ENVIRONMENTAL BOARD AGENDA

Tuesday, November 26, 2024

Broadcast on Cable TV Channel 16
and northmetrotv.com/lino-lakes-stream

ADVISORY BOARD MEETING, 6:30 P.M.

Council Chambers (televised)

1. Call to Order and Roll Call
2. Pledge of Allegiance
3. Public Comment (*sign-in prior to start of meeting per Rules of Decorum*)
4. Setting the Agenda: Addition or Deletion of Agenda Items
5. Approval of Minutes: October 30, 2024
6. Action Items
    A. Distribute for public comment North Oaks Mixed Use Development EAW
    B. Peltier Ponds PUD Concept Plan Review
7. Discussion Items
    A. Project Updates
        EAB Extension through 2026
    B. Recycling Updates

ADJOURNMENT

Meeting guidelines on reverse side.

CITY OF LINO LAKES
ADVISORY BOARD MEETING GUIDELINES

Advisory boards are fact-finding bodies established to aid the City Council in specific areas. The decisions of any board are considered advisory only and all final decisions rest with the City Council. Board meetings shall operate in accordance with the procedures established by the City Council. The following meeting guidelines are derived from the City Council Rules of Decorum.

Members of the Audience – No person in the audience shall engage in disorderly or disruptive conduct such as audible commentary during a meeting, hand clapping, stamping of feet, whistling, using profane language, yelling and similar demonstrations, which conduct disturbs the peace and good order of the meeting.

Public Comment– Comments from the public will be accepted on any matter, whether on the agenda or not. Comments will not be accepted during specific agenda items unless a Public Hearing has been noticed. Please remember to be courteous and respectful and abide by the following guidelines:

- Sign-in prior to the start of the meeting
- Step up to the microphone when recognized by the Presiding Officer (Chair or Vice-Chair)
- State your name and address for the record
- State the subject to be discussed
- Limit comments to 4 minutes
- Address comments to the board as a whole, not any specific member
- No question may be asked of a board member or staff member without the permission of the Presiding Officer (Chair or Vice-Chair)
- Elect a spokesperson for a group of persons who wish to address the board on the same subject

Public Hearing – A public hearing is a separate item of business on the agenda. It gives the public an opportunity to comment on the topic identified. Please remember to be courteous and respectful and abide by the guidelines outlined for public comment (although no sign-in required). Typically, a public hearing proceeds as follows:

1. The Presiding Officer (Chair or Vice-Chair) will announce the agenda item and staff will present their report.
2. Board members have the opportunity to ask staff questions about the item.
3. The Presiding Officer (Chair or Vice-Chair) opens the public hearing and will recognize those who want to speak.
4. The Presiding Officer (Chair or Vice-Chair) shall close the public hearing.
5. The Board will then discuss the item. No further public comments are allowed.
6. The Board will make a recommendation and/or decision.

After a motion has been made or a public hearing has been closed, no member of the public shall address the board from the audience on the matter under consideration. The Presiding Officer (Chair or Vice-Chair) shall maintain strict order and etiquette at all meetings.

CITY OF LINO LAKES
ENVIRONMENTAL BOARD MEETING

DATE:	**October 30, 2024**
TIME STARTED:	**6:30 p.m.**
TIME ENDED:	**7:48 p.m.**
MEMBERS PRESENT:	**John Sullivan, Shawn Holmes Julia Nelson, Jonathan Parsons Lindsay Buchmeier**
MEMBERS ABSENT:	**Alexander Schwartz**
STAFF PRESENT:	**Michael Grochala, Thomas Hoffman Clarissa Grilley, Marissa Ertel**

1. CALL TO ORDER AND ROLL CALL

Chair Sullivan called the Environmental meeting to order at 6:30 p.m. on Wednesday October 30, 2024.

2. PLEDGE OF ALLEGIANCE

3. PUBLIC COMMENT (sign in prior to start of meeting per Rules of Decorum)

Nobody was present for the public comment period.

4. SETTING THE AGENDA: Addition or Deletion of Agenda Items

Chair Sullivan made a motion to approve the October 30, 2024 agenda. Ms. Nelson seconded. Motion carried 5 – 0.

5. APPROVAL OF MINUTES: September 25, 2024

Chair Sullivan made a motion to approve the September 25, 2024 minutes. Ms. Nelson seconded. Motion carried 5 – 0.

6. ACTION ITEMS

A. Lino Retail 2.0 Preliminary Plat, Rezoning, CUP, Site and Building Plan Review and Street Vacation

Mr. Grochala presented the staff report.

The applicant, Java Companies, LLC, is proposing to plat and develop three (3) commercial lots near Lake Drive, Marketplace Drive, and 77th Street. 77th Street is proposed to be vacated between Maryland Drive and Lake Drive. A new street (Marketplace Drive) will be dedicated as part of the plat and constructed to replace 77th Street.

The City has been planning for the relocation of 77th Street since the Market Place development was approved in 2002. 77th Street was limited to a right-in/right out access at Lake Drive as part of the Marketplace intersection signal improvements as that time. The City purchased the property at 7685 Lake Drive in 2019 in preparation for the
improvements.

Java Companies has entered into a purchase agreement with the City for acquisition of the City's two lots north of existing 77th Street and a remnant of the 7685 Lake Drive property.

Java Companies, LLC, will be responsible for replacing all trees that are removed per City landscape requirements.

B. Community Gardens

Ms. Buchmeier inquired if there is an opportunity to identify a new location for the community gardens.

Mr. Grochala stated the City is working on identifying a new location for the Community Garden program.

Chair Sullivan made a motion to approve the recommendations by staff. Mr. Parsons seconded. Motion carried 5 – 0.

7. DISCUSSION

A. Recycling Updates

Clarissa Grilley, Recycling Intern, presented her staff report.

Ms. Grilley tracked around 230 cars for the October Recycling Saturday.

1st Choice Document Destruction reports 2000 pounds of paper that has been shredded.

The organics drop off program has increased this year. Seventeen residents have signed up for drop off this year, seven of those were from October alone.

B. Project Updates – Wilkinson Lakes Development

Mr. Grochala provided project updates.

There is a potential BMP project outside of the development. This would be a partnership between the City, VLAWMO and North Oaks Co.

The team is currently looking for options on how to reduce sediment and nutrient loading. The cost of the project would be split three ways, between the City, VLAMO and North Oaks Co. The City share would be covered by Surface Water Management Fund.

Mr. Sullivan would like to see plans presented to the Board as more information becomes available.

C. Emerald Ash Borer Injections

Thomas Hoffman, Environmental Coordinator, spoke about the EAB injections that have been occurring since 2001. The City is looking to extend the contract through 2026. The plan is to treat fewer trees each year and use treatments as a bridge to avoid removing all trees at once due to the cost of removal.

D. Otter Lake Road Extension Project – Open House

Mr. Grochala stated there is a planned open house for the Otter Lake Road Extension Project will be held on Thursday November 7th from 5:30 p.m. to 7:30 p.m. at the Laborers Training Center.

8. ADJOURN

Chair Sullivan made a motion to adjourn the meeting at 7:48 p.m. Motion was seconded by Ms. Nelson.
Motion carried 5 – 0.

Respectfully submitted,
Marissa Ertel – Office Specialist

ENVIRONMENTAL BOARD
AGENDA ITEM 6A

STAFF ORIGINATOR:	Tom Hoffman
MEETING DATE:	November 26, 2024
REQUEST:	Distribute for Public Comment North Oaks Mixed Use Development Environmental Assessment Worksheet
APPLICANT:	North Oaks Company, LLC

BACKGROUND:

North Oaks Company, LLC (Developer) is proposing a mixed-use development project on approximately 120 acres abutting Centerville Road and Ash St in the southcentral quadrant of the City.   The property is guided for low, medium and high density residential uses in the City's 2040 Comprehensive Plan. The Environmental Board reviewed a development concept plan for part of the property in September of this year for Wilkinson Waters

Due to the proposed number of residential units and commercial real estate, preparation of an Environmental Assessment Worksheet (EAW) is required by Minnesota Rules. The process operates according to rules adopted by the state's Environmental Quality Board (EQB). The EAW document is designed to provide a brief analysis and overview of the potential environmental impacts for a specific project and to help the City, referred to as the Responsible Government Unit (RGU), determine whether an Environmental Impact Statement (EIS) is necessary. The questions contained within the document are established by the EQB.

The EAW is not meant to approve or disapprove a project, but is simply a source of information to guide other approvals and permitting decisions. In fact it is one of the advantages to larger scale development projects. Preparation of the EAW will help inform the design of the project before the submittal of a formal development application.

The information provided in the EAW was prepared by the development team and reviewed by City Staff and the City's Engineer WSB and Associates and determined to be complete. The next step in the process is for the City Council to authorize distribution of the document for public comment. A notice of the documents availability will be published in the Environmental Quality Board (EQB) Monitor and notification sent to specified public agencies. The document will be available on the City website for review. The public comment period lasts for 30 days. During that period all interested parties may submit written comments to the City. At the end of the 30 day period, the

City reviews all of the public comments, as well as the content of the EAW to determine whether the project needs further changes or analysis. The City will prepare a written response to all substantive comments received during the public comment period.

Once completed the City Council will determine if potential impacts of the project are significant enough to require the preparation of an Environmental Impact Statement. If not, the Council will adopt a finding of no significant impact and the environmental review process ends. The developer may then begin to prepare the design of the project and the land use application information.

A representative from WSB and Associates will be present at the meeting to provide an overview of the EAW document and address any questions from board members. Again, the decision to distribute the EAW for public comment or any future decision regarding the need for an EIS is not an approval or disapproval of the project.

ENVIRONMENTAL DIRECTION:

Recommend distribution of the document for public comment.

ATTACHMENTS:

1. EAW

Environmental Assessment Worksheet

This most recent Environmental Assessment Worksheet (EAW) form and guidance documents are available at the Environmental Quality Board's website at**:** https://www.eqb.state.mn.us**/** The EAW form provides information about a project that may have the potential for significant environmental effects. Guidance documents provide additional detail and links to resources for completing the EAW form.

Cumulative potential effects can either be addressed under each applicable EAW Item or can be addressed collectively under EAW Item 21.

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:** *North Oaks Mixed Use Development*

2. **Proposer:** *North Oaks Company LLC*

Contact person: *Lauren Grouws*
Title: *VP Development*
Address: *5959 Centerville Road, Suite 200*
City, State, ZIP: *North Oaks, MN 55127*
Phone: *253.312.6913*
Fax:
Email: *Lauren@northoaks.com*

3. **RGU:** *City of Lino Lakes*

Contact person: *Katie Larsen*
Title: *City Planner*
Address: *600 Town Center Parkway*
City, State, ZIP: *Lino Lakes, MN 55014-1182*
Phone: *651.982.2426*
Fax:
Email: *klarsen@linolakes.us*

4. **Reason for EAW Preparation:** (check one)

Required:
☐ EIS Scoping
☒ Mandatory EAW

Discretionary:
☐ Citizen petition
☐ RGU discretion
☐ Proposer initiated

If EAW or EIS is mandatory give EQB rule category subpart number(s) and name(s):
MN Rules 4410.4300, Subp. 19

5. **Project Location:**

- County: *Anoka*
- City/Township: *Lino Lakes*
- PLS Location (¼, ¼, Section, Township, Range): *Secs 34 & 35, T31N, R22W*
- Watershed (81 major watershed scale): *20 – Mississippi River – Twin Cities*
- GPS Coordinates: *45° 7'33.52"N, 93° 4'16.09"W*

- Tax Parcel Number: *34-31-22-34-0001, 34-31-22-43-0006, 34-31-22-43-0007, 34-31-22-43-0008, 34-31-22-43-0010, 34-31-22-44-0001, 34-31-22-44-0006, 34-31-22-44-0008, 35-31-22-33-0002.*

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

- County map showing the general location of the project; *(See Appendix A – Figure 1)*
- U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable); *(See Appendix A – Figure 2)*
- Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan. *(See Exhibit A)*
- List of data sources, models, and other resources (from the Item-by-Item Guidance: *Climate Adaptation and Resilience* or other) used for information about current Minnesota climate trends and how climate change is anticipated to affect the general location of the project during the life of the project (as detailed below in item 7. Climate Adaptation and Resilience).

6. Project Description:

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

The North Oaks Company LLC is proposing construction of a mixed-use development located in the City of Lino Lakes, Anoka County, Minnesota. The project will include the construction of senior housing, market-rate apartments, affordable housing, commercial space, and single-family lots.

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

The Project will consist of the construction of a new mixed-use development. This will consist of a combination of single family residential homes, townhomes, apartment complexes, senior living, and retail space.

1) *Construction activities that will manipulate the environment will include tree removals, site preparation and earthwork, utility installation, and the construction of new structures including housing units and retail stores as well as the construction of roads, walks/trails, and stormwater ponds. See Appendix B for the current site plan of the project. Construction wastes will be generated during the project construction.*

2) *N/A, there are no existing equipment or industrial processes located within the project area.*

3) *N/A, there are no existing structures located within the project area.*

4) *Site preparation work is anticipated to begin as soon as spring 2025. Site construction is anticipated to take place over the course of multiple phases which will occur over the course of several years dependent upon market conditions.*

c. Project magnitude:

Description	**Number**
Total Project Acreage	*120.0*
Linear project length	*N/A*
Number and type of residential units	*Single Family: 71 Lots (71 Units)* *4-Plex: 5 Buildings (20 Units)* *6-Plex: 6 Buildings (36 Units)* *Apartment: 2 Buildings (200 Units)* *Senior Living: 1 Building (100 Units)*
Residential building area (in square feet)	*38.2 Acres*
Commercial building area (in square feet)	*4.1 Acres (178,596 SF)*
Industrial building area (in square feet)	*0.00*
Institutional building area (in square feet)	*0.00*
Other uses – (in square feet)	*0.00*
Structure height(s)	*Apartments = 40'* *Townhomes = 35'* *Single Family Home = 35'* *Retail = 30'*

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 this project is to create new housing opportunities within the City of Lino Lakes, as well as the construction of new retail opportunities. This project is not being carried out by a governmental unit. The need for this project is demonstrated by the following goal of the Housing Plan laid out in The City of Lino Lakes 2040 Comprehensive Plan (November 9, 2020), hereinafter referred to as The 2040 Plan: "Improve availability of affordable and life-cycle housing". Development of this project would help the city meet these goals by providing new housing opportunities for existing and future residents of Lino Lakes looking for single-family or multi-family housing options.

e. Are future stages of this development including development on any other property planned or likely to happen? ☐ Yes ☒ No

If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

Construction of this project will occur in phases. Additionally, one ghost plat is included in the project area that may or may not end up as part of the project (See Concept 1 within Appendix B). This EAW is covering the project as a whole and includes the ghost plat area in order to incorporate all potential future impacts.

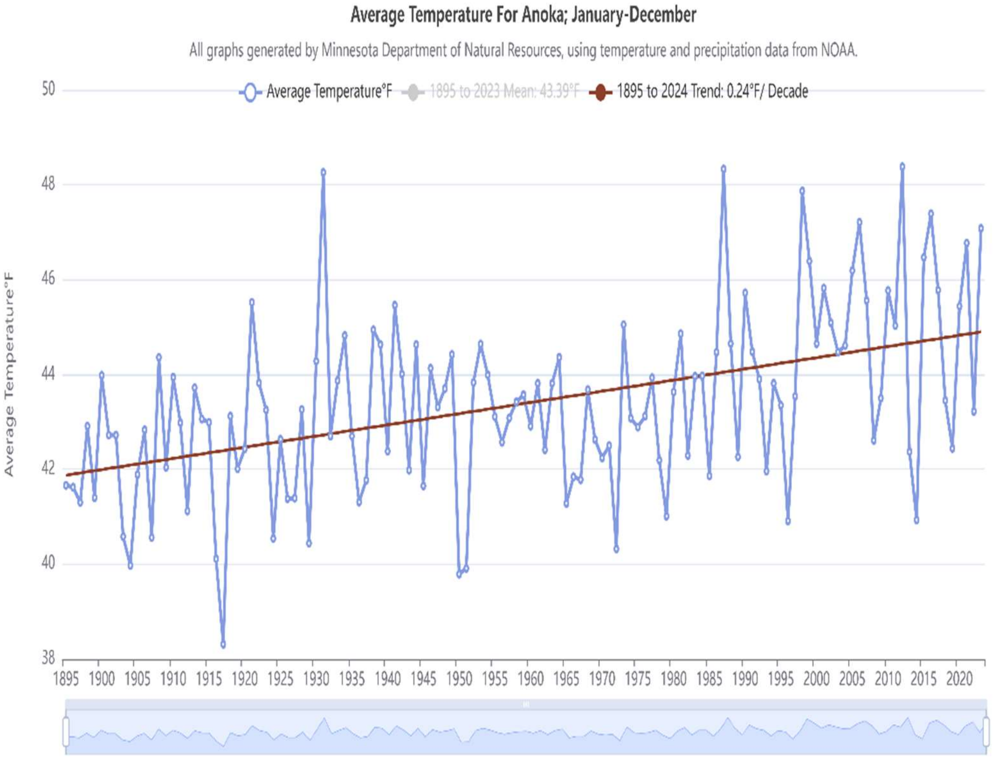
f. Is this project a subsequent stage of an earlier project? ☐ Yes ☒ No
If yes, briefly describe the past development, timeline and any past environmental review.

N/A

7. Climate Adaptation and Resilience:

a. Describe the climate trends in the general location of the project (see guidance: *Climate Adaptation and Resilience*) and how climate change is anticipated to affect that location during the life of the project.

Climate trends in Minnesota have included warmer temperatures and increased rainfall. According to the Minnesota Department of Natural Resources (MnDNR) climate trends webpage[1] *between 1895 and 2020 average temperatures have warmed by 3.0 degrees Fahrenheit and annual precipitation has increased by an average of 3.4 inches. The local trends within Anoka County have been consistent with the statewide trends as evidenced from the graphs below. These upward trends in average temperature and precipitation are expected to continue at the project site over the life of the Project. Projected climate graphs are included below.*

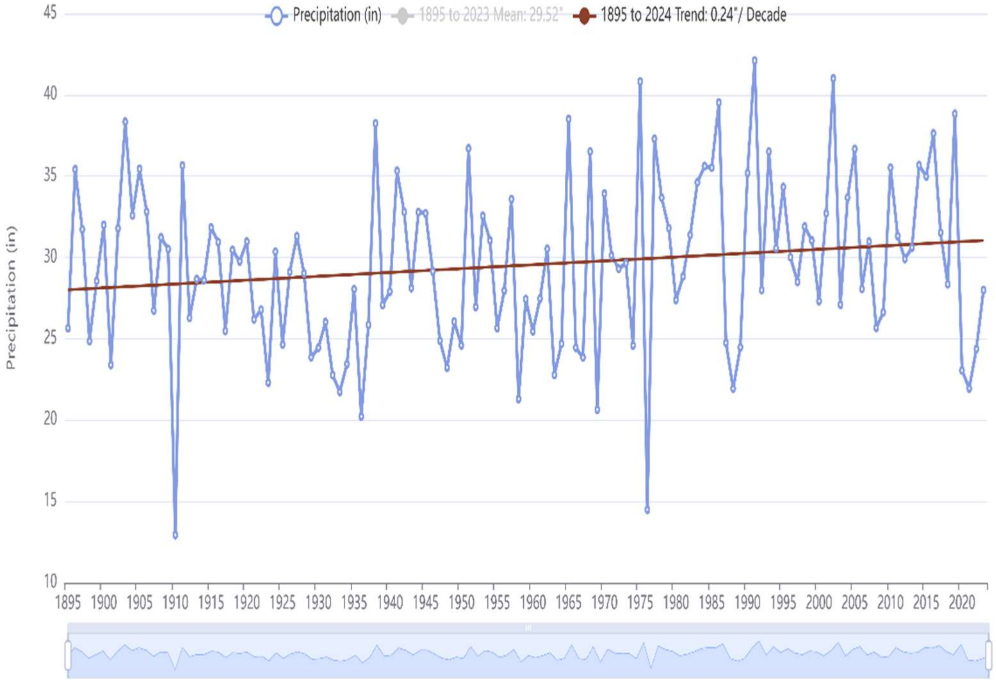


---

[1] https://arcgis.dnr.state.mn.us/climateexplorer/main/historical

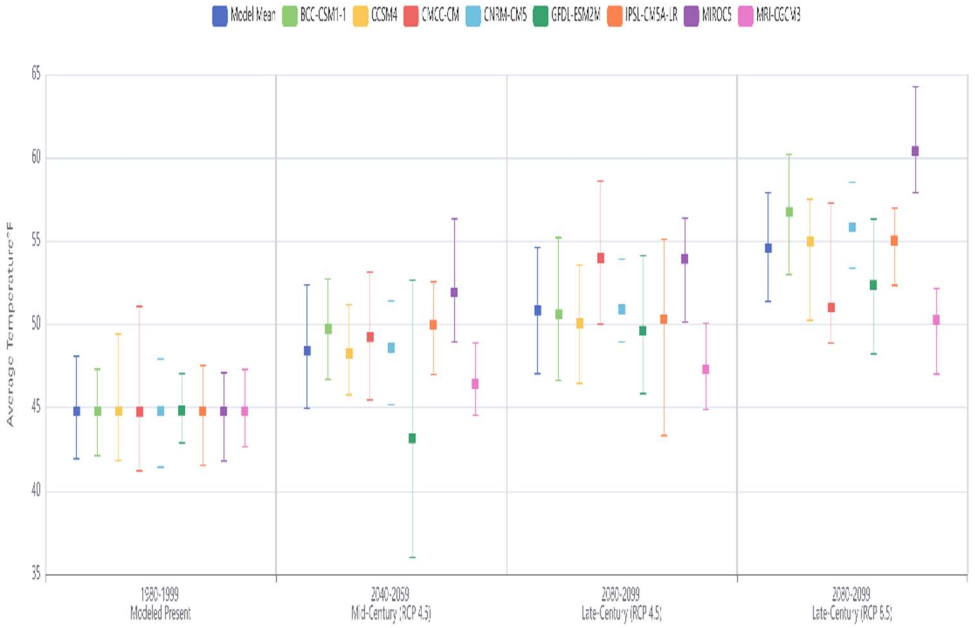
Precipitation For Anoka; January-December

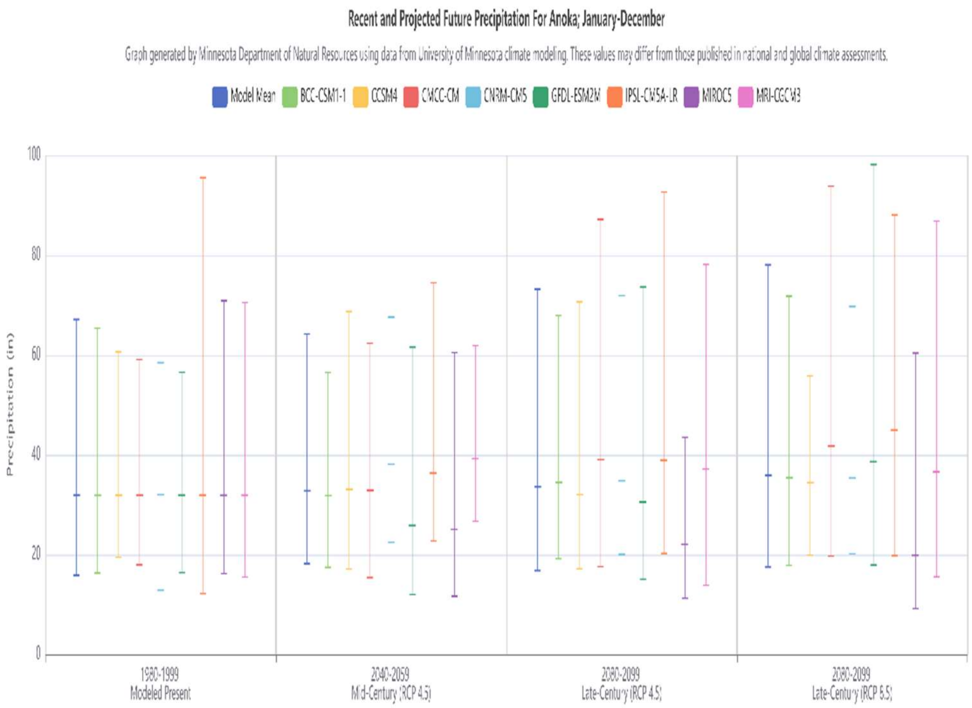
All graphs generated by Minnesota Department of Natural Resources, using temperature and precipitation data from NOAA.



Recent and Projected Future Average Temperature For Anoka; January-December

Graph generated by Minnesota Department of Natural Resources using data from University of Minnesota climate modeling. These values may differ from those published in national and global climate assessments.





b. For each Resource Category in the table below: Describe how the project's proposed activities and how the project's design will interact with those climate trends. Describe proposed adaptations to address the project effects identified.

