July 2013 version

Environmental Assessment Worksheet

This Environmental Assessment Worksheet (EAW) form and EAW Guidelines are available at the Environmental Quality Board's (EQB) EAW Process webpage. (EQB, 2020). The EAW form provides information about a project that may have the potential for significant environmental effects. The EAW Guidelines provide additional detail and resources for completing the EAW form.

Cumulative potential effects can either be addressed under each applicable EAW Item, or can be addresses collectively under EAW Item 19.

Note to reviewers: Comments must be submitted to the RGU during the 30-day comment period following notice of the EAW in the *EQB Monitor*. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an EIS.

1. Project Title:

Nolte Family Irrigation Project

2. Proposer:

Contact Person: Timothy Nolte
Title: Family Farmer
Address: 26914 181st Ave
City, State, Zip: Sebeka, MN 56477
Phone: 218-539-0322
Email: noltelivestock@wcta.net

3. RGU:

Contact Person: Jill Townley
Title: Supervisor, Environmental Review Unit
Address: 500 Lafayette Rd.
City, State, Zip: St. Paul, MN 55155
Phone: 651-259-5168
Fax: 651-296-1811
Email: jill.townley@state.mn.us

4. Reason for EAW Preparation:

Required	Discretionary
☐ EIS Scoping	✓ Citizen petition
☐ Mandatory EAW	☐ RGU discretion
	☐ Proposer initiated

If EAW is mandatory, give EQB rule category subpart number(s) and name(s): Not applicable.

5. Project Location:

County: Wadena
City/Township: North Germany

PLS Location (¼, ¼, Section, Township, Range):

¼, ¼	Section	Township	Range
NW1/4, SW1/4	4	136	34
E1/2, SW1/4	4	136	34
NE1/4	9	136	34
W1/2, NW1/4	10	136	34
NW1/4, SW1/4	10	136	34
N1/2, SW1/4, SW1/4	10	136	34
W1/2, SE1/4	10	136	34
SE1/4, SE1/4	10	136	34
E1/2, SW1/4	10	136	34

Watershed (81 major watershed scale): Redeye River (07010102)
GPS Coordinates: Unknown
Tax Parcel Number(s):
08.004.3010
08.004.3020
08.009.1010
08.010.2020
08.010.3020
08.010.4030
08.010.4040

At a minimum, attach each of the following to the EAW:

- County map showing the general location of the project;
- U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable); and
- Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan.

Figures and Attachments

- Figure 1: Site Vicinity Map
- Figure 2: USGS Topographic 1:24,000
- Figure 3: Current Land Use
- Figure 4: Proposed Project Land Use
- Figure 5: Straight River GWMA and Pineland Sands Area Boundary
- Figure 6: Domestic Well Locations

- Figure 7: Irrigation Well Locations
- Figure 8: Nearby structures
- Figure 9: Cumulative Potential Effects to Groundwater—Geographic Scope
- Figure 10: Cumulative Potential Effects to Surface Water—Geographic Scope
- Figure 11: Cumulative Potential Effects to Visual Resources, Habitat and Ecological Resources—Geographic Scope
- Figure 12: Cumulative Potential Effects to Groundwater—Background Conditions
- Figure 13: Cumulative Potential Effects to Surface Water— Background Conditions
- Figure 14: Cumulative Potential Effects to Visual Resources, Habitat and Ecological Resources—Background Conditions
- Figure 15: Cumulative Potential Effects to Groundwater—Reasonably Foreseeable Projects
- Figure 16: Cumulative Potential Effects to Surface Water— Reasonably Foreseeable Projects
- Figure 17: Cumulative Potential Effects to Visual Resources, Habitat and Ecological Resources—Reasonably Foreseeable Projects

- Attachment A: 2019 Aerial Photo
- Attachment B: Natural Heritage Information System (NHIS) Correspondence
- Attachment C: State Historic Preservation Office (SHPO) Correspondence
- Attachment D: Pesticides Available for Use
- Attachment E: Pineland Sands Regional Environmental Topics
- Attachment F: References

6. Project Description:

a. Provide the brief project summary to be published in the *EQB Monitor*, (approximately 50 words).

Mr. Timothy Nolte proposes to convert 303 acres of formerly privately owned and managed timberland to irrigated agriculture for livestock grazing and commodity/staple crop production. The land is currently used as non-irrigated crop and livestock grazing land. The conversion would consist of the removal of remaining standing timber and associated stumps, land cultivation and the operation of three groundwater-supplied center pivot irrigation systems.

b. Give a complete description of the proposed project and related new construction, including infrastructure needs. If the project is an expansion, include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities.

Mr. Timothy Nolte (the proposer), is proposing to convert 303 acres of previously, privately owned and managed commercial timberland and agricultural land (dryland crops and grazing) to irrigated agriculture land use for crop production and livestock grazing (Figure 1 and 2).

Figure 1 – Site Vicinity Map

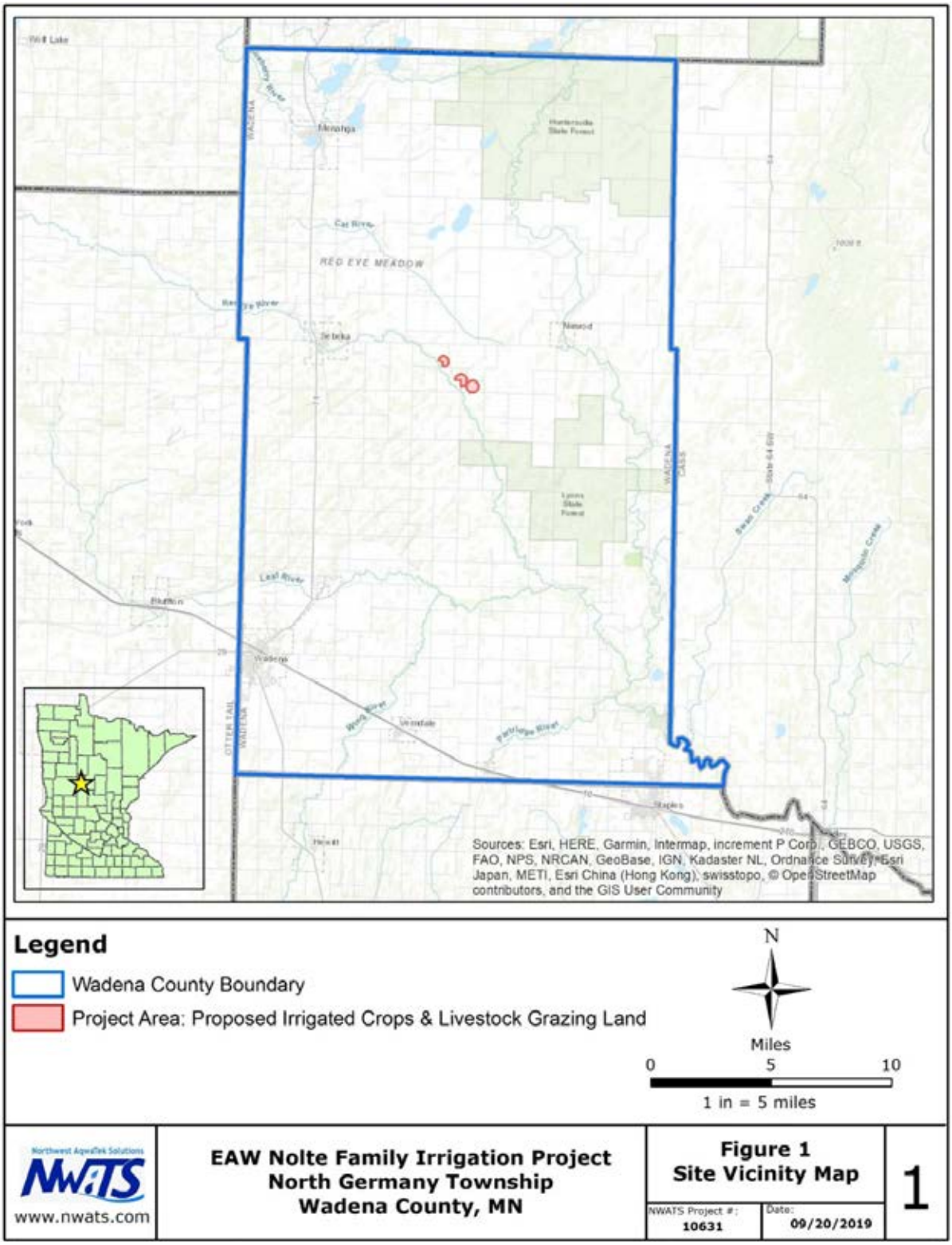
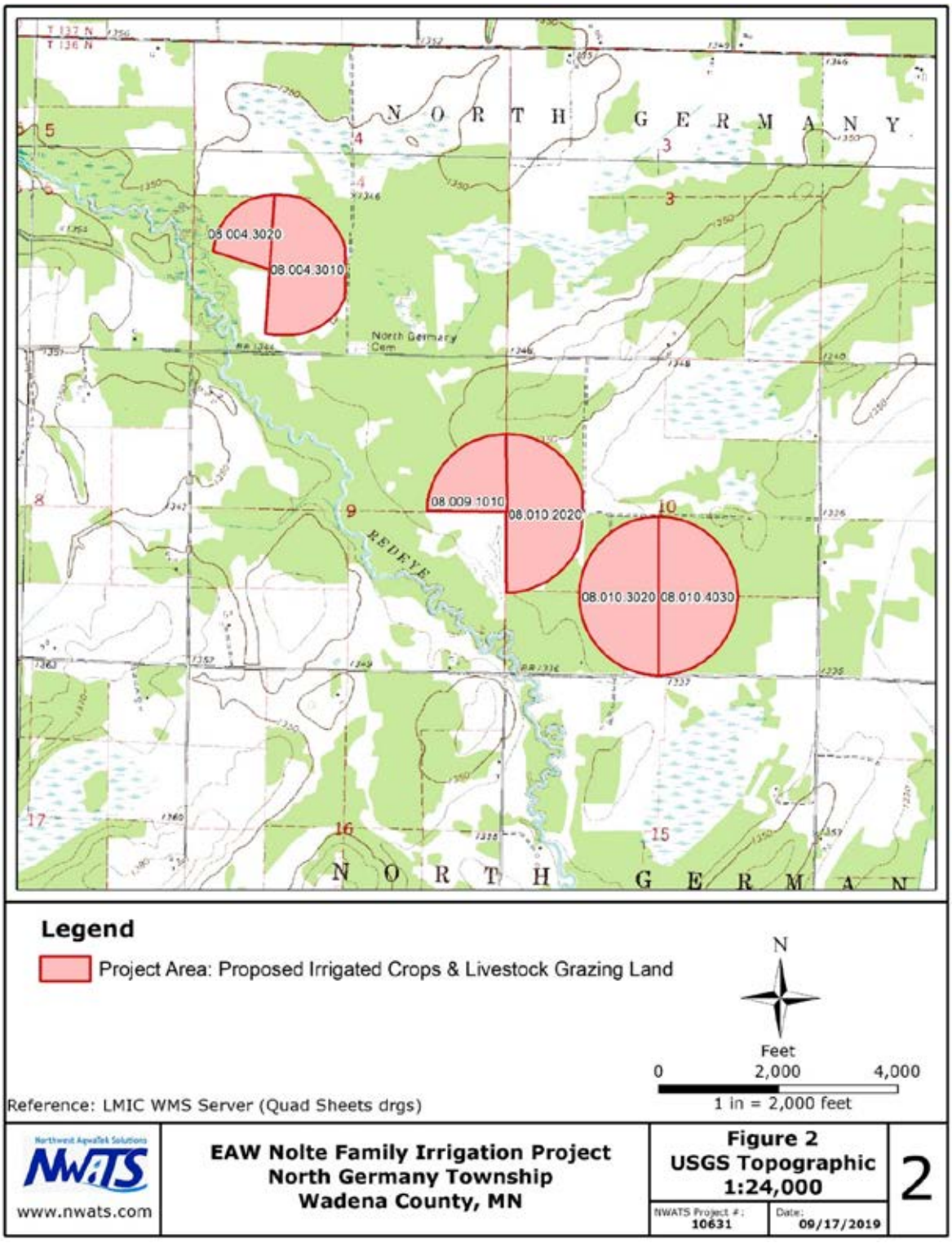


Figure 2 – USGS Topographic



The proposed project is located within Sections 4, 9 and 10 of North Germany Township in Wadena County, Minnesota. Between approximately 2014 and 2018, much of the timber in the proposed project area was harvested to its current land cover (165 acres of cropland, 132 acres of brush/grassland and 6 acres of wooded/forest (Figure 3). The proposed land use includes 303 acres of irrigated land for hay production, forage for cattle grazing, and periodic row crop production with pre-plant and after-harvest livestock grazing (Figure 4). The proposer would cultivate the irrigated lands for a variety of staple crops, incorporated with cover crops for grazing forage.

Figure 3 – Current Land Use

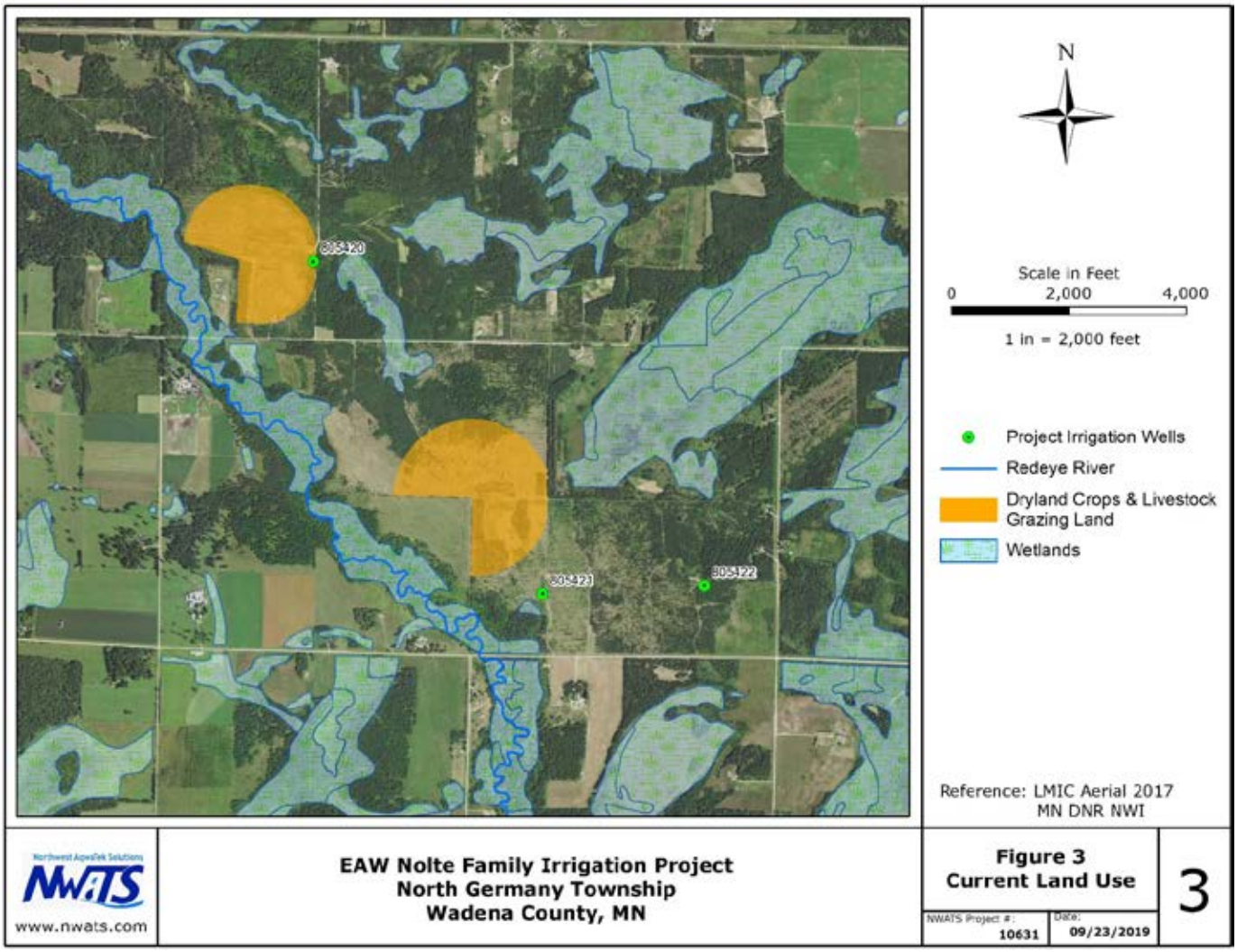
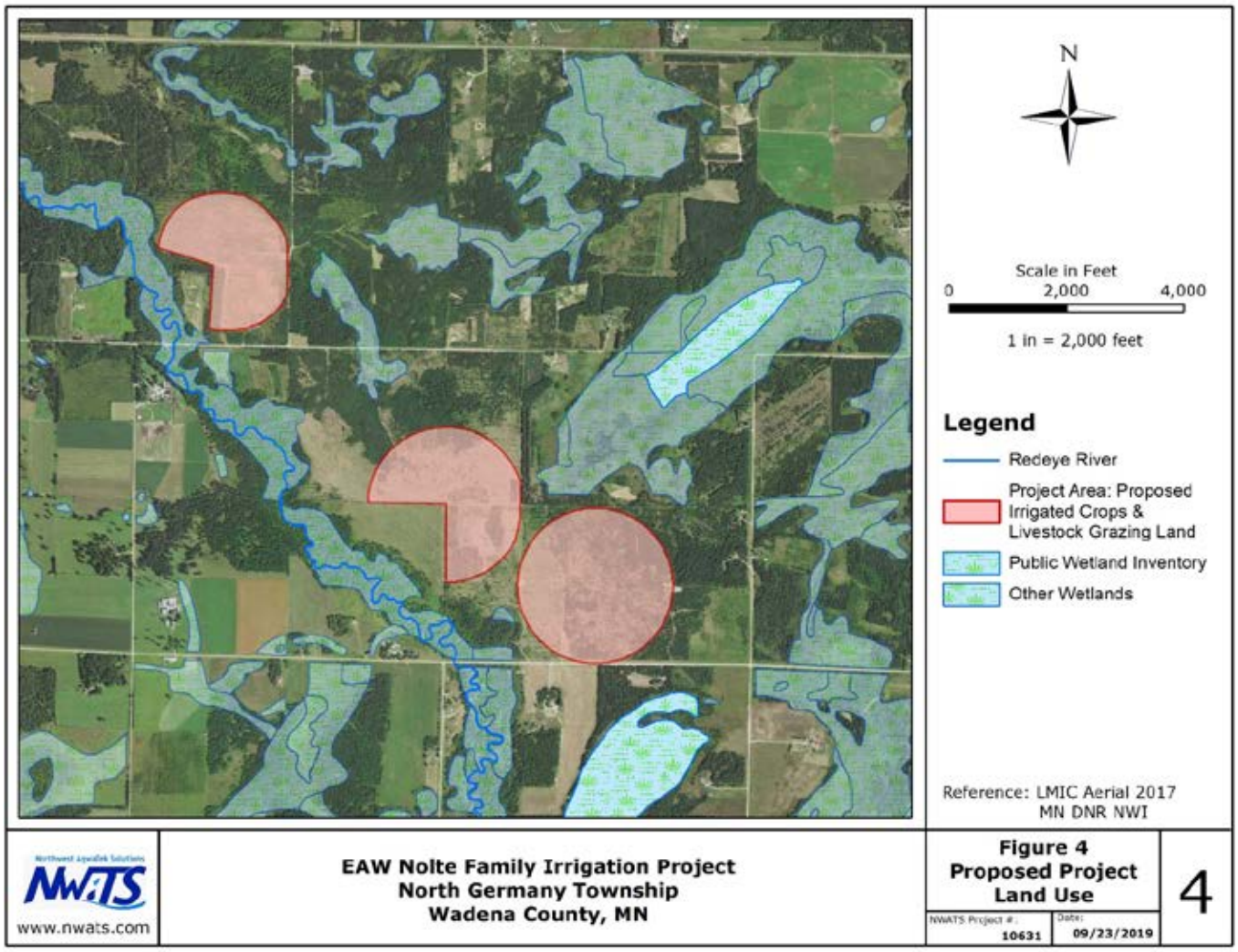


Figure 4 – Proposed Project Land Use



The number of cattle grazing the land would vary depending on the protein content of the forage at the time of grazing. Because the cattle would be grazing in a pasture operation, it does not meet the definition of a feedlot. All access roads are in place and the watering areas for the cattle within the project area consist of portable watering tanks and would continue as such.

