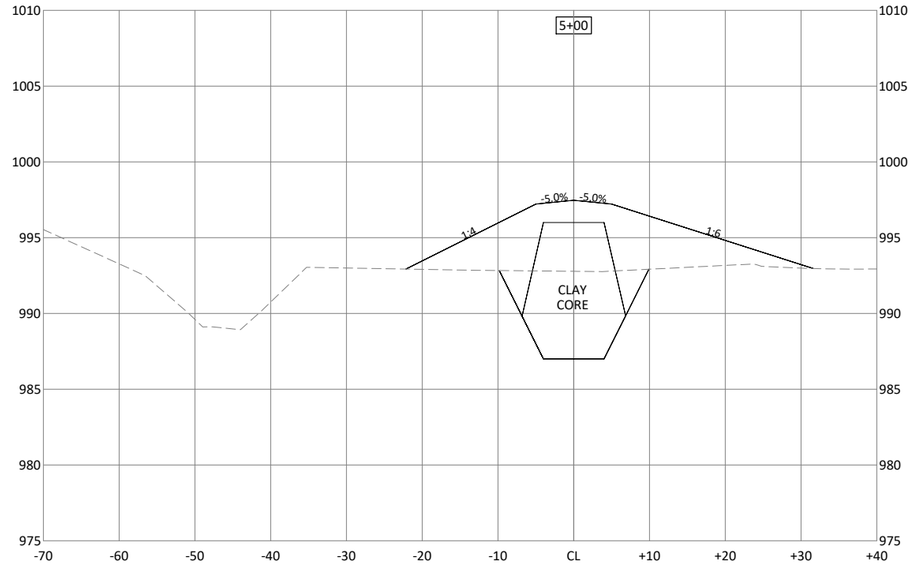
BERM CROSS SECTIONS

SHEET C4.01









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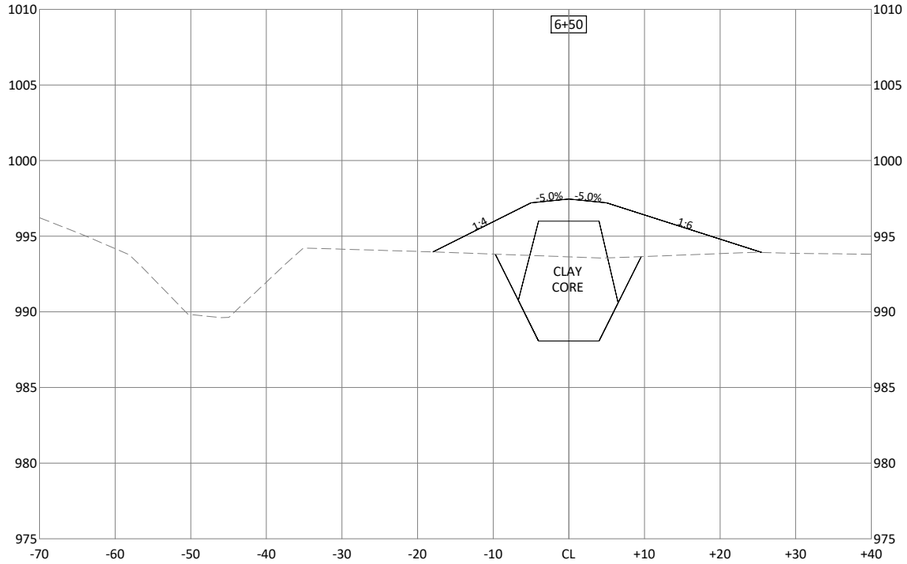
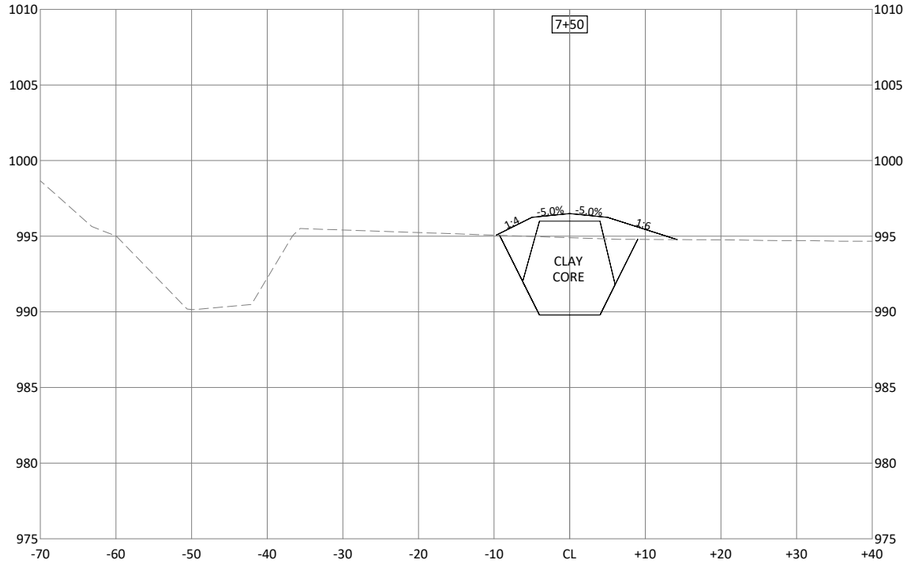
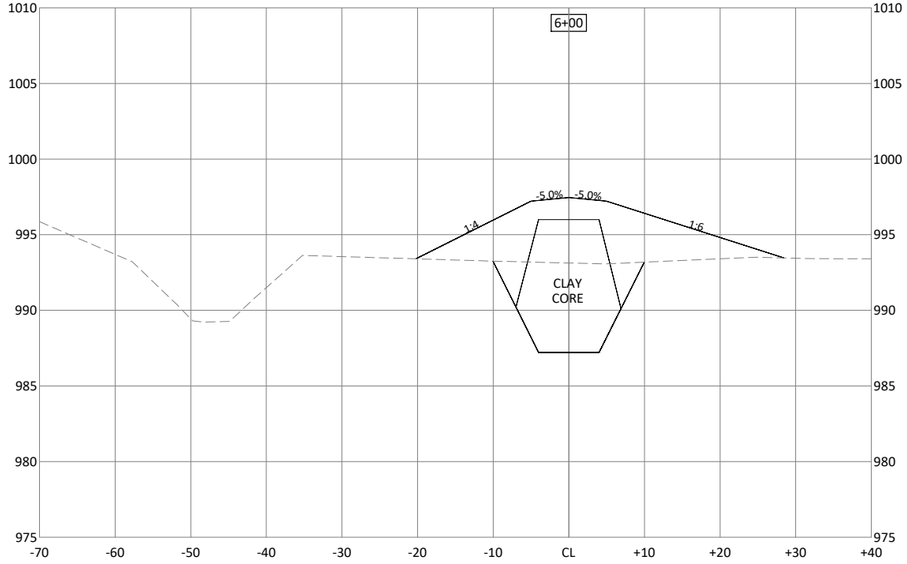
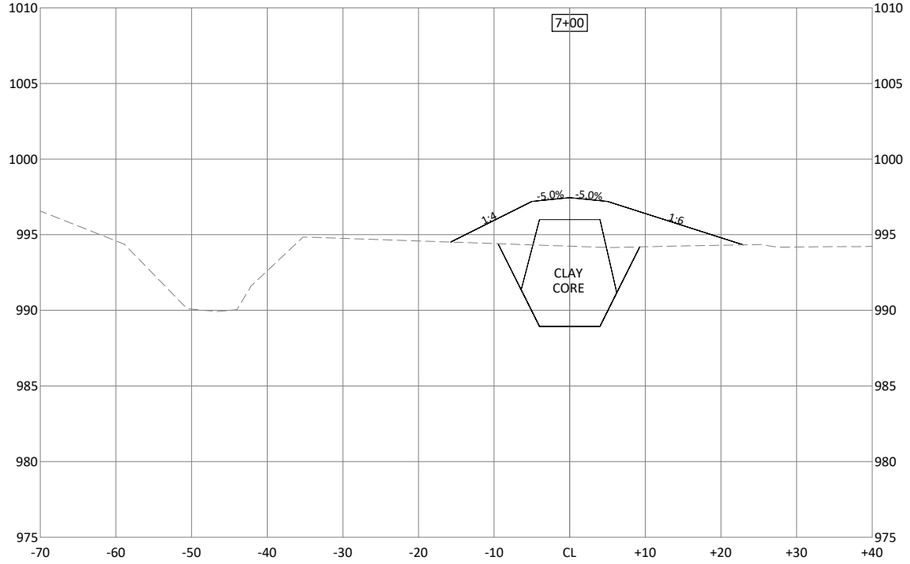
SULLIVAN WETLAND BANK
BERM CROSS SECTIONS

SHEET
C4.02









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SULLIVAN WETLAND BANK

BERM CROSS SECTIONS

SHEET C4.03

PROPOSED CONSERVATION EASEMENT

DNR REAL ESTATE MGT PROPERTY

SULLIVAN PROPERTY

HANSEN PROPERTY

OAK PROPERTY

SULLIVAN PROPERTY

WETLAND 01
POOL EL=994.50

WETLAND 02

SULLIVAN PROPERTY

O'CONNELL PROPERTY

PROPOSED CONSERVATION EASEMENT

DNR REAL ESTATE MGT PROPERTY

ST THOMAS SPORTSMAN ASSOCIATION PROPERTY

LEGEND

- STATE SEED MIX 35-241 (19.5 ACRES)
- CUSTOM WET MEADOW MIX (4.9 ACRES)
- CUSTOM EMERGENT MIX (1.9 ACRES)
- DEEP MARSH PILOT SEED MIX (4.7 ACRES)
- WETLAND REHAB SEED MIX (8.0 ACRES)
- A TYPE 4 PLUGS (515 PLUGS)
- TYPE 6 SHRUB PLUGS (856 PLUGS)

HORZ. SCALE 0 100 200 FEET

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TODD SULLIVAN
SULLIVAN WETLAND BANK
PROPOSED SEEDING PLAN

SHEET C5.01