Resource Category	**Climate Considerations**	**Project Information**	**Adaptations**
Project Design	*Development may negatively affect urban heat island conditions in the area.*	Climate change risks and vulnerabilities identified include: • *Roofing materials and asphalt will absorb heat during the day and radiate it at night, which increases the urban heat island effect*	*Landscaping and greenspace will reduce heat island effect.*
Land Use	*Land use conversion will increase the amount of impervious surface area.*	Climate change risks and vulnerabilities identified include: • *Approximately 18 acres of impervious surface will be created from the project.*	*The project includes nine stormwater ponds designed to store and treat stormwater generated from the site.*

Water Resources	*Address in item 12*	*Address in item 12*	*Address in item 12*
Contamination/ Hazardous Materials/Wastes	*Waste materials will be generated from the construction of the Project.*	Climate change risks and vulnerabilities identified include: • Wastes generated from construction will likely include solid waste and washout water.	*Any hazardous waste products generated or stored within the project area during construction will be properly contained and disposed of.*
Fish, wildlife, plant communities, and sensitive ecological resources (rare features)	*Address in item 14.*	*Address in item 14.*	*Address in item 14.*

8. **Cover types:** Estimate the acreage of the site with each of the following cover types before and after development:

Cover Types	Before (acres)	After (acres)
Wetlands and shallow lakes (<2 meters deep)	*44.1*	*43.4*
Deep lakes (>2 meters deep)	*0.0*	*0.0*
Wooded/forest	*11.2*	*8.3*
Rivers/streams	*0.0*	*0.0*
Brush/Grassland	*8.1*	*10.6*
Cropland	*55.6*	*0.0*
Livestock rangeland/pastureland	*0.0*	*0.0*
Lawn/landscaping	*1.0*	*27.1*
Green infrastructure TOTAL (from table below*)	*0.0*	*0.0*
Impervious surface	*0.0*	*25.9*
Stormwater Pond (wet sedimentation basin)	*0.0*	*4.7*
Other	*0.0*	*0.0*
TOTAL	***120.0***	***120.0***

**Existing land cover can be seen in Appendix A – Figure 3. Proposed land cover can be seen in Appendix A – Figure 4.*

Green Infrastructure*	Before (acreage)	After (acreage)
Constructed infiltration systems (infiltration basins/infiltration trenches/rainwater gardens/ bioretention areas without underdrains/swales with impermeable check dams)	*0.0*	*0.0*
Constructed tree trenches and tree boxes	*0.0*	*0.0*
Constructed wetlands	*0.0*	*0.0*
Constructed green roofs	*0.0*	*0.0*
Constructed permeable pavements	*0.0*	*0.0*
Other (describe)	*0.0*	*0.0*
TOTAL*	*0.0*	*0.0*
Trees	**Percent**	**Number**
Percent tree canopy removed or number of mature trees removed during development	*25%*	*Undetermined at this time*
Number of new trees planted	*N/A*	*Undetermined at this time*

9. **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 review has been completed. See Minnesota Rules, Chapter 4410.3100.*

Unit of Government	Type of Application	Status
U.S. Army Corps of Engineers (USACE)	*Clean Water Act Section 404 Permit*	*To be Submitted*
Minnesota Department of Health (MDH)	*Watermain Extension Permit*	*To be Submitted*
Minnesota Department of Natural Resources (MnDNR)	*Water Appropriation Permit (Construction Dewatering)*	*To be Submitted, if necessary*
Minnesota Pollution Control Agency (MPCA)	*National Pollution Discharge Elimination System (NPDES)/State Disposal System (SDS) General Permit*	*To be Submitted*
	Sanitary Sewer Extension Approval	*To be Submitted*
	Section 401 Water Quality Certification or Waiver	*To be Submitted*

Unit of Government	Type of Application	Status
Rice Creek Watershed District	*Wetland Conservation Act Delineation Boundary Concurrence*	*Approved*
	Wetland Mitigation Plan	*To be Submitted*
	Stormwater Management Permit	*To be Submitted*
	Erosion and Sediment Control Plan	*To be Submitted*
	Floodplain Alteration Permit	*To be Submitted*
	Wetland Alteration Permit	*To be Submitted*
Anoka County	*Access Permit(s)*	*To be Submitted*
	Right-of-Way Permit(s)	*To be Submitted*
City of Lino Lakes	*Rezoning*	*To be Submitted*
	Plat	*To be Submitted*
	Municipal Water Connection Permit	*To be Submitted*
	Sanitary Sewer Connection Permit	*To be Submitted*
	Grading Permit	*To be Submitted*
	Building Permit	*To be Submitted*
	Stormwater Management Permit	*To be Submitted*
	Erosion and Sediment Control Plan	*To be Submitted*
	Floodplain Alteration Permit	*To be Submitted*

Cumulative potential effects may be considered and addressed in response to individual EAW Item Nos. 10-20, or the RGU can address all cumulative potential effects in response to EAW Item No.22. If addressing cumulative effect under individual items, make sure to include information requested in EAW Item No. 21.

10. Land use:

a. Describe:

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

   Existing land use of the site consists primarily of cultivated agricultural fields and wetland areas. The Existing Land Use Map within The 2040 Plan has the Project site mapped as Agricultural and Open Water (Appendix C). Existing land cover on site can be seen in Appendix A – Figure 3.

Adjacent land consists primarily of similar land uses, such as agricultural, open water/wetland areas, rural residential lots, as well as single family residential to the south. The Project site as well as adjacent farmland to the west, include mapped soils considered prime farmland. There are no parks and open space, cemeteries, trails located adjacent to the Project site.

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.

The Future Land Use Plan within The 2040 Plan has portions of the Project site listed for primarily residential land use. This includes areas of low, medium, and high density residential (Appendix C). These are defined within The 2040 Plan as 1.6 to 3, 4 to 6, and 6 to 8 dwellings per acre respectively.

A portion of the Project site was also mapped as a Signature Gateway District. This district is defined in The 2040 Plan as follows: "The Signature Gateway District is reserved for high visibility, high traffic corridors serving as an entrance to the Community. The district allows residential at a density of 8.0 to 10.0 units per acre with 15 units per acre allowed if the project meets the City's housing goals. The district allows for development of multiple complementary uses on a single site including a combination of higher density residential, commercial services, and employment opportunities. This district incorporates planning parameters estimating the ratio of the residential and commercial mix. These ranges are flexible and may change based on a specific development proposal."

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

The Project site is currently zoned as R – Rural per the City of Lino Lakes Zoning Map (January 5, 2023). There are areas of FEMA Zone A Floodplain mapped within the project site (See FEMA FIRM in Appendix C). There are no wild and scenic river segments, critical areas, agricultural preserves, or airport safety zones located within or adjacent to the project site.

iv. If any critical facilities (i.e. facilities necessary for public health and safety, those storing hazardous materials, or those with housing occupants who may be insufficiently mobile) are proposed in floodplain areas and other areas identified as at risk for localized flooding, describe the risk potential considering changing precipitation and event intensity.

The are no critical facilities currently located within the Project site or proposed to be constructed as part of the project.

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

There are no identified compatibility conflicts between the proposed project and nearby land uses or any local or regional plans. The existing zoning, however, is not compatible with the proposed land use.

c. Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 10b above and any risk potential.

The Project site will be rezoned with the City of Lino Lakes to bring it in line with the Future Land Use Map (Appendix C) within The 2040 Plan. Impacts within the floodplain will be permitted through the City of Lino Lakes and the Rice Creek Watershed District.

11. 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.

Minnesota Geological Survey data within the Project site lists the bedrock geology as St. Peter sandstone and Prairie du Chien Group. Depths to the bedrock ranged from approximately 90 to 180 feet. There are no known or mapped sinkholes, shallow limestone, shallow aquifers, or karst features identified within or near the project area.

Karst features are illustrated on Appendix A – Figure 5.

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 12.b.ii.

NRCS soil classifications with the Project Site and are illustrated on Appendix A – Figure 6, soils unit characteristics are provided in the following table.

Map Symbol	Soil Unit Name	Slopes (%)	HEL*	Hydrologic Group**	Hydric Rating***	Farmland Classification
AnC	*Anoka loamy fine sand*	*6-12*	*NHEL*	*A*	*Non-Hydric*	*Not prime farmland*
Bm	*Blomford loamy fine sand*	*-*	*NHEL*	*B/D*	*Predominately Hydric*	*Not prime farmland*
BtB	*Braham loamy fine sand*	*2-6*	*NHEL*	*A*	*Predominately Non-Hydric*	*Farmland of statewide importance*
Cb	*Cathro muck*	*-*	*NHEL*	*B/D*	*Hydric*	*Not prime farmland*

Map Symbol	Soil Unit Name	Slopes (%)	HEL*	Hydrologic Group**	Hydric Rating***	Farmland Classification
Du	*Dundas loam*	*-*	*NHEL*	*B/D*	*Predominately Hydric*	*Prime farmland if drained*
HdB	*Hayden fine sandy loam*	*2-6*	*NHEL*	*B*	*Predominately Non-Hydric*	*All areas are prime farmland*
HdC2	*Hayden fine sandy loam, eroded*	*6-12*	*PHEL*	*B*	*Non-Hydric*	*Farmland of statewide importance*
Iw	*Isanti fine sandy loam*	*-*	*NHEL*	*A/D*	*Predominately Hydric*	*Not prime farmland*
Kr	*Kratka loamy fine sand*	*-*	*NHEL*	*B/D*	*Hydric*	*Not prime farmland*
Lb	*Lake beaches*	*-*	*NHEL*	*A/D*	*Predominately Non-Hydric*	*Not prime farmland*
Lw	*Loamy wet land*	*-*	*NHEL*	*B/D*	*Hydric*	*Prime farmland if drained*
Ma	*Markey muck, occasionally ponded*	*0-1*	*NHEL*	*A/D*	*Hydric*	*Not prime farmland*
Mc	*Marsh*	*-*	*NHEL*	*A/D*	*Hydric*	*Not prime farmland*
NeA	*Nessel fine sandy loam*	*1-4*	*NHEL*	*C*	*Predominately Non-Hydric*	*All areas are prime farmland*
Rf	*Rifle mucky peat*	*-*	*NHEL*	*A/D*	*Hydric*	*Not prime farmland*
SoA	*Soderville fine sand*	*0-3*	*NHEL*	*A/D*	*Predominately Non-Hydric*	*Farmland of statewide importance*
ZmB	*Zimmerman fine sand*	*1-6*	*NHEL*	*A*	*Predominately Non-Hydric*	*Not prime farmland*
ZmC	*Zimmerman fine sand*	*6-12*	*NHEL*	*A*	*Predominately Non-Hydric*	*Not prime farmland*

**Highly Erodible Land*
HEL: Highly Erodible Land
PHEL: Potentially Highly Erodible Land
NHEL: Not Highly Erodible Land

***Infiltration Rate*
A: >0.30 in/hr
B: 0.15-0.30 in/hr
C: 0.05-0.15 ins/hr
D: <0.05 in/hr

****Percent Hydric Rating*
Hydric: 100%
Predominately Hydric: ≥ 67% & <100%
Partially Hydric: ≥ 33% & <67%
Predominately Non-Hydric: ≤ 1% & <33%
Not Hydric: 0%

The erosion capabilities of the soils are susceptible as described by the NRCS Soil Erodibility (Kw) Factor rating which ranges across the site from 0.10 to 0.32. Construction activities will temporarily expose soils to an increased risk of erosion from wind and precipitation. Appropriate erosion and sediment control best management practices (BMPs) will be selected based on current site conditions and maintained through the duration of each construction phase to reduce the potential of sedimentation occurring to surface water resources or migrating offsite. Temporary BMPs will be inspected and maintained (per the NPDES Construction Stormwater Permit) until permanent vegetation and stabilization has occurred. Permanent BMPs will be incorporated into project design to minimize erosion during routine operational activities (post-construction).

A geotechnical evaluation of the site has been completed which included 16 soil borings across the site. A map of the boring locations and detailed description of the soils observed at each is included in Exhibit D – Geotechnical Report. Recommendation provided within the report for design and consideration have been taken into account including performing soil corrections during subgrade preparation and performing dewatering during excavations.

Topography of the Project site, collected via LiDAR, is illustrated on Appendix A – Figure 7. Site elevations were shown ranging from 894 to 932 msl. Site topography generally slopes northwest towards Cedar Lake within the western half of the site and south toward Wilkinson Lake within the eastern half. Some areas of steep slopes (12% or greater) are present within the site.

- NOTE: For silica sand projects, the EAW must include a hydrogeologic investigation assessing the potential groundwater and surface water effects and geologic conditions that could create an increased risk of potentially significant effects on groundwater and surface water. Descriptions of water resources and potential effects from the project in EAW Item 12 must be consistent with the geology, soils and topography/land forms and potential effects described in EAW Item 11.

12. Water resources:

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

i. Surface water - lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, shoreland classification and floodway/floodplain, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include the presence of aquatic invasive species and the 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 two DNR Public Waters Basins, Cedar Lake (02001200) and Wilkinson Lake (62004300) located partially within the project area. Cedar Lake is located within the western half of the Project site and continues offsite to the north; Wilkinson Lake is located within the east half and continues offsite to the south. There are no DNR Public Waters watercourses, designated wildlife lakes, migratory waterfowl feeding/resting areas, trout streams/lakes, MPCA or MDNR listed calcareous fens, outstanding resource value waters, and county or jurisdictional ditches within or adjacent to the project area.

Ten wetland areas have been delineated within the Project site totally approximately 44.1 acres. These wetlands include 2, 3, and 6 wetlands with Wet Meadow, Shallow Marsh, and Shrub-carr plant communities as well as Type 1 farmed wetland areas.

Prominent water features located within 1 mile of the project site include the aforementioned Cedar and Wilkinson Lakes, fourteen additional DNR Public Waters Basins, as well as one DNR Public Waters Watercourse. Refer to the table below for a list of the waterbodies.

Waterbody Name	**PWI Label**	**PWI Number**	**Distance from Site**	**Shoreland Classification**	**Impairments**
Cedar	Public Water Basin	2001200	0.00 Mi	Natural Environment	None
Wilkinson	Public Water Basin	62004300	0.00 Mi	Natural Environment	Nutrients
Amelia	Public Water Basin	2001400	0.06 Mi NE	Natural Environment	None
Unnamed	Public Water Watercourse	M-053.5-006	0.36 Mi S	None	None
Otter	Public Water Basin	2000300	*0.46 Mi E*	Recreational Development	Hg-F
Unnamed	Public Water Wetland	2056400	0.52 Mi NW	None	None
Deep	Public Water Basin	62001800	0.53 Mi SW	Recreational Development	None
Unnamed	Public Water Wetland	2056300	0.76 Mi N	None	None
Unnamed	Public Water Wetland	62009302	0.81 Mi S	None	None
Unnamed	Public Water Wetland	62009100	0.82 Mi SE	None	None
Unnamed	Public Water Wetland	62009301	0.84 Mi S	None	None
Unnamed	Public Water Wetland	2056200	0.93 M NE	None	None
Unnamed	Public Water Wetland	62009200	0.94 Mi S	None	None
Unnamed	Public Water Wetland	2055500	0.95 Mi N	None	None
Unnamed	Public Water Basin	2056500	0.96 Mi NW	None	None
Unnamed	Public Water Wetland	62009000	0.98 Mi SE	None	None
Unnamed	Public Water Wetland	2057000	0.99 Mi NE	None	None

There are two MPCA Section 303d listed impaired waters located within a 1-mile radius of the project site. This included a deep-water portion of Wilkinson Lake mapped outside of the Project site as well as Otter Lake. Wilkinson Lake was listed for Aquatic Recreation due to Nutrients while Otter Lake was listed for Aquatic Consumption due to Mercury in Fish Tissue (Hg-F).

Surface water resources located within and adjacent to the Project site are illustrated on Appendix A – Figure 8.

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.

1) *The depth to ground water appears to vary greatly across the site. During the geotechnical evaluation of the site 16 soil borings were completed across the site. Water tables, when they were observed, ranged from 894.9' to 919.1' MSL. A map of the boring locations and boring logs documenting water tables observed is included in Appendix D – Geotechnical Report.*

   The Minnesota Department of Natural Resources Cooperative Groundwater Monitoring Website maintains data on ground water levels. The closest, actively read, observation well to the Project site is DNR Observation Well #02012 (MDH #208573), which is located approximately 2 miles north of the Project site. The water level in the most recent data record (September 27, 2024) was measured at 890.57' MSL.

2) *The Project site is not located within any Wellhead Protection Area (WHPA). However, the Project site is located within close proximity to the Lino Lakes East WHPA. The boundary of the Lino Lakes East WHPA is illustrated on Appendix A – Figure 9.*

   Per the City's 2015 Wellhead Protection Plan, the Project site is located within the moderate vulnerability portion of the City's 2020 Drinking Water Supply Management Area (DWSMA) Evaluation that incorporated Well No. 6, which will appear in the City's next Wellhead Protection Plan update around 2025.

3) *According to the Minnesota Department of Health – Minnesota Well Index, there is one identified well located within the Project site. This was Well #420603, a domestic well.*

   Groundwater resources located within and adjacent to the Project site are illustrated on Appendix A – Figure 9.

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. below.

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 Project site is located within the City of Lino Lakes' Sewer District 4. Per The 2040 Plan, future improvements within this district will discharge to the White Bear Township trunk sanitary sewer in Centerville Road, then to the Metropolitan Council Environmental Services (MCES) regional interceptor collection system, and ultimately to the MCES Metropolitan Wastewater Treatment Plant (WWTP).

Construction of new sanitary sewer lines will be required to service the project. The projected wastewater flow rate for the site following construction is an average flow rate of 88,800 gallons per day with a peak flow rate of 199,700 gallons per day. The City of Lino Lakes and White Bear Township will execute an agreement for the utilization of a portion of the capacity in the White Bear Township trunk sanitary sewer. The proposed residential and retail land uses are expected to generate wastewater of typical domestic strength and character.

The location of the Metro WWTP and existing interceptors are illustrated on Appendix A – Figure 10.

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. If septic systems are part of the project, describe the availability of septage disposal options within the region to handle the ongoing amounts generated as a result of the project. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion.

   N/A. Currently none of the parcels that comprise the project site utilize subsurface sewage treatment systems (SSTS). Several of the adjacent properties currently utilize a SSTS. These properties will be unaffected by the Project.

   The locations of the adjacent properties with existing SSTS are illustrated on Appendix A – Figure 10.

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, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects.

   N/A

ii. Stormwater - Describe changes in surface hydrology resulting from change of land cover. Describe the routes and receiving water bodies for runoff from the project site (major downstream water bodies as well as the immediate receiving waters). Discuss environmental effects from stormwater discharges on receiving waters post construction including how the project will affect runoff volume, discharge rate and change in pollutants. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion. For projects requiring NPDES/SDS Construction Stormwater permit coverage, state the total number of acres that will be disturbed by the project and describe the stormwater pollution prevention plan (SWPPP), including specific best management practices to address soil erosion and sedimentation during and after project construction. Discuss permanent stormwater management plans, including methods of achieving volume reduction to restore or maintain the natural hydrology of the site using green infrastructure practices or other stormwater management practices. Identify any receiving waters that have construction-related water impairments or are classified as special as defined in the Construction Stormwater permit. Describe additional requirements for special and/or impaired waters.

The quality of existing stormwater runoff from the project is typical of agricultural land. Stormwater runoff flows from upland areas to lower elevations on site as sheet flow where it generally gets conveyed into either Cedar or Wilkinson Lake.

Up to approximately 60 acres of land are expected to be impacted during construction. A Stormwater Pollution Prevention Plan (SWPPP) will be developed for the project to ensure protection of water resources during construction. Due to the adjacent Wilkinson Lake, an impaired water, the special provisions for impaired waters included within the Minnesota Construction Stormwater General Permit will be included within the SWPPP. Temporary erosion and sediment control best management practices (BMPs) will initially be installed (per the project's SWPPP), maintained/repaired, and amended throughout the construction phases as required to remain compliant with the applicant's NPDES Construction Stormwater Permit. BMPs may include (but are not limited to) silt fence, bio-rolls/filter logs, rock construction entrances, mulch/hydro mulch, and permanent native seeding or turf seeding in appropriate areas.

The quality of stormwater runoff from the project post construction will be typical of an urban land use with impervious surfaces and lawn/landscaping generally generating higher concentrations of total suspended solids and total phosphorus. Stormwater runoff is proposed to be conveyed into permanent constructed stormwater treatment infrastructure (e.g. infiltration basins, filtration basins, holding ponds, vegetated swales, etc.) across the site for treatment prior to discharge. These features will be designed to reduce flows to receiving waters and to accommodate for the increased precipitation projected to occur based on climate trends. Flow reductions will be calculated and included within the required stormwater management permits.

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. Discuss how the proposed water use is resilient in the event of changes in total precipitation, large precipitation events, drought, increased temperatures, variable surface water flows and elevations, and longer growing seasons. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation. Describe contingency plans should the appropriation volume increase beyond infrastructure capacity or water supply for the project diminish in quantity or quality, such as reuse of water, connections with another water source, or emergency connections.

No appropriations of surface waters are proposed as part of the Project. Water will be sourced from the City of Lino Lakes's existing public water supply system (PWS # 1020023) and/or the White Bear Township existing public water supply system (PWS # 1620025). The Lino Lakes PWS is currently sourced from five groundwater wells (MDH #s 240171, 559373, 554207, 722629, and 767887). Construction of new watermains will be required to service the project. . The projected water demand for the site is an average flow rate per capita of 88,800 gallons per day with a peak flow rate per capita of 199,700 gallons per day.

Short-term temporary construction dewatering of surface or ground waters may be required at the time of construction (depending on current field conditions) to facilitate construction activities (e.g., utility installation, etc.). If dewatering is anticipated to exceed 10,000 gallons per day or 1,000,000 gallons per year, the contractor will be required to obtain a Water Appropriations Permit from the Department of Natural Resources (MnDNR) Division of Waters prior to initiating such activities. Measures to avoid, minimize, or mitigate the environmental effects from construction related to dewatering are unknown at this time, and therefore will be determined when developing the dewatering plan as required by a Stormwater Pollution Prevention Plan amendment of the NPDES Construction Stormwater Permit.

iv. Surface Waters

a) 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, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. 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.

Approximately 44 acres of wetland are located throughout the Project site. The site was field delineated in 2022 by Kjolhaug Environmental Services.

Wetland impacts were avoided to the extent possible during the preliminary design phase of the overall site plan (Appendix B). The final design will attempt to avoid and/or minimize impacts to the extent possible. Should unavoidable impacts remain, the proper permitting processes will be followed in accordance with the Minnesota Wetland Conservation Act (WCA) and/or Section 404 of the Clean Water Act as applicable. This process would involve applying for a replacement plan potentially requiring compensatory mitigation. The area of wetland impact and jurisdictional status of the wetlands will be determined by the proper governmental agency during the permitting process following conclusion of the environmental review process.

b) 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, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. 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.

No other surface water features (lakes, streams, intermittent channels, or county/jurisdictional ditches) will be physically or indirectly altered during the construction or operation of the proposed project. Cedar and Wilkinson Lakes were avoided during the preliminary design phase of the overall site plan (Appendix B).

Temporary erosion and sediment control best management practices (BMPs) will initially be installed (per the project's SWPPP), maintained/repaired, and amended throughout the construction phases to avoid indirect impacts to water resources. BMPs may include (but are not limited to) silt fence, bio-rolls/filter logs, rock construction entrances, mulch/hydro mulch, and permanent native seeding or turf seeding in appropriate areas. Following construction, permanent constructed stormwater treatment infrastructure (e.g. infiltration basins, filtration basins, holding ponds, vegetated swales, etc.) will help protect and provide storage and treatment to waters prior to discharging into water resources.

13. 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.

Minnesota Pollution Control Agency (MPCA) records do not indicate any current or former contamination sites within or immediately adjacent to the project area. The MPCA's What's In My Neighborhood database of known sites within proximity of the project area is illustrated on Appendix A – Figure 11. There were two documented petroleum leaks within close proximity to the project site. These leaks occurred at the Biolab Corporation and Holiday Stationstore #3567 sites, both of which were located approximately 0.07 miles southeast of the project site. The Biolab site had a release documented on March 6, 1990, which was issued regulatory site closure on January 15, 1991. The Holiday site had releases documented on October 11, 2007 and April 7, 2017. These releases were issued regulatory site closures on July 7, 2008, and December 21, 2017 respectively.

The project proposer anticipates a minimal risk of encountering contaminated materials or groundwater during construction based on the lack of past land uses and due to geographic location of the listed leak sites in relation to the project area. Project construction and operation is not expected to cause or exacerbate a pre-project contaminated condition(s); therefore, no measures are planned to avoid, minimize, or mitigate adverse effects from existing contamination or potential environmental hazards.

If potentially contaminated materials (or other environmental hazards) are discovered during construction activities, the project proposer/contractor will immediately cease activities in the area, then take appropriate and reasonable actions to contain and reduce the human health/environmental risk prior to contacting the State of Minnesota Duty Officer, Anoka County, and project proposer's representative. The development of a Contingency Plan or Response Action Plan will be initiated if analytical results characterize the discovered materials as a regulated contaminated waste.

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.

   Solid and liquid wastes generated from construction materials and equipment are expected in minimal amounts during periods of active construction. Wastes may include sediment laden construction dewatering or typical construction debris associated with residential development (lumber, siding, roofing materials, etc.). The contractor will be required to immediately haul offsite and/or temporarily store and dispose (or recycle) of all waste in accordance with MPCA regulations and the NPDES Construction Stormwater Permit.

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 new above or below ground tanks to store petroleum or other materials. Indicate the number, location, size and age of existing tanks on the property that the project will use. 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.