Land preparation is proposed to occur early in spring of 2020. To prepare the land, the remaining six acres of timber, resulting stumps and undergrowth from previous timberland management activities would be removed. A chainsaw and backhoe would be used to remove trees and stumps and an industrial disc and rake would be used to remove the roots.

The irrigation wells were drilled on the following dates (see Figure 3):

- Permit Application #2017-4235: September 4, 2014; Well 805420 UTM: X 350509; Y 5163110
- Permit Application #2017-4236: September 16, 2014: Well 805421 UTM: X 349649; Y 5163050
- Permit Application #2017-4237: September 15, 2014: Well 805422 UTM: X 348401; Y 5164815

The proposer anticipates that the irrigation systems would be operated shortly after the land preparation activities are complete and prior to the 2020 growing season. The irrigation systems would operate within the acreage shown in Figure 4.

Permanent barbed wire fencing is installed around the project area. Portable electric fencing is currently being used and would continue to be used to contain the cattle while grazing within the project area. The proposer does not plan any cattle related building structures in the proposed project area.

Upon establishment of the irrigation systems, portable watering troughs would be placed within the fencing as needed for livestock watering. Consequently, as the cattle graze among the 303 acres, they would not need access to the nearby Redeye River for their water supply.

c. Project magnitude:

Type	Amount
Total Project Acreage	303 acres
Linear project length	NA
Number and type of residential units	0
Commercial building area (in square feet)	0
Industrial building area (in square feet)	0
Institutional building area (in square feet)	0
Other uses – "Staple crop production incorporated with cover crops for livestock grazing".	303 acres
Structure height(s)	NA

d. Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.

The purpose of the proposed irrigation project is to expand and enhance current farming and cattle grazing operations of the Nolte Family Farm.

e. Are future stages of this development including development on any other property planned or likely to happen, Yes or No? No
If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review. Not applicable.

f. Is this project a subsequent stage of an earlier project, Yes or No? If yes, briefly describe the past development, timeline and any past environmental review. No

7. Cover Types:

Estimate the acreage of the site with each of the following cover types before and after development:

Cover Type	Before	After
Wetlands	0	0
Deep water/streams	0	0
Wooded/forest	6	0
Brush/Grassland	132	0
Cropland	165	303
Lawn/landscaping	0	0
Impervious Surface	0	0
Stormwater Pond	0	0
Other (describe)	0	0
Total	303	303

8. Permits and approvals required:

List all known local, state and federal permits, approvals, certifications and financial assistance for the project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure. *All of these final decisions are prohibited until all appropriate environmental reviews has been completed. See Minnesota Rules, Chapter 4410.3100.*

Unit of Government	Type of Application	Status
DNR	Water Appropriation Permits (3)	Pending
NRCS/SWCD	Soil and Water Conservation Plan	Preparing
MDA	Minnesota Agricultural Water Quality Certification	Obtained

Cumulative potential effects may be considered and addressed in response to individual EAW Item Nos. 9-18, or the RGU can address all cumulative potential effects in response to EAW Item No. 19. If addressing cumulative effect under individual items, make sure to include information requested in EAW Item No. 19

9. Land Use:

a. Describe:

i. Existing land use of the site as well as areas adjacent to and near the site, including parks, trails, prime or unique farmlands.

The Minnesota Geospatial Information Office, County Land Use webpage indicates the majority of the area located in Wadena County is cultivated with grassland and forested areas. Lands within the proposed project area have been used for dryland crop production, forage for livestock grazing, and conventional silviculture practices. Adjacent land use is managed for conventional silviculture and harvest, farmland for dry-land crops production and livestock grazing. It includes wetlands, shallow marsh and shrubs and a portion of the Redeye River. Small, private unpaved roadways are present between sections of cultivated forest. The following summarizes the existing land uses by parcel number of the site (see Figure 2) and the adjacent acreage that is owned by the proposer. This information was provided by the proposer and surveyed from recent 2019 aerial photography (see Attachment A):

Parcels 08.004.3010 and 08.004.3020:
Within parcels 08.004.3010 and 08.004.3020, the land use consists of dry land crop production and livestock grazing of existing forage.

Parcel 08.009.1010:
Within parcel 08.009.1010, the land use in the northern half and southwestern portion consists of livestock grazing of existing forage. Within the northern half of the parcel, a wetland is centrally located along the northern boundary. The land use in the southeastern portion of the parcel consists of dry land crop production and livestock grazing of forage.

Parcels 08.010.2020, 08.010.3020, and 08.010.4030
Within parcels 08.010.2020, 08.010.3020, and 08.010.4030, the land use consists of livestock grazing of existing forage. Within parcel 08.010.2020, the land use consists of dryland crop production and livestock grazing of forage. Within parcels 08.010.3020 and 08.010.4030, the land use consists of livestock grazing of forage. Within the southwestern portion of parcel 08.010.3020 and near its western boundary, a portion of the Redeye River occurs. Within a small area of the northwestern section of 08.010.4030, several rows of trees remain from past commercial timberland operations.

Adjacent land to the north, west, south and southwest of the proposed project area is primarily agricultural land with a portion of the Redeye River flowing through the land. The adjacent land to the east and northeast consists of agricultural land, commercial timberland, and shallow marsh and shrubs.

There is a parcel of county tax forfeit land in section 10. Otherwise, there are no other public lands, parks or trails adjacent or near to the proposed project area.

ii. Plans. Describe planned land use as identified in comprehensive plan (if available) and any other applicable plan for land use, water, or resources management by a local, regional, state, or federal agency.

Wadena County

The Wadena County Comprehensive Plan is an ongoing land use planning document to actively guide the County's goals for agricultural, industrial, recreational and community development. The Plan was adopted in 2013 to address short- and long-term goals for the County in six core functional areas; natural resources, land use, economic development, transportation, facilities and services, and parks and recreation.

Wadena County Water Management Plan

The Wadena County Local Water Management Plan (2016-2026) identifies four areas of priority concern which are:

1. Cumulative impacts of current, past or potential land use on the surface water resources within the Redeye and Crow Wing River Watersheds;
2. Cumulative impacts of current, past or potential land use on the groundwater resources in the Pineland Sands and Wadena Surficial Aquifers;
3. Ensure groundwater sustainability to adequately address all various uses of groundwater;
4. Restore and protect key aquatic and terrestrial habitats that have positive impacts on water quality.

Redeye River

A portion of the Redeye River is located adjacent to the proposed project site. According to MPCA's Redeye River Watershed Restoration and Protection Strategies Report (WRAPS), nearly half of the watershed's land use is agricultural, 30% is forested, 15% is wetlands, and about 4% is developed communities and industries. The Redeye River Watershed begins at Wolf Lake and joins the Leaf River, before draining into the Crow Wing River near Staples. The WRAPS, available online at MPCA's website, recommends livestock access control measures, maintain/increase riparian buffers, and appropriate manure management along this reach of the Redeye River. A Total Maximum Daily Load Study (TMDL) for the Redeye River Watershed Pollutant Reduction Project is also available online at MPCA's website and includes the same best management practices as WRAPS in order to mitigate environmental effects of manure from entering streams and impacting water quality.

iii. Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.

The proposed project area is zoned for mixed agriculture and forestry (A-2) and shoreline overlay (S-1). Both zones allow for all agricultural land uses without a permit; however, specific performance standards are established in the ordinance for agriculture practices within these zones.

The proposed project area is not located within a floodplain, wild and scenic river corridor, critical area or agricultural preserve.

b. Discuss the project's compatibility with nearby land uses, zoning, and plans listed in Item 9a above, concentrating on implications for environmental effects.

Wadena County

The proposed project appears compatible with all nearby land uses and therefore, is not anticipated to negatively impact the nearby existing land uses which include livestock grazing, agricultural crop production, commercial silviculture and hunting. The proposed project would include the implementation of agricultural best management practices that foster soil health, incorporate research-based nutrient and irrigation application standards, and enhance adaptive crop rotation for reducing nutrient and agrichemical inputs. Specifically, as the proposer has currently established certification in the Minnesota Agricultural Water Quality Certification Program, which contractually commits the operation to implement and maintain best management practices through September 30, 2029. This would include following University of Minnesota Best Management Practices (BMPs) for fertilizer and pesticides, United States Department of Agriculture (USDA) National Resources Conservation Service (NRCS) Practice Standard 449 for irrigation, and other conservation practices and management on all parcels and crops across the entire operation. Consequently, no incompatibilities have been identified for the proposed project and the area in which it will with respect to zoning requirements and county comprehensive plans.

Wadena County Water Management Plan

With respect to compatibility with the County Water Management Plan, the proposer recently became a certified producer of the Minnesota Agricultural Water Quality Certification Program (MAWQCP). The certification (# 19-159-010-023) recognizes that the proposer uses agricultural best management practices that enhance the water quality of Minnesota's rivers, lakes, streams, wetlands and groundwater. The Minnesota Department of Agriculture authorized the certification on behalf of the Minnesota Pollution Control Agency, Minnesota Department of Natural Resources, and the Board of Water and Soil Resources pursuant to Minnesota Governor's Executive Order 19-12. All parties agree that the MAWQCP is in the public interest as it enhances the water quality of rivers, lakes, streams, wetlands and groundwater, as well as promotes and accelerates environmental stewardship by Minnesota's farmers such as the proposer. In addition, the agreement for certification is governed by Minnesota State Statutes Sections 17.9891-17.993 which include the procedures for implementing the program as required for the certification.

The proposer duties are outlined in their MAWQCP agreement. The duties that are directly related to the Wadena County Local Water Management Plan include maintaining compliance with all water quality rules and regulations in place at the time of certification and performing the management practices on the land as outlined in the Certification Instrumentation Report. The practices include implementing the following:

- Maintaining controlled and managed livestock access to the Redeye River for water quality protection and streambank protection. On the proposer's home farm, which is adjacent to the Redeye River, the proposer has a livestock watering system which is supplied by a well. In this way, the cow-calf herd has alternative water sources other than the river.

- Proper Management of feed yards, including proper stockpiling and application of livestock manure in accordance with Minnesota Pollution Control Agency (MPCA) and NRCS standard.

- Management of crop residue cover by tillage of sod and of cornstalks to be performed in the spring only and keeping the time between spring tillage and planting as short as possible.

- Nutrient management by applying commercial fertilizer and livestock manure at rates and in a manner which is in accordance with University of Minnesota recommendations. Also, the proposer has a Manure Management Plan (MMP) through the NRCS – Wadena office. The

proposer is currently up-to-date on any and all required permits through the MPCA regarding their cattle in feedlots and/or feed yards.

- Pasture management by continuing good techniques such as rotational grazing and maintaining riparian buffers or grassed filter strips along the river and streams.

The proposer's farming operation involves pasture and forage for a herd of 600 cow-calf pairs. The proposer has been cattle farming for several decades. Their operations incorporate soil health principals, nutrient management practices, and industry standard cattle density grazing management practices to ensure sustainable pasture recovery and forage crop productivity. The density of the cattle grazing on the 303 acres would vary as the quantity of feed available is constantly changing as well as the fact that as calves, yearlings, etc., grow, their nutrient needs increase. The proposer has a grazing plan and it follows both the NRCS and MDA recommended guidelines.

Through the signed MAWQC agreement, the public receives assurances that certified producers are using conservation practices to protect Minnesota's lakes, rivers and streams. Consequently, no incompatibilities have been identified for the proposed project and the area in which it will occur with respect to the county water management plan.

Redeye River

The proposer currently practices and commits to the following BMPs as recommended in the WRAPS and TDML reports for protecting the water quality of the watershed:

- Nitrogen application rates following University of Minnesota recommendations;
- Timing of nitrogen application with crop use;
- Livestock exclusion - controlled stream crossings;
- Pasture management;
- Residue management - conservation tillage, forage planting;
- Improved manure (nutrient) management;
- Manure application based on nutrient testing, calibrated equipment, recommended rates;
- Manure spreading setbacks;
- Rotational grazing (livestock integration with crop production);
- Cover crops;
- Crop rotations;
- Conservation cover (pollinator habitat and crop residue management).

c. Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 9b above.

- Maintenance of MAWQCP certification and certification status.
- Implementation of BMPs and conservation practices identified in the soil and water conservation plan currently being developed for the proposed project.

No other incompatibilities have been identified with the plans and zoning requirements listed above.

10. Geology, soils, and topography/land forms:

a. Geology - Describe the geology underlying the project area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for the project and any effects the project could have on these features. Identify any project designs or mitigation measures to address effects to geologic features.

The Pineland Sands region of Minnesota consists of 996 square miles of glacial deposits in Becker, Cass, Hubbard, Todd and Wadena Counties (Reppe, 2005).

The geology of the proposed project area is described by Helgeson (1977) and the Wadena County Geologic Atlas (Lusardi and Marshall, 2016) as glacially deposited layers of sand and gravel (described as glacial outwash) separated by silt and clay layers (described as Till or paleo lake sediments). The deposits were from several different glaciation events during the Late Wisconsin ice age.

The outwash sands and gravels at the land surface generally cover the entire Pineland Sands area with the exception of topographic highs of till deposits such as the drumlin fields in Wadena County. Till, which is poorly sorted glacial deposits containing a large percentage of fines such as silt and clay, directly underlies the surficial outwash. The base of the Pineland Sands/Surficial Outwash is considered to be the top of the first till or clay layer underlying the surficial deposits (Helgesen, 1977).

Beneath this first till deposit are several layers of sands and gravels deposited as outwash in older glaciation events. These sand and gravel layers are separated by additional till. The till's silt and clay layers confine these deeper outwash deposits.

There are two aquifer systems in the area (Eckman, 2002). The first is the unconfined aquifer located in the outwash at the land surface commonly referred to as the Pineland Sands surficial aquifer. The second is a system of confined (buried) aquifers.

The Pineland Sands water table (unconfined) aquifer occurs within the outwash deposits that start at the land surface. The unconfined aquifer sands and gravels extend from the surface to a depth of approximately 135 feet with the water table occurring between zero and 130 feet below land surface. There are many wells completed within the water table aquifer throughout the pineland sands area. The water table at the proposed project site is assumed to occur at a depth of approximately ten feet based on the water level in the proposer's domestic well which is just south and west of the proposed project area.

The confined (buried) aquifers beneath the water table aquifer occur in the glacially deposited outwash gravels and sands separated by and confined by the till. These older materials have fewer wells completed within them.

The Wadena County Geologic Atlas (Lusardi and Marshall, 2016) have identified the sand and gravel formations that make up identified and potential aquifers in both the unconfined and confined systems as outwash deposits. Although individual water bearing units are not identified in the Wadena County Geologic Atlas, aquifers are presumably associated with the coarser textured sands and gravels where many wells are completed. The geologic cross section C-C' of from this atlas has identified the approximate elevations of these sand and gravel layers (aquifers) near the proposal area. The following table contains the information on the potential aquifers, both confined and unconfined, near the site.

Aquifer System	Aquifer Formation (Lusardi and Marshall, 2016)	Approximate Elevation (feet above mean sea level)	General Aquifer Name
Unconfined (water table)	New Ulm, Hewitt – Itasca Phase, and Independence	1,360 (surface) to 1,310	Pineland Sands Surficial (unconfined) Aquifer
Confined (buried)	Hewitt – Alexandria Phase	1,290 to 1,310	Pineland Sands Confined Aquifer
Confined (buried)	Browerville	1,160 to 1,290	Pineland Sands Confined Aquifer
Confined (buried)	Meyer Lake Member-Lake Henry	1,120 to 1,160	Pineland Sands Confined Aquifer
Confined (buried)	St. Francis	1,090 to 1,120	Pineland Sands Confined Aquifer
Confined (buried)	Eagle Bend	1,060 to 1,090	Pineland Sands Confined Aquifer
Confined (buried)	Undifferentiated Pleistocene	930 to 1,060	Pineland Sands Confined Aquifer

Based on the well construction logs (i.e., well depths) of the three existing proposed irrigation wells within the proposed project area, the wells appear to be completed in confined buried sand aquifers within the Browerville Formation. These three inactive irrigation wells range in depth from 140 to 157 feet. The locations of the wells are shown in Figure 3. The well located in the northwest section of the proposed project area (805420) is screened between the depths of 104 and 140 feet with two thick clay layers above the screened interval confining this aquifer. Projection of this well onto the Wadena County Geologic Atlas Part A cross section C-C' indicates this well is likely completed within the Browerville outwash2 sand layer within the Browerville Formation. The other two wells (805421 and 805422) are in the southeast section of the proposed project area and are screened between the depths of 135 to 157 feet. These wells also have at least two clay layers above the screened portion, indicating that they are completed in confined aquifers. The supplemental cross sections for the Wadena County Geologic Atlas Part A (cross section 25) indicates these wells are likely completed within either the Browerville outwash2 or Browerville outwash3 sand layers within the Browerville Formation. The water level (potentiometric surface) rises to a depth of approximately 2 feet below ground surface in well 805420 and 6 feet below ground surface in wells 805421 and 805422.

The bedrock underlying the confined aquifers consists of Paleoproterozoic slate and greywacke. The depth to bedrock ranges between 825 to 950 feet above mean sea level (Lusardi and Marshall, 2016) across the area. This type of bedrock does not generally provide useable quantities of water.

The effects that the proposed project could have on the hydrogeology/geology and the measures to mitigate the effects are discussed in items 11.b.iii., 12.c., 19.a. and 19.c.

b. Soils and topography - Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 11.b.ii

The NRCS Web Soil Survey (USDA NRCS, July 2019) maps provide the identification of several soils units within the proposed project area. Loamy sand is the major soil type consisting of the Menahga, Friendship-Meehan, Roscommon and Huntersville units. The following table provides the soil unit characteristics.

Soil Symbol	Soil Unit Name	Slope (%)	Erosion (T) Factor	Hydrologic Group	Hydric Rating	Farmland Classification	Acres in Project Area	Percent of Project Area
139B	Huntersville loamy fine sand	1-6	4	A	6	Farmland of statewide importance	1	0.2%
458A	Menahga loamy sand	0-2	5	A	2	Not Prime	134	44%
458B	Menahga loamy sand	1-8	5	A	3	Not Prime	2	1%
834	Friendship-Meehan loamy sands	0-3	5	A	6	Not Prime	159	52.5%
1943	Roscommon loamy sand	0-2	5	A/D	96	Not Prime	6	2%
1969	Evart-Isan complex, channeled	0-1	2	B/D	85	Not Prime	1	0.3%

TABLE NOTES: T Factor: An estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year on a scale of 1-5, 1 being the lowest (low level of erosion can be tolerated) and 5 being the highest (high level of erosion can be tolerated without affecting crop productivity).

Hydrologic Group: Group of soils having similar runoff potential under similar storm and cover conditions. Soils in the United States are placed into four groups A, B, C, D and three dual classes A/D, B/D and C/D, based on the soil's internal drainage characteristics. Group A soils are well-drained soils with low runoff potential. Group B and C soils have moderately low and moderately high runoff potential, respectively. Group D soil have high runoff potential. Dual classes are used where there is a water table within 24 inches of the surface. The first letter applies to the drainage class if drained, and the D refers to the undrained condition.

Hydric Rating: This rating indicates the percentage of a map unit that meets the criteria for hydric soils. Each map unit is rated based on its respective components and the percentage of each component within that map unit.

According to the USDA NRCS Web Soil Survey, less than 2.5% of the 303 acre area is sensitive to surface runoff. The majority of the soils have high nitrate leaching potential if manure or commercial fertilizer is applied and from mineralization of soil organic matter. As described below, the proposed cropping rotation in this project area includes a deep-rooted perennial crop and cover crops which reduces the risk of nitrate leaching losses.

The area is predominately flat with gentle slopes (0 - 8%). Visual observations of the Nolte fields by a Minnesota Department of Agriculture staff member during a Minnesota Agricultural Water Quality Certification Program (MAWQCP) certification site visit indicated that the slopes are predominantly in the 0 – 5% range. The elevation ranges from 1336 feet to 1366 feet (AMSL). The highest point of elevation is in the northeast corner of section 10, and where the lowest is in the southeast corner of section 10. Grading would not be necessary due to the relatively flat topography of the area. Excavation associated with the proposed project would include the removal of stumps and roots of the trees. The disturbed topsoil would be redistributed in place.

The light soils such as loamy sands are considered highly erodible according to the NRCS. Much of the proposed project area consists of these soils. However, to mitigate the potential for erosion, the adjacent parcels owned by the proposer would have green cover (such as hay) for grazing purposes throughout the year, and the other surrounding parcels have mature trees and shrubs. The proposer practices no fall tillage and plant a rye grain cover crop on fields where silage is chopped. There are grassy buffers, trees and shrubs that are at least 630 feet wide between the Redeye River and the proposed irrigated cropland that can filter sediment and nutrients from runoff that enters the river. Upon establishment of the irrigation systems on the 303 acres of the proposed project, electric fencing would be installed around the acreage and portable watering troughs would be placed within the fencing as needed for livestock watering. Consequently, as the cattle graze among the 303 acres, they would not need access to the Redeye River for their water supply.

The irrigated cropland would be under a four- to five-year crop rotation. The proposed 5-year rotation includes the following:

- 1st year: Corn interseeded with annual rye grass and clover. Upon harvest, the cover crop would be available for grazing and the corn stock stubble would remain in the fields until

it is disked in prior to planting the following growing season.

- 2nd year: Oats crop; followed by cover crop of alfalfa and fescue interseeded with oats regrowth.
- 3rd year: Alfalfa and fescue.
- 4th year: Alfalfa and fescue.
- 5th year: Potatoes or edible beans, either interseeded with cover crop or followed by cover crop depending on crop grown.

The crops grown during the proposed four-year rotation would be similar those above except that the potatoes/beans crop would replace the alfalfa and fescue in the 4th year. The crop management plan is to alternate the crops grown on the respective parcels so that no one crop is grown on more than one parcel of the project site per growing season.

Up until three years ago, the proposed project area was forested land cover; since that time, only six acres of the 303 acres contains standing trees; the remainder of the trees have been cleared for agricultural land. Forested land cover typically experiences lower erosion than agricultural land.

The project proposes to incorporate cattle grazing among the irrigated fields. The Sustainable Farming Association of Minnesota promotes five principles to enhance soil health. These principles, commonly referred to as "Soil Health Principles" include:

- Keep the soil covered
- Minimize soil disturbance
- Increase crop diversity
- Keep living roots in the soil
- Integrate Livestock

The proposer incorporates all five principles into their farming operation. Having the ground covered and minimizing the disturbance of the soil enhances the microbial activity within the soil (Solberg, 2019). The addition of cattle grazing stimulates and enhances the microbial activity. As the cattle shed the microbes, the microbes inoculate the soil which accelerates the decomposition of plant material and the development of humus (organic matter). Humus significantly affects the bulk density of the soil and contributes to its retention capabilities of moisture and nutrients. Humus increases the ability of the soil to store nutrients in the soil and prevent them from being leached. Recent soil sampling of the northwestern field of the proposed project area shows that the organic matter is at 2.3 percent which is respectable considering the relatively recent transition of the field to forage crop production and cattle grazing.

The inclusion of alfalfa represents a very desirable rotation. Alfalfa is a deep-rooted crop which is an excellent scavenger of nitrate from the soil and since it is a legume it does not require fertilization with nitrogen. Incorporating cover crops and alfalfa with grasses, followed by grazing, enhances agricultural soil health, humus production and soil stability; greatly reduces runoff, soil erosion, agrichemical inputs; and improves manure re-absorption. The proposer practices no fall tillage during the years that their fields are brought into row crop production. Their goal is to minimize the time between spring tillage and planting. When top- dressing of nitrogen is performed in corn production years, the proposer broadcasts annual rye at the same time. The rye serves as the cover crop which is utilized for grazing in the fall.

As presented under Item 9.b., the proposer has acquired certification under the MAWQCP. The certification requires the proposer to implement nutrient management practices applied in a manner which is in accord with University of Minnesota guidelines and recommendations.

The area of the proposed project is subject to Part 1 of Minnesota's Groundwater Protection Rule, effective June 28, 2019. The purpose of the Rule is to minimize potential nitrogen fertilizer sources of nitrate pollution to the state's groundwater. Part 1 of the Rule restricts the application of nitrogen fertilizer in the fall and on frozen soils in vulnerable groundwater areas. In these areas, nitrate can move easily through soil and into groundwater. Vulnerable areas are determined based on the presence of coarse textured soils within the upper 36 inches from the surface, shallow bedrock, or karst geology. An entire quarter-section is included if 50% or more of the quarter-section is considered vulnerable. Determinations are made using the USDA's NRCS soil maps and the DNR karst geology maps. An operation that is certified through the MAWQCP is deemed to be compliance with the Groundwater Protection Rule for the duration of the producer's water quality certification, which would apply to the project proposer.

11. Water resources:

a. Describe surface water and groundwater features on or near the site in a.i. and a.ii.

i. Surface water - lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within 1 mile of the project. Include DNR Public Waters Inventory number(s), if any.

There are no surface water features within the 303-acre proposed project area.

Nearby Wetlands

Within the northern half of parcel 08.009.1010, a Wetland Conservation Act (1991) (WCA) regulated wetland is centrally located along the northern boundary (Figures 3 and 4). Within the southern half of parcel 08.010.3020, a WCA wetland occurs within the southeastern corner of the parcel. Also, a Public Waters Inventory (PWI) wetland occurs to the north and east of the proposed project area (PWI# 85W) as well as to the south (PWI# 84W). No special designations occur for these water bodies.

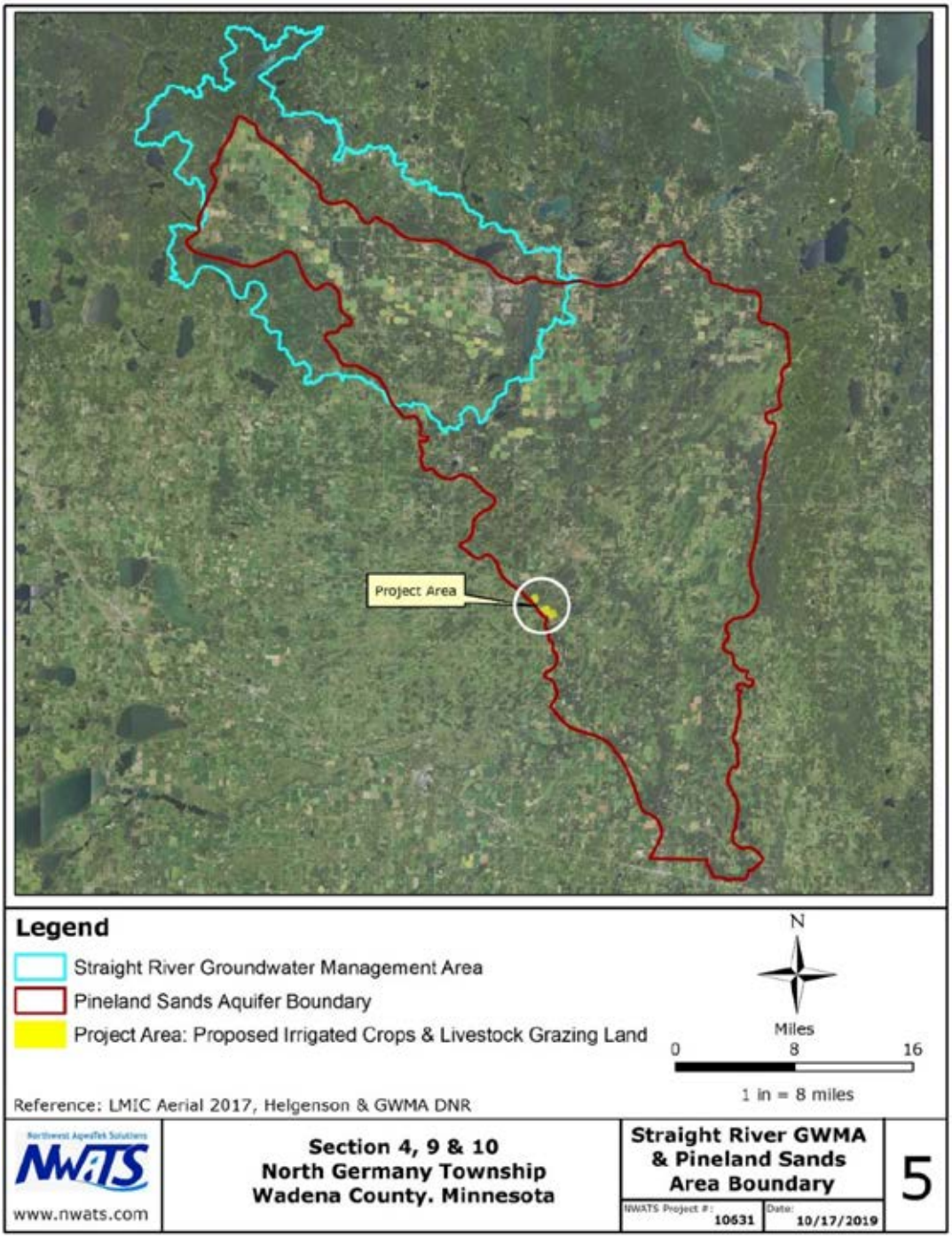
Nearby public waters

A stretch of the Redeye River (PWI 56079a) flows to the west, south and southwest of the proposed project area. The Redeye River is not a designated trout stream. However, within one-mile of the proposed project area, the River (AUID 07010107-503) is listed by the MPCA under Section 303d of the CWA as an Impaired Water for *Escherichia coli,* which includes the reach that is adjacent to the proposed project boundaries. Causes for impairment are runoff from manure applied as fertilizer as well as livestock grazing in riparian areas. The proposer hauls approximately 19,000 bushels per year of solid, bedded cattle manure to their fields. Average weight of each bushel is approximately 75.5 pounds equating to a total weight of approximately 1.44 million pounds or 720 tons. Failing septic systems were identified as a minor pollutant source.

Other

The proposed project area is located outside of the Straight River Groundwater Management Area (see Figure 5).

Figure 5 – Straight River GWMA and Pineland Sands Boundary



ii. Groundwater – aquifers, springs, seeps. Include: 1) depth to groundwater; 2) if project is within a MDH wellhead protection area; 3) identification of any onsite and/or nearby wells, including unique numbers and well logs if available. If there are no wells known on site or nearby, explain the methodology used to determine this.

Groundwater

The aquifers beneath and near the proposed project area are described above under Item 10a. Based on nearby well logs, the depth to groundwater beneath the proposed project area is approximately 10 feet.

Wellhead Protection Area

The proposed project area is not within a Minnesota Department of Health (MDH) Wellhead Protection area.

Nearby wells

There are seven inactive water appropriation permits (i.e., pending permit applications, preliminary well construction assessments and withdrawn permit applications) and fourteen domestic wells within one mile of the proposed project area as identified in the Minnesota Well Index. The locations of the wells are provided in Figures 6 and 7. Three of the seven inactive wells are those proposed for operation and two were dug for pits/ponds (not wells). A domestic well survey completed for the permit applications has found an additional 23 wells not in the Minnesota Well Index. One permit, 1989-3086, is just outside the one-mile radius and has been used in the past and currently is used for cattle watering. There are no public drinking water wells located near the proposed project area or within the proposed groundwater geographic scope (discussed in Item 19).

Figure 6 – Domestic Well Locations

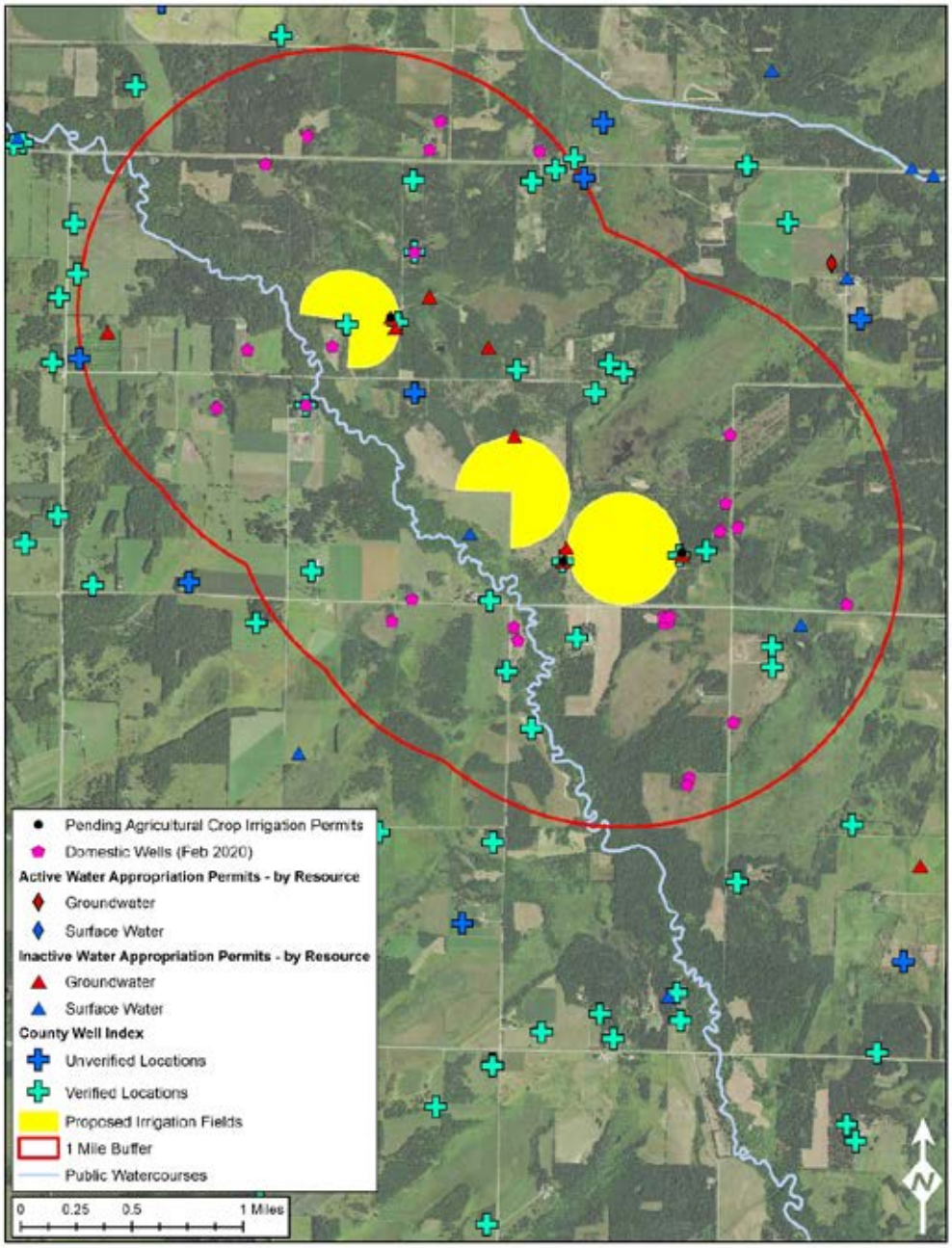
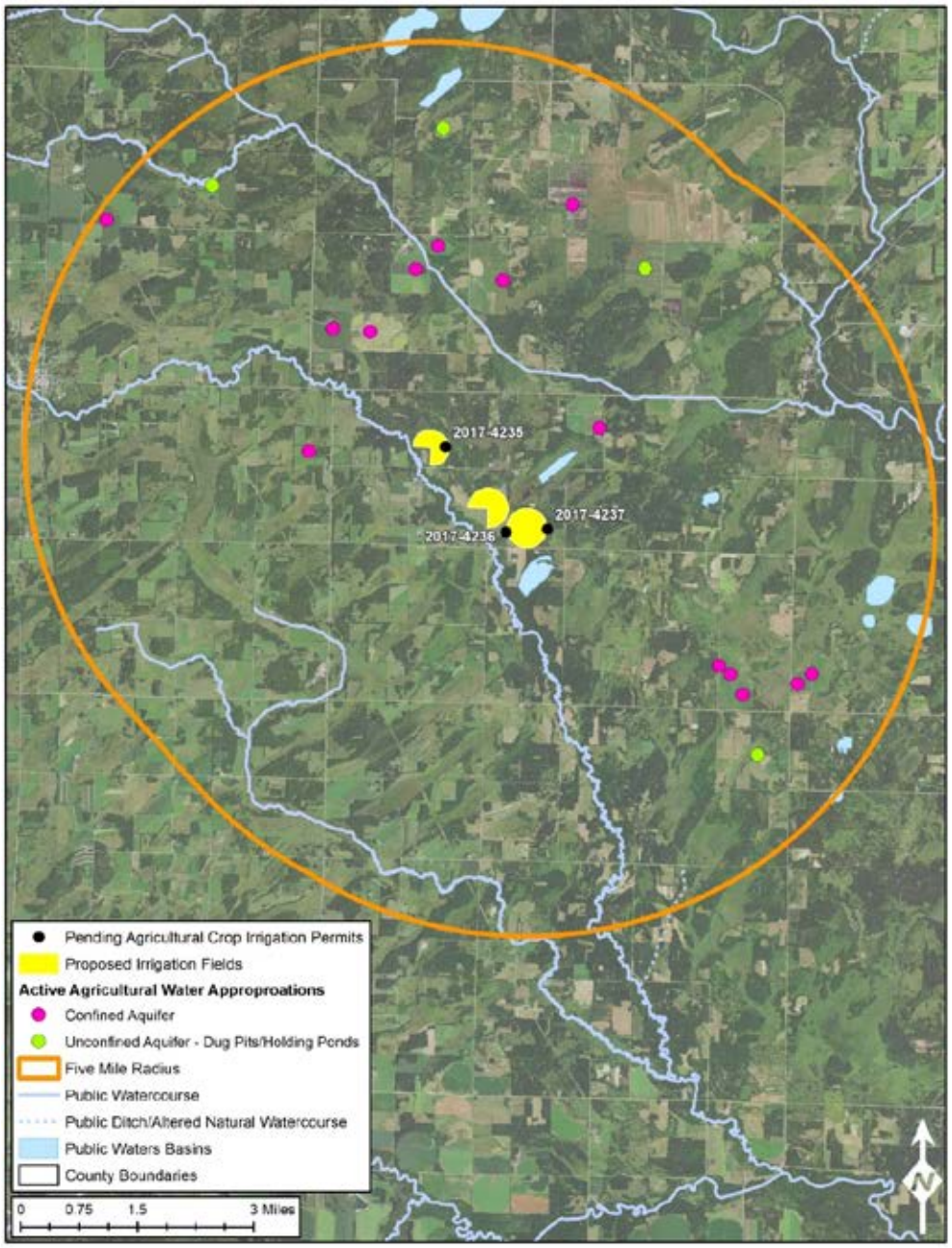


Figure 7 – Irrigation Well Locations



b. Describe effects from project activities on water resources and measures to minimize or mitigate the effects in Item b.i. through Item b.iv.

i. Wastewater - For each of the following, describe the sources, quantities and composition of all sanitary, municipal/domestic and industrial wastewater produced or treated at the site.

1) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.

The proposed project would not generate wastewater.

2) If the wastewater discharge is to a subsurface sewage treatment systems (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system.
   The proposed project would not generate wastewater.
3) If the wastewater discharge is to surface water, identify the wastewater treatment methods and identify discharge points and proposed effluent limitations to mitigate impacts. Discuss any effects to surface or groundwater from wastewater discharges.
   The proposed project would not generate wastewater.

ii. Stormwater - Describe the quantity and quality of stormwater runoff at the site prior to and post construction. Include the routes and receiving water bodies for runoff from the site (major downstream water bodies as well as the immediate receiving waters). Discuss any environmental effects from stormwater discharges. Describe stormwater pollution prevention plans including temporary and permanent runoff controls and potential BMP site locations to manage or treat stormwater runoff. Identify specific erosion control, sedimentation control or stabilization measures to address soil limitations during and after project construction.

Due to the relative flat topography of the proposed project area and presence of sandy soil, little runoff is expected; the routes of any runoff would depend on quantity and be variable and multidirectional. There are no existing or planned man-made conveyances; therefore, flow would be primarily sheet flow. Ultimately, the receiving water bodies would include the Redeye River and nearby wetlands.

Soil and water conservation plans are being developed for the proposed project area and are currently pending. There is no stormwater quantity or quality data available for the proposed project area prior to any conversion activity as none has been collected in the past. Furthermore, the proposed project area is relatively flat. If any change in runoff quantity does occur from the proposed project, runoff likely would not be significant within the watershed context due to cover crops and BMPs implemented. Also, there are grassy buffers, trees and shrubs that are at least 630 feet wide between the Redeye River and the proposed irrigated cropland.

iii. Water appropriation: Describe if the project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use and purpose of the water use and if a DNR water appropriation permit is required. Describe any well abandonment. If connecting to an existing municipal water supply, identify the wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation.

The proposed project proposes to appropriate groundwater from confined aquifers within sands designated as Browerville sands 2 or 3 per the Part A Wadena County Geologic Atlas. The water would be used for the irrigation of crops during the growing season, which is seasonally limited to April 1 through October 1 (or November 15 for land with a crop) in Minnesota. Three irrigation wells and three water appropriation permits are necessary to irrigate the 303 acres. The irrigation wells have already been installed. No additional wells would be installed for the proposed project.

Application for the permits occurred December 11, 2017. The applications were assigned reference numbers 2017-4237, 2017-4236 and 2017-4235. The combined maximum requested appropriation of the three permits equate to approximately 100 million gallons per year. The maximum total

inches of water requested is 12 inches per acre. An aquifer test will be conducted with the permit application, which will include a risk analysis of the rates and volumes for each permit.

It is challenging to determine the potential for adverse well interference with nearby domestic wells without an aquifer test, which will be required during the permit application process. As shown in the Wadena County geologic atlas, the geology in this area changes significantly within a short distance, therefore an aquifer test with nested monitoring wells will be needed at this site. This will help determine the leakage between systems and provide the data needed to evaluate impacts from pumping the deeper confined aquifer(s) on the other aquifers and the surficial resources.

An assessment of the Pineland Sands unconfined aquifer was conducted by Helgesen (1977) and updated by Reppe (2005). The depth to the water table in this aquifer ranges from slightly below the surface to 40 feet. Net areal recharge to this aquifer is estimated at 5 inches per year (Helgeson, 1977). Major sources of recharge are from snowmelt and intense rainfall, infiltration from surface water, and flow across aquifer boundaries (Reppe, T.H.C, 2005). Losses of water from this unconfined aquifer include evapotranspiration, groundwater flow to surface water via springs, flow across aquifer boundaries, and withdrawals by pumping wells.

As discussed above, the three proposed irrigation wells are completed in confined aquifers within the Browerville Formation beneath the unconfined aquifer. There is no nearby testing of the proposed pumped aquifer; therefore, information on how the aquifer responds to pumping is not known. In addition, recharge to the Pineland sands confined aquifers within the area of the proposed project has not been studied directly. However, recharge is expected to be similar to other areas of glacial deposition and will likely occur from direct hydrologic connections to or by leakage from surface water features and other aquifers. An aquifer test with nested monitoring wells will be conducted at this site as part of the permitting process. The results from this test will help evaluate the impacts from pumping the three proposed irrigation wells on the aquifer systems.

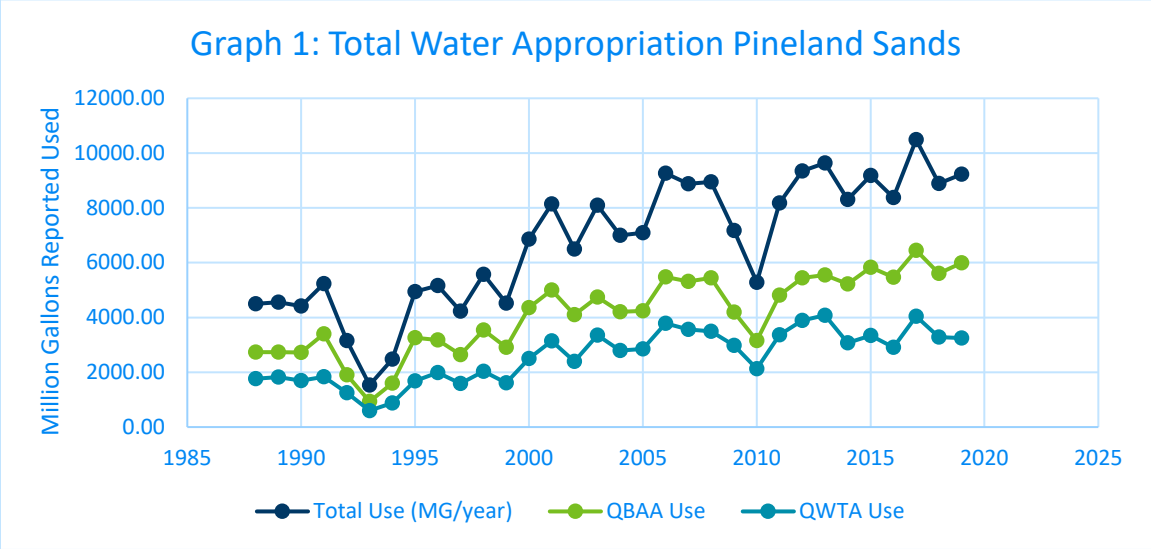
Overall, the unconfined aquifer is quite expansive but varies in thickness across the pineland sands area. Lusardi (2016) notes that the units of till and deeper aquifers tend to be discontinuous and variable in thickness and elevation over relatively short distances. The confined aquifers in the area tend to be more channelized with varying vertical and horizontal interconnectivity. The exact lateral extent of these aquifers (including the source aquifer for the proposer wells) is not known and may result in boundary conditions which could affect the long term viability of the water supply. The presence of barrier or recharge boundaries would affect the aquifer response to pumping. Although there has been research on the water table system sustainability, well yields and storage; there is no information on the confined aquifer systems which are the source of water for the proposed irrigation wells. Therefore, the aquifer test that will be conducted as part of the permitting requirements will help this understanding of the source aquifer(s) for the irrigation wells. Any evaluation of the total volume of sustainable pumping would need to involve construction of a groundwater model.

There are no water level observation wells that are maintained by the DNR within five miles of the proposed project area completed in the confined aquifers of the Undifferentiated Drift.

A review of water level measurements from observation wells completed in the unconfined, surficial (water table) Pineland Sands aquifer, maintained by the DNR, and for which data extends as far back as the late 1970s, reveals no discernible changes in water levels beyond those which occur on a seasonal basis. Although statistical analysis was not conducted, there are no observable trends in

the DNR collected water level data. The connectivity of the water table system to the source aquifer for the pumped wells is not known.

According to Minnesota DNR Water Use database, as of 2019, the total annual permitted volume is just under 25 billion gallons per year for both the unconfined and confined aquifer systems throughout the Pineland Sands region. Groundwater appropriations do not generally meet or exceed the permitted amount. For example, the 2019 groundwater appropriation permits in the Pineland Sands region totaled approximately 9.2 billion gallons in water use. This was further broken down into aquifer types; with 3.2 billion appropriated from the Quaternary water table aquifer (QWTA) and 6 million appropriated from Quaternary buried artesian aquifers (QBAA). Graph 1 shows the use in the Pineland sands area from 1988 to present.



iv. Surface Waters:

1) Wetlands: Describe any anticipated physical effects or alterations to wetland features such as draining, filling, permanent inundation, dredging and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed. Identify measures to avoid (e.g., available alternatives that were considered), minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts will occur in the same minor or major watershed, and identify those probable locations.

There are no wetlands within the proposed project area. Physical effects or alterations to wetland features are not anticipated. The aquifer test conducted as part of the water appropriation permitting process can be used to evaluate pumping impacts on nearby wetlands outside the proposer's land that are connected to the surficial aquifer.

2) Other surface waters: Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed

to avoid or minimize turbidity/sedimentation while physically altering the water features. Discuss how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.

Physical Effects

There are no surface water features within the proposed 303-acre project area. Direct, physical effects or alterations to surface water features are not anticipated. The aquifer test conducted as part of the water appropriation permitting process will be used to evaluate pumping impacts on nearby streams, including the Redeye River, that are connected to the surficial aquifer.

Water Quality

The proposed area comprises sandy soils which are vulnerable to leaching. Agrichemicals, including nutrients and pesticides (e.g., insecticides, herbicides) would be used within the proposed project area for agricultural crop production purposes.

When a pesticide is applied to a field, it may meet a variety of fates. It may be taken up by plants, degrade into other chemical forms, be carried away to surface waters by runoff and erosion, reach groundwater through leaching, or be lost to the atmosphere through volatilization. Fate of a pesticide depends upon many factors, including the physical and chemical properties of the pesticide, site conditions (soil type, temperature, precipitation, amount of sunlight, etc.) and management practices.

For most pesticides, the potential for loss to surface water or leaching into groundwater depends mainly on the half-life, water solubility, and adsorption coefficient. In general, pesticides with a long half-life have a higher potential of reaching surface or groundwater because they are exposed to hydrologic forces for a longer period of time. Adsorption coefficient and solubility in water are the main determinants for pesticide mobility. Pesticides which have low solubility or have high adsorption coefficients tend to remain near the soil surface and are more susceptible to surface loss through runoff while water soluble pesticides with low adsorption coefficients have high potential to leach to groundwater.

The MDA currently monitors 40 sites in Becker, Hubbard, Ottertail and Wadena counties. Forty-five different pesticides or pesticide breakdown products (or degradates) have been detected in these counties. The lab methods for pesticides are exceedingly sensitive with detection limits typically in ng/L or parts-per-trillion. To date there have been Health Risk Limit (HRL) exceedances at two different sites in Wadena county. The follow-up samples had concentrations below the HRL.

Loss of pesticides to groundwater, surface water, or air can be reduced by following pesticide best management practices. The MDA recommends the use of pesticide best management practices whenever any pesticide is applied. More information on the MDA's website by searching "best management practices for pesticides."

The Redeye River Watershed assessment report indicates that some streams within the watershed do not meet water quality standards for aquatic life, drinking water, and fish consumption beneficial uses. The main concerns within the watershed include low dissolved oxygen levels, excess sediment, increased drainage and flow alterations, and high bacteria levels. Land conversion from forest to irrigated row crop agriculture has not been identified as a significant source of water quality concerns within the Redeye River Watershed. Recent

expansion of irrigated agriculture has primarily been in the adjacent Crow Wing River Watershed.

However, the MPCA's 2016 Watershed Restoration and Protection Strategies (WRAPS) Report for the Redeye River found aquatic life stressors, including dissolved oxygen, turbidity, and measures of fish and macroinvertebrate health to meet water quality standards (MPCA 2014). There is not currently a state standard for nitrate relative to aquatic life, but one is in development.

Fertilizer usage/applications within the proposed project area would include both commercial based (e.g., nitrogen, urea, ammonium nitrate, ammonium sulfate, potassium nitrate, phosphorus and potassium) and manure based. A broader discussion regarding impacts to surface waters (e.g., impairment, water quality from agricultural and livestock operations) are discussed in Item 19b (Cumulative Potential Effects) and Attachment E.

Mitigation

There are grassy buffers, trees and shrubs that are at least 630 feet wide between the Redeye River and the proposed irrigated cropland that can filter sediment and nutrients from runoff that enters the river. Upon establishment of the irrigation systems on the 303 acres of the proposed project, electric fencing would be installed around the acreage and portable watering troughs would be placed within the fencing as needed for livestock watering. Consequently, as the cattle graze among the 303 acres, they would not need access to the Redeye River for their water supply.

Under MAWQCP certification (which the proposer has obtained), the proposer is contractually committed to following University of Minnesota BMPs for nitrogen for a 10 year term of certification (ending 9-30-2029). This certification also contractually commits the proposer to following Standard-level Integrated Pest Management criteria which in simplest terms includes:

- At least 2 crops in the rotation or perennial crop
- Follows label
- Accurate pest identification
- Rotates Modes of Action
- Proactive scouting
- Applies pesticides based on UMN

To protect water resources, the proposer would utilize University of Minnesota recommended nitrogen BMPs focusing on using the lowest recommended inputs and timing of application. Other practices the proposer would implement to reduce nitrogen losses such as the inclusion of a perennial crop in the rotation, extensive use of cover crops and bringing livestock into the rotation, and is described in Item 10.b.

Additional information regarding measures to avoid, mitigate or minimize surface water impacts are discussed in Item 10 (Geology, Soils). A broader discussion of nutrient and pesticide impacts is discussed in Item 19 (Cumulative Potential Effects) and Attachment E (Pineland Sands Regional Environmental Topics)

12. Contamination/Hazardous Materials/Wastes:

a. Pre-project site conditions. Describe existing contamination or potential environmental hazards on or in close proximity to the project site such as soil or ground water contamination, abandoned dumps, closed

landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-project site conditions that would be caused or exacerbated by project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.

To determine if existing contamination or potential environmental hazards exist on, or in close proximity to the proposed project area, the MPCA "What's in My Neighborhood" online database was accessed (MPCA, 2020). The database does not indicate any sites of existing or potential environmental hazards within the proposed project area.

b. Project related generation/storage of solid wastes. Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of solid waste including source reduction and recycling.

There would be no generation or storage of solid wastes within the proposed project area.

c. Project related use/storage of hazardous materials: Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location and size of any above or below ground tanks to store petroleum or other materials. Discuss potential environmental effects from accidental spill or release of hazardous materials. Identify measures to avoid, minimize or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.

Equipment used for the tree/stump removal will have fuels/oils associated with them and there is a potential for leaks or spills that could impact nearby surface waters or the shallow groundwater. The operation of heavy equipment in and near lakes, streams and wetlands obligates the project proposers to develop a plan for managing fuels and lubricants, including a plan of action to implement in the event of spills. Project proposers and their contractors should be prepared to respond to spills and to recover and contain spilled material as quickly and thoroughly as possible. For petroleum spills that are five or more gallons, the project proposers and/or their contractors are required to contact the State Duty Officer at (651) 649-5451 or (800) 422-0798. Information on reporting spills and leaks is available on the MCPA Reporting Leaks and Spills webpage (MPCA, June 2014)

Chemicals available for use

Agrichemicals, including nutrients and pesticides (e.g., insecticides, herbicides) would be used within the proposed project area for agricultural crop production purposes. The proposer does not store any agrichemicals on their farm; rather, they are ordered prior to application and unused portions are returned shortly after application.

Pesticides are commonly applied to agricultural land to control weeds (herbicides), insects (insecticides), and plant diseases (fungicides). Exact chemical usage at the proposed project location is uncertain based upon crop rotation, pests and field requirements. A list of all pesticides available for use for the proposed project are listed in Attachment D, arranged by the proposer's planned crops (corn, rye grass and clover; oats, alfalfa and fescue; potatoes).

In addition to the potential pesticides listed in Attachment D, the proposer would use corn seed treated with Poncho 250; which includes a neonicotinoid insecticide, clothianidin, to limit crop damage by nematodes.

Potential environmental and/or human health impacts of chemicals

The proposed area comprises sandy soils which are vulnerable to leaching. Poncho 250 contains neonicotinoid insecticide clothianidin, which is highly toxic to pollinators and aquatic invertebrates. Abraded dust from seed treated with neonicotinoid can be harmful to pollinators. When pesticides are applied to a field they have the potential to be taken up by plants, degrade into other chemical forms, be carried away to surface waters by runoff and erosion, affect land and aquatic organisms, reach groundwater through leaching (including groundwater used for drinking), or be lost to the atmosphere through volatilization.

Potential pesticide impacts are also addressed in Item 11 (water resources), Item 13 (fish, wildlife and sensitive resources) and Item 16 (air). Nitrogen use is discussed in Items 11 and 19.

Measures to mitigate chemical impacts

All agrichemicals must be handled and applied in accordance with the product label requirements and would be applied by licensed applicators. Measures to avoid, minimize or mitigate adverse effects from the use of the agrichemicals in the proposed project area would be implemented in accordance with the label requirements, respective Safety Data Sheets (SDS), and, when applicable, the MDA administered state chemigation rule and permit program.