   Hazardous materials (portable fuel tanks and lubricants) may be used for equipment operations during construction and temporarily placed onsite in sealed containers (at all times) and under secured restricted access during non-working hours. These materials will only be used during active construction for refueling and maintenance of construction equipment. To ensure that fuel spills do not contaminate surface and ground waters, construction and maintenance activities would occur at reasonable distances from surface waters and steep sloped areas. The contractor will be required to abide by the Pollution Prevention Management Measures (Part IV.F.2) of the NPDES Construction Stormwater Permit. All hazardous materials will be removed from the Project site upon completion of construction.

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 waste storage and disposal associated with construction activities will comply with the NPDES Storm Water Pollution Prevention Plan during periods of construction. Following construction, the development is not anticipated to generate significant volumes of hazardous wastes.

14. 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.

Ecological land units for the project area have been mapped and defined in the Ecological Classification System (ECS), which has been adopted by the Minnesota DNR. The project location occurs in the St. Paul Baldwin Plains and Moraines subsection (222Md). The St. Paul Baldwin Plains and Moraines subsection largely consists of the eastern half of Twin Cities metropolitan area and is dominated by urban land use.

The Project site itself largely consists of agricultural and wetland areas. Wetlands comprise approximately 44 acres of the site. This includes multiple wetland plant communities including Type 1 – Seasonally Flooded Basin, Type 2 – Fresh (wet) Meadow, Type 3 – Shallow Marsh, and Type 6 – Shrub-carr.

b. Describe rare features such as state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota 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 (MCE_______________) from which the data were obtained and attach the Natural Heritage Review letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.

There were no mapped Minnesota County Biological Survey (MCBS) Sites of Biodiversity Significance or native plant communities located within the Project site. MCBS Sites of Biodiversity Significance and native plant communities are present adjacent to the Project site within Wilkinson Lake. This included the North Oaks Natural Area MCBS site which has biodiversity significance rating of Outstanding. Within this MCBS site were two MnDNR mapped native plant communities, a Marsh system and a Wet Meadow/Carr system. These were mapped approximately 80' to the south of the Project site. MBS sites and Native Plant Communities are illustrated on Appendix A – Figure 12.

Natural Heritage Information System (NHIS) data for Anoka County has been obtained by ISG via a license agreement with the Minnesota DNR (2023-018). A review of the database identified 1 rare feature within the Project site that could have the potential to be adversely affected by the proposed project. This rare feature was the Blanding's Turtle. The were two mapped element occurrences of the Blanding's Turtle that overlapped with the Project site.

An official NHIS Review of the project was completed (MCE-2024-00460). A copy of the review letter is included within Appendix C. In addition to the Blanding's Turtle this letter identified the Forster's tern and tricolored bat in the vicinity of the Project site.

A U.S. Fish & Wildlife Service Official Species List for the Project site, generated from the Information for Planning and Consultation (IPaC)[2], listed one federally listed endangered species, the Rusty Patched Bumble Bee (RPBB). There was one species, the Salamander Mussel, listed as Proposed Endangered, one species, the Western Regal Fritillary, listed as Proposed Threatened, as well a one Candidate species, the Monarch Butterfly. There was one additional species listed, the Whooping Crane, which had a designation of Non-essential Experimental Population. There were no critical habitats mapped within the project site. The U.S. Fish & Wildlife Service Official Species List can be seen in Exhibit C.

---

[2] https://ipac.ecosphere.fws.gov/

c. Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project including how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. 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.

Existing plant communities will be affected by the change in land use. The prominent land use that will be converted is active agricultural land which provides poor habitat for wildlife. Impacts to more sensitive natural areas including Wilkinson and Cedar lakes were avoided and minimized to the extent feasible. An approximate 0.7 acres of unavoidable permanent wetland impacts are anticipated to occur as a result of the construction of the Project. Wetland impacts were limited to currently farmed wetland areas. Additionally, approximately 2.9 acres of wooded land will be removed.

The habitat of the RPBB varies throughout the year. Per the DNR NHIS Letter "April through October this species uses underground nests in upland grasslands, shrublands, and forest edges, and forages where nectar and pollen are available. From October through April the species overwinters under tree litter in upland forests and woodlands." Due to several of these habitats being present within the Project site, it was determined that the project will result in a "May Effect" for the RPBB.

Monarch butterfly's live in a variety of habitats but need nectar sources for food and can only lay eggs on milkweed plants. There is potential for Monarch Butterfly to be located at the Project site. Due to this, it was determined that the project will result in a "May Effect" for the Monarch butterfly.

Salamander Mussels inhabits rivers, streams, and in some cases lakes with natural flow regimes. None of these habitats will be impacted by the Project. As a result, it was determined that the project will result in a "No Effect" determination to the Salamander Mussel.

Measures to prevent the spread of invasive species during construction include working in non-infested areas first before moving to infested areas, thoroughly cleaning equipment after working in infested areas and before mobilizing to a different portion of the project site or a different project and revegetating disturbed areas as soon as possible after construction is completed in an area.

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

Unavoidable wetland impacts will be minimized to the greatest extent feasible, considering the site constraints of each proposed wetland impact and surrounding area (such as special considerations per MN Rules 8420.0515).

Wetland impacts were avoided to the extent possible during the preliminary design phase of the overall site plan (Appendix B). The final design will attempt to avoid and/or minimize impacts to the extent possible. Should unavoidable impacts remain, the proper permitting processes will be followed in accordance with the WCA and/or Section 404 of the Clean Water Act as applicable. This process would involve applying for a replacement plan potentially requiring compensatory mitigation.

The area of wetland impact and jurisdictional status of the wetlands will be determined by the proper governmental agency during the permitting process following conclusion of the environmental review process.

Recommendations and requirements provided by the DNR within the NHIS review letter will be implemented into the project. This includes preparing a Blanding's Turtle Avoidance Plan, which will be submitted to the NHIS team for review and approval, avoiding initial disturbance to wetland area between April 15-July 15, and avoiding tree removal between June 1-August 15. Additional consultation will be held with the USFWS regarding the Rusty Patch Bumble Bee.

15. 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.

An Official Minnesota Historical Society State Historic Preservation Office (SHPO) review of the project was requested. The following response was received: "Due to limited staff and resources, the Minnesota State Historic Preservation Office is no longer able to provide formal responses to technical assistance requests". A review of the Minnesota's Statewide Historic Inventory Portal (MnSHIP) in lieu of the formal review, was recommended within the SHPO correspondence. No known historic features were mapped within the Project site. The entirety of the Project site was within an area mapped as "Restricted" with a Historic Inventory Number of AN-LKC-00013.

In addition, the National Register of Historic Places (NRHP) and Minnesota Office of the State Archaeologist (OSA) Portal were reviewed with no known historic or archaeological features mapped within the Project site. No impacted to any historic structures, archeological sites, and/or traditional cultural properties are anticipated to occur as part of the project. A copy of the SHPO correspondence can be seen in Appendix F. MnSHIP and NRHP resources are illustrated on Appendix A – Figure 13.

16. 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 portions of Cedar and Wilkinson Lakes located within the Project site. These water bodies are currently landlocked within private property and is not visible to the public from existing Rights-of-Way. Development of the Project will avoid impacting these areas to the extent feasible and will provide scenic views of the water body within the future neighborhood from roads, sidewalks, homes, and yards.

The completed Project will not create any significant visual nuisances such as intense light pollution or vapor plumes. Visual impacts will consist of nighttime lighting consisting of streetlamps and yard lights typical of residential development and required for public safety reasons.

17. 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. 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.

   The Project is not anticipated to result in any temporary or permanent stationary sources of air emissions. There are no existing permitted air facilities or sensitive receptors within the vicinity 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 project will result in an increase to local traffic. This will result in an increase to local vehicle air emissions. A number of recommended improvements to the public roadway network have been included within the Traffic Impact Analysis Report. Examples include adding dedicated turn lanes to intersections and reevaluating posted speed limits to aid in traffic circulation and reduce stationary idling times. The Traffic Impact Analysis Report is included in Appendix H – Traffic Impact Study.

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 17a). 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.

   Dust common to construction and earth moving practices is expected (in the form of fugitive dust) during periods of dry weather. Dust will be visually monitored and recorded in conjunction with the NPDES Construction Stormwater Permit inspections. Appropriate dust control best management practices (such as soil wetting, misting/water vapor, and hydraulic additives) may be implemented (upon inspection or public complaint) by the contractor as necessary to control dust from leaving the Project site during all phases of construction. Specific dust control best management practices will be determined based on severity, weather conditions (i.e. wind speed), and current site conditions.

   Dust and odors caused from vehicles parked within driveways and along streets will vary depending on the number and types of vehicles actively moving in one area and current weather conditions. Pollutants generated from vehicle exhausts may concentrate and linger (possibly where vehicles congregate) which may cause a short-term odor that eventually dissipates.

18. Greenhouse Gas (GHG) Emissions/Carbon Footprint

a. GHG Quantification: For all proposed projects, provide quantification and discussion of project GHG emissions. Include additional rows in the tables as necessary to provide project-specific emission sources. Describe the methods used to quantify emissions. If calculation methods are not readily available to quantify GHG emissions for a source, describe the process used to come to that conclusion and any GHG emission sources not included in the total calculation.

Two phases of the project need to be quantified, the construction phase and the operation phase. Greenhouse gases (GHGs) commonly include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), fluorinated gases (chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3)). There are three types of emissions: Scope 1, 2, and 3. All estimated/projected GHG emissions are provided on an average lifetime (50-year) annualized basis using the CO2 equivalent (CO2eq).

<u>Construction Emissions</u>

GHGs emitted during the construction phase are primarily from mobile equipment (passenger cars, trucks, and construction equipment). The U.S. EPA's Emission Factors for GHG inventories was used to calculate emissions from 'mobile sources' during the construction phase. It was assumed the construction would last for approximately 72 weeks (6-day weeks). Emissions were divided by the project timeline (50 years) to get annualized emissions.

<u>Operation Emission – Mobile Sources</u>

A total of 3054 trips per day are estimated to be generated by the project (See Appendix H). This included 1527 trips entering and leaving. To estimate traffic emissions, it was assumed that this was 1527 unique passenger vehicles. It was assumed each vehicle travels 12,000 miles per year or 33 miles per day. The fuel efficiency of said vehicles was estimated at 25 miles per gallon (based on the average for model year 2015 and 2020 to incorporate varying vehicle ages). It was also assumed future residents drive gasoline-powered, light duty vehicles.

<u>Off-site Electricity Production</u>

Emissions from electricity production offsite were based on the U.S. EPA's Emission Factors for GHG Inventories based on the upper Midwest (MRO West) Emissions and Generation Resource Integrated Database (eGRID) subregion. To estimate annual energy usage, data from the Minnesota Energy Data Dashboard was utilized. Specifically, the electric demand per single family residential unit of 800KWh/month and the demand per apartment unit of 550KWh/month.

<u>Off-site Waste Management</u>

Emission factors from U.S. EPA's Center for Corporate Climate Leadership (CCCL) GHG Emission Hub were utilized to provide estimates of offsite waste management emissions. According to the U.S. EPA, in 2018 292.4 million short tons of municipal solid waste was generated (4.9 pounds per person per day). With 327 living units with an estimated 2 persons per unit, as well ass 100 senior living units a total of 754 persons was estimated for the site

GHG calculations were conducted using the ISG Greenhouse Gas Emissions Calculator (ISGHG). The ISGGHG is similar to the EPA's Simplified GHG Emissions Calculator (SGEC) and is based on the Revised Environmental Assessment Worksheet Guidance (EQB, 2022). Refer to Appendix G for GHG calculations.

The following tables are examples; other layouts are acceptable for providing GHG quantification results.

Construction Emissions

Scope	Type of Emission	Emission Sub-type	Project-related CO_2e Emissions (tons/year)	Calculation method(s)
Scope 1	Combustion	Mobile Equipment	*4.62*	*ISGHG*
Scope 1	Land Use	Conversion	*N/A*	*N/A*
Scope 1	Land Use	Carbon Sink	*N/A*	*N/A*
TOTAL			*4.62*	*ISGHG*

Operational Emissions

Scope	Type of Emission	Emission Sub-type	Existing facility CO_2e Emissions (tons/year)	Project-related CO_2e Emissions (tons/year)	Total CO_2e Emissions (tons/year)	Calculation method(s)
Scope 1	Combustion	Mobile Equipment	*0*	*6,829.24*	*6,829.24*	*ISGHG*
Scope 1	Combustion	Stationary Equipment	*0*	*0*	*0*	*N/A*
Scope 1	Combustion	Area	*0*	*0*	*0*	*N/A*
Scope 1	Non-Combustion	Stationary Equipment	*0*	*0*	*0*	*N/A*
Scope 1	Land Use	Carbon Sink	*0*	*0*	*0*	*N/A*
Scope 2	Off-site Electricity	Grid-based	*0*	*1,577.82*	*1,577.82*	*ISGHG*
Scope 2	Off-site Steam Production	Not applicable	*0*	*0*	*0*	*N/A*
Scope 3	Off-site Waste Management	Area	*0*	*386.34*	*386.34*	*ISGHG*
TOTAL			***0***	***8,793.40***	***8,793.40***	***ISGHG***

b. GHG Assessment

i. Describe any mitigation considered to reduce the project's GHG emissions.

Due to the minimal emissions that will result from the project (<25,000 TPY CO2e Emitted) no mitigation measures were deemed necessary. However, tree plantings will be a part of the project which will provide carbon sequestration.

ii. Describe and quantify reductions from selected mitigation, if proposed to reduce the project's GHG emissions. Explain why the selected mitigation was preferred.

N/A.

iii. Quantify the proposed projects predicted net lifetime GHG emissions (total tons/#of years) and how those predicted emissions may affect achievement of the Minnesota Next Generation Energy Act goals and/or other more stringent state or local GHG reduction goals.

Utilizing ISGHG the projected annual CO2e emissions from the operation of the project was 8,793 tons/year. With a projected project life of 50 years the net CO2e emissions are 439,670 tons. This represents a very small amount when compared to state-wide GHG emissions and would have minimal effect on the State of Minnesota's or the local area's GHG reduction goals.

19. 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.

1) *Existing noise in the Project area includes vehicle traffic from adjacent roads.*

2) *Sensitive receptors located within proximity to the project site include adjacent residential homes.*

3) *Exterior noise while construction is taking place may range from 65-95 dBA. Post-construction exterior noise is anticipated to be generated from intermittent traffic and recreational activities. All exterior noise is expected to be less than the State of Minnesota noise rules in a residential land use setting (<65 dBA daytime & <55 dBA nighttime).*

4) *Nearby residential homes may experience a temporary increase in noise duration and frequency during construction; however, these noises will be conducted during restricted hours. Post construction noise will be typical of surrounding residential areas and will not exceed the State of Minnesota statutory limits for residential receptors (NAC 1), Minnesota Rules 7030.0040, therefore, any noise anticipated from standard operations and construction activities will not result in a decreased quality of life.*

20. 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.

   1) *Currently the site has no designated parking stalls. Post construction there will be, 803 parking stalls across the site. Additionally, street parking will be available across much of the rural residential portions of the site.*

   2) *The estimated total average daily traffic generated is approximately 3,790 vehicle trips per day. A detailed breakdown of site traffic is available in the Traffic Impact Analysis Report included in Appendix H – Traffic Impact Analysis.*

3) *The project is estimated to generate 279 vehicle trips at peak hour of adjacent street traffic on weekday mornings (7:30 AM to 8:30 AM) and 519 vehicle trips at peak hour of adjacent street traffic on weekday afternoons (4:15 PM to 5:15 PM). See table below for reference.*

	Total New Trips	**Entering**	**Exiting**
Weekday AM (AM Peak Hour of Adj Street Traffic)	279	107	172
Weekday AM (AM Peak Hour of Generator)	408	164	244
Weekday PM (PM Peak Hour of Adj Street Traffic)	519	282	237
Weekday PM (PM Peak Hour of Generator)	608	344	264
Weekday	3790	1895	1895

4) *Estimates were generated utilizing the ITE Trip Generation Manual (11th Edition).*

5) *Alternative methods of transportation include public transportation via Anoka County's Travel Transit Link, a regional service connecting customers from Lino Lakes to fixed-route transit services. Additionally, trails are proposed as part of the upcoming intersection reconstruction project for the intersections of CSAH J / Ash Street, CSAH 21 / Centerville Road, and CSAH 32 / Ash Street.*

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: http://www.dot.state.mn.us/accessmanagement/resources.html)* or a similar local guidance,

The project will result in an increase to local traffic. Recommended improvements to the roadway network have been included within the Traffic Impact Analysis Report, including adding sidewalks or shared use paths to the development roadway network and ensuring highway easements are planned within the development for future roadway realignment. Below, is a summary table showing the difference in delays between the build and no build scenarios for the PM 2045 Design Year. The Traffic Impact Analysis Report is included in Appendix H – Traffic Impact Analysis.

	Design Year PM Delay (sec)	
Intersection	**2045 No Build**	**2045 Build**
CSAH 21/Centerville Rd & CSAH J/Ash St	11.9	17.8
CSAH 21/Centerville Rd & CSAH 32/Ash St	9.2	10.2
CSAH 32/Ash St & Monarch Way	0.5	1.1
CSAH 32/Ash St & Rapp Farm Blvd	0.8	0.7
CSAH 32/Ash St & Holly Drive N	1.5	1.5
Wilkinson Lake Blvd & South Access Wilkinson	0	2.5

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

Recommended improvements to the roadway network have been described within the Traffic Impact Analysis Report, including adding sidewalks or shared use paths to development roadways and ensuring the highway easements are planned within the development for future roadway realignment. CSAH 32/Ash Street suggest a need for roadway geometry changes between Monarch Way and CSAH 21/Centerville Rd, and a suggested design speed of 45 MPH. The Traffic Impact Analysis Report is included in Appendix H – Traffic Impact Analysis.

21. **Cumulative potential effects:** (Preparers can leave this item blank if cumulative potential effects are addressed under the applicable EAW Items)

    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.

    Site preparation work is anticipated to begin as soon as the Spring of 2025. Site construction will take place over the course of phases which may last up to multiple years dependent upon market conditions. Construction activities will include tree removals, site earthwork, utility installation, and the construction of housing units, roads, walks/trails, and stormwater ponds.

    It is estimated that the project may result in up to approximately 0.7 acres of permanent wetland impacts that will occur as a result of construction of the Project including the ghost plat areas. This includes the following:

    Wetland impacts were avoided to the extent possible during the preliminary design phase of the overall site plan (Appendix B). The final design will attempt to avoid and/or minimize impacts to the extent possible. Should unavoidable impacts remain, the proper permitting processes will be followed in accordance with the WCA and/or Section 404 of the Clean Water Act as applicable. This process would involve applying for a replacement plan potentially requiring compensatory mitigation. The area of wetland impact and jurisdictional status of the wetlands will be determined by the proper governmental agency during the permitting process following conclusion of the environmental review process.

    An estimated 2.9 acres of wooded land will be cleared to allow for construction of the Project. A tree preservation plan will be submitted to the City of Lino Lakes for approval prior to commencing construction.

    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 future projects that may interact with environmental effects of the proposed Project potentially include adjacent residential developments. The City of Lino Lakes Comprehensive Plan projects the city to experience consistent population growth through the year of 2035. The growing population will result in an increased need for housing. Properties adjacent to the Project site are currently zoned for single-family residential use and as a result will likely be looked at as potential sites for development. Due to the lengths of planning and design any adjacent developments likely will not occur during the same timeframe as the construction of the Project.

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.

Following construction, the Project is not anticipated to contribute to any additional environmental effects resulting in cumulative potential effects. Therefore, the Project is not anticipated to contribute to any significant environmental effects due to cumulative effects.

In addition to the potential environmental impacts addressed by items 1 to 20, the economic and sociological impacts of the project were considered. The economic and social impacts of the project on the local community are anticipated to be beneficial by bringing additional housing opportunities and property/sales tax income following construction.

22. Other potential environmental effects: If the project may cause any additional environmental effects not addressed by items 1 to 21, 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.

There are no other known or potential environmental effects that were not discussed in EAW items 1 to 21.

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

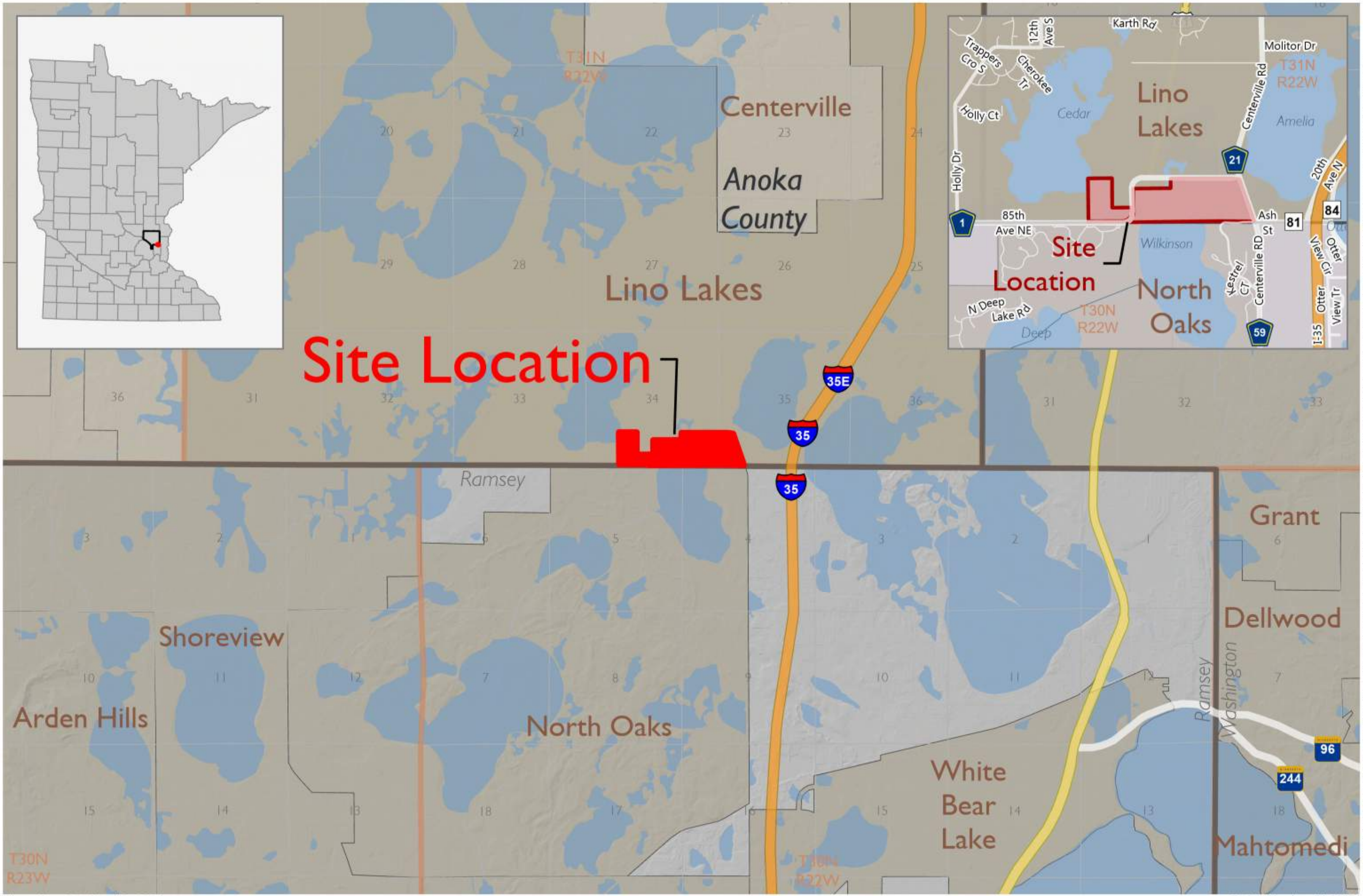
I hereby certify that:

- 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__________________________________ Date ________________________________