The USEPA carries out exposure potential and risk evaluations for all registered pesticides to ensure that use according to label directions will not result in adverse human health effects or cause unreasonable harmful effects on wildlife and the environment.

Since the proposed project area comprises sandy soils which are vulnerable to the leaching of chemicals, Pesticide Water Quality Best Management Practices should be made part of management practices to mitigate adverse effects of pesticides. Additionally, the proposer should follow seed treatment BMPs.

d. Project related generation/storage of hazardous wastes - Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling.

Hazardous wastes would not be generated or stored within the proposed project area.

13. Fish, wildlife, plant communities, and sensitive ecological resources (rare features):

a. Describe fish and wildlife resources as well as habitats and vegetation on or in near the site.

Fish Resources and Habitats

No substantial fish habitats are found within the proposed project boundaries. There are two open water wetlands adjacent to the proposed project area, however, no significant impacts to this open water are expected. Additionally, a soil and water conservation plan is being developed for the proposed project area.

In order to evaluate pumping impacts on wetlands and streams near the site, DNR recommends an aquifer test to determine any potential impacts from pumping the confined aquifer on surficial aquifers. The proposer is aware that an aquifer test would be required during permitting and that DNR would reevaluate any impacts following the aquifer test in the permitting process. The aquifer test

specifications plan is to pump well 805421 (permit 2017-4236) for a minimum of 4 days and up to 7 days depending on stabilization (consistent water levels) while monitoring several wells in the area.

Wildlife Resources and Habitat

The areas surrounding the proposed project area contain wetlands, marshland, grassland, floodplain, grazing land, agricultural land, and commercially cultivated and natural forest habitats. The area is likely home to deer, small mammals, birds, reptiles and amphibians. The proposed project is not expected to significantly impact wildlife in the area, but the permanent barbed wire fencing surrounding the project area and the portable electric fencing may alter their patterns of movement. The conversion of the proposed project area to irrigated agriculture will provide some structures such as the center pivot, sprinkler heads, associated concrete pad and wheel towers. However, no significant negative impacts to existing wildlife resources and habitats are anticipated from the structures and overall project.

b. Describe rare features such as state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota County Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within close proximity to the site. Provide the license agreement number (LA-____) and/or correspondence number (ERDB _____) from which the data were obtained and attach the Natural Heritage letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.

The DNR Natural Heritage Information System (NHIS) (ERDB 2020080) was queried to determine if any significant natural features and rare features are known to occur within one-mile radius of the proposed project area (see Attachment B for correspondence). The rare features that may be adversely affected by the proposed project are as follows:

Ecologically Significant Areas

- A small portion within the proposed project area (the west part of parcel 08.004.3020) is within an area that has been preliminarily identified as a Minnesota County Biological Survey (MBS) Site of Moderate Biodiversity Significance. Sites ranked as moderate contain occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery. Minimal disturbance in the area is recommended. Indirect impacts from surface runoff or the spread of invasive species also should be considered.
- A Jack Pine Barrens native plant community (classification version 1.5) was documented in 1980 along the border of sections 10 and 15. That record corroborates other native plant community data from the Minnesota Natural Resources Research Institute's (NRRI) Potential Native Plant Community (NPC) mapping project which indicates rare jack pine woodland communities are present in this area. The boundaries of this native plant community were not delineated. This area has been previously disturbed and was not included in the NHIS review letter as a concern.

State-Listed Species – Special Concern

- The Creek Heelsplitter (*Lasmigona compressa*) has been documented in the Redeye River which flows through properties that are adjacent to the proposed project area. Mussels are particularly vulnerable to deterioration in water quality, especially increased siltation. Implementation of effective erosion prevention and sediment control practices should occur throughout the duration of the project. These include the exclusion of livestock from accessing the river and river banks. If feasible, a buffer of vegetation should remain between the agricultural field and river.
- Booming grounds of the Greater Prairie Chicken (*Tympanuchus cupido*) have been documented in an

adjacent section to the proposed project area. During the mating season, usually from April 1st through May 15th, males gather in areas of short vegetation where they defend small territories with booming sounds. After the booming season, the birds disperse and nest in areas of dense, undisturbed cover. Booming grounds may move slightly from year to year.

c. Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to known threatened and endangered species.

Run-off, drift and volatilization of pesticides may present a potential threat to plant and pollinator species diversity throughout the remaining jack pine woodland native plant communities, and increases the potential for impaired water status in the nearby Redeye River. Expansion of row crops and fencing would cut off migration corridors and movement, isolating remaining small pockets of jack pine woodlands for some wildlife habitat use, including pollinator hatching and foraging. The use of manure fertilizer increases potential for exacerbation of impaired water status.

Minimal disturbance of the land within the proposed project area would occur during land preparation activities being that most of the proposed project area currently consists of dryland crops and forage for livestock grazing. The portion of the proposed project area (approximately 1 acre) preliminarily identified as having moderate biodiversity significance is currently dry-land farmed and grazed. Therefore, no disturbance would occur to the land outside of seasonal farming operations and grazing in this area of the proposed project.

In the southeast portion of the proposed project area, where the NHIS observation of a jack pine woodland was documented, land preparation activities would include removing the remaining six acres of timber within the proposed project area, resulting stumps and undergrowth from previous timberland management activities, and any remaining slash windrows and remaining piles. To complete these activities, a chainsaw and backhoe would be utilized to remove the trees and stumps and an industrial disc and rake would be used to remove the roots. Although this area has received past disturbance, these proposed activities (removing timber, stumps, undergrowth, slash, disc and raking) would completely alter and remove the natural characteristics of this rare ecosystem. The proposed area of disturbance is approximately ¾ to 1 mile to the northeast of the Prairie Chicken booming grounds; therefore, no disturbance to the Prairie Chickens during the mating season is anticipated. However, the area wildlife manager would be contacted annually to inquire about any locational changes to the booming grounds. The past and proposed future land clearing practices also increase the likelihood of invasive species introduction and spread.

d. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to fish, wildlife, plant communities, and sensitive ecological resources.

To minimize deterioration of the water quality of the Redeye River, and therefore, minimize impact to the Creek Heelsplitter, the proposer would maintain riparian buffers and grassed filter strips along the Redeye River in accordance with the MAWQCP certification. Due to the flat and gentle slopes of the proposed project area and the occurrence of green cover throughout most of the year for grazing purposes, no erosion or delivery of soil or nutrients from the proposed project area to the river is anticipated and is therefore, considered negligible. In addition, the proposer would continue the practice of cow-calf herd controlled managed access to the river resulting in water quality and streambank protection. Integrated Pest Management is contractually required in the proposer's MAWQP certification:

- At least 2 crops in the rotation or perennial crop
- Follows label
- Accurate pest identification
- Rotates Modes of Action
- Proactive scouting
- Applies pesticides based on UMN

Based on these mitigation measures, negative impacts to the Creek Heelsplitter are not anticipated.

14. Historic Properties:

Describe any historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. Include: 1) historic designations, 2) known artifact areas, and 3) architectural features. Attach letter received from the State Historic Preservation Office (SHPO). Discuss any anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to historic properties.

Based on a review of the proposed project information, the State Historic Preservation Office (SHPO) found no known historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. The SHPO database review is included as Attachment C.

15. Visual:

Describe any scenic views or vistas on or near the project site. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.

There are no designated scenic views or vistas on or near the proposed project site. The proposed project is a typical agricultural operation and visual impacts from the respective farming equipment are not expected to be adverse. Temporary visual impacts would include clearing and material stockpiling (timber slash piles). The change in land cover is a general regional concern among some residents of the Pineland Sands area. The slash pile disposal would generate smoke; however, slash pile burning is temporary and typical in this agricultural/commercial silviculture part of the state. As such, any environmental effects associated with slash pile burning would be limited and temporary in nature.

16. Air:

a. Stationary source emissions - Describe the type, sources, quantities and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants, and any greenhouse gases. Discuss effects to air quality including any sensitive receptors, human health or applicable regulatory criteria. Include a discussion of any methods used assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.

   There are no stationary sources of air emissions on-site and/or proposed as part of the proposed project.

b. Vehicle emissions. Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g. traffic operational

improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.

The proposed project would have site traffic typical of an agricultural operation. Vehicle activity would increase during the spring (planting) and fall (harvest) seasons. Minor impacts to air quality are anticipated to occur only during the planting and harvest seasons and are not likely to produce long term impacts. Equipment used would include field tractors, semitrailers, crop harvest trucks, agrichemical delivery and application vehicles and equipment, and personal farm vehicles. Air emission calculations are not estimated for the proposed project since the traffic generation is anticipated to be minimal and intermittent.

c. Dust and odors. Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under item 16a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.

Potential air impacts

The proposed project includes irrigated cropland operating under a four- to five-year crop rotation. Project operation may create temporary fugitive dust during planting, harvest and tilling activities. Smoke would be generated periodically for a couple months during the timber and stump removal activities as the associated slash piles are burned. Long term effects are not anticipated from these activities.

While exact chemical usage at the proposed project location is uncertain based upon crop rotation, pests and field requirements, it is likely that pesticides would be applied based on the anticipated crops. A list of all pesticides available for use for the proposed project are listed in Attachment D, arranged by the proposer's planned crops (corn, rye grass and clover; oats, alfalfa and fescue; potatoes). Some pesticides can be lost to volatilization in air. Additionally, some pesticides may pose greater risks than others via off-site air movement to sensitive ecological and human receptors, such as daycares, schools, residences, pollinators and other sensitive plant and animal species. Abraded dust from neonicotinoid treated seed can be harmful to pollinators. Air application has greater potential for particle drift than ground application. Particle drift can occur for both volatile and non-volatile chemicals. Risk with the use of all pesticides depends upon several factors, including type of pesticide, toxicity, physical and chemical properties, use pattern, and time of application.

Measures to mitigate air effects

The USEPA evaluates risk with the use of all pesticides prior to approving chemicals for use and label requirements are intended to mitigate these risks. For example, labels often specify spray equipment, nozzle and droplet size requirements and include wind speed application restrictions to reduce drift potential.

The State of California requires a worse-case scenario, one-quarter mile buffer for soil fumigants around schools and other difficult to evacuate sites; beyond one-quarter mile is considered to be a negligible risk to sensitive populations. (CDPR, January 2018). There are no schools, daycares or residences within one-quarter mile of the proposed project site, so human health risk from off-site air movement of the pesticides, even those that are most likely to volatize (e.g., soil fumigants) is considered negligible/low.

Proposer should follow seed treatment BMPs. Additionally, the MAWQCP certification is mandating the proposer use a standard level of Integrated Pest Management (that includes following pesticide BMPs).

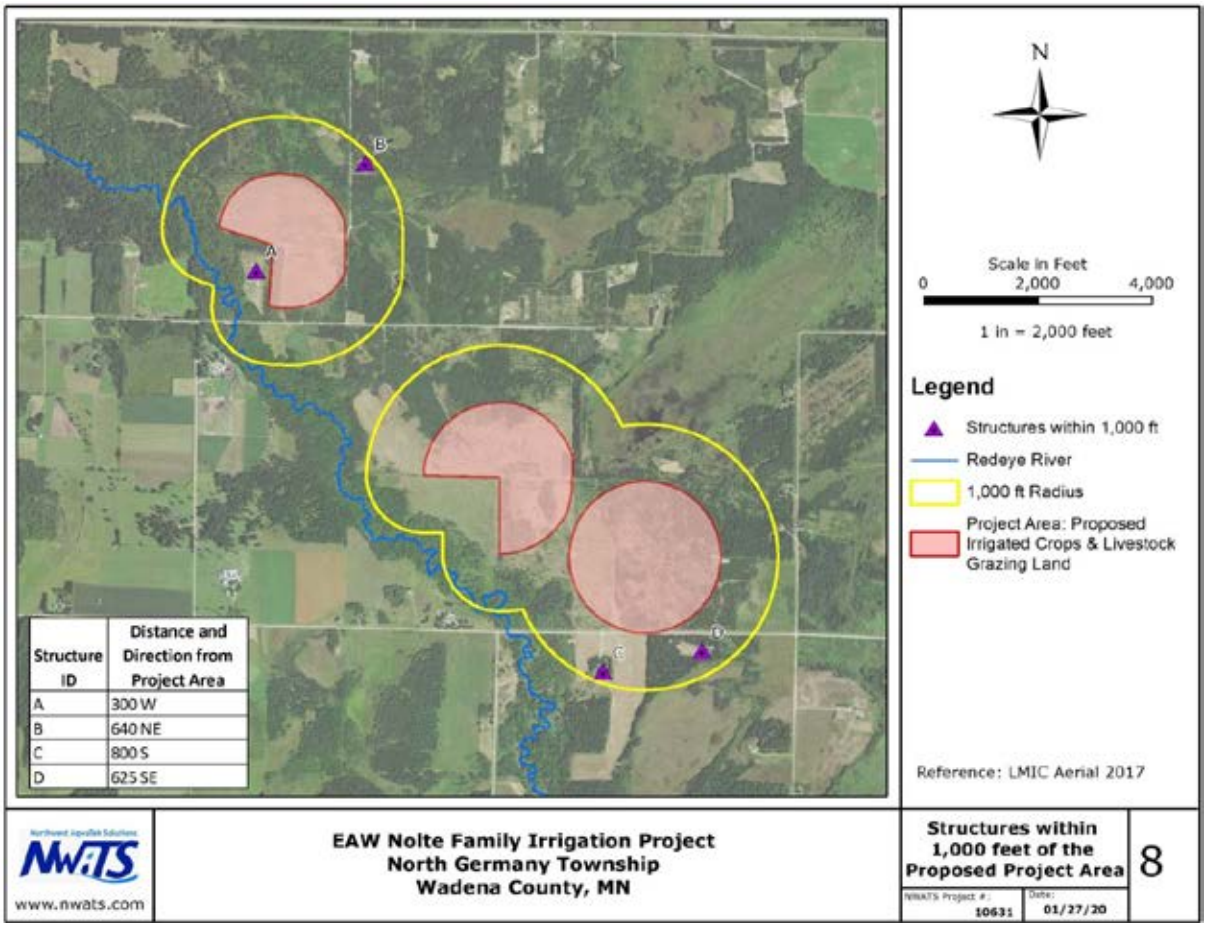
17. Noise:

Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including 1) existing noise levels/sources in the area, 2) nearby sensitive receptors, 3) conformance to state noise standards, and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.

The land surrounding the proposed project area is rural. The northwest portion of the proposed project area ranges from 400 to 1,100 feet from the nearest nearby rural homes. Figure 8 indicates locations of nearby structures, which are a mix of residential and nonresidential buildings.

- Structure ID A appears to include about 10 residential structures
- Structure ID B appears to include 3 residential structures and 1 non-residential.
- Structure ID C appears to include 1 residential structure and 2 non-residential.
- Structure ID D appears to include 1 residential structure and 5 non-residential

Figure 8 – Nearby Structures



Existing ambient noise sources are primarily generated from typical farming and livestock grazing operations as well as vehicle traffic on county and township roads.

The proposed project may create periodic and temporary increase in noise during timber and stump removal and harvest activities. State of Minnesota Rules Chapter 7030 describes the noise standards for limiting levels of sound established for public health and welfare. The proposed project area is classified as a Noise Area Classification (NAC) 3 receptor. However, noise generated under the proposed project (mostly from the initial clearing) would have to meet NAC 1 standards at the nearest nearby rural homes. For example, any noise generated by sawing/disking would have to meet NAC 1 standards at the nearby residences, even if the source of the noise is a NAC 3 receptor.

The proposer anticipates that farming and land preparation would be limited to daytime hours. Noise levels for timber and stump removal would be limited to early spring of 2020. The limited duration of timber and stump removal activities are not expected to exceed State of Minnesota noise standards. MPCA Noise Program recommends whoever is doing the clearing appropriately muffles the saws, backhoes, and any other applicable hand or heavy equipment. Further recommendations include land-clearing activities in the northwestern portion of the project area – nearest the nearby residences – should be limited to daytime hours (7:00 A.M. to 10:00 P.M.).

18. Transportation:

a. Describe traffic-related aspects of project construction and operation. Include: 1) existing and proposed additional parking spaces, 2) estimated total average daily traffic generated, 3) estimated maximum peak hour traffic generated and time of occurrence, 4) indicate source of trip generation rates used in the estimates, and 5) availability of transit and/or other alternative transportation modes.

The proposed project is located in a rural setting with no constructed parking spaces. Site traffic would be typical of agricultural and livestock grazing operations. The proposer expects there would be periodic and short-term increases in traffic during the growing season, harvest season and the gathering and movement of livestock. Local traffic would increase temporarily during removal of timber and stumps due to the movement of work crews and construction materials.

There are no alternative modes of transportation for agricultural and livestock grazing operations.

b. Discuss the effect on traffic congestion on affected roads and describe any traffic improvements necessary. The analysis must discuss the project's impact on the regional transportation system. *If the peak hour traffic generated exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW.* Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 *(available at the Minnesota Department of Transportation Access Management webpage)* or a similar local guidance (MNDOT, 2020).

The traffic generated by the proposed project would not exceed 250 vehicles, or 2,500 trips per day within the proposed project area or surrounding area. During the planting and harvest season, the periods in which most of the traffic would occur, approximately 5 vehicles would take 5 to 10 vehicle trips per day to get to and from the proposed project area and transport crop and/or livestock to storage or market. The vehicle traffic is not expected to have an adverse effect to local traffic; therefore, a traffic study is not needed.

c. Identify measures that will be taken to minimize or mitigate project related transportation effects.

The project proposes designated access points for vehicle traffic into the proposed project area. The designated access points are located off county and township roads. Driver caution would be used when entering and exiting the area. The drivers of the vehicles would be responsible for abiding to all posted speed limits, traffic signs and load restrictions.

19. Cumulative potential effects:

Recent history of environmental review and the Pineland Sands Area

The conversion of forest or naturally vegetated land to irrigated agriculture in the Pineland Sands Area has been an ongoing issue for over eight years. During this time period there has been one Environmental Assessment Worksheet (EAW) prepared by Cass County, two discretionary EAW Orders by Minnesota Department of Natural Resource (DNR), both of which were vacated prior to completion of the process, and three Citizen Petitions for an EAW all on the topic of land conversion to irrigated agriculture. The Nolte Family Farm EAW is only the second EAW to be prepared on this over this time period and is the result of the third Citizen Petition requiring an EAW, whereas the previous two petitions did not. The purpose of providing this history is to share information of how this topic has developed and efforts the DNR has taken

to address the issue. An understanding of the history can provide context for recent decisions and help decision makers think critically about land conversions to irrigated agriculture in the region. Additional information and discussion regarding these issues can be found in Attachment E: Pineland Sands Regional Environmental Topics. Information included in EAW Item 19 below is focused only on the proposed project that is the subject of this EAW, and is not inclusive of broader regional environmental issues.

Assessment of cumulative potential effects within an EAW is focused on the specific proposed project that is the subject of the EAW. One of the main purposes of an EAW is to determine, "if the project" has the potential for significant environmental effects. In order to provide a meaningful assessment of a project's contribution to cumulative potential effects, the geographic and temporal scope of the assessment needs to be within the environmentally relevant area where project related impacts would occur. The environmentally relevant area for the Nolte Family Farm project is variable depending on the specific environmental effect, but in all cases the geographic area is smaller than the Pinelands Sands Area.

The 2013 Minnesota Environmental Quality Board guidance document, *EAW Guidelines*, directs RGUs preparing EAWs to consider the possibility that environmental effects associated with the proposed project may result in accumulating impacts when added to the existing landscape of environmental effects. *EAW Guidelines* includes the following guidance:

> *"The EAW form requires an analysis of impacts that are not only those of the project under review but also other projects that could contribute similar effects, resulting in a "cumulative potential effect,"... The definition of CPE is found at Minn. Rules 4410.0200, Subp. 11a, and reads, in part, "Cumulative potential effects" means the effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects."*

a. Describe the geographic scales and timeframes of the project related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.

Identification of project related Environmental Effects

The environmental effects that have the potential to contribute to cumulative potential effects have been identified as the following:

i. Contamination of groundwater, specifically due to nitrate and pesticides;
ii. Contamination of surface water, specifically due to nitrate and pesticides;
iii. Visual Impacts due to chemical controls and deforestation, including
    - Habitat Loss due to chemical controls and deforestation; and
    - Impacts to Ecological features, such as pollinators, sensitive and rare resources, and native plant communities, and impacts from invasive species, due to use of chemical controls and deforestation.

Identification of Geographic Area and Timeframe for Environmental Effects

Initially, the Pineland Sands Area (Helgeson, 1977) was used as an area to approximate a homogenous area that would potentially serve as scope of the geographic area for analysis. As discussed in Attachment E: Pineland Sands Regional Environmental Topics, the Pineland Sands Area was initially

defined in a 2015 discretionary EAW ordered by DNR to define a boundary for assessment of the R.D. Offutt company's initial project proposal of approximately 50 different new wells and agricultural irrigation fields. The Pineland Sands Area is a large geographic area, which encompasses the Straight River Groundwater Management Area. There is variability within the Pineland Sands aquifer, which means that it might be an appropriate geographic scope for analyzing the cumulative potential of some environmental effects, but is not an appropriate boundary for the proposed project-specific analysis of cumulative environmental effects.

The above listed environmental effects that are associated with the proposed project are those that may have the possibility of combining with background conditions or other projects' environmental effects and have the potential to result in a cumulative effect. To conduct the analysis on these listed environmental effects, each of the effects was analyzed for the likely geographic scope and timeline in which the environmental effect would occur. The environmental effects that resulted in the same geographic area and scope have been grouped together for ease of understanding.

i. Groundwater Contamination, specifically due to nitrate and pesticides

To develop the geographic area and timeline associated with groundwater contamination, data and previous investigation information were evaluated to ascertain the most appropriate boundary for any potential environmental effects to groundwater. Water is the expected medium for nitrate and pesticide transport.

Surface water and shallow groundwater are closely connected in the Pineland Sands Area, so although the established boundaries are different, the processes and scopes for developing the boundaries are similar.

Groundwater in the Pineland Sands Area consist of both confined and unconfined (water table) aquifers with varying connectivity. The confined aquifers generally have at least one layer of low conductivity material (such as clay), at least 10 feet thick, between the aquifer and the land surface. This confining layer reduces the ability of contaminants to reach these aquifers. The water table aquifer generally only has sand or gravel between the land surface and the top of the aquifer. It is also the closest aquifer to the land surface. Therefore, the water table aquifer is the most susceptible aquifer to groundwater contamination. The water table aquifer's boundaries were used as the best representative for determining the impacts of nitrate and pesticide application from the Nolte farm on groundwater (Helgeson, 1977).

The water table is also highly connected to the surface water features in this area. Analyses by Stark et al (1994), Helgesen (1977), LaBaugh et al (1981), Siegel (1980) and Walker et al (2009), have shown that shallow groundwater and surface water are interconnected in this area and both are heavily dependent on recharge from precipitation. Therefore, watershed maps (i.e., drainage areas for surface water features) were overlain on the Pineland Sands water table aquifer. The Nolte permits are in the Redeye Watershed, so that watershed was used to further refine the geographic scope boundary for the proposed project.

Mapping of the pollution sensitivity of near-surface materials (DNR, 2016, Methods to estimate near-surface pollution sensitivity PDF: Minnesota Department of Natural Resources, County Geologic Atlas program, GW-03) was used to further refine the scoping boundary for the project. The pollution sensitivity map was overlain on the Redeye Watershed boundary and the

Pineland Sands (Helgeson) map. The areas within the watershed boundary with high sensitivity to pollution were used as the next step in developing the scoping boundary. Although both pesticides and nitrate can leach into groundwater, nitrate is more mobile in water than most pesticides and is used in higher amounts. Therefore it is expected to be found more frequently and in higher concentration in runoff and leachate.

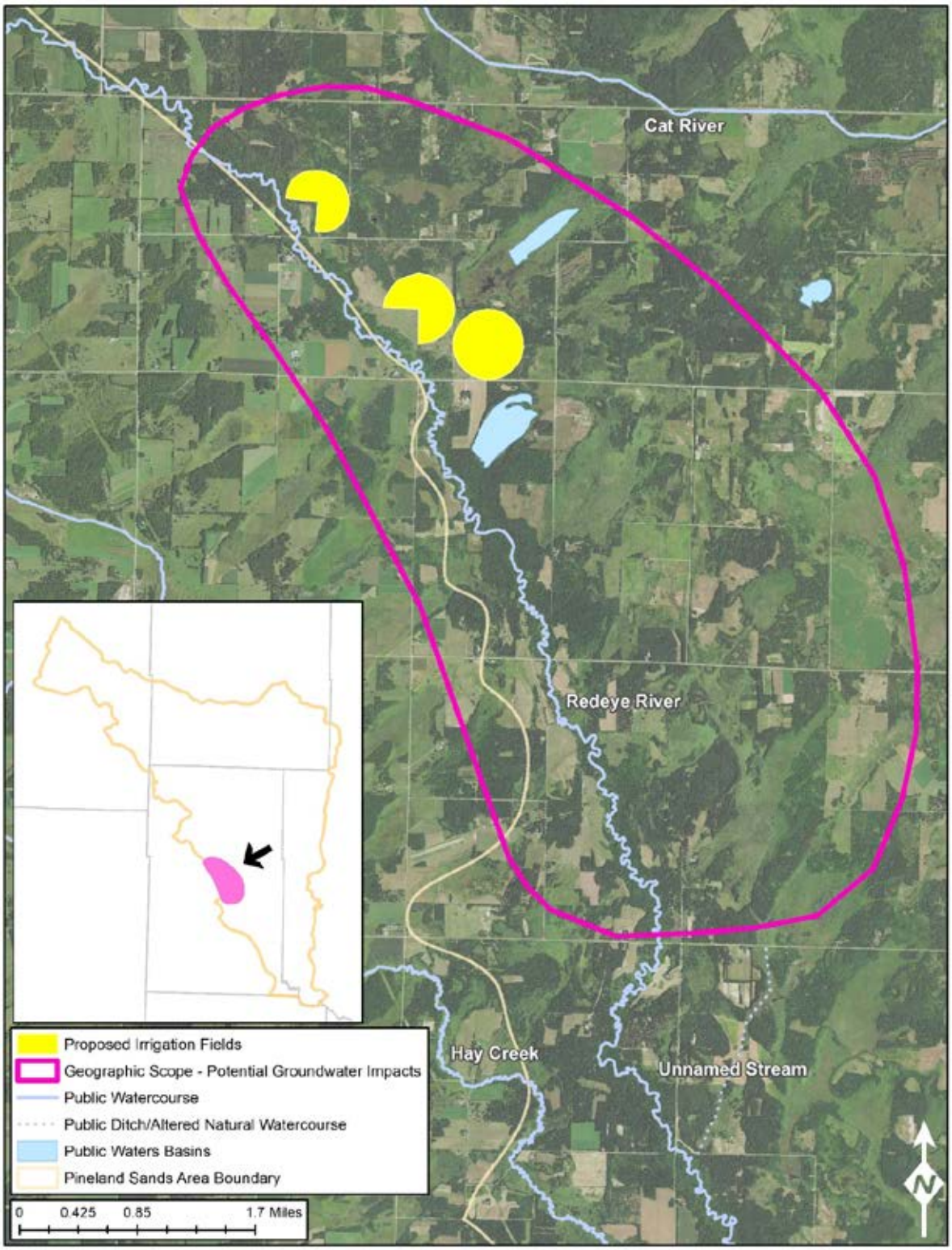
The U.S. Geological Survey (USGS) has published work, *Presence, Distribution, and Potential Sources of Nitrate and Selected Pesticides in the Surficial Aquifer along the Straight River in North-Central Minnesota, 1992-930* (Ruhl, 1995) evaluating the movement of nitrate in the water table aquifer of the Straight River area, (part of the previously defined Pineland Sands Area). That report noted that increased nitrate-nitrogen concentrations from fertilizer was found near cultivated croplands. Decreased nitrate-nitrogen was found in forested areas. Detections of the pesticide atrazine were also found more frequently in cultivated croplands. The report found that nitrate in groundwater generally followed the direction of groundwater flow. Sources of fertilizer nitrate were identified as cultivated croplands.

Figure 7 from the 1995 USGS report is a cross section through the study area from northwest in a forested area, through cultivated cropland ending to the southeast at the Straight River. The cross section trace is shown in Figure 3 of that report. The cross section shows there is generally low nitrate-nitrogen in the forested area to the northwest and higher concentrations to the southwest. This shows that nitrate-nitrogen in the surficial aquifer follows groundwater flow, with down gradient groundwater from cultivated cropland generally having higher nitrate concentrations than up gradient. The report notes that there is an increased concentration of nitrate in the middle part of the aquifer in the middle of the cross section, probably resulting from downward movement of nitrate from the cultivated croplands there. The increased concentration of nitrate near the bottom of the aquifer in the downgradient section (towards the Straight River) is attributed to mixing of the nitrate enriched recharge from the middle of the cross section with the water near the bottom of the aquifer. It is also clear from this report that groundwater discharges to the Straight River.

The scoping boundary was drawn to include a buffered area around the proposed irrigation fields, the watershed boundary, and topographic boundaries to the east and west. This buffered area is intended to provide a conservative estimate for the extent of environmental effects to groundwater sources, including shallow groundwater sources. This scoping boundary was then generalized to these features and extended downstream to the physical infrastructure of County Highway 8 to capture possible groundwater discharge to, and transport in, the Redeye River.

Based on this information, the area outlined in Figure 9 below, as indicated by the pink boundary, was determined to be the geographic scope for cumulative potential effects to groundwater for the proposed project. The timeline of impacts for the proposed project is ongoing as the proposer has indicated an intent to operate as irrigated agriculture for an undefined, unlimited period of time into the future.

Figure 9. Cumulative Potential Effects to Groundwater - Geographic Scope



ii. Surface Water Contamination, specifically due to nitrate and pesticides

Watershed boundaries around the project area were used as the initial data source to determine the influence and contribution to cumulative potential effects for surface water contamination from the proposed project. Based on the groundwater geographic area that had been established for this cumulative potential effects analysis, the local sub-watershed level (HUC 12) within the groundwater geographic area was included, as well as the local sub-watersheds (HUC 12) abutting the downstream Redeye to the confluence with the Crow Wing. This became the outline for the geographic scope for surface water contamination.

To determine the influence of groundwater on establishing the geographic scope, previous research conducted in the broader area was reviewed. Aquifer tests run in the Straight River Groundwater Management area (GWMA) along with well logs were reviewed to get a better idea of the aquifers of the area. Additionally, stream flow monitoring to identify groundwater and surface water interaction was reviewed, area well logs, observation well data and synoptic data were reviewed to further identify aquifer boundaries. While this data was collected from the Straight River GWMA, similarities between the Straight River GWMA Pineland Sands Area and the proposed project area indicate that the conclusions from the Straight River GWMA analysis would likely apply at the proposed project site.

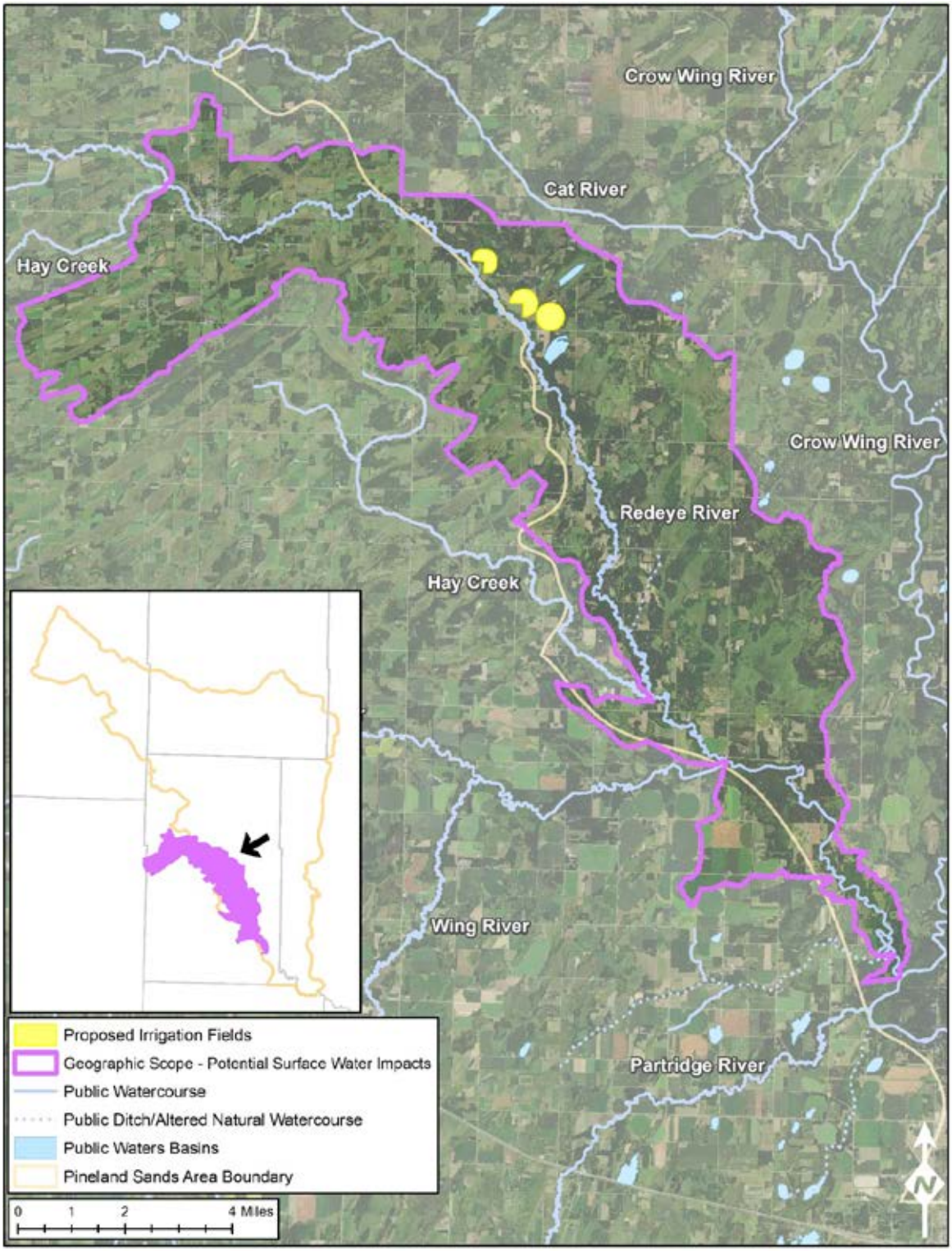
Helgeson (1977) evaluated the Pineland Sands water table aquifer and produced a contour map of the water table. He showed that the general groundwater flow direction for the Pineland Sands area is to the southeast. DNR re-evaluated this map by evaluating water table elevations in wells from the Minnesota Well Index (MDH, MGS, 2019). The USGS Hydrologic Atlas for this area also clearly shows flow towards rivers and streams, which function as the primary discharge features for the water table system. The resulting refined contour map of the Pineland Sands Area near the proposed project applications show a similar water table flow direction.

Monitoring by DNR in the broader Pineland Sands Area has shown that confined and unconfined aquifers tend to be interconnected. The interconnectivity can vary across the area. Based on the geology and depositional environment of the Nolte site, it is likely that the confined aquifers are at least somewhat connected to the unconfined aquifer. The amount of interconnectivity will be evaluated with an aquifer test in the near future.

For most pesticides and their breakdown products, the potential for loss to surface water or leaching into groundwater depends mainly on the half-life, water solubility, and adsorption coefficient. In general, pesticides with a long half-life have a higher potential of reaching surface or groundwater because they are exposed to hydrologic forces for a longer period of time. Adsorption coefficient and solubility in water are the main determinants for pesticide mobility. Pesticides which have low solubility or have high adsorption coefficients tend to remain near the soil surface and are more susceptible to surface loss through runoff while water soluble pesticides with low adsorption coefficients have high potential to leach to groundwater.

Based on this information, the area outlined in Figure C2 below, as indicated by the purple boundary, was determined to be the surface water contamination geographic scope for the proposed project. The timeline of impacts for the proposed project is ongoing as the proposer has indicated an intent to operate as irrigated agriculture for an undefined, unlimited period of time into the future.

Figure 10. Cumulative Potential Effects to Surface Water - Geographic Scope



The Pineland Sands Aquifer Area is not an ecologically based geographic scope for visual impacts, habitat impacts, and associated impacts to sensitive and rare resources such as pollinators, sensitive and rare resources, and native plant communities, including impacts from invasive species due to use of chemical controls and deforestation. For these environmental effects, the DNR's Ecological Classification System (ECS) was utilized to establish a geographic area for assessment.

In general, the DNR's ECS framework is used to identify, describe, and map progressively smaller areas of the landscape containing uniform ecological characteristics. This includes both biotic and abiotic factors like climate, geology, topography, soil, hydrology and vegetation. The Land Type Association (LTA) level of this classification is the finest scale DNR has mapped for the entirety of the state, and is primarily defined by glacial landforms, topography, wetland patterns and lake/stream distributions, soil parent material, and pre-European settlement vegetation.

Within the Pineland Sands Aquifer area, there are primarily four LTAs that share similar ecological characteristics (glacial deposits/landforms, sandy soil profiles, and uncommon to rare native plant communities). While the native plant community mapping is incomplete across these LTAs, the University of Minnesota Natural Resources Research Institute's (NRRI) Potential Native Plant Community (NPC) mapping project provides an informed prediction of the native plant communities across this area. This includes the rare jack pine woodland native plant communities, classified as Central Dry Pine Woodland (FDc23)- ranked state and globally imperiled, and Central Rich Dry Pine Woodland (FDc24)- ranked state imperiled to vulnerable. The conservation status ranks (i.e., imperiled) of these woodland communities was initially prompted by intensive commercial forest management practices, but extensive conversion from natural woodlands to agricultural land uses has only elevated the conservation concerns for these ecological communities.