Title _________________________________

Appendix A – GIS Figures



Thursday, October 10, 2024

Project Number: 24-30671

S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map - aprx

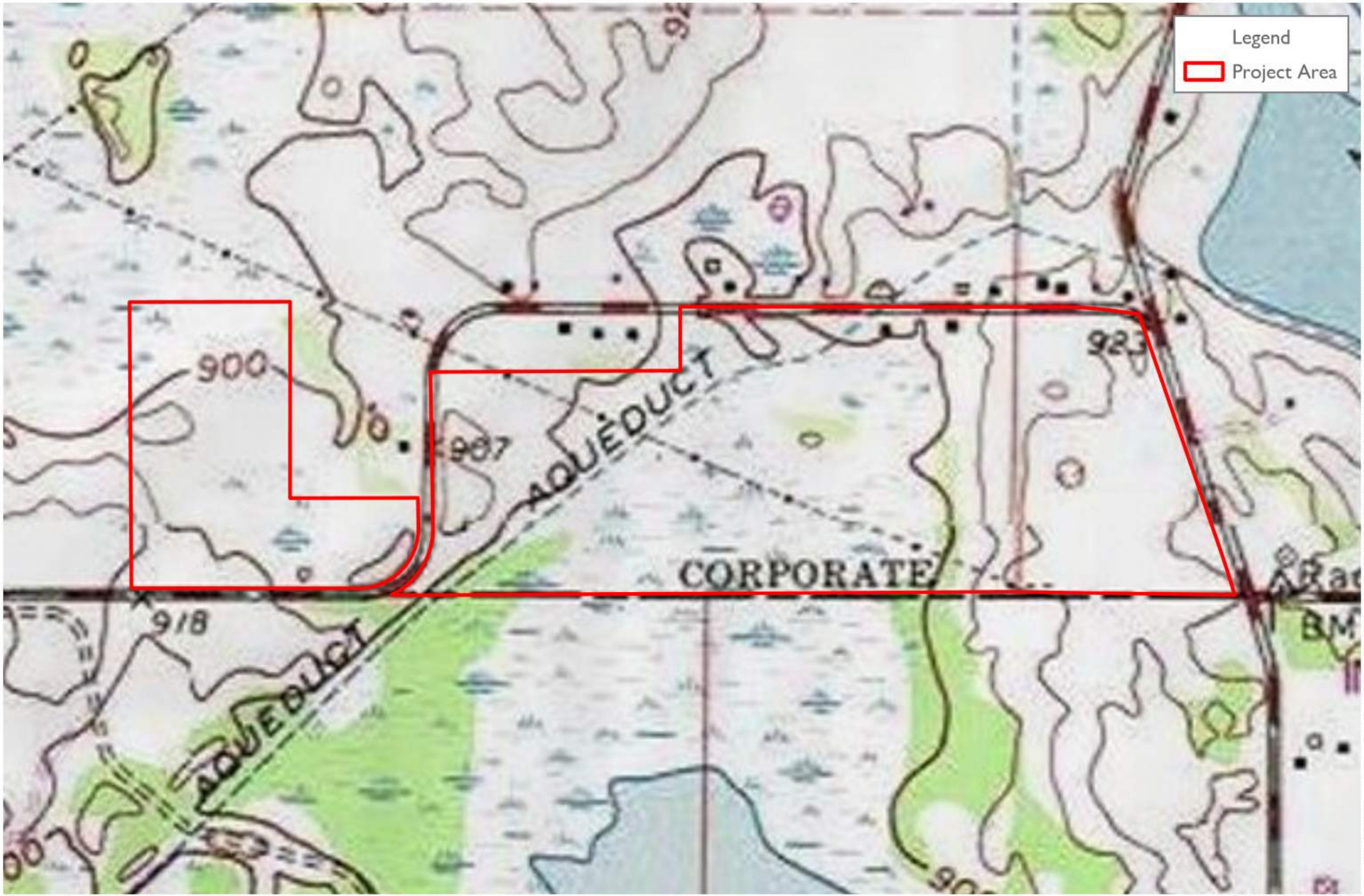
0 0.5 1
Miles
1 inch = 1 miles

N

Figure 1
Project Location Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Municipalities (MnDOT, 2016)
Roads (MnDOT, 2020)
Lakes (MN DNR, 2020)
Counties (MN DNR, 2013)
PLSS (USGS)

ISG



Thursday, October 10, 2024

Project Number: 24-30671

S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes Development\Master P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map - aprx

0 360 720 Feet

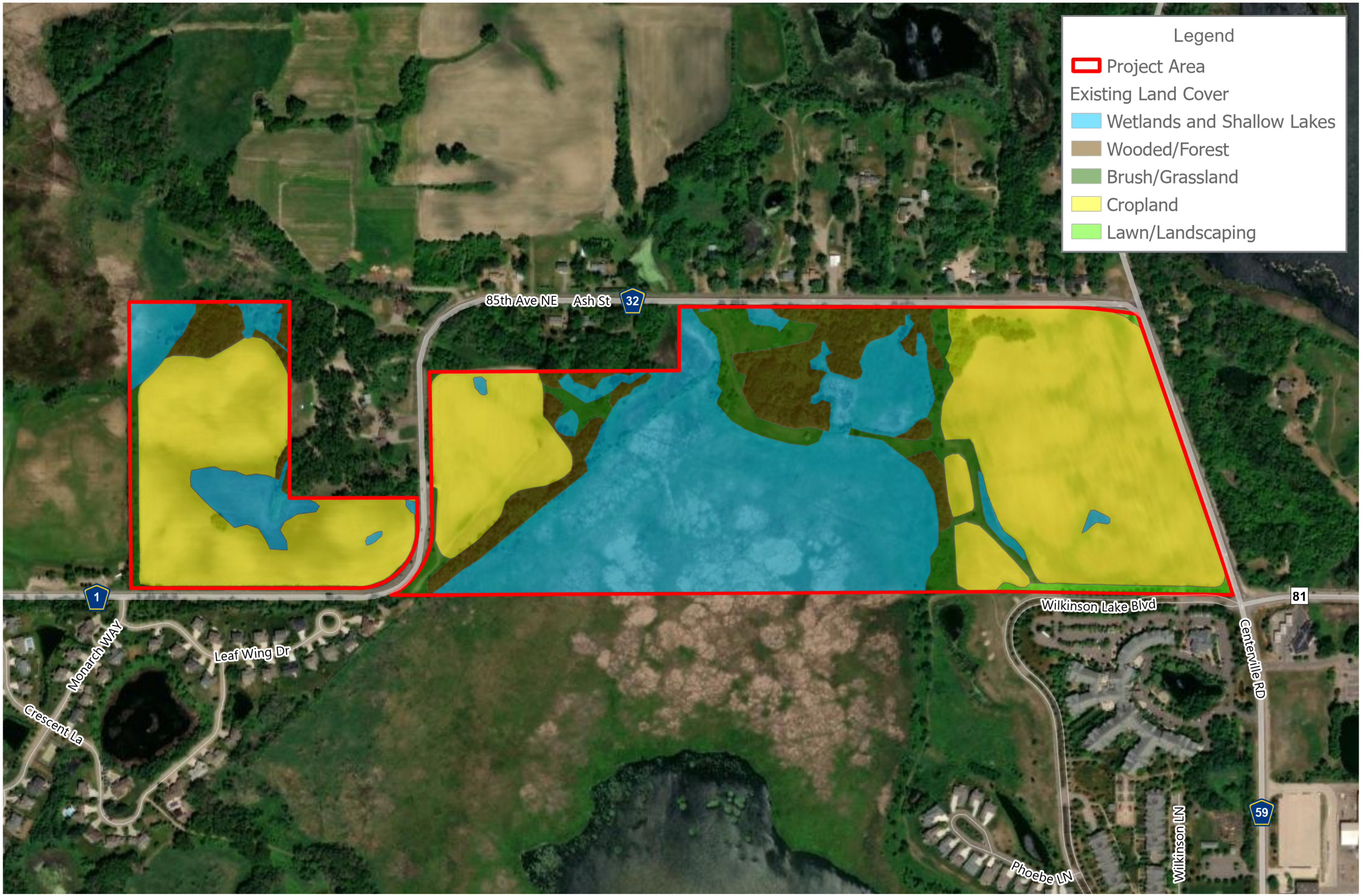
1 inch = 600 feet

N

Figure 2
USGS Topographic Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
24k USGS Quads (USA Topo Maps)

ISG



S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes MN\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map \- 30671 Pro Editing Map -.aprx

Friday, November 15, 2024

Project Number: 24-30671

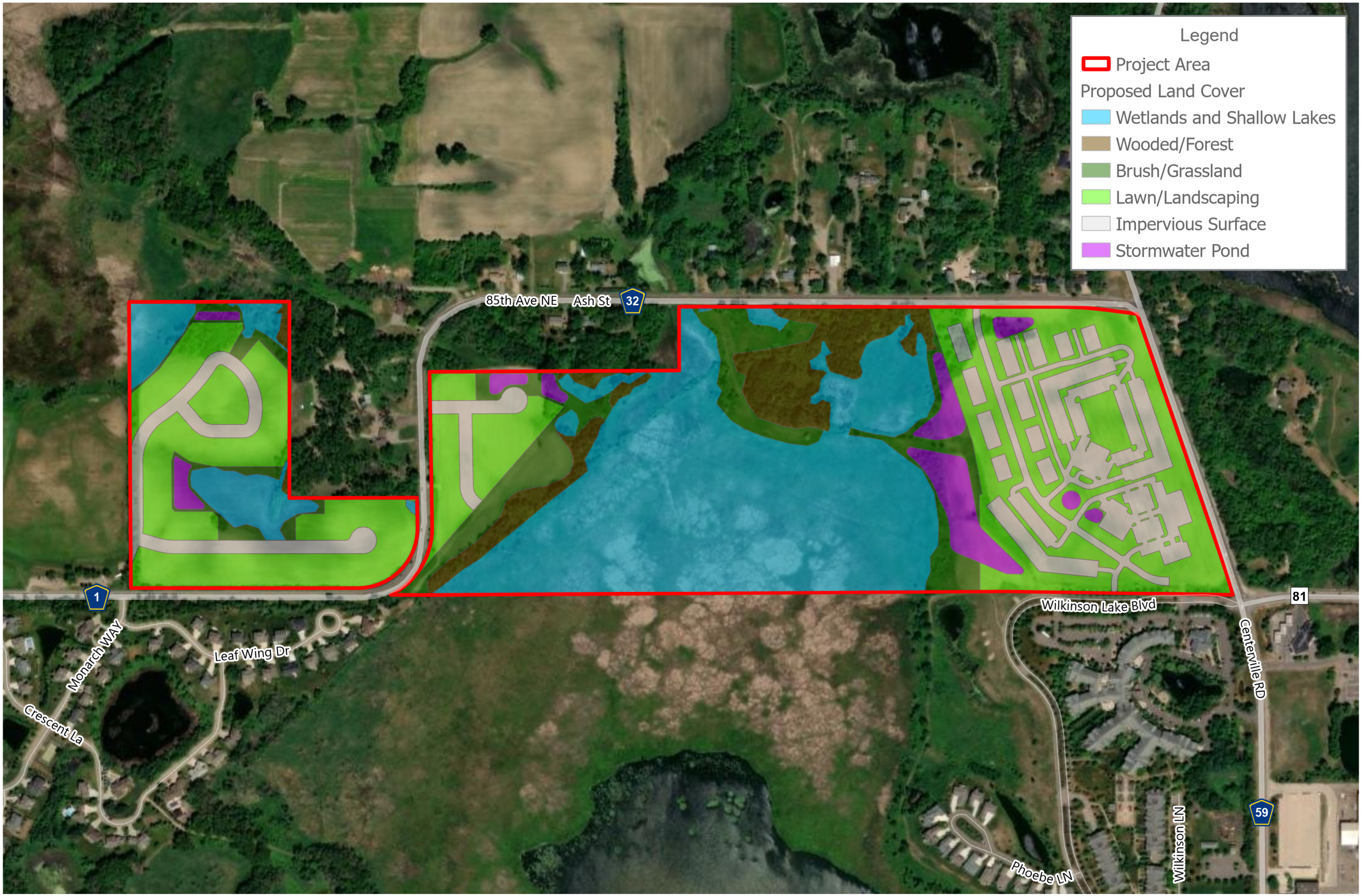
0 300 600
Feet
1 inch = 600 feet

N

Figure 3
Existing Land Cover Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI, 2023)

ISG



S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map -.aprx

Friday, November 15, 2024

Project Number: 24-30671

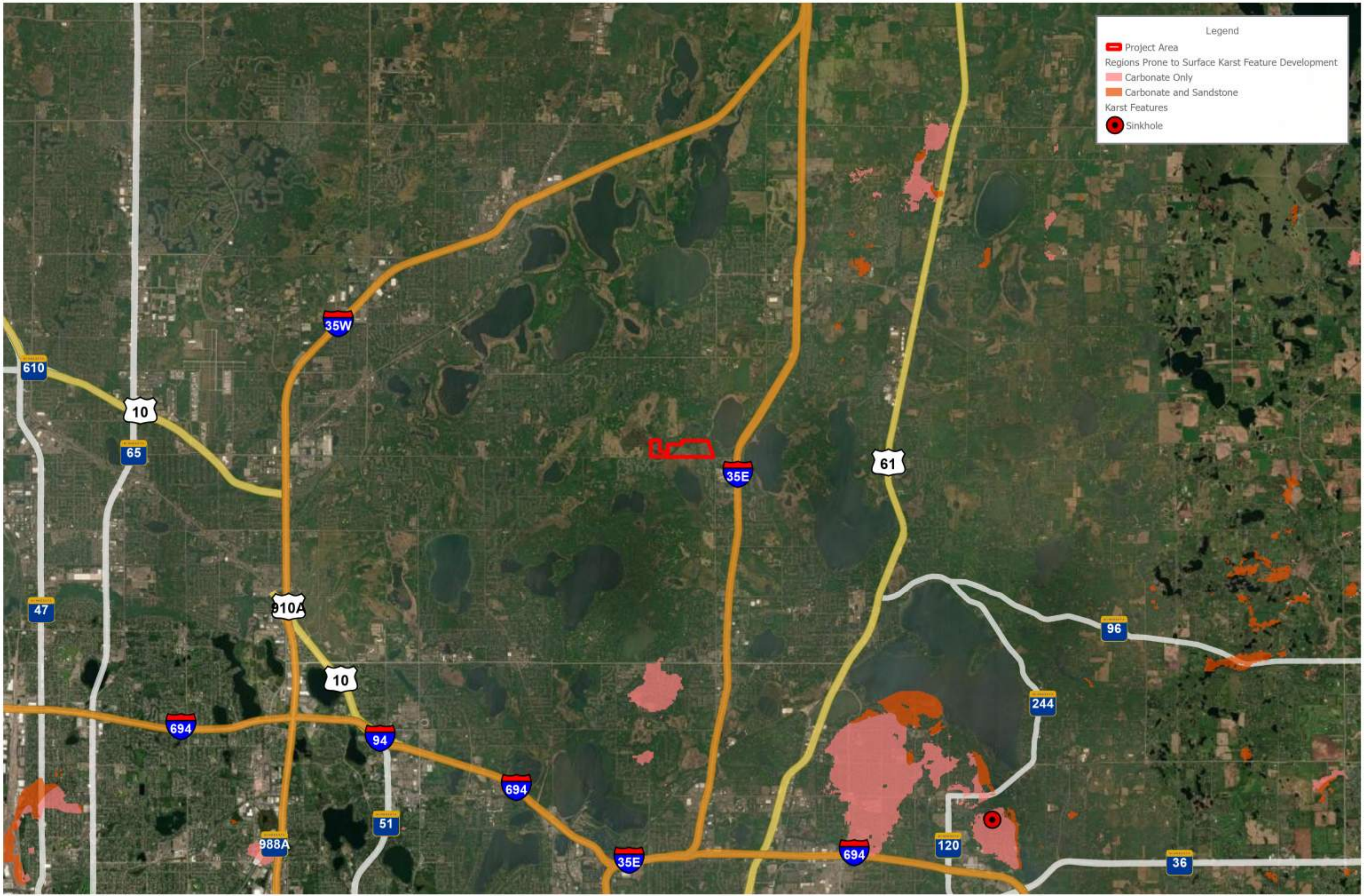
0 300 600
Feet
1 inch = 600 feet

N

Figure 4
Proposed Land Cover Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI, 2023)

ISG



S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map - aprx

Thursday, October 10, 2024

Project Number: 24-30671

0 1 2 Miles

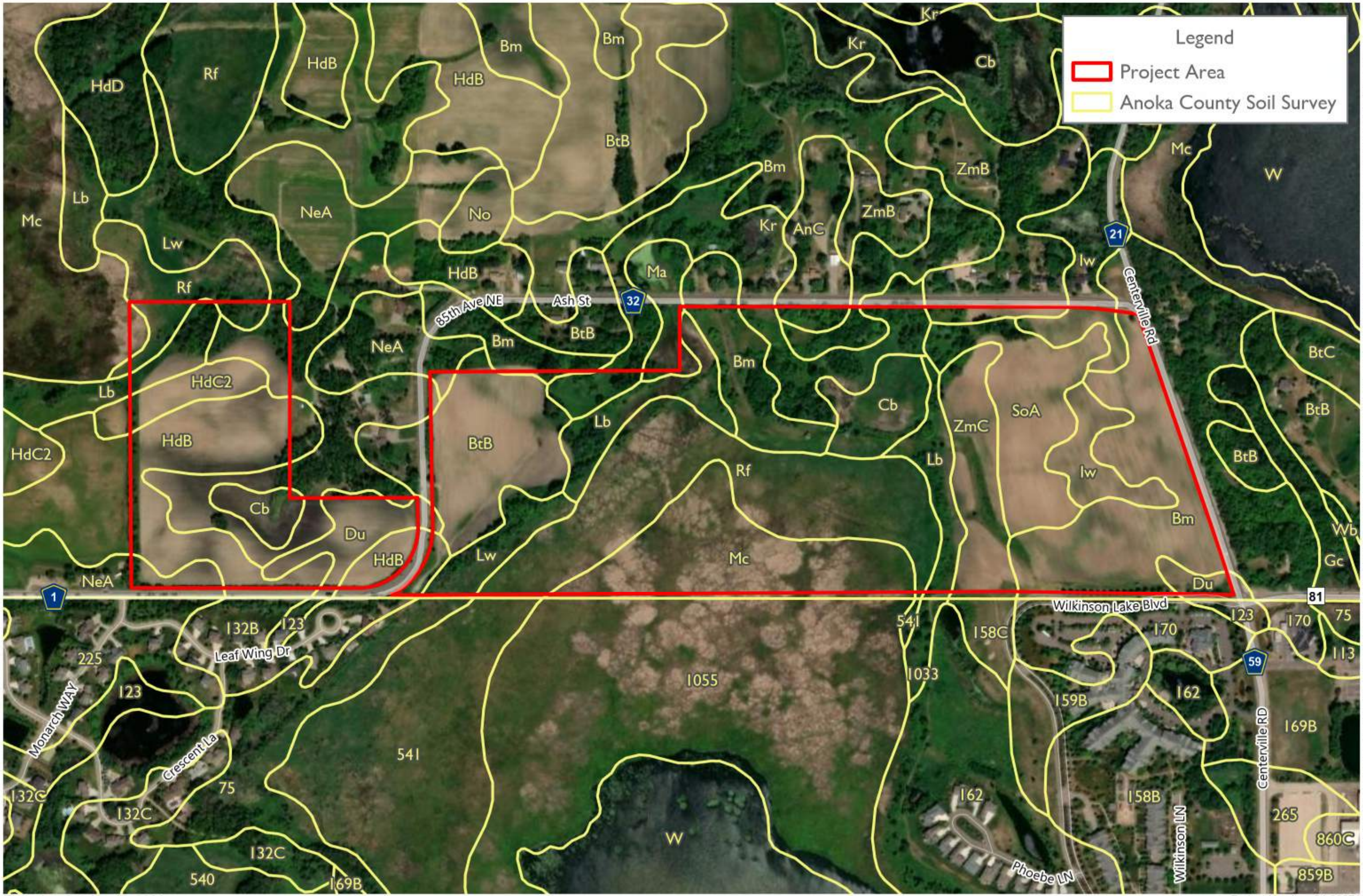
1 inch = 2 miles

N

Figure 5
Geology Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI, 2023)
Karst Features (DNR, 2020)

ISG



Thursday, October 10, 2024

Project Number: 24-30671

S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map - aprx

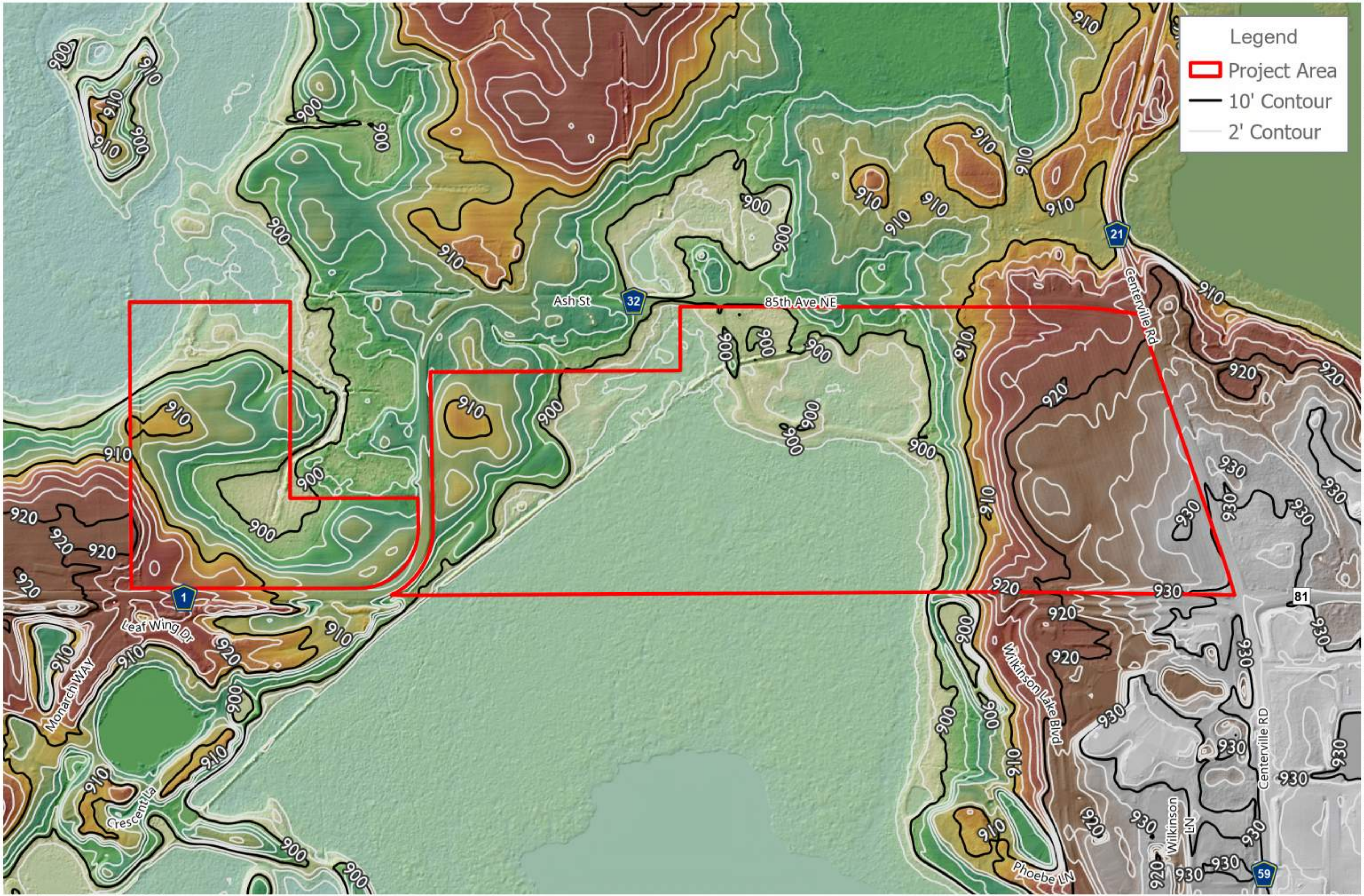
0 300 600 Feet
1 inch = 600 feet

N

Figure 6
Anoka County Soil Survey Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI 2023)
Soil Survey (USDA NRCS, 2017)

ISG



Thursday, October 10, 2024

Project Number: 24-30671

S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map - aprx

0 300 600 Feet

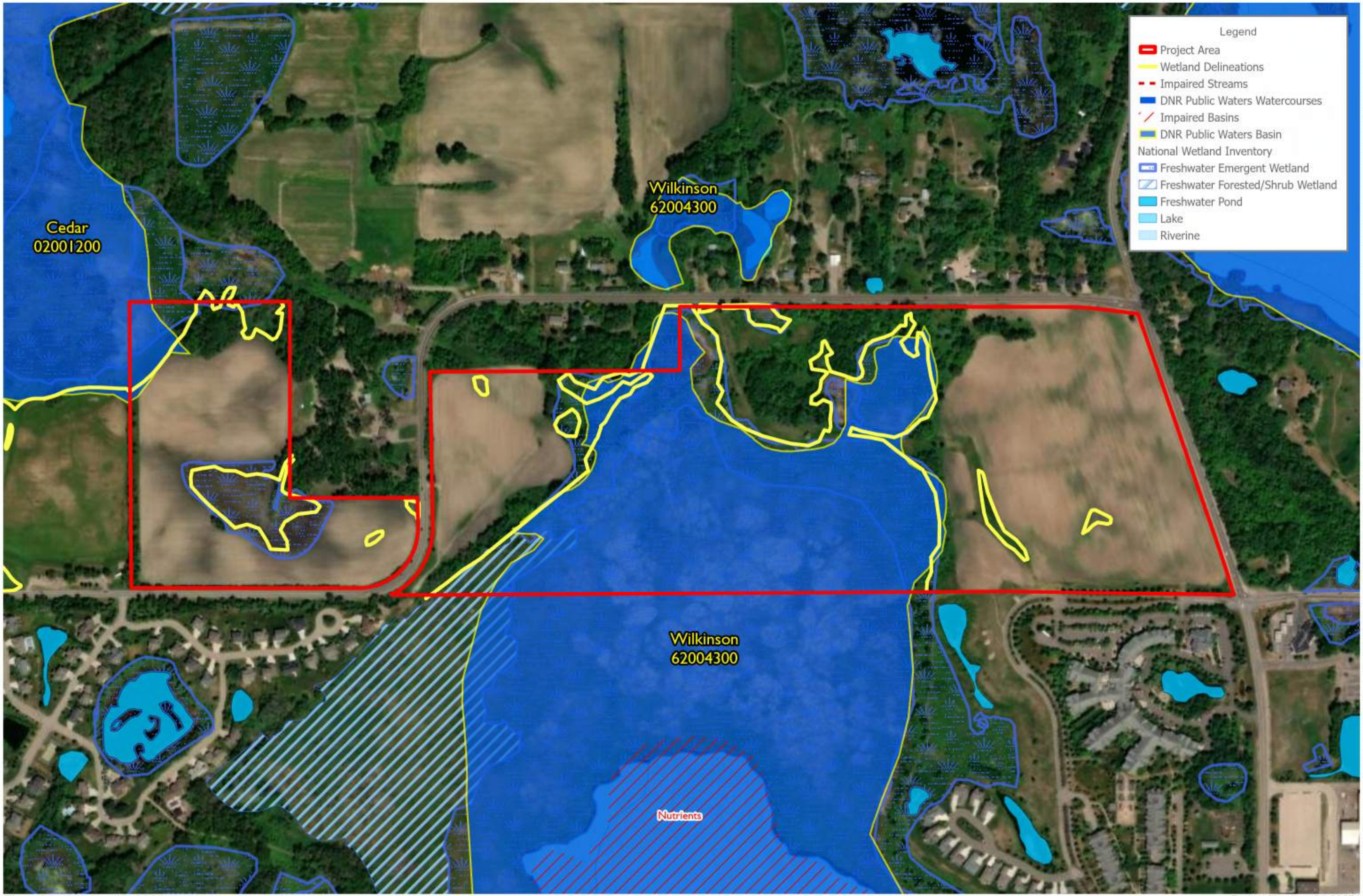
1 inch = 600 feet

N

Figure 7
LiDAR Elevations and Hillshade Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Contours (MnTopo, 2011)
Hillshade (MnTopo, 2011)