Below are the formal descriptions of the LTAs included in the Pineland Sands Area for the geographic scope of these potential environmental effects:

- Nc11. Park Rapids Sand Plain - 377,024 acres
  Concept: A landscape dominated by level to rolling outwash plains formed by the Wadena Lobe glacier. Channels formed by post-glacial melt water are common. Uplands occupy 82%, wetlands occupy 11%, and lakes occupy 7% of the LTA (MN DNR, 1998). The majority of the mineral soils have sandy loam (52%) or sand (40%) textures. Fifty five percent of the upland soils formed under a combination of prairie and forest vegetation while 43% formed under forest vegetation. The majority of the upland presettlement vegetation was dry pine forest (53%) and lowland (boreal) hardwood conifer (22%) (Shadis, 1999 and Marschner, 1974). The majority of lowland presettlement vegetation was conifer bog and swamp (Marschner, 1974).

- Nc10. Nimrod Drumlin Plain - 140,699 acres
  Concept: A landscape dominated by level Rainy and Wadena Lobe outwash plains. Long narrow ridges (drumlins) of till material are very common. Uplands occupy 64%, wetlands occupy 36% and lakes occupy <1% of the LTA (MN DNR, 1998). The majority of the mineral soils have sand over sandy loam textures and sandy loam over sand or gravel textures. They formed under forest vegetation. Hardpans are common in the subsoil. Uplands in the western third of the LTA have sandy soils with features from

forming under prairie and forest vegetation. Long narrow peatlands are very common. The majority of the upland presettlement vegetation was dry pine with minor amounts of lowland (boreal) hardwood conifer (Shadis, 1999 and Marschner, 1974). The lowland presettlement vegetation was conifer bog and swamp (26%) and wet prairie (25%) (Marschner, 1974).

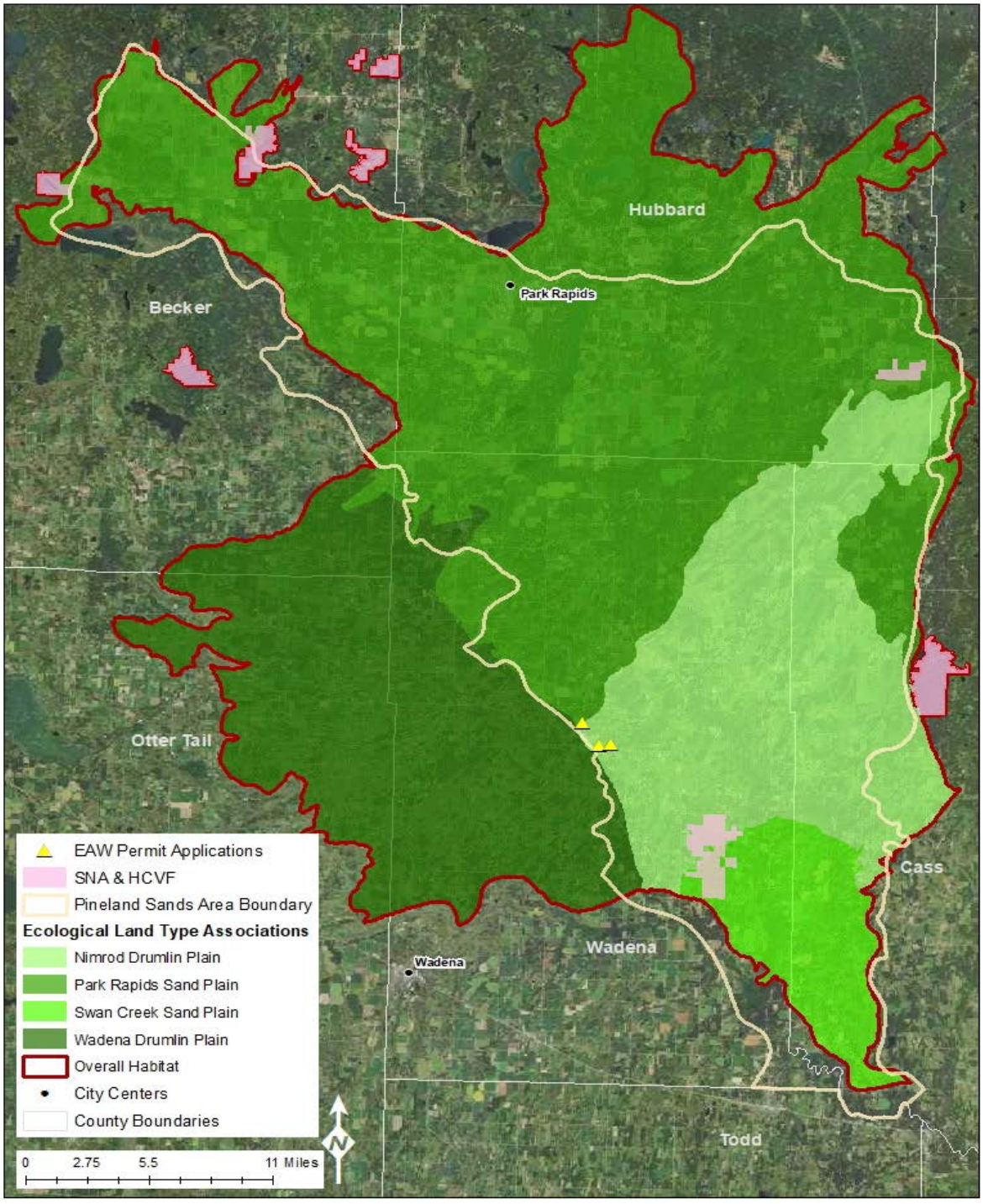
- Nc09. Wadena Drumlin Plain - 162,505 acres
  Concept: A rolling drumlin field formed by the Wadena Lobe glacier. Uplands occupy 79%, wetlands occupy 21% and lakes occupy <1% of the LTA (MN DNR, 1998). Soil parent material is sandy loam till with a hardpan. Soils formed under forest vegetation.

- Nc08. Swan Creek Sand Plain - 39,924 acres
  Concept: A landscape dominated by level Rainy and Wadena Lobe outwash plains. Soil parent material is sand. The sand has been reworked by wind; dune features are common. Uplands occupy 64%, wetlands occupy 35% and lakes occupy 1% of the LTA (MN DNR, 1998).

The Park Rapids Sand Plain LTA has the strongest connection to the cumulative effects related to habitat loss and impacts to ecological features, and contains the greatest amount of these jack pine woodland communities. Conversely, the Wadena Drumlin Plain LTA is probably the loosest fit to these topics, as it contains fewer jack pine woodlands and the fire-dependent native plant communities within this area tend to classify out to southern floristic region communities (i.e. FDs37, dry-mesic oak woodlands). To both reinforce the ecological values present within this geographic area and account for nearby sensitive landscape features, DNR High Conservation Value Forest (HCVF) sites and Scientific and Natural Areas (SNA) within and adjacent to these four LTAs were included in this geographic scope as well.

Based on this information, the area as shown in Figure 11 was determined to be the geographic scope for the cumulative potential effects to habitat loss and other ecological resources for the proposed project and includes the four Land Type Associations listed above. The timeline of impacts for the proposed project is ongoing as the proposer has indicated an intent to operate as irrigated agriculture for an undefined, unlimited period of time into the future.

Figure 11. Cumulative Potential Effects to Visual Resources, Habitat and Ecological Resources - Geographic Scope



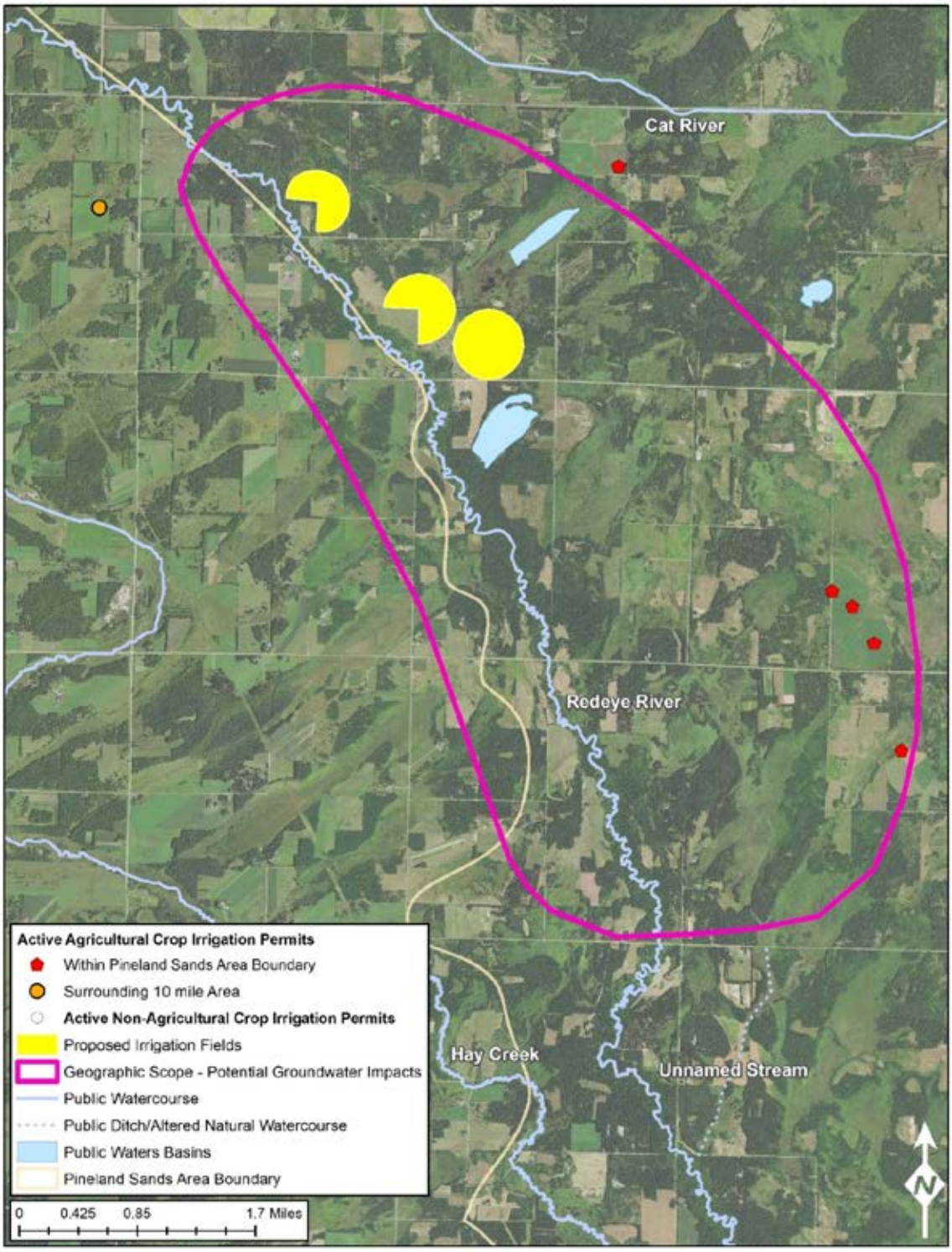
Past and Present Conditions

i. Groundwater

To define the existing background of environmental conditions to which the proposed project would potentially be contributing, the DNR reviewed existing use trends in water appropriations. Existing water appropriation permits for active agricultural crop irrigation permits were identified within the geographic scope identified above. Four active permits of Agricultural Crop Irrigation occur within the groundwater contamination geographic scope identified, approximately 3 miles from the proposed project location. These four permits have been authorized within the past ten years. No other existing permitted appropriators for Agricultural Crop Irrigation have been identified within the proposed project's geographic scope. There are two additional permitted appropriations nearby outside of the geographic scope of environmental effects. However, these are unlikely to have effects that interact with the proposed project, based on the conservative assumptions made when defining the geographic area for the proposed project's potential environmental effects on groundwater. These existing permits are depicted in Figure 12 below.

Regional information regarding the type and extent of nitrate contamination in groundwater and the existence of pesticides within groundwater sources are discussed in Attachment E.

Figure 12. Cumulative Potential Effects to Groundwater – Background Conditions

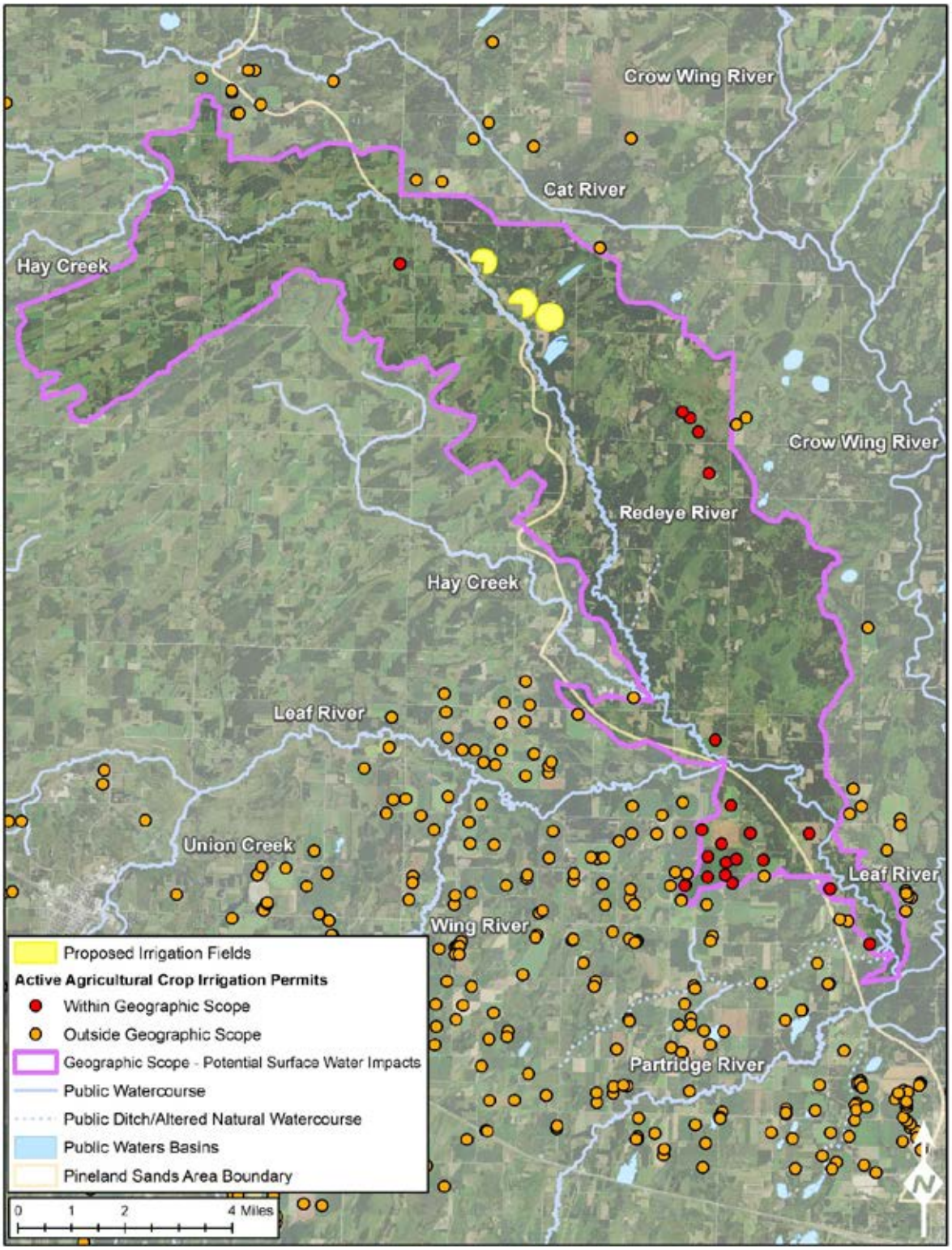


ii. Surface water

Because of the interconnectivity between groundwater and surface water sources, the same data identifying existing permit holders for Agricultural Irrigation that was used to establish background conditions for assessing groundwater environmental effects was also used to define the surface water background conditions. Because this geographic area is larger than the one identified for groundwater, there is a greater number of existing permits within surface water geographic scope than within the groundwater geographic scope discussed above. However, within the geographic scope of potential cumulative effects, the total of existing permits is 21, composed of both long-standing appropriations (greater than 10 years old), and appropriations permitted within the last ten years. None of these other permits are located within a mile of the proposed project, the fields for which are indicated in yellow in Figure 13 below. The majority of permits that occur within this geographic area are in the southern-most section of the defined area, and are among a much greater concentration of water appropriations permits than where the proposed project is located.

Considered within the background conditions for surface water as well are the existing impairments for lakes and streams within the geographic scope. The Redeye River, which runs through the center of the geographic scope identified, is currently impaired for E. coli. E. coli impairments can indicate the presence of sewage or manure in the water, which can make the stream unsafe for swimming. However, the MPCA's 2016 Watershed Restoration and Protection Strategies (WRAPS) Report for the Redeye River/Leaf River system found aquatic life stressors, including dissolved oxygen, turbidity, and measures of fish and macroinvertebrate health to meet water quality standards. There is not currently a state standard for nitrate, but one is in development. Nitrate in the WRAPS Reports of the Redeye River/Leaf River system, and its downstream receiving watershed the Crow Wing River currently have low levels of nitrates but have shown signs of systematic, but modest increases.

Figure 13. Cumulative Potential Effects to Surface Water – Background Conditions

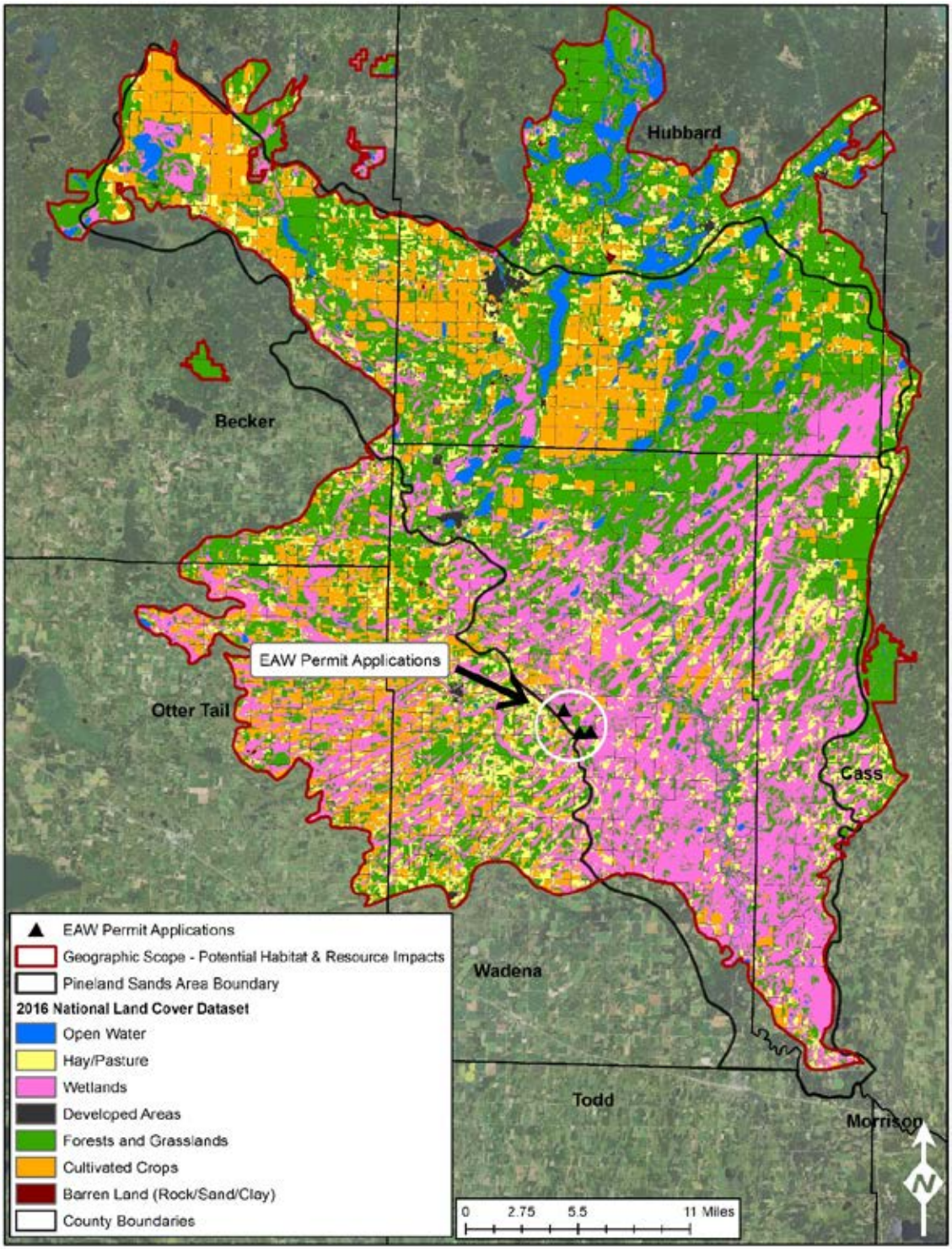


iii. Visual Impacts, Habitat Loss and Impacts to Ecological features

Existing conditions for the area within the geographic scope, as described, were originally formed under forested conditions. Existing soils are typically sandy or sandy loams with hardpans located within the subsoils. Vegetative communities under presettlement conditions in upland were dry pine forest and lowland (boreal) hardwood conifer. In lowland, it was conifer bog and swamp. Current assessment of land use within the area is now composed of agricultural and forested uses, areas of wetlands, as well as a small portion of residential and community development.