ISG



S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map - aprx

Thursday, October 10, 2024

Project Number: 24-30671

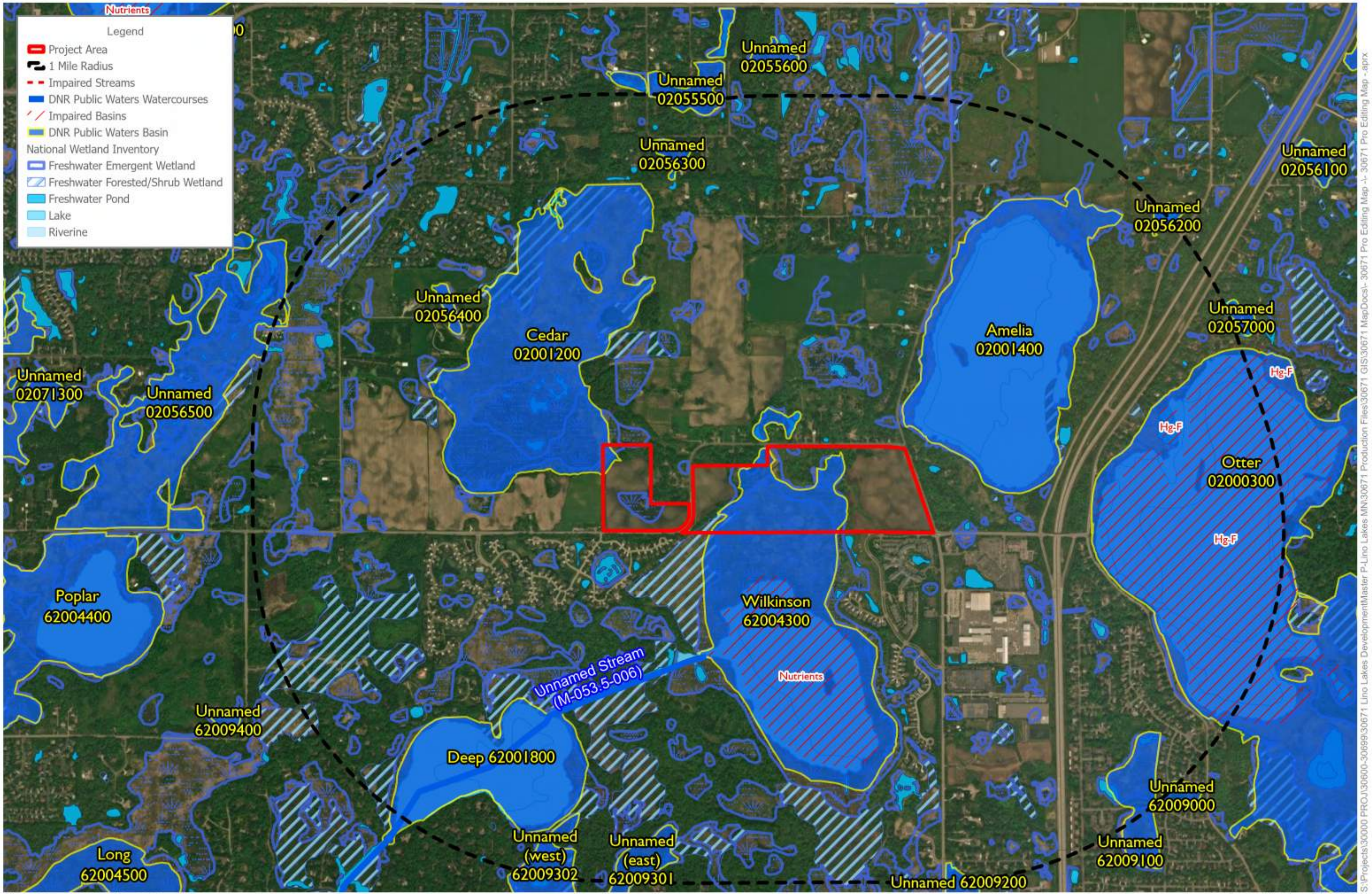
0 300 600
Feet
1 inch = 600 feet

N

Figure 8a
Surface Water Resources Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI, 2023)
NWI (MN DNR, 2019)
PWI (MN DNR, 2020)
Impaired Waters (MPCA, 2022)

ISG



Thursday, October 10, 2024

Project Number: 24-30671

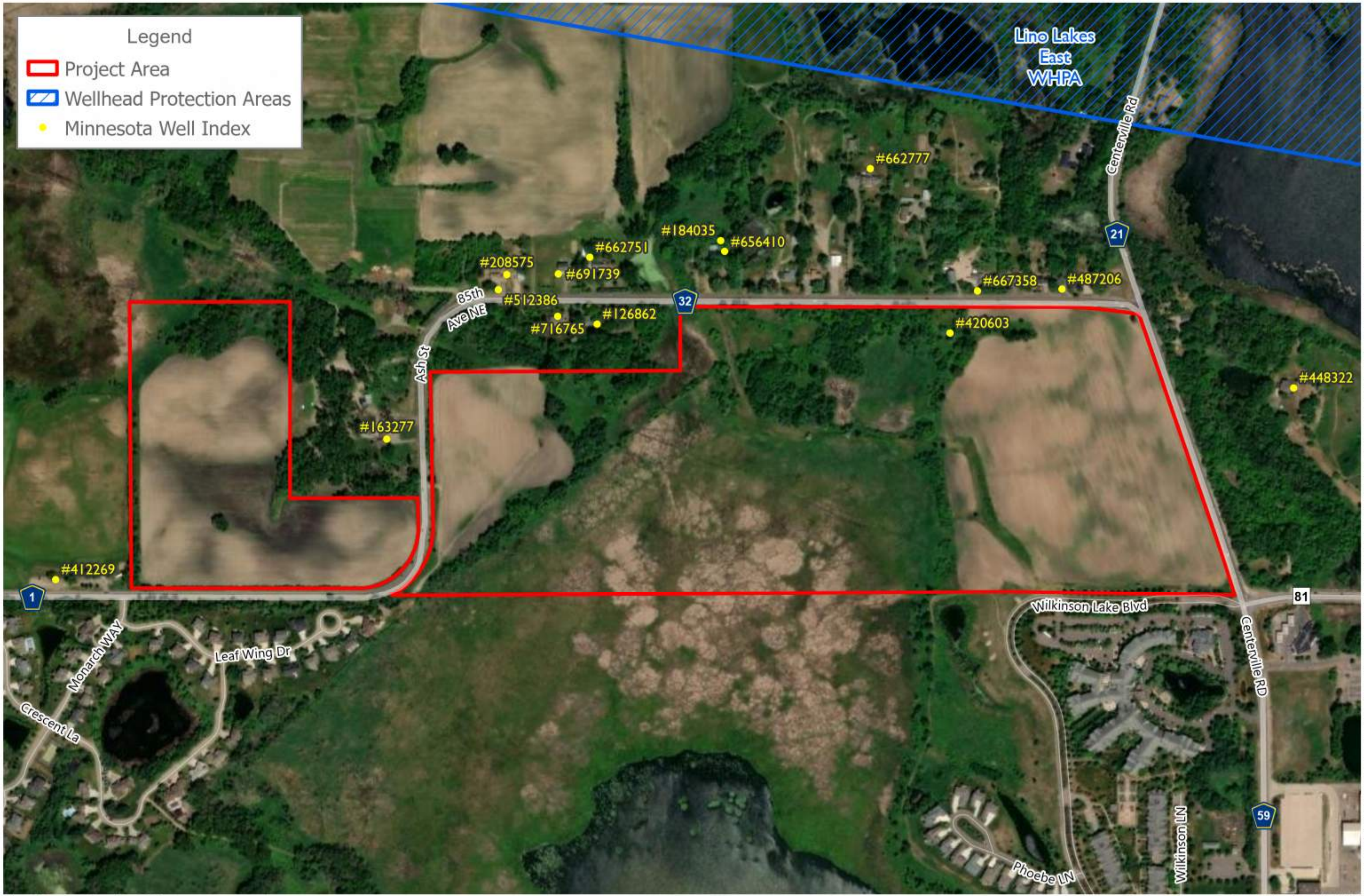
0 1,000 2,000
Feet
1 inch = 2,000 feet

N

Figure 8b
Surface Water Resources Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI, 2023)
NWI (MN DNR, 2019)
PWI (MN DNR, 2020)
Impaired Waters (MPCA, 2022)

ISG



Thursday, October 10, 2024

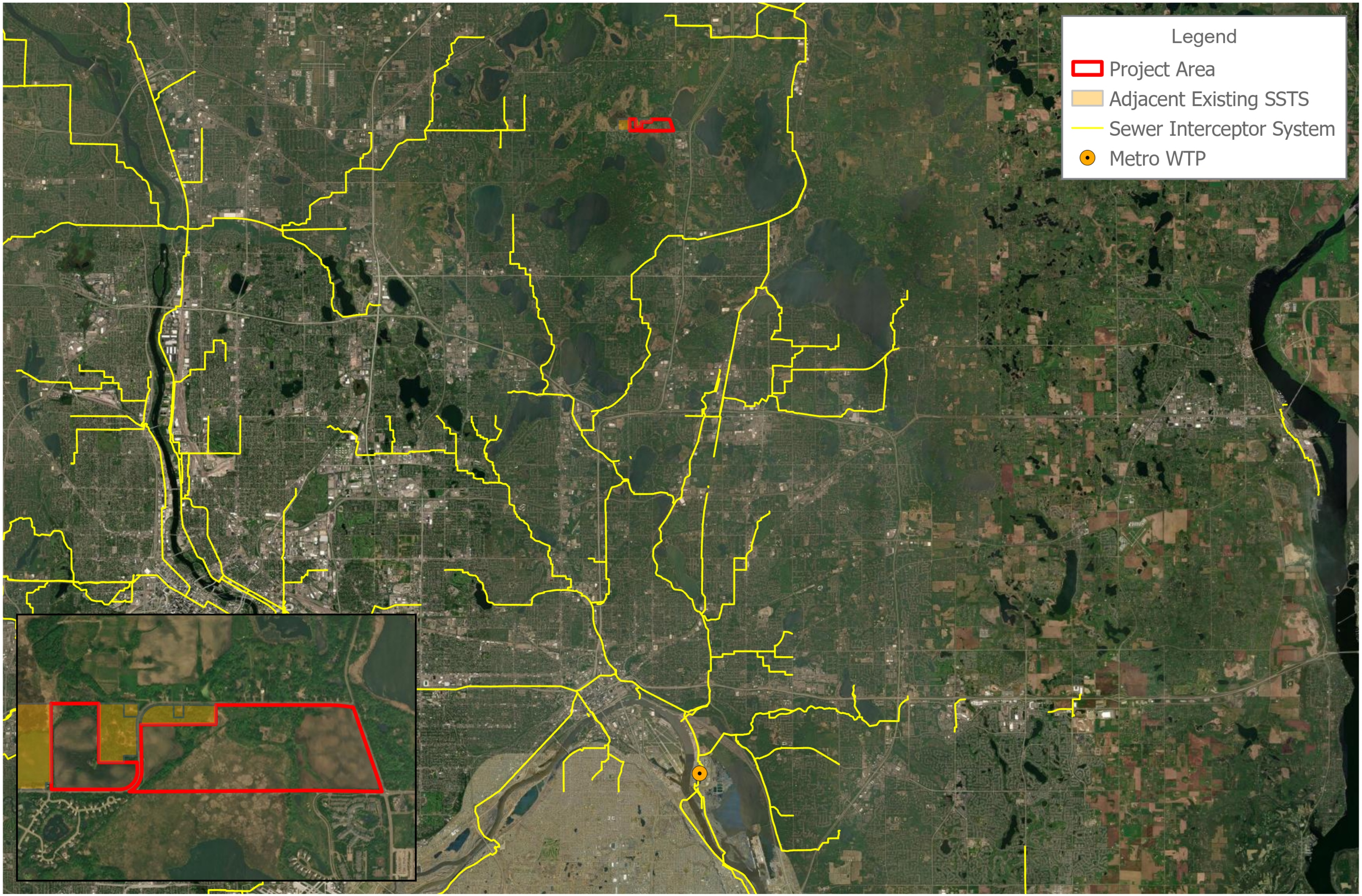
Project Number: 24-30671

S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map - aprx

Figure 9
Groundwater Resources Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI, 2023)
MWI (MDH, 2023)
WHPA (MDH, 2019)

ISG



S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map -.aprx

Friday, November 15, 2024

Project Number: 24-30671

Figure 10

Wastewater Resources Map

North Oaks Development

Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI, 2023)
SSTS (Lino Lakes, 2020)
WTP (MetCon, 2024)

ISG

S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map - aprx

Thursday, October 10, 2024

Project Number: 24-30671

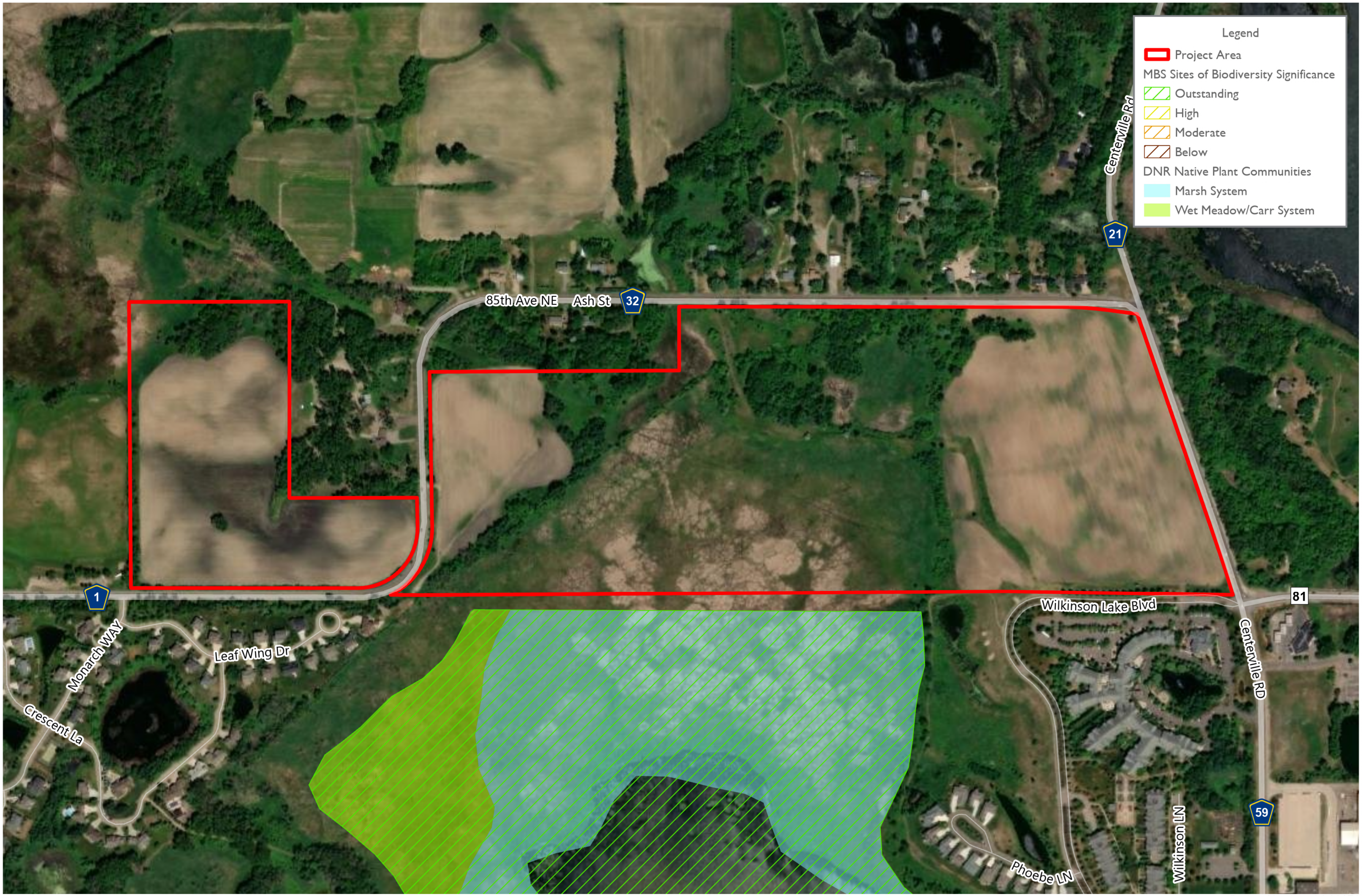
0 500 1,000
Feet
1 inch = 1,000 feet

N

Figure 11
What's In My Neighborhood Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI, 2023)
WIMN (MPCA, 2023)

ISG



S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes DevelopmentMaster P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map -.aprx

Friday, November 15, 2024

Project Number: 24-30671

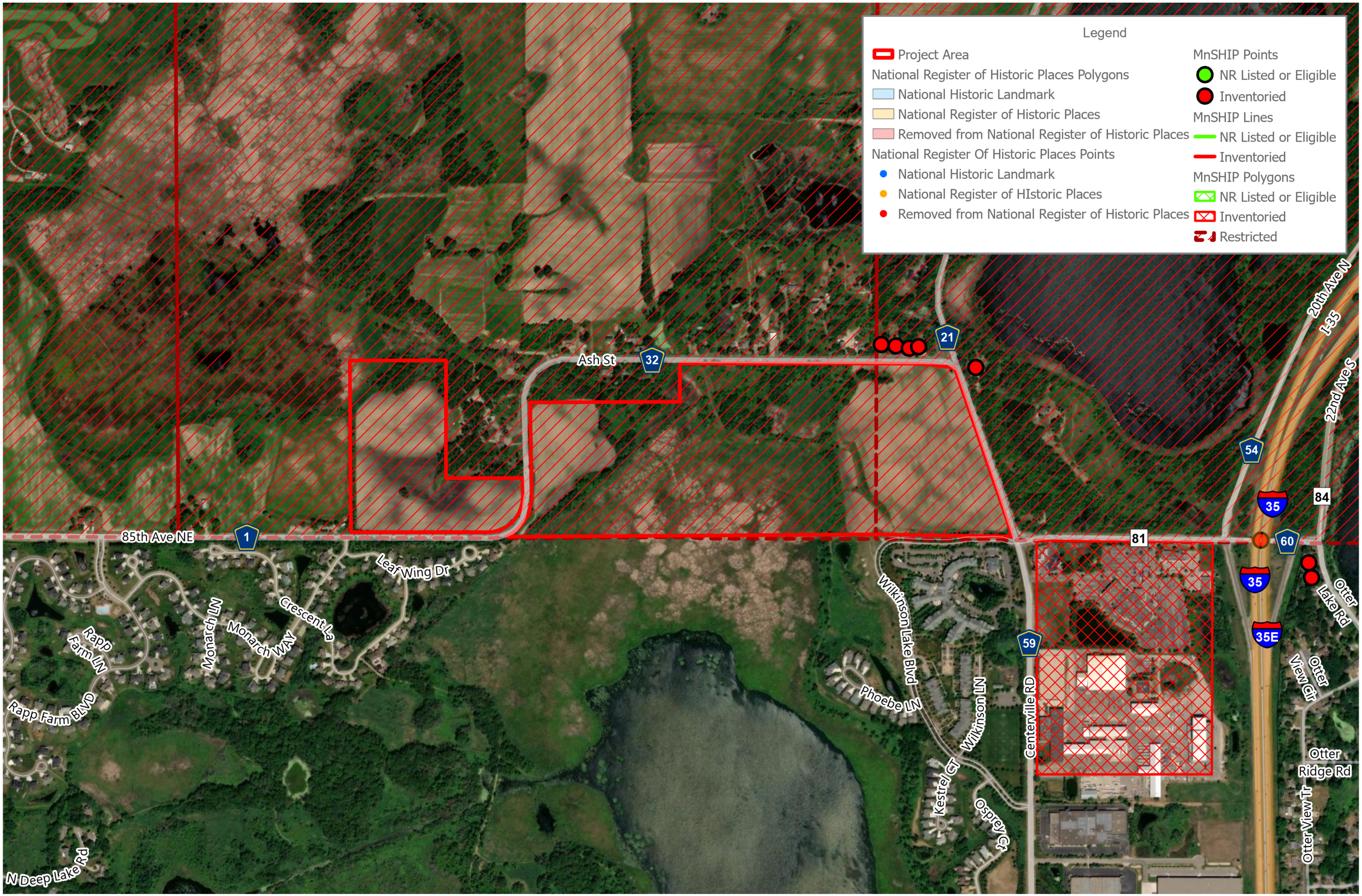
0 300 600
Feet
1 inch = 600 feet

N

Figure 12
Ecological Resources Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
MBS Sites (MnDNR, 2024)
Plant Communities (MnDNR, 2024)

ISG



S:\Projects\30000 PROJ\30600-30699\30671 Lino Lakes Development\Master P-Lino Lakes MN\30671 Production Files\30671 GIS\30671 MapDocs\- 30671 Pro Editing Map -\- 30671 Pro Editing Map -.aprx

Friday, November 15, 2024

Project Number: 24-30671

0 500 1,000
Feet
1 inch = 1,000 feet

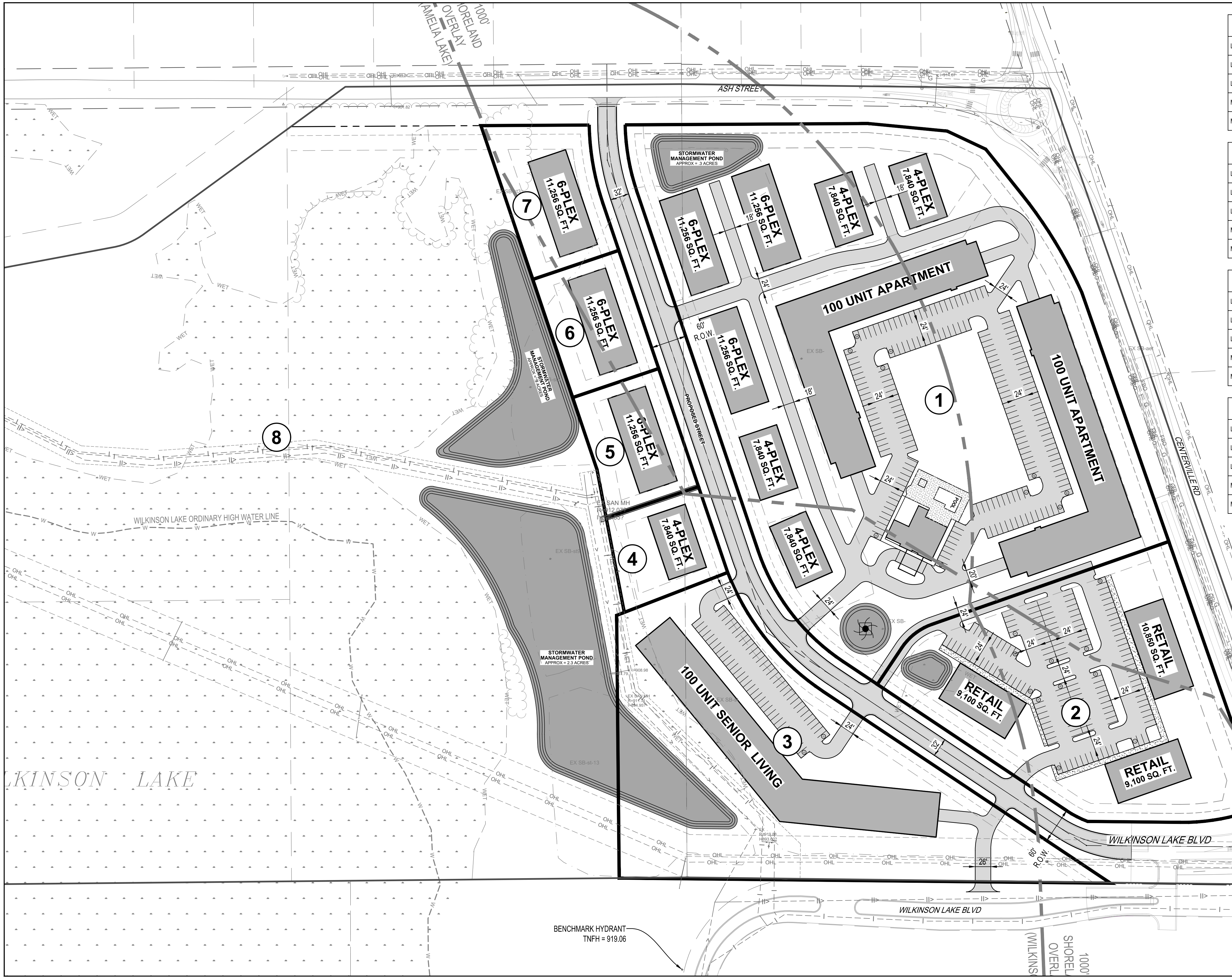
N

Figure 13
Historic Properties Map
North Oaks Development
Lino Lakes, Anoka County, Minnesota

Source(s):
Orthophoto (ESRI, 2023)
MnSHIP (SHPO, 2024)
NRHP (NPS, 2024)

ISG

Appendix B – Site Plan



LOT 1	
LAND USE CLASSIFICATION	R-4 : HIGH DENSITY RESIDENTIAL DISTRICT
LOT AREA:	12.4 AC
LOT WIDTH:	1051'
MIN LOT AREA:	0.5 AC
MIN LOT WIDTH:	100'

LOT 2	
LAND USE CLASSIFICATION	GB : GENERAL BUSINESS DISTRICT
LOT AREA:	4.1 AC
LOT WIDTH:	682'
MIN LOT AREA:	0.5 AC
MIN LOT WIDTH:	100'

LOT 3	
LAND USE CLASSIFICATION	R-4 : HIGH DENSITY RESIDENTIAL DISTRICT
LOT AREA:	5.2 AC
LOT WIDTH:	835'
MIN LOT AREA:	0.5 AC
MIN LOT WIDTH:	100'

LOT 4	
LAND USE CLASSIFICATION	R-4 : HIGH DENSITY RESIDENTIAL DISTRICT
LOT AREA:	0.6 AC
LOT WIDTH:	151'
MIN LOT AREA:	0.5 AC
MIN LOT WIDTH:	100'

LOT 5	
LAND USE CLASSIFICATION	R-4 : HIGH DENSITY RESIDENTIAL DISTRICT
LOT AREA:	0.7 AC
LOT WIDTH:	208'
MIN LOT AREA:	0.5 AC
MIN LOT WIDTH:	100'

LOT 6	
LAND USE CLASSIFICATION	R-4 : HIGH DENSITY RESIDENTIAL DISTRICT
LOT AREA:	0.7 AC
LOT WIDTH:	208'
MIN LOT AREA:	0.5 AC
MIN LOT WIDTH:	100'

LOT 7	
LAND USE CLASSIFICATION	R-4 : HIGH DENSITY RESIDENTIAL DISTRICT
LOT AREA:	0.9 AC
LOT WIDTH:	216'
MIN LOT AREA:	0.5 AC
MIN LOT WIDTH:	100'

LOT 8	
LAND USE CLASSIFICATION	OPEN SPACE
LOT AREA:	49.7 AC
LOT WIDTH:	N / A
MIN LOT AREA:	N / A
MIN LOT WIDTH:	N / A

DEVOTED AREA	
TOTAL SITE AREA:	75.9 AC
AREA DEVOTED TO NON-RESIDENTIAL USES:	56 AC
AREA DEVOTED TO RESIDENTIAL USES:	19.9 AC
AREA DEVOTED TO RESIDENTIAL USE BY BUILDING OR STRUCTURE TYPE OR USE TYPE (PROPOSED RANGE OF INDIVIDUAL BUILDING SIZES):	
TOWNHOUSE:	7,480 SF - 11,256 SF
APARTMENT / SENIOR LIVING:	41,014 SF - 45,895 SF
COMMERCIAL:	9,100 SF - 10,850 SF
AREA DEVOTED TO COMMON OPEN SPACE:	0.0 AC
AREA DEVOTED TO PUBLIC OPEN SPACE:	49.7 AC
AREA DEVOTED TO STREETS:	2.2 AC
AREA DEVOTED TO COMMERCIAL USES:	4.1 AC
AREA DEVOTED TO INDUSTRIAL OR OFFICE USES:	0.0 AC

PROJECT PHASES	
PHASE 1A	LOT 1
PHASE 1B	LOT 1
PHASE 2	LOTS 4-7
PHASE 3	LOT 3
PHASE 4	LOT 2

0 80 160
SCALE IN FEET

N

PRELIMINARY SITE PLAN

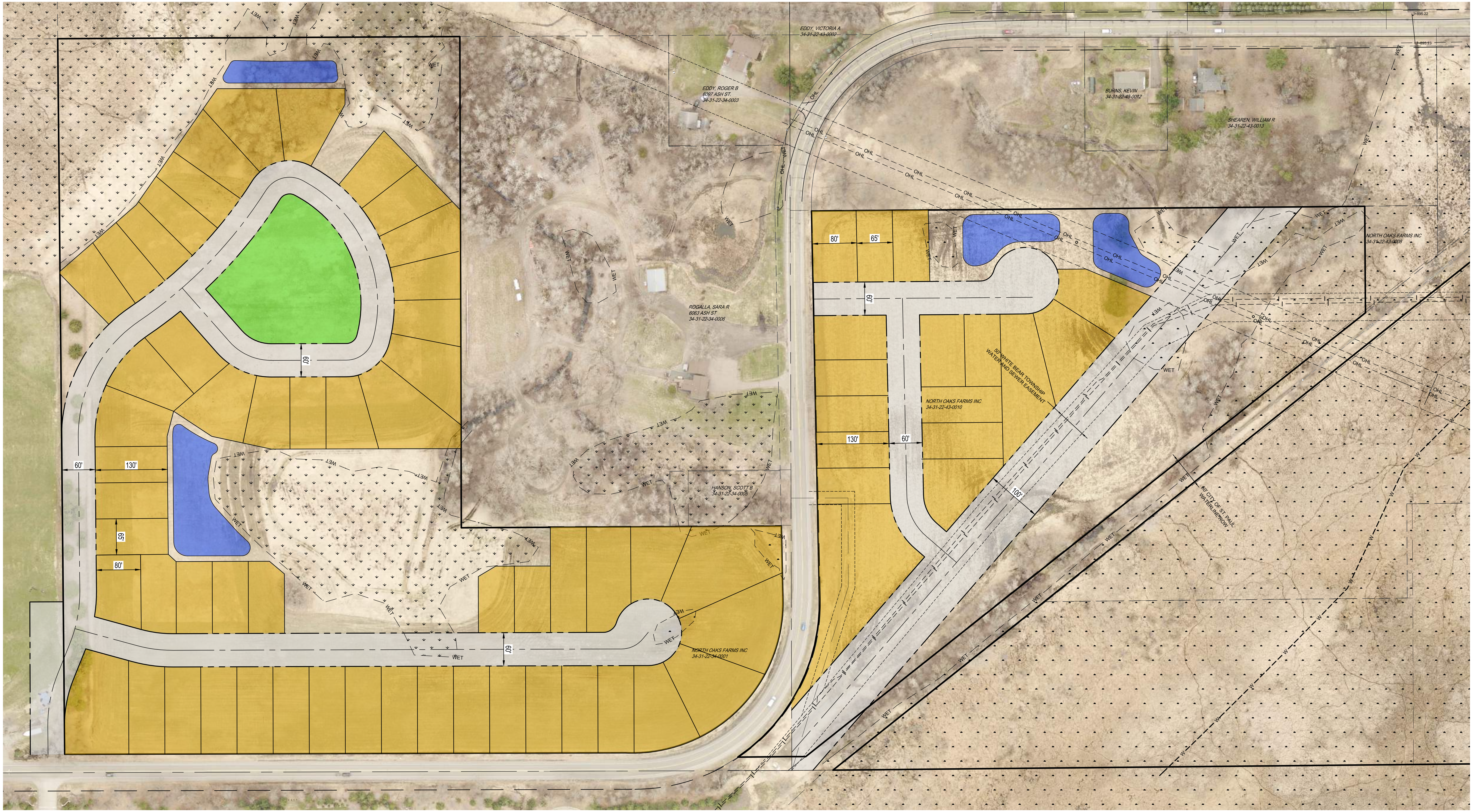
ISG

Architecture + Engineering + Environmental + Planning

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MN - 08/12/24
ISG PROJECT NO. 24-30671

DEDICATION - INTEGRITY - STEWARDSHIP - COLLABORATION - CREATIVITY

CRW architecture + design group



CONCEPT 1

0 80 160
SCALE IN FEET

N

ISG

Architecture + Engineering + Environmental + Planning

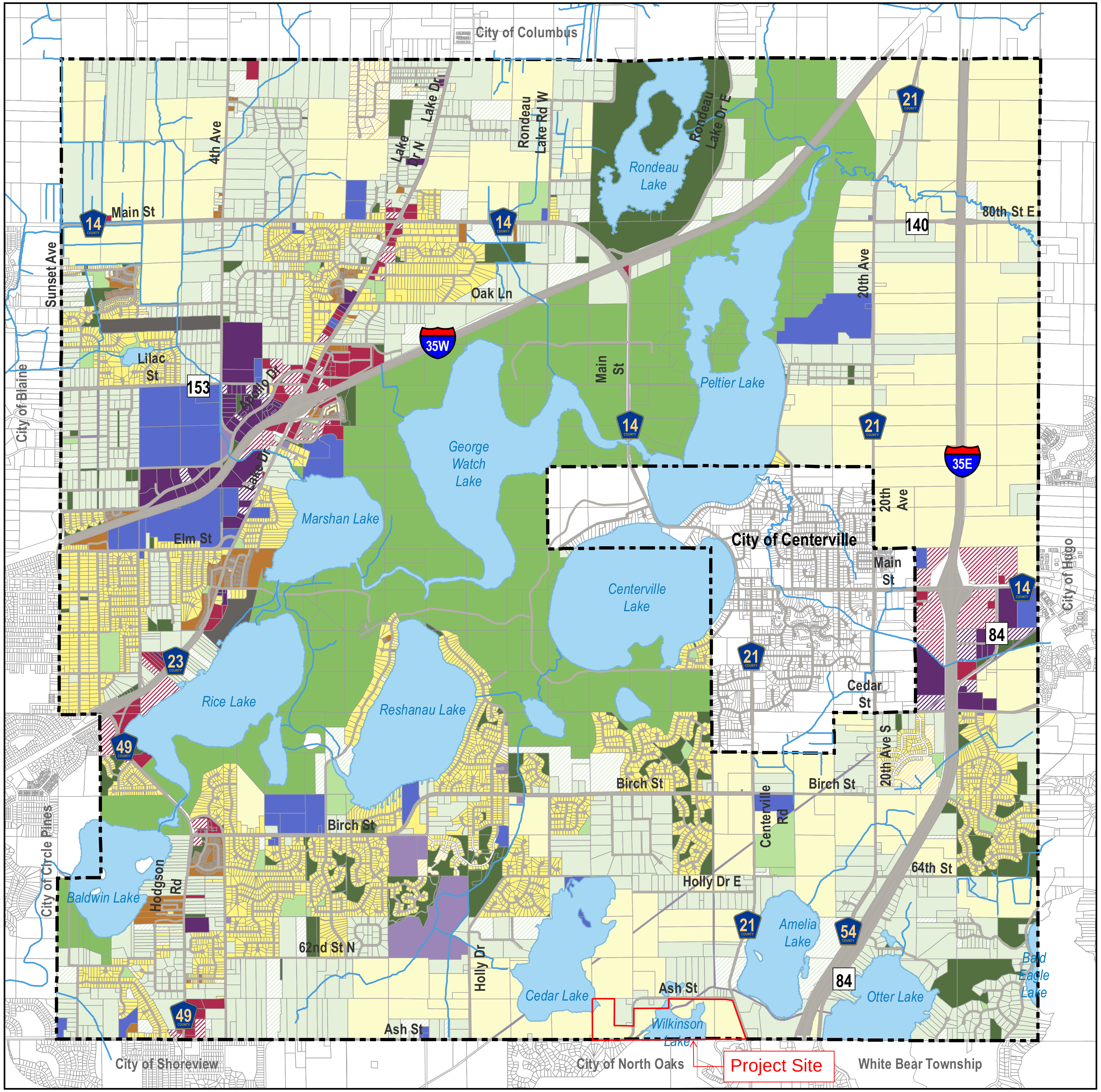
NORTH OAKS FARMS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/02/24
ISG PROJECT NO. 24-30671

ISGInc.com

Appendix C – Zoning and Land Use

CITY OF LINO LAKES
2040
COMP PLAN

Figure 2-17
2017 Existing Land Use

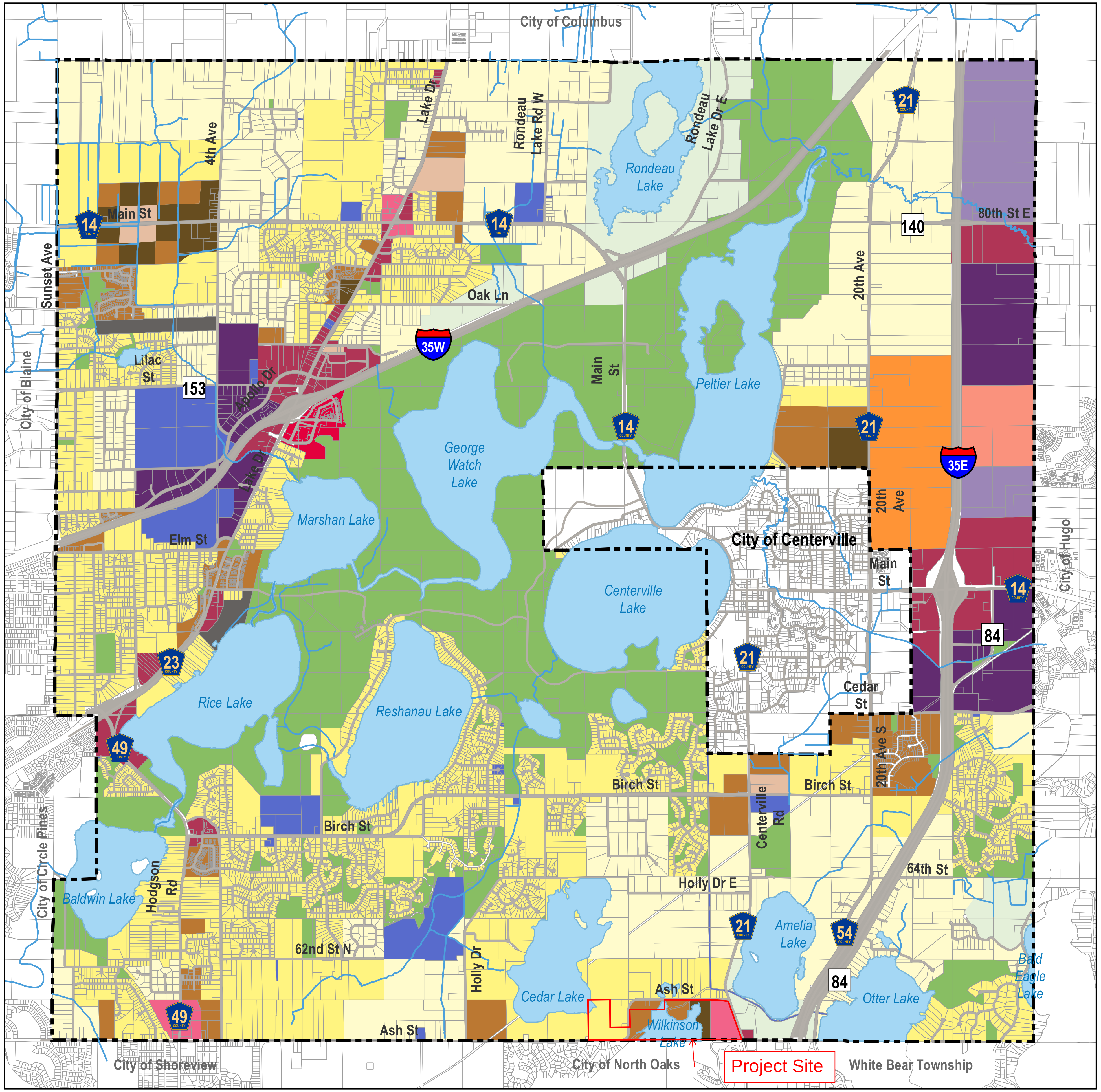


Legend

Date: 2/6/2018 **2-17**

CITY OF LINO LAKES
2040
COMP PLAN

Figure 3-2
2040 Future Land Use

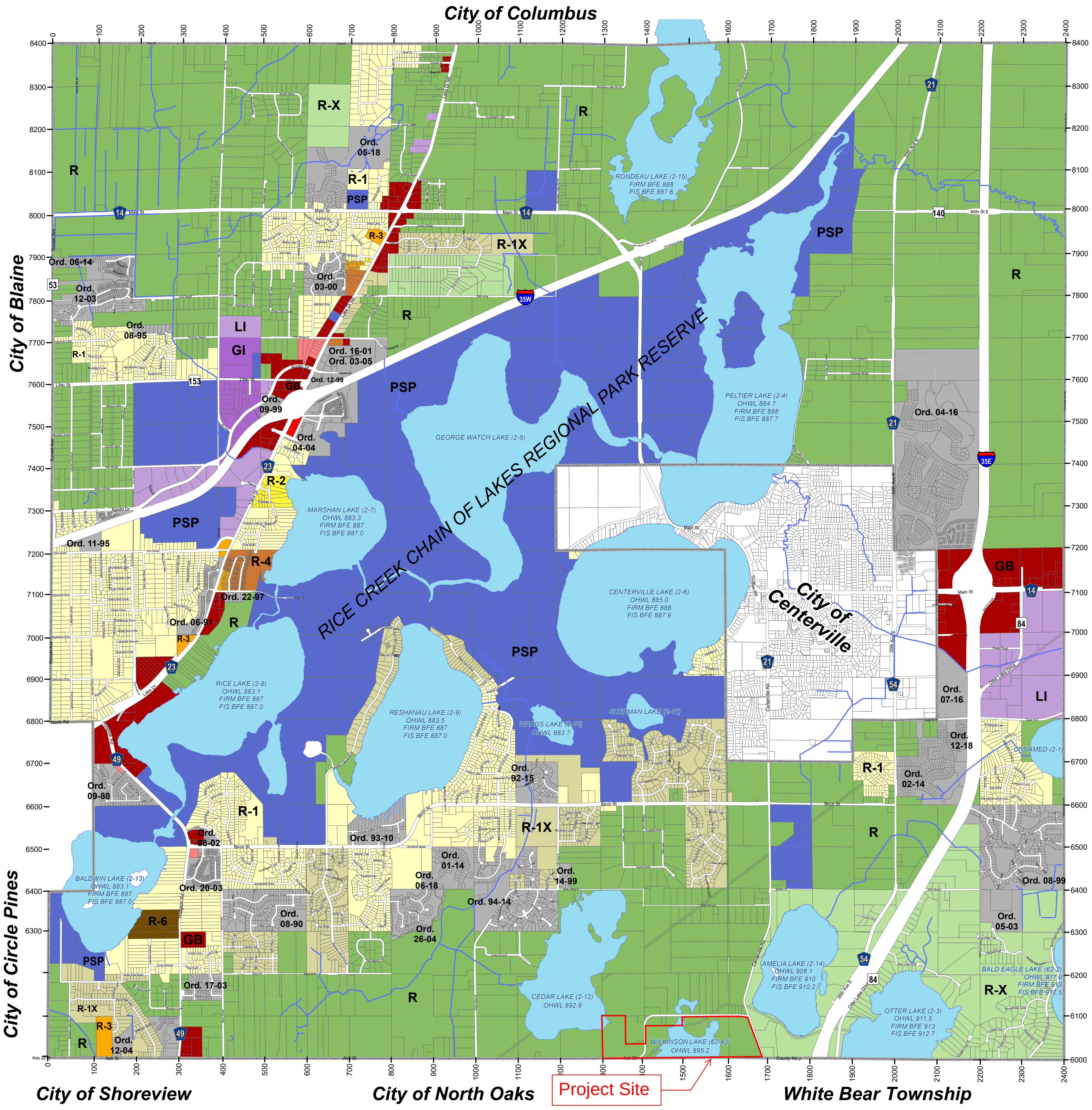


Legend

🟩 Permanent Rural
🟨 Urban Reserve
🟨 Low Density Residential
🟧 Low Density Mixed Residential
🟫 Medium Density Residential
🟫 High Density Residential
🟫 Planned Residential / Commercial
🟧 Office Residential
🟥 Signature Gateway District
🟥 Commercial
🟥 Town Center
🟪 Business Campus
🟪 Industrial
🟦 Civic and Institutional
🟩 Parks and Open Space
⬛ Private Airfield
⬜ Right-of-Way
🟦 Open Water
⬚ Municipal Boundary
⬜ Parcels
— Streams

3,500 1,750 0 3,500
Feet
N

Date: 11/9/2020



Zoning Map of Lino Lakes

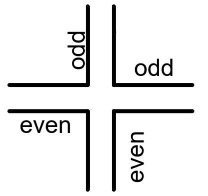
Legend

ZONING

🟩	R	Rural
🟩	R-X	Rural Executive
🟨	R-1	Single Family Residential
🟨	R-1X	Single Family Executive
🟨	R-2	Two Family Residential
🟧	R-3	Medium Density Residential
🟧	R-4	High Density Residential
🟫	R-5	High Density Residential and Business
🟫	R-6	Manufactured Home Park
🟥	NB	Neighborhood Business
🟥	LB	Limited Business
🟥	GB	General Business
🟪	LI	Light Industrial
🟪	GI	General Industrial
🟪	BC	Business Campus
🟦	PSP	Public Semi-Public
⬜	PUD	Planned Unit Development

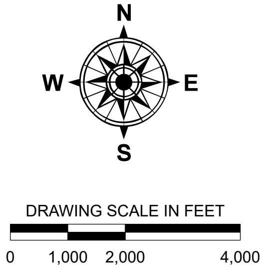
Lino Lakes
Community Development
600 Town Center Parkway
Lino Lakes, Minnesota 55014

Phone (651) 982-2400



HOUSE NUMBERING SYSTEM

Maps are for illustrative purposes only.
Recent changes may not be included.
Land Use and Zoning Information
should be verified with City Staff.



Coordinate System: *Anoka County NAD83 Feet*
Lambert Conformal Conic

Anoka County Parcel Data: *April 2023 Release*

Updated Through Ord. No. 08-22
Effective January 5, 2023

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided in digital format by the USDA-FSA Aerial Photography Field Office. This information was photogrammetrically compiled at a scale of 1:12,000 from aerial photography dated 2009.

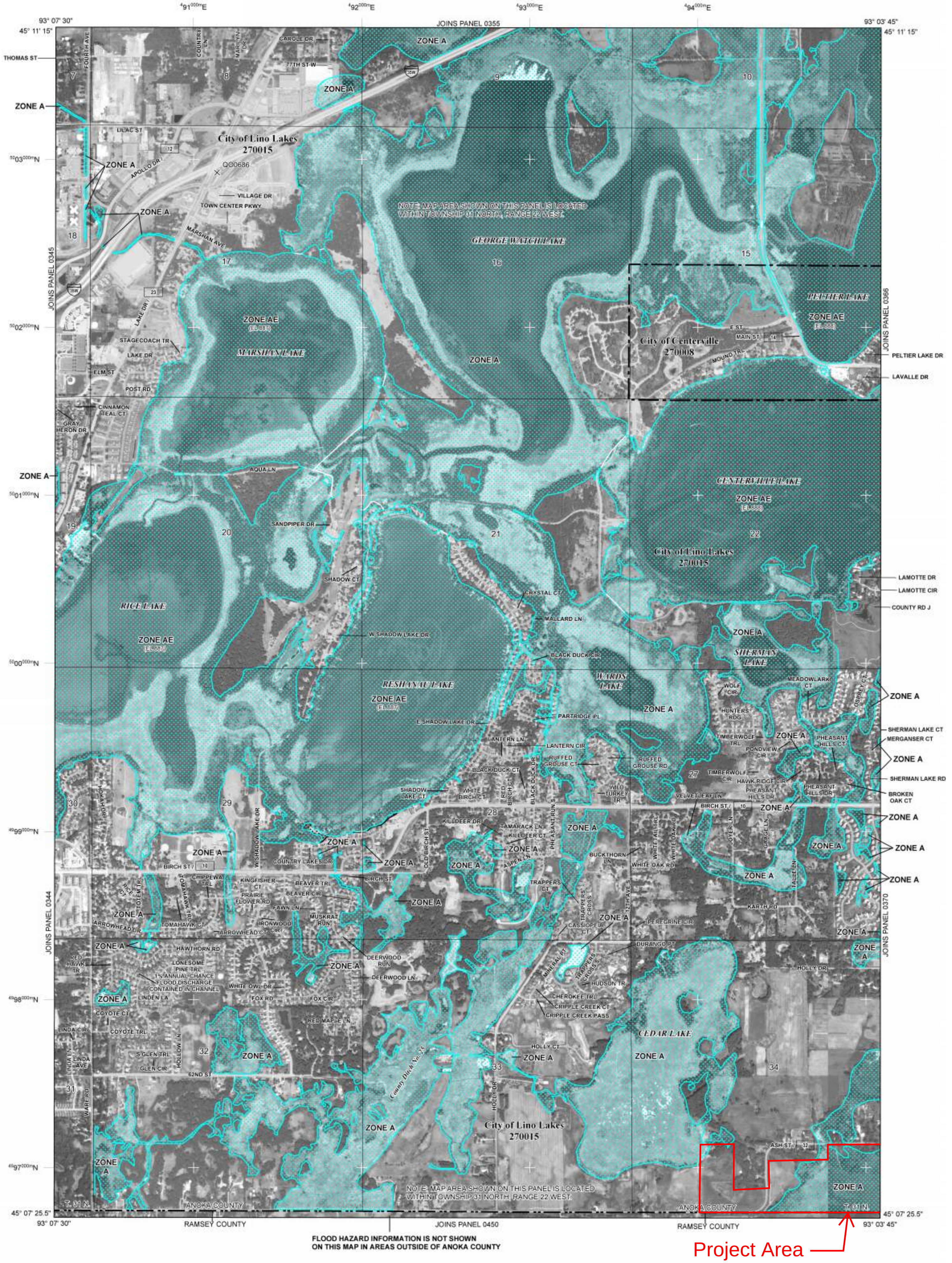
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

▨ SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨ FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▒ OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

☐ OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

▧ COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

▧ OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

———	1% Annual Chance Floodplain Boundary
———	0.2% Annual Chance Floodplain Boundary
— —	Floodway boundary
— — —	Zone D boundary
• • • • • • • • • • • • •	CBRS and OPA boundary
▬ ◄	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
(23)- - - - - -(23)	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
$^{48}89^{000m}$ N	1000-meter Universal Transverse Mercator grid values, zone 15
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
December 16, 2015

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 1000'

500	0	1000	2000	FEET
300	0	300	600	METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0365E

FIRM
FLOOD INSURANCE RATE MAP
ANOKA COUNTY, MINNESOTA
AND INCORPORATED AREAS

PANEL 365 OF 450
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CENTERVILLE, CITY OF	270008	0365	E
LINO LAKES, CITY OF	270015	0365	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
27003C0365E

EFFECTIVE DATE
DECEMBER 16, 2015

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base Map information shown on this FIRM was provided in digital format by the USDA-FSA Aerial Photography Field Office. This information was photogrammetrically compiled at a scale of 1:12,000 from aerial photography dated 2009.