Within the geographic scope of the proposed project, there are a number of High Conservation Value Forests (HCVF) and Scientific and Natural Areas (SNA) areas that illustrate the proximity to some of the sensitive ecological receptors in the geographic area. HCVFs are defined as "areas of outstanding biological or cultural significance," and are required to be managed to maintain or enhance conservation values. SNAs are areas that preserve and maintain Minnesota's natural heritage, including ecological and geological diversity for present and future generations for scientific study and public understanding.

Figure 14. Cumulative Potential Effects to Visual Resources, Habitat and Ecological Resources – Background Conditions



b. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.

Reasonably Foreseeable Projects

Once background conditions are established for project related potential environmental effects, reasonably foreseeable future projects must be identified to complete the project-specific cumulative potential effects analysis.

What constitutes a reasonably foreseeable project is explained in the definition of Cumulative Potential Effects, located in Minnesota Rules 4410.0200 Subpart 11.a. It states, in part, that future projects must be included in the cumulative potential effects analysis if they are, "…*actually planned or for which a basis of expectation has been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects."*

The definition of Cumulative Potential Effects further directs RGUs to determine whether a future project is reasonably foreseeable using the following method,

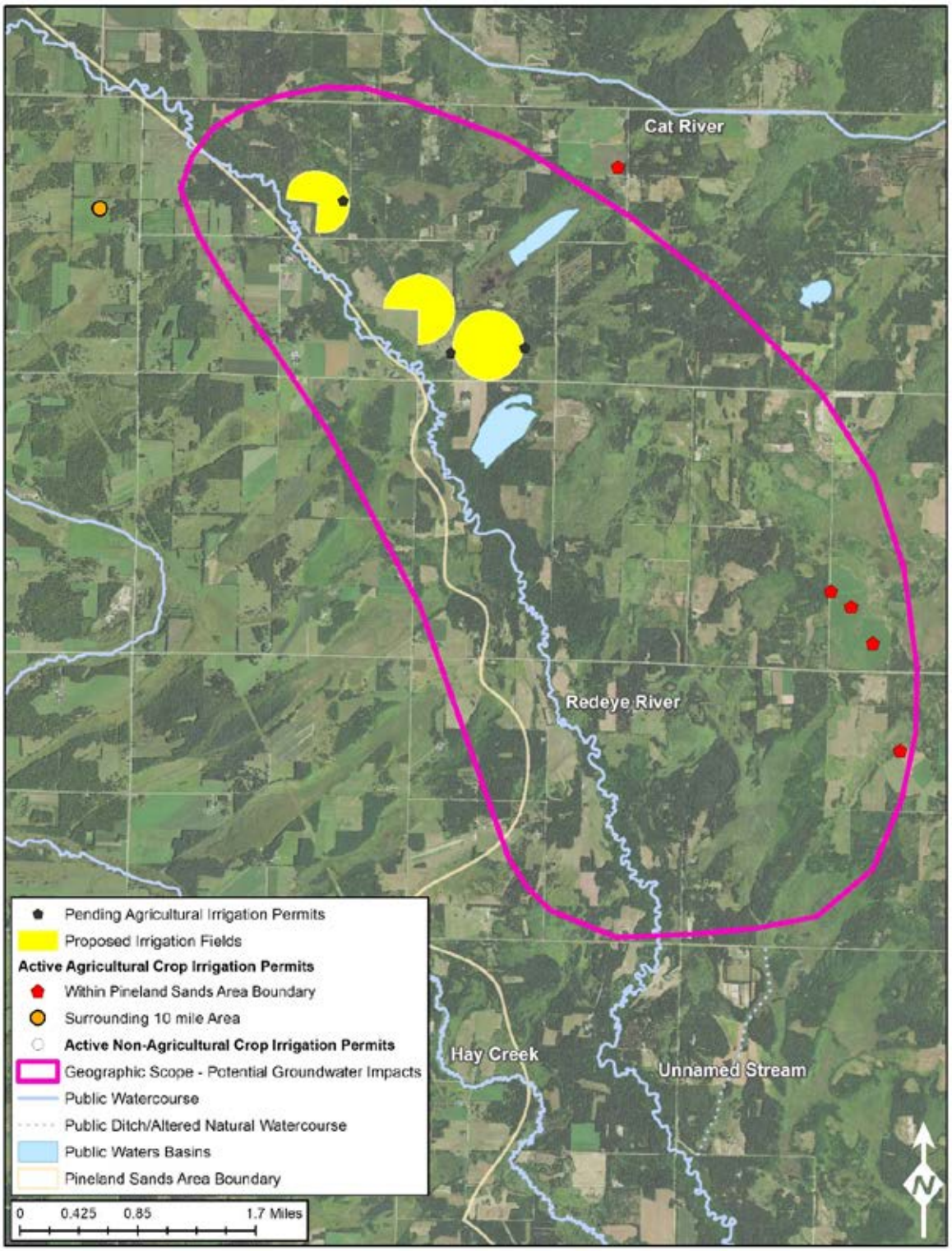
> *"In determining if a basis of expectation has been laid for a project, an RGU must determine whether a project is reasonably likely to occur and, if so, whether sufficiently detailed information is available about the project to contribute to the understanding of cumulative potential effects. In making these determinations, the RGU must consider: whether any applications for permits have been filed with any units of government; whether detailed plans and specifications have been prepared for the project; whether future development is indicated by adopted comprehensive plans or zoning or other ordinances; whether future development is indicated by historic or forecasted trends; and any other factors determined to be relevant by the RGU."*

Below is a description of how DNR as RGU for this project identified and included future projects determined to be reasonably foreseeable.

i. Groundwater

A water use permit is required for water users in Minnesota withdrawing greater than 1 million gallons per day or 10 million gallons per year from a surface water or groundwater. Water users must apply for a permit through the Minnesota Permitting and Reporting Service before use is allowed. A search was conducted for any currently pending permits for Agricultural Crop Irrigation within the geographic scope of potential effects to groundwater for the proposed project. Only the pending permits associated with the proposed project were identified as a result of this search. Figure 15 depicts in black the pending permits that are located within the geographic scope identified, which are limited to the proposed permit applications associated with this project. No other permits were identified within the geographic scope of potential cumulative environmental effects for groundwater.

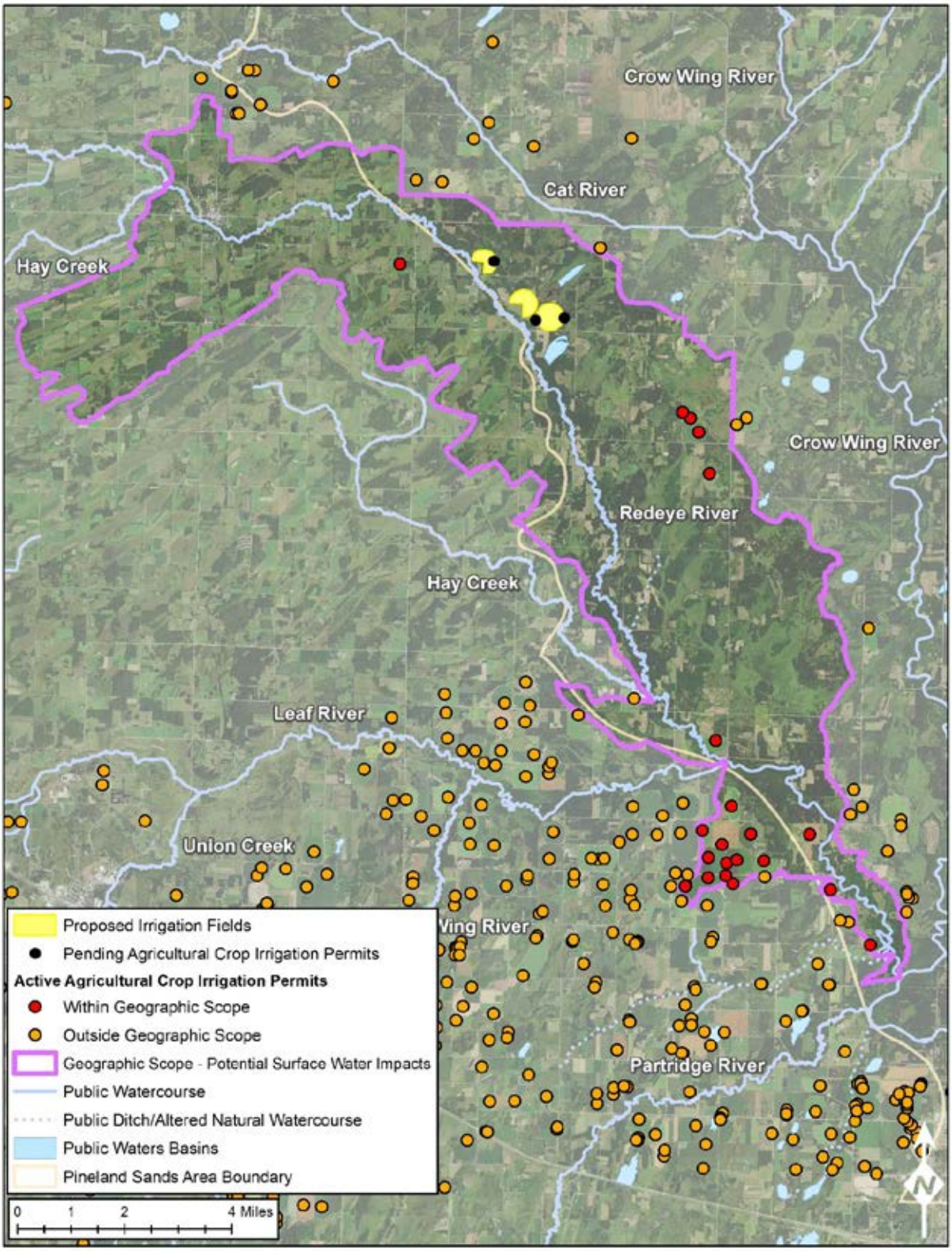
Figure 15. Cumulative Potential Effects to Groundwater – Reasonably Foreseeable Projects



ii. Surface water

To determine reasonably foreseeable projects that may have with environmental effects on surface water, a review of pending permit applications was conducted for the geographic scope for surface water impacts. These pending permit applications are depicted in black on Figure 16 below, and are limited, similarly to the groundwater area, to the permit applications associated with the proposed project. No other reasonably foreseeable projects were identified within the geographic scope of potential cumulative environmental effects to surface waters associated with the proposed project.

Figure 16. Cumulative Potential Effects to Surface Water – Reasonably Foreseeably Projects

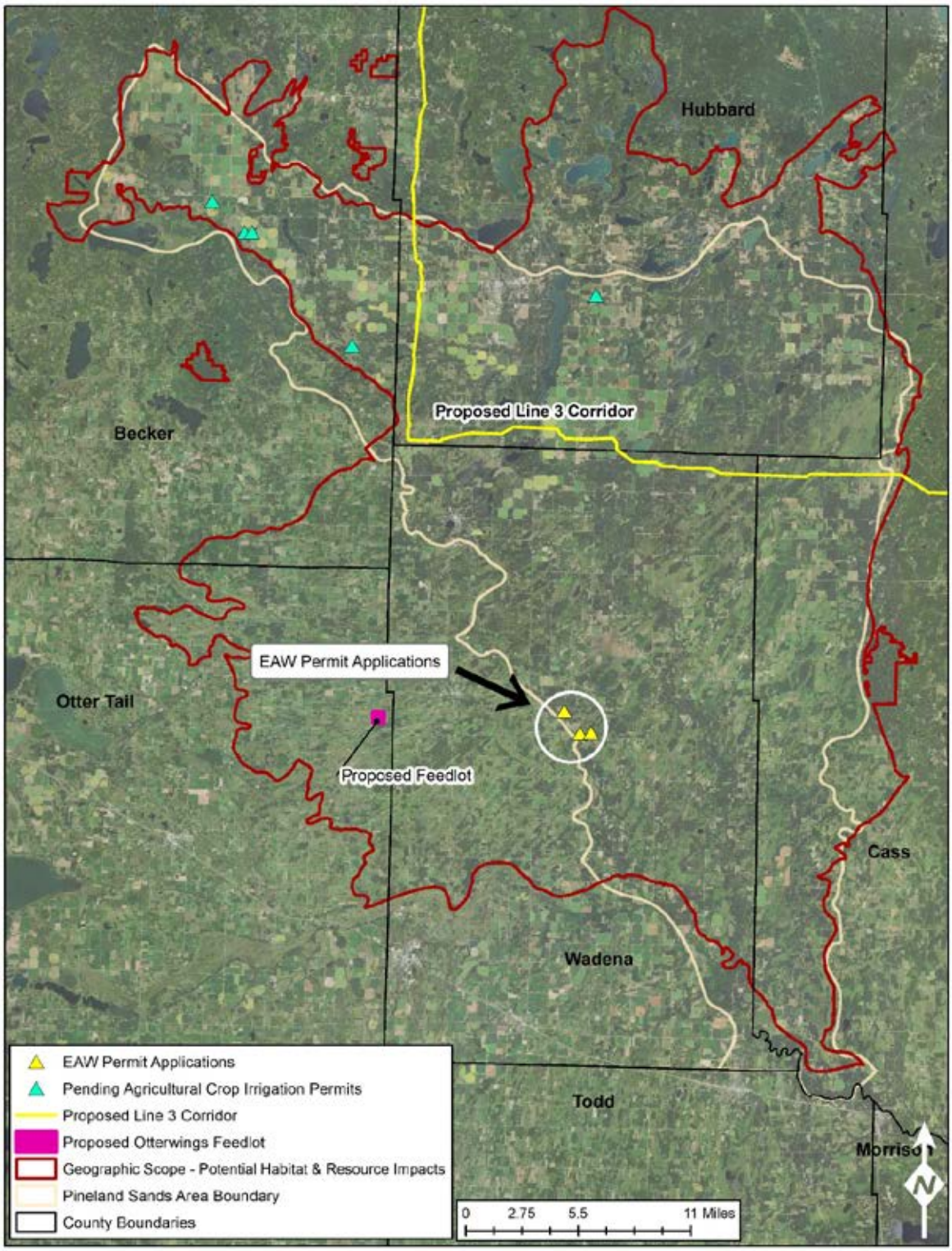


iii. Visual Impacts, Habitat Loss and Impacts to Ecological features

Environmental effects to unique vistas, habitat loss, and impacts to ecological features are each connected to land use decisions. Upon searching for other reasonably foreseeable projects within the defined geographic scope, two projects were identified that met the criteria of "reasonably foreseeable, for which a basis of expectation has been laid," that also occurred within the defined geographic area. One if the projects identified was the proposed Line 3 pipeline replacement project, which will have an impact to land use due to the required 200-foot wide right of way that will need to be cleared and maintained around the project. The other project identified was a large feedlot facility intended to operate as a large-scale dairy. Land use impacts would be limited to the area in the immediate vicinity of the proposed feedlot project. No other reasonably foreseeable projects were identified within the established geographic area.

While each of these projects may have some potential to create localized environmental effects on these resources, the footprint of environmental effects between these projects are unlikely to overlap, indicating that environmental effects are expected to be minimal.

Figure 17. Cumulative Potential Effects to Visual Resources, Habitat and Ecological Resources – Reasonably Foreseeable Projects



c. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.

i. Groundwater

Based on the geographic area and timeline for the proposed project, the overall cumulative nature of potential environmental effects to groundwater from the proposed project and those within the geographic area are expected to contribute very minimally to any contamination of groundwater due to nitrates or pesticides.

While the potential cumulative environmental effects due to project-related effects are likely negligible, there remains a groundwater contamination issue within the broader regional area. Discussion of this issue is included in Attachment E.

ii. Surface water

Based on the geographic area and timeline for the proposed project, the overall cumulative nature of potential environmental effects to surface water contamination from the proposed project and those within the geographic area are expected to contribute very minimally to any contamination of surface water.

While the potential cumulative environmental effects due to project-related effects are likely negligible, there remains a surface water quality has been a focus of studies, data collection, reports and planning efforts within the broader regional area. Discussion of surface water quality in the region is included in Attachment E.

iii. Visual Impacts, Habitat Loss and Impacts to Ecological features

Given the limited number of projects identified in the geographic area identified for the analysis, the overall cumulative nature of potential environmental effects to visual impacts, habitat loss, and impacts to ecological features from the proposed project and those within the geographic area are expected to contribute only minimally to the overall environmental effects. Any impacts are expected to be minimal and very localized such that it is not anticipated that these environmental effects have any potential to overlap or accumulate.

While the potential cumulative environmental effects due to project-related effects are likely negligible, there remain concerns regarding land use and habitat loss within the broader regional area. Discussion of environmental impacts due to land use in the region is included in Attachment E.

20. Other potential environmental effects:

If the project may cause any additional environmental effects not addressed by items 1 to 19, describe the effects here, discuss the how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.

RGU Certification

*(The Environmental Quality Board will only accept **SIGNED** Environmental Assessment Worksheets for public notice in the EQB Monitor.)*

I hereby certify that:

- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as connected actions or phased actions, as defined at Minnesota Rules, parts 4410.0200, subparts 9c and 60, respectively.
- Copies of this EAW are being sent to the entire EQB distribution list.

Signature: Jill Townley **Date**: April 3, 2020

Title: Environmental Review Unit Supervisor