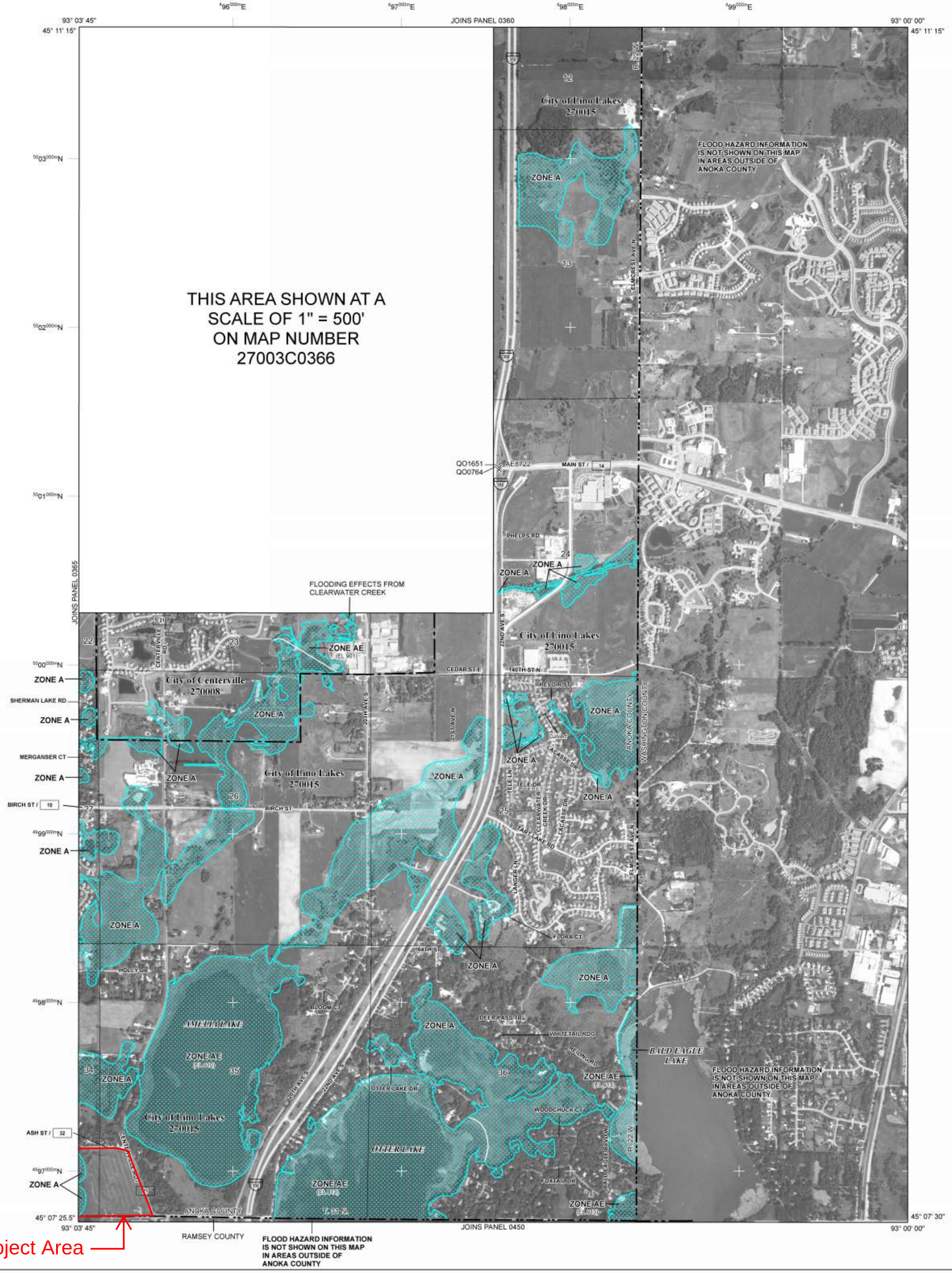
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

🟦 SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨ FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▒ OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

☐ OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

▧ COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

▨ OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

———	1% Annual Chance Floodplain Boundary
———	0.2% Annual Chance Floodplain Boundary
— —	Floodway boundary
— — —	Zone D boundary
•••••••••••••	CBRS and OPA boundary
🟦	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
(23)- - - - -(23)	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000m N	1000-meter Universal Transverse Mercator grid values, zone 15
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
December 16, 2015

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

FEET	500	0	1000	2000	
METERS	300	0	300	600	

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0370E

FIRM

FLOOD INSURANCE RATE MAP

ANOKA COUNTY, MINNESOTA
AND INCORPORATED AREAS

PANEL 370 OF 450
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CENTERVILLE, CITY OF	270008	0370	E
LINO LAKES, CITY OF	270015	0370	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
27003C0370E

EFFECTIVE DATE
DECEMBER 16, 2015

Federal Emergency Management Agency

Appendix D – Geotechnical Report

Preliminary Geotechnical Evaluation Report

Proposed Wilkinson Waters Development
Southwest of County Road J and Centerville Road
Lino Lakes, Minnesota

Prepared for

North Oaks Company LLC

Professional Certification:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

John T. Carlson, PE
Senior Engineer
License Number: 20633
August 22, 2024

Project B2402335

Braun Intertec Corporation

BRAUN
INTERTEC
The Science You Build On.

[redacted]
[redacted]

August 22, 2024 Project B2402335

Ms. Lauren Grouws
North Oaks Company LLC
5959 Centerville Road, Suite 200
North Oaks, MN 55127

Re: Preliminary Geotechnical Evaluation
Proposed Wilkinson Waters Development
Southwest of County Road J and Centerville Road
Lino Lakes, Minnesota

Dear Ms. Grouws:

We are pleased to present this Preliminary Geotechnical Evaluation Report for the proposed Wilkinson Waters development located in the southwest quadrant of County Road J and Centerville Road in Lino Lakes, Minnesota. Please see the attached report for a detailed discussion on the field exploration results and our recommendations. The report should be read in its entirety.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact John Carlson at 952.540.7248 (johcarlson@braunintertec.com).

Sincerely,

BRAUN INTERTEC CORPORATION

John T. Carlson, PE
Senior Engineer

Henry Vloo, PE
Senior Engineer

c: Mr. Joseph Westphal, Braun Intertec

Table of Contents

Description **Page**

Table of Contents (continued)

Description **Page**

A. Introduction

A.1. Project Description

This Preliminary Geotechnical Evaluation Report addresses the design and construction of the proposed Wilkinson Waters development located in the southwest quadrant of County Road J and Centerville Road in Lino Lakes, Minnesota. The Wilkinson Waters development is in the design phase and grading or building plans with proposed floor grades and building foundation loads is not yet available. The project will include the construction of 2 apartment buildings, 1 senior living building, 3 retail buildings, and 11 townhouse buildings, with associated underground utilities, stormwater management, and bituminous drive lanes and parking lots. Tables 1 through 4 provide a summary of project details. The attached

Table 1. Apartment and Senior Living Buildings Description

Aspect	Source	Description
Below grade levels	Assumed	1
Above grade levels	Assumed	3
Finished floor elevation	Assumed	930 feet
Lower-level floor elevation	Assumed	920 feet
Maximum Column loads	Assumed	300 kips
Wall loads	Assumed	6 to 8 kips/ft
Nature of construction	Assumed	The buildings will be constructed with precast planks and wood framing with typical cast-in-place concrete footings and bearing walls.
Site Grading	Assumed	We anticipate that general exterior site grades will be raised about 5 to 10 feet during grading.

Table 2. Retail Buildings Description

Aspect	Source	Description
Below grade levels	Assumed	0 (Slab-on-Grade)
Above grade levels	Assumed	1
Finished floor elevation	Assumed	930 feet
Maximum Column loads	Assumed	100 kips
Wall loads	Assumed	2 to 4 kips/ft
Nature of construction	Assumed	The buildings will be slab-on-grade, constructed with wood framing, with cast-in-place concrete footings and bearing walls.
Site Grading	Assumed	We anticipate that general exterior site grades will be raised about 5 to 10 feet during grading.

Table 3. Townhouse Buildings Description

Aspect	Source	Description
Below grade levels	Assumed	0 (Slab-on-Grade)
Above grade levels	Assumed	2
Finished floor elevation	Assumed	930 feet
Maximum Column loads	Assumed	50 kips
Wall loads	Assumed	1 to 2 kips/ft
Nature of construction	Assumed	The buildings will be slab-on-grade and constructed with wood framing with typical cast-in-place concrete footings and bearing walls.
Site Grading	Assumed	We anticipate that general exterior site grades will be raised about 5 to 10 feet during grading.

Table 4. Site Aspects and Grading Description

Aspect	Description
Pavement type	Bituminous drive lanes and parking lots with exterior concrete flatwork
Pavement loads	Light Duty = 50,000 ESALs (assumed)* Heavy Duty = 200,000 ESALs (assumed)*
Stormwater management	4 stormwater ponds with 2 in the west, 1 in the north and 1 in the south Retail area.

*Equivalent 18,000-lb single axle loads based on 20-year design.

The proposed site layout is shown on the attached Soil Boring Location Sketch.

A.2. Site Conditions and History

Currently, the site exists as cultivated fields or wetlands with some brush and trees around the margins of the site. The west portion of the site is a wetland associated with Wilkinson Lake. Based on the boring locations, current site grades range from about 904 to 929 feet Mean Sea Level (MSL) and generally slopes down to the west to the wetland area.

The following recent aerial Photograph 1 shows the current site conditions.

Photograph 1. Aerial Photograph of the Site

Photograph obtained from Google Maps.

A.3. Purpose

The purpose of our preliminary geotechnical evaluation is to characterize subsurface geologic conditions at selected exploration locations, evaluate their impact on the project, and provide geotechnical recommendations for the design and construction of proposed Wilkinson Waters development.

A.4. Background Information and Reference Documents

We reviewed the following information:

- Concept plan 5 dated June 12, 2024, prepared by ISG.
- Aerial photographs of the project area using Google Earth®.
- The Surficial Geology Map for Anoka County prepared by the University of Minnesota. The map is denoted as Atlas C-27, Plate 3, Surficial Geology, and is dated 2010.

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

A.5. Scope of Services

We performed our scope of services for the project in accordance with our Proposal QTB192060 dated March 18, 2024. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.
- Staking and clearing the exploration location of underground utilities. We selected and staked the new exploration locations. We acquired the surface elevations and locations with GPS technology using the State of Minnesota’s permanent GPS base station network. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings.

- Performing 16 standard penetration test (SPT) borings, denoted as ST-1 to ST-16, to nominal depths of 14 1/2 to 21 feet below grade across the site. Borings ST-1 and ST-2 were not drilled due to soft ground conditions.

- Performing laboratory testing on select samples to aid in soil classification and engineering analysis.

- Preparing this report containing a boring location sketch, logs of soil borings, a summary of the soils encountered, results of laboratory tests, and preliminary recommendations for structure and pavement subgrade preparation and the design of foundations, floor slabs, exterior slabs, utilities, stormwater improvements and pavements.

B. Results

B.1. Geologic Overview

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Boring Results

Table 5 provides a summary of the soil boring results in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheet in the Appendix includes definitions of abbreviations used in Table 5.

Table 5. Subsurface Profile Summary*

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Topsoil	SM, ML	N/A	▪ Encountered at the surface of all 14 boring locations and consisted of silty sand and sandy silt. ▪ Thicknesses at boring locations about 1/2 to 1 1/2 feet. ▪ Brown to dark brown in color. ▪ Moisture condition generally moist.
Alluvium	SP-SM, SM, CL, CH	2 to 15 blows per foot (BPF)	▪ Encountered below the topsoil in most of the borings. ▪ Alluvium varied and extended to depths from about 7 to greater than 14 1/2 feet below grade. ▪ Mostly silty sand and sand with lesser amounts of lean clay and fat clay. ▪ Brown, dark brown, and gray in color. ▪ Moisture condition generally moist to wet.
Glacial Till	CL, SC, SM, SP-SM	4 to 17 BPF	▪ Encounter below the topsoil and/or alluvium at Borings ST-5, ST-7, ST-9, ST-10 through ST-12, ST-15, and ST-16. ▪ Generally clayey sand and sandy lean clay with lesser amounts of sand and silty sand. ▪ Brown and gray in color. ▪ Moisture condition generally moist to wet.

*Abbreviations defined in the attached Descriptive Terminology sheet.

B.3. Groundwater

Table 6 summarizes the depths where we observed groundwater; the attached Log of Boring sheets in the Appendix also include this information and additional details.

Table 6. Groundwater Summary

Location	Measured Surface Elevation (feet)	Measured Depth to Groundwater (feet)	Corresponding Groundwater Elevation (feet)
ST-3	905.4	9	896 1/2
ST-4	917.5	6	911 1/2
ST-5	905.8	9 1/2	895 1/2
ST-6	915.2	7	908
ST-7	920.9	2	919
ST-8	923.8	5	918 1/2
ST-9	903.9	9	895

Location	Measured Surface Elevation (feet)	Measured Depth to Groundwater (feet)	Corresponding Groundwater Elevation (feet)
ST-10	924.1	5	919
ST-11	923.8	5	918 1/2
ST-12	924.1	5	919
ST-13	904.1	8 1/2	895 1/2
ST-14	917.7	7 1/2	910
ST-15	925.3	7	918
ST-16	929.6	Not Observed	----

At Borings ST-3, ST-5, ST-9, and ST-13 performed in the west portion of the site adjacent to the wetland, groundwater was encountered between depths of about 8 to 9 feet, which correspond to elevations of about 895 to 896 feet. At Borings ST-4, ST-6 through ST-8, ST-10 through ST-12, ST-14 and ST-15 performed in the central and east portions of the site, groundwater was encountered between depths of about 2 to 7 feet, which correspond to elevations of about 908 to 919 feet.

The site is situated between Wilkinson Lake (OHW 895.2 feet) and Amelia Lake (OHW 908.1 feet). The ordinary high water (OHW) levels were obtained from the MN DNR Lake Finder website.

Based on the results of the borings, it is our opinion that some of the groundwater encountered in the borings in the higher portion of the site is perched groundwater within granular alluvial soil layers overlying less permeable clayey glacial till soils. We anticipate that seams or zones of perched water will be present at variable elevations across the site and should be expected during construction.

Because the apartment and senior buildings will likely have below grade parking as well as an in-ground pool, we recommend that additional soil borings be completed in which we can install piezometers. The piezometers can measure groundwater levels over an extended period of time to assist in establishing low floor grades. Project planning should expect groundwater will fluctuate seasonally and annually.

B.4. Laboratory Test Results

We performed mechanical analyses through a #200 sieve (P200) and moisture content tests in accordance with American Society for Testing and Materials (ASTM) procedures on samples recovered from the SPT borings. The P200 and moisture content tests are shown on the Log of Boring Sheets included in the Appendix, across from the associated soil sample.

C. Recommendations

C.1. Design and Construction Discussion

C.1.a. Building Subgrade Preparation

The preliminary plans indicate the proposed development will contain 2 apartment buildings and 1 senior living building that will all contain below grade parking levels, 3 slab-on-grade retail buildings and 11 slab-on-grade townhouse buildings. Based on the results of the borings and the anticipated finished floor elevation of 930 feet for the buildings, we anticipate a soil correction will be required for the buildings with fills up to about 10 feet required to establish grade. We anticipate the soil correction will involve removing the topsoil, existing fill and soft/very loose soils. Also, any relic buried structures – such as old pavements, wells, cisterns, utility lines, floor slabs or foundations, etc., should be removed from building pads and paved areas.

Any areas of loose or disturbed sands in the excavation bottoms should be moisture conditioned, if necessary, and surface compacted to increase the density and uniformity of the sands prior to footing or fill placement.

C.1.b. Reuse of On-Site Soils

The on-site native soils, free of organic materials and debris, appear suitable for reuse as engineered fill. Some of the on-site soils will likely require moisture conditioning (drying or wetting) prior to reuse and compaction. However, the higher moisture content lean clay and the fat clay should not be used as structural fill. Any materials to be used as engineered fill should be tested and approved by the geotechnical engineer prior to placement.

C.1.c. Effects of Groundwater

Groundwater was encountered in 13 of the 14 soil borings during drilling. At the 4 borings performed in the west portion of the site adjacent to the wetland, groundwater was encountered between depths of about 8 to 9 feet, which correspond to elevations of about 895 to 896 feet. At 9 of the 10 borings performed in the central and east portions of the site, groundwater was encountered between depths of about 2 to 7 feet, which correspond to elevations of about 908 to 919 feet. The attached Log of Boring sheets in the Appendix also include this information and additional details.

The groundwater levels were highly variable; therefore, it is our opinion that some of the groundwater observed in the borings is perched in permeable sand layers overlying slower draining clay layers. Excavation trenches for utility installation will likely intercept some of these permeable layers creating difficult backfilling conditions. Once the site grading and utility construction is complete, we expect some of the perched water conditions of the site may change.

The contractor should immediately remove any collected water within the excavations to facilitate construction and proper backfilling. Project planning should include temporary sumps and pumps for excavations in low-permeability soils, such as clays and silts. Dewatering of high-permeability soils (e.g., sands) from within the excavation with conventional pumps has the potential to loosen the soils, due to upward flow, and we recommend that well points or dewatering wells be used in these areas.

To further evaluate the groundwater conditions on this site, additional soil borings should be completed and piezometers should be installed and monitored. This additional groundwater data would assist in establishing the below grade parking levels of the apartment and senior living buildings. It will also assist with designing the below-grade pool.

C.1.d. Additional Evaluation

This draft report assumes that the buildings will be supported by spread footing foundations designed for a maximum net allowable bearing pressure of 3,000 pounds per square foot (psf). As design of the development progresses and the building floor grades and building loads are established, we recommend completing additional soil borings to determine if a higher soil bearing pressure is feasible.

C.2. Site Grading and Subgrade Preparation

C.2.a. Building Subgrade Excavations

We recommend soil corrections to remove any unsuitable materials from the building footprint and oversize area prior to construction. We define unsuitable materials as any existing fill, frozen materials, topsoil, organic soils, existing utilities, building debris, pavements, and/or soft or very loose soils. Table 7 shows the anticipated soil correction excavation depths and associated bottom elevations for each of the borings. We have assumed that structures will be constructed at each boring location. If structures are not planned at individual boring locations, the depth of soil correction work could be reduced.

Table 7. Anticipated Soil Correction Excavation Depths

Location	Measured Surface Elevation (feet)	Anticipated Excavation Depth (feet)	Anticipated Excavation Bottom Elevation (feet)
ST-3	905.4	1**	904 1/2
ST-4	917.5	1/2	917
ST-5	905.8	9	897
ST-6	915.2	1/2	914 1/2
ST-7	920.9	1 1/2	919 1/2
ST-8	923.8	1/2	923
ST-9	903.9	1	903
ST-10	924.1	1	923
ST-11	923.8	1	923
ST-12	924.1	1	923
ST-13	904.1	1	903
ST-14	917.7	1	916 1/2
ST-15	925.3	1	924 1/2
ST-16	929.6	1	928 1/2

** - Recommend moisture conditioning and surface compacting upper looser sands.

Note - Borings ST-1 and ST-2 not drilled.

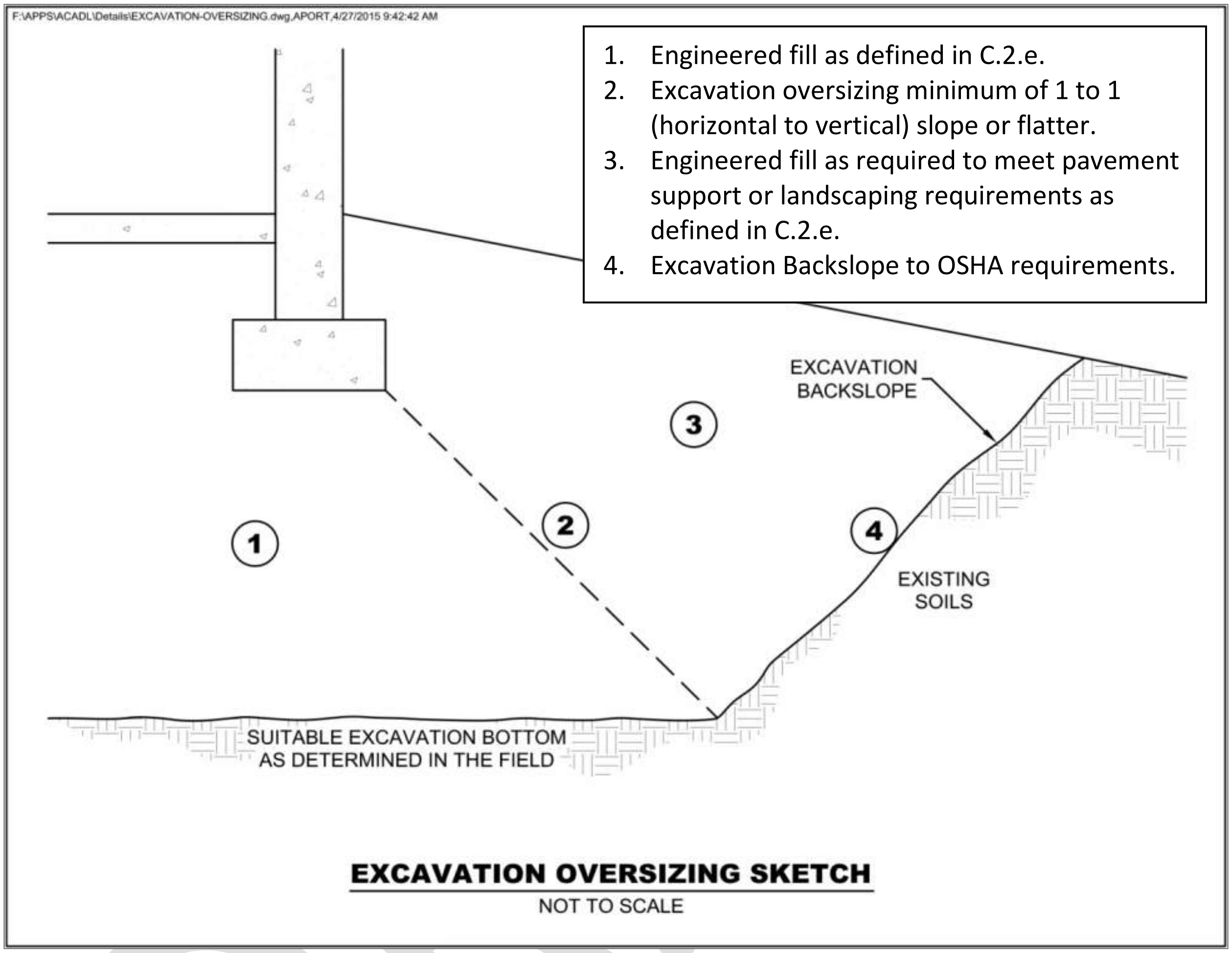
Excavation depths will vary between and away from the borings. Portions of the excavations may also extend deeper than indicated by the borings. A geotechnical representative should observe the excavations to make the necessary field judgments regarding the suitability of the exposed soils and to evaluate for additional subcuts are warranted.

The contractor should use equipment and techniques to minimize soil disturbance. Loose or disturbed sands should be moisture conditioned, if necessary, and surface compacted to increase their density and uniformity prior to engineered fill and/or concrete placement.

C.2.b. Excavation Oversizing

When removing unsuitable materials below structures or pavements, we recommend the excavation extend outward and downward at a slope of 1H:1V (horizontal:vertical) or flatter. See Figure 1 for an illustration of excavation oversizing.

Figure 1. Generalized Illustration of Oversizing



The design team should evaluate that adequate oversizing of soil corrections can be achieved. Additional consideration of this adjacent to the existing building is provided in Section C.4. If adequate oversizing cannot be achieved, we should be consulted as additional recommendations may apply.

C.2.c. Excavated Slopes

Based on the borings, we anticipate on-site soils in excavations will generally consist of sands and silty sands. These soils are typically considered as Type C Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type C soils should have a gradient no steeper than 1 1/2H:1V.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, “Excavations and Trenches.” This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

C.2.d. Excavation Dewatering

We recommend removing groundwater from the excavations. Project planning should include temporary sumps and pumps for excavations in low-permeability soils, such as clays and silts. Dewatering of high-permeability soils (e.g., sands) from within the excavation with conventional pumps has the potential to loosen the soils, due to upward flow, and we recommend that well points or dewatering wells be used in these areas.

C.2.e. Engineered Fill Materials and Compaction

Table 8 below contains our recommendations for engineered fill materials.

Table 8. Engineered Fill Materials*

Locations To Be Used	Engineered Fill Classification	Possible Soil Type Descriptions	Gradation	Additional Requirements
▪ Below foundations ▪ Below interior slabs	Structural fill	SP-SM, SM, SC	100% passing 3-inch sieve < 25% passing #200 sieve	< 2% Organic Content (OC) Plasticity Index (PI) <20%
Any structural fill greater than 8 feet (from slab grade)	Deep Structural fills	SP, SP-SM	100% passing 3-inch sieve < 12% passing #200 sieve	< 2% OC
▪ Drainage layer ▪ Non-frost-susceptible	▪ Free-draining ▪ Non-frost-susceptible fill	SP	100% passing 1-inch sieve < 50% passing #40 sieve < 5% passing #200 sieve	< 2% OC
Behind below-grade walls, beyond drainage layer	Retained fill	SP-SM, SM, SC	100% passing 3-inch sieve	< 2% OC Plasticity Index (PI) < 4%
Pavements	Pavement fill	SP-SM, SM, SC, CL	100% passing 3-inch sieve	< 2% OC PI < 20%
Below landscaped surfaces, where subsidence is not a concern	Non-structural fill	SP-SM, SM, SC, CL, OL	100% passing 6-inch sieve	< 10% OC

*More select soils comprised of coarse sands with < 5% passing #200 sieve may be needed to accommodate work occurring in periods of wet or freezing weather.

We recommend spreading engineered fill in loose lifts of approximately 8 to 12 inches thick. We recommend compacting each lift of engineered fill with a full size, vibrating, sheepsfoot compactor, or similar in accordance with the criteria presented below in Table 9. The project documents should specify relative compaction of engineered fill, based on the structure located above the engineered fill, and vertical proximity to that structure.

Table 9. Compaction Recommendations Summary

Reference	Relative Compaction, percent (ASTM D698 – Standard Proctor)	Moisture Content Variance from Optimum, percentage points	
		< 12% Passing #200 Sieve (typically SP, SP-SM)	> 12% Passing #200 Sieve (typically CL, SC, SM)
Below bulding pads, less than 10 feet of fill	98	±3	-1 to +3
Below bulding pads, more than 10 feet of fill	100	±2	-1 to +2
Within 3 feet of pavement subgrade	100	±2	-2 to +1
More than 3 feet below pavement subgrade	95	±3	-1 to +3
Below landscaped surfaces	90	±5	-1 to +5

The project documents should not allow the contractor to use frozen material as engineered fill or to place engineered fill on frozen material. Frost should not penetrate under foundations during construction.

We recommend performing density tests in engineered fill to evaluate if the contractors are effectively compacting the soil and meeting project requirements.

C.2.f. Special Inspections of Soils

We recommend including the site grading and placement of engineered fill within the building pad under the requirements of Special Inspections, as provided in Chapter 17 of the International Building Code, which is part of the Minnesota State Building Code. Special Inspection requires observation of soil conditions below engineered fill or footings, evaluations to determine if excavations extend to the anticipated soils, and if engineered fill materials meet requirements for type of engineered fill and compaction condition of engineered fill. A licensed geotechnical engineer should direct the Special Inspections of site grading and engineered fill placement. The purpose of these Special Inspections is to evaluate whether the work is in accordance with the approved Geotechnical Report for the project. Special Inspections should include evaluation of the subgrade, observing preparation of the subgrade (surface compaction or dewatering, excavation oversizing, placement procedures and materials used for engineered fill, etc.) and compaction testing of the engineered fill.

C.3. Spread Footings

Table 10 below contains our recommended parameters for foundation design.

Table 10. Recommended Spread Footing Design Parameters

Item	Description
Maximum net allowable bearing pressure (psf)	3,000
Minimum factor of safety for bearing capacity failure	3.0
Minimum width (inches)	Strip footing – 24 Column footing – 36
Minimum embedment below final exterior grade for heated structures (inches)	42
Minimum embedment below final exterior grade for unheated structures or for footings not protected from freezing temperatures during construction (inches)	60
Total estimated settlement (inches)	Less than 1 inch
Differential settlement	Typically, about 2/3 of total settlement

C.4. Below-Grade Walls

Foundation walls or below grade (basement) walls will have lateral loads from the surrounding soils transmitted to them. Designs should also consider the slope of any fill and dead or live loads, including equipment and materials, placed within a horizontal distance behind the walls that is equal to the height of the walls. Our recommended values also assume the wall design provides drainage to prevent water from accumulating behind the walls. The construction documents should clearly identify the material properties of the soil the contractor should use for wall fill.

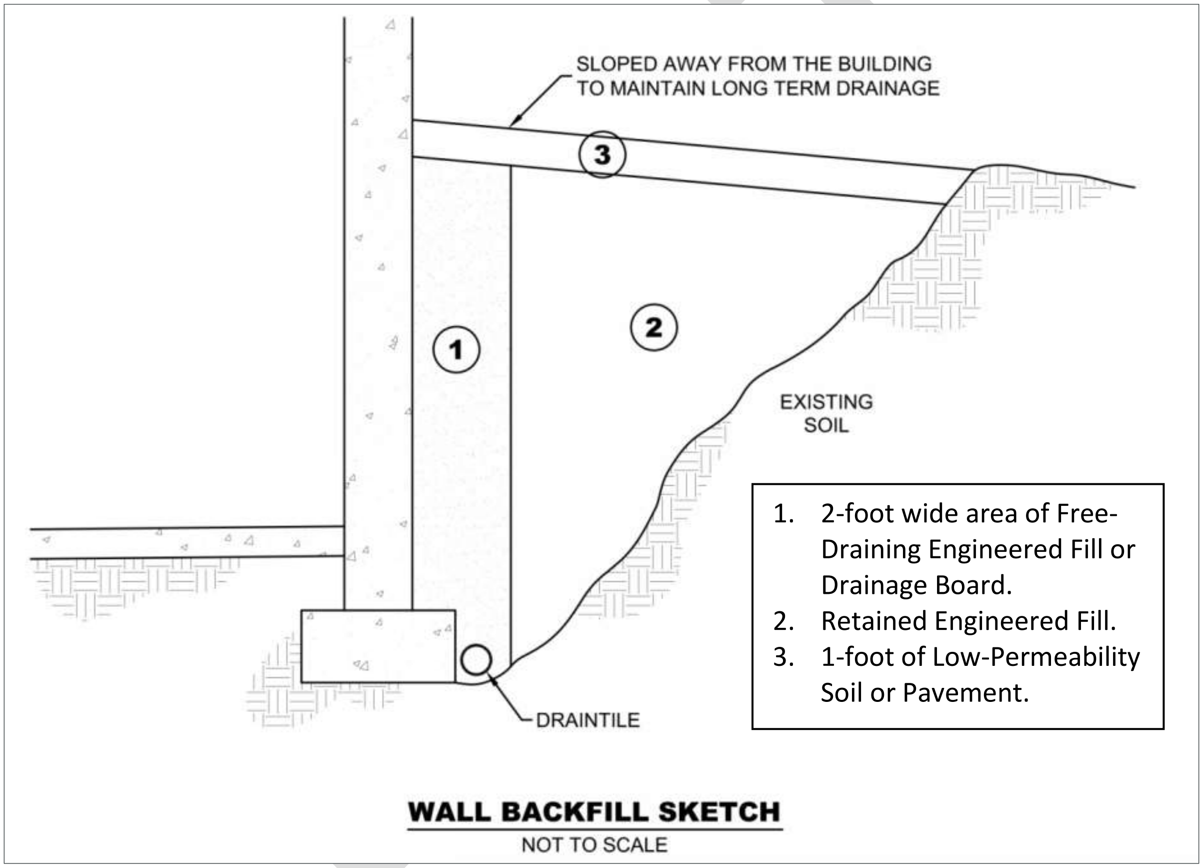
The project documents should indicate if walls need bracing prior to filling and allowable unbalanced fill heights.

C.4.a. Drainage Control

We recommend installing drain tile to remove water behind the below-grade walls, at the location shown in Figure 2. The below-grade wall drainage system should also incorporate free-draining, engineered fill or a drainage board placed against the wall and connected to the drain tile.

Even with the use of free-draining, engineered fill, we recommend general waterproofing of below-grade walls that surround occupied or potentially occupied areas because of the potential cost impacts related to seepage after construction is complete.

Figure 2. Generalized Illustration of Wall Engineered Fill



The materials listed in the sketch should meet the definitions in Section C.2.e. Low-permeability material is capable of directing water away from the wall, like clay, topsoil or pavement. The project documents should indicate if the contractor should brace the walls prior to filling and allowable unbalanced fill heights.

As shown in Figure 3, we recommend Zone 2 consist of retained engineered fill, and this material will control lateral pressures on the wall.

C.4.b. Configuring and Resisting Lateral Loads

Below-grade wall design can use active earth pressure conditions, if the walls can rotate slightly. If the wall design cannot tolerate rotation, then design should use at-rest earth pressure conditions. Rotation up to 0.002 times the wall height is generally required for walls supporting sand. Rotation up to 0.02 times the wall height is required when wall supports clay.

Table 11 presents our recommended lateral coefficients and equivalent fluid pressures for wall design of active, at-rest and passive earth pressure conditions. The table also provides recommended wet unit weights and internal friction angles. Designs should also consider the slope of any engineered fill and dead or live loads placed behind the walls within a horizontal distance that is equal to the height of the walls. Our recommended values assume the wall design provides drainage so water cannot accumulate behind the walls. The construction documents should clearly identify what soils the contractor should use for engineered fill of walls.

Table 11. Recommended Below-Grade Wall Design Parameters – Drained Conditions

Retained Soil	Wet Unit Weight (pcf)	Friction Angle (degrees)	Active Equivalent Fluid Pressure (pcf)	At-Rest Equivalent Fluid Pressure (pcf)	Passive Equivalent Fluid Pressure* (pcf)
Clayey soil (CL, SC)	125	26	50	70	320
Silty Sand (SM)	130	30	42	62	390
Sand (SP, SP-SM)	120	34	35	55	N/A

*Based on Rankine model for soils in a region behind the wall extending at least 2 horizontal feet beyond the bottom outer edges of the wall footings and then rising up and away from the wall at an angle no steeper than 60 degrees from horizontal.

Sliding resistance between the bottom of the footing and the soil can also resist lateral pressures. We recommend assuming a sliding coefficient equal to 0.3 between the concrete and on site soil.

The values presented in this section are un-factored.

C.5. Interior Slabs

C.5.a. Moisture Vapor Protection

Excess transmission of water vapor could cause floor dampness, certain types of floor bonding agents to separate, or mold to form under floor coverings. If project planning includes using floor coverings or coatings, we recommend placing a vapor retarder or vapor barrier immediately beneath the slab. We also recommend consulting with floor covering manufacturers regarding the appropriate type, use and installation of the vapor retarder or barrier to preserve warranty assurances.

C.5.b. Radon

We recommend installing a radon mitigation system in accordance with local building code. Our certified and licensed radon mitigation professionals can assist in this design, at your request.

C.6. Frost Protection

A mixture of clay, silty sand, and sand will underlie exterior slabs (i.e., sidewalks, stoops, etc.). We consider the clay and silty sands to be moderately to highly frost susceptible. Soils of this type can retain moisture and heave upon freezing. In general, this characteristic is not an issue unless these soils become saturated, due to surface runoff or infiltration, or are excessively wet in situ. Once frozen, unfavorable amounts of general and isolated heaving of the soils and the surface structures supported on them could develop. This type of heaving could affect design drainage patterns and the performance of exterior slabs and pavements, as well as any isolated exterior footings and piers.

Note that general runoff and infiltration from precipitation are not the only sources of water that can saturate subgrade soils and contribute to frost heave. Roof drainage and irrigation of landscaped areas in close proximity to exterior slabs, pavements, and isolated footings and piers, contribute as well.

C.6.a. Frost Heave Mitigation

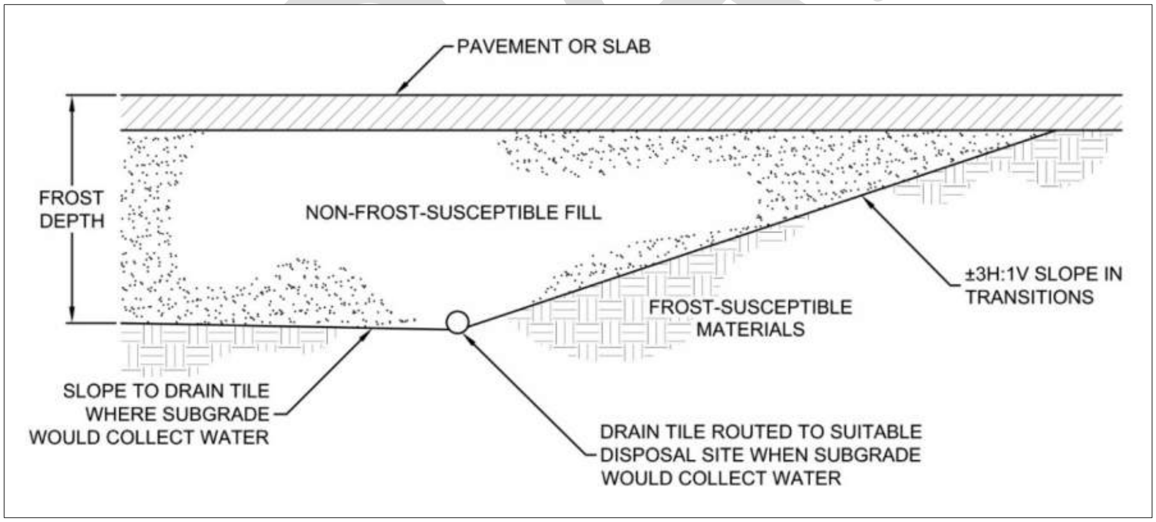
To address most of the heave related issues, we recommend setting general site grades and grades for exterior surface features to direct surface drainage away from buildings, across large, paved areas and away from walkways. Such grading will limit the potential for saturation of the subgrade and subsequent heaving. General grades should also have enough “slope” to tolerate potential larger areas of heave, which may not fully settle after thawing.

Even small amounts of frost-related differential movement at walkway joints or cracks can create tripping hazards. Project planning can explore several subgrade improvement options to address this condition.

One of the more conservative subgrade improvement options to mitigate potential heave is removing any frost-susceptible soils present below the exterior slab areas down to a minimum depth of 4 feet below subgrade elevations or to the bottom of adjacent footing grades. We recommend filling the resulting excavation with non-frost-susceptible fill (i.e., clean sand). We also recommend sloping the bottom of the excavation toward one or more collection points to remove any water entering the engineered fill. This approach will not be effective in controlling frost heave without removing the water.

An important geometric aspect of the excavation and replacement approach described above is sloping the banks of the excavations to create a more gradual transition between the unexcavated soils considered frost susceptible and the engineered fill in the excavated area, which is not frost susceptible. The slope allows attenuation of differential movement that may occur along the excavation boundary. We recommend slopes that are 3H:1V, or flatter, along transitions between frost-susceptible and non-frost-susceptible soils. Figure 3 shows an illustration summarizing some of the recommendations.

Figure 3. Frost Protection Geometry Illustration



Another option is to limit frost heave in critical areas, such as doorways and entrances, via frost-depth footings or localized excavations with sloped transitions between frost-susceptible and non-frost-susceptible soils, as described above.

Over the life of slabs, cracks will develop and joints open, which will expose the subgrade and allow water to enter from the surface and either saturate or perch atop the subgrade soils. This water intrusion increases the potential for frost heave or moisture-related distress near the crack or joint. Therefore, we recommend implementing a detailed maintenance program to seal and/or fill any cracks and joints. The maintenance program should give special attention to areas where dissimilar materials abut one another, where construction joints occur and where shrinkage cracks develop.

C.7. Pavements

C.7.a. Pavement Subgrade Preparation

We recommend the following steps for pavement and exterior slab subgrade preparation. Note that project planning may need to require additional subcuts to limit frost heave.

1. Strip unsuitable soils consisting of topsoil, organic soils, and vegetation from the area, within the proposed pavement subgrade area.

2. Have a geotechnical representative observe the excavated subgrade to evaluate if additional subgrade improvements are necessary.

3. Slope subgrade soils to allow the removal of accumulating water.

4. Scarify, moisture condition, and surface compact the subgrade with at least five passes of a large roller with a minimum drum diameter of 3 1/2 feet.

5. Place pavement engineered fill to grade and compact in accordance with Section C.2.e. to bottom of pavement section. See Section C.6 for additional considerations related to frost heave.

6. Proofroll the pavement subgrade as described in Section C.7.b.

C.7.b. Pavement Subgrade Proofroll

After preparing the subgrade as described above and prior to the placement of the aggregate base, we recommend proofrolling the subgrade soils with a fully loaded tandem-axle truck. We also recommend having a geotechnical representative observe the proofroll. Areas that fail the proofroll likely indicate soft or weak areas that will require additional soil correction work to support pavements.

The contractor should correct areas that display excessive yielding or rutting during the proofroll, as determined by the geotechnical representative. Possible options for subgrade correction include moisture conditioning and re-compaction, subcutting and replacement with soil or crushed aggregate, chemical stabilization and/or geotextiles. We recommend performing a second proofroll after the aggregate base material is in place, and prior to placing bituminous or concrete pavement.

C.7.c. Design Sections

Our scope of services for this project did not include laboratory tests on subgrade soils to determine an R-value for pavement design. Based on our experience with similar silty sand soils anticipated at the pavement subgrade elevation, we recommend pavement design assume an R-value of 30. Note the contractor may need to perform limited removal of unsuitable or less suitable soils to achieve this value. Table 12 provides recommended pavement sections, based on the soils support and traffic loads.

Table 12. Recommended Bituminous Pavement Sections

Use	Light Duty	Heavy Duty
Minimum asphalt thickness (inches)	3 1/2	4
Minimum aggregate base thickness (inches)	8	12

C.7.d. Bituminous Pavement Materials

Appropriate mix designs are critical to the performance of flexible pavements. We can provide recommendations for pavement material selection during final pavement design.

C.7.e. Concrete Flatwork

Subgrade preparation for concrete flatwork (aprons, dumpster pads, etc.) should be consistent with those recommendations provided for exterior slabs and bituminous pavements. We anticipate traffic loads on sidewalks will be limited to primarily pedestrian foot traffic. Given the assumed subgrade parameters and loading conditions, we recommend design of concrete flatwork include a minimum 5-inch concrete section over 6 inches of aggregate base.

C.7.f. Subgrade Drainage

Given the abundance of native silty sands at or near pavement subgrades, we recommend installing perforated drainpipes throughout pavement areas at low points, around catch basins, and behind curb in landscaped areas. We also recommend installing drainpipes along pavement and exterior slab edges where exterior grades promote drainage toward those edge areas. The contractor should place drainpipes in small trenches, extended at least 8 inches below the aggregate base material.

C.7.g. Performance and Maintenance

We based the above pavement designs on a 20-year performance life for bituminous. This is the amount of time before we anticipate the pavement will require reconstruction. This performance life assumes routine maintenance, such as seal coating and crack sealing. The actual pavement life will vary depending on variations in weather, traffic conditions and maintenance.

It is common to place the non-wear course of bituminous and then delay placement of wear course. For this situation, we recommend evaluating if the reduced pavement section will have sufficient structure to support construction traffic.

Many conditions affect the overall performance of the exterior slabs and pavements. Some of these conditions include the environment, loading conditions and the level of ongoing maintenance. With bituminous pavements in particular, it is common to have thermal cracking develop within the first few years of placement and continue throughout the life of the pavement. We recommend developing a regular maintenance plan for filling cracks in exterior slabs and pavements to lessen the potential impacts for cold weather distress due to frost heave or warm weather distress due to wetting and softening of the subgrade.

C.8. Utilities

C.8.a. Subgrade Stabilization

Earthwork activities associated with utility installations located inside the building area should adhere to the recommendations in Section C.2.e.

For exterior utilities, we anticipate the soils at typical invert elevations will be suitable for utility support. However, if construction encounters unfavorable conditions such as soft clay, organic soils or perched water at invert grades, the unsuitable soils may require some additional subcutting and replacement with sand or crushed rock to prepare a proper subgrade for pipe support. Project design and construction should not place utilities within the 1H:1V oversizing of foundations.

C.8.b. Corrosion Potential

Based on our experience, the sandy soils encountered by the borings are moderately corrosive to metallic conduits, but only marginally corrosive to concrete. We recommend specifying non-corrosive materials or providing corrosion protection, unless project planning chooses to perform additional tests to demonstrate the soils are not corrosive.

C.9. Stormwater

Based on laboratory tests run on selected samples from the borings we estimated infiltration rates for the soils we encountered, as listed in Table 13. These estimated infiltration rates represent the long-term infiltration capacity of a practice and not the capacity of the soils in their natural state. Field testing, such as with a double-ring infiltrometer (ASTM D3385), may justify the use of higher infiltration rates. However, we recommend adjusting field test rates by the appropriate correction factor, as provided for in the Minnesota Stormwater Manual or as allowed by the local watershed. We recommend consulting the Minnesota Stormwater Manual for stormwater design.

Table 13. Soil Infiltration Rates

Soil Type	Hydrologic Soil Group	Infiltration Rate * (inches/hour)
Sands (SP-SM)	A	0.8
Silts, very fine sands, silty or clayey fine sands (ML, SM, SC)	C	0.2
Sandy clay, silty clay, lean clay, fat clay (CLS, CL-ML, CL, CH)	D	0.06

*From Minnesota Stormwater Manual. Rates may differ at individual sites.

Fine-grained soils (clays and silts), topsoil, or organic matter that mixes into or washes onto the soil will lower the permeability. The contractor should maintain and protect infiltration areas during construction. Furthermore, organic matter and silt washed into the system after construction can fill the soil pores and reduce permeability over time. Proper maintenance is important for long-term performance of infiltration systems.

This geotechnical evaluation does not constitute a review of site suitability for stormwater infiltration or evaluate the potential impacts, if any, from infiltration of large amounts of stormwater.

C.10. Additional Considerations

C.10.a. Below Grade Pool

Because of the potential for higher perched groundwater on this site, it may be necessary to design the below grade pool to resist buoyancy that could be caused by groundwater, especially if the bottom of the pool is less than 3 feet from groundwater.

C.10.b. Equipment Support

The recommendations included in the report may not be applicable to equipment used for the construction and maintenance of this project. We recommend evaluating subgrade conditions in areas of shoring, scaffolding, cranes, pumps, lifts and other construction equipment prior to mobilization to determine if the exposed materials are suitable for equipment support or require some form of subgrade improvement. We also recommend project planning consider the effect that loads applied by such equipment may have on structures they bear on or surcharge – including pavements, buried utilities, below-grade walls, etc. We can assist you in this evaluation.

C.10.c. Additional Soil Borings and Piezometers

When the final site concept plan has been established, we recommend additional soil borings to further define the site soil conditions. Piezometers could then be installed in several of the additional soil borings to further define the site groundwater conditions.

D. Procedures

D.1. Penetration Test Borings

We drilled the penetration test borings between March 25 and April 15, 2024, with an all-terrain-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151, taking penetration test samples at 2 1/2- or 5-foot intervals. The boring logs show the actual sample intervals and corresponding depths.

We sealed penetration test boreholes meeting the Minnesota Department of Health (MDH) Environmental Borehole criteria in general accordance with MDH procedures.

D.2. Exploration Logs

D.2.a. Log of Boring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials and present the results of penetration resistance and other in-situ tests performed. The logs also present the results of laboratory tests performed on penetration test samples and groundwater measurements.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

D.2.b. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance in-situ testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.3. Material Classification and Testing

D.3.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

D.3.b. Laboratory Testing

The exploration logs in the Appendix note the results of the laboratory tests performed on geologic material samples. We performed the tests in general accordance with ASTM procedures.

D.4. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes, as noted on the boring logs.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our preliminary evaluation, analyses, and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this preliminary report on a limited amount of information, and we made several assumptions to help us develop our preliminary recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining Braun Intertec to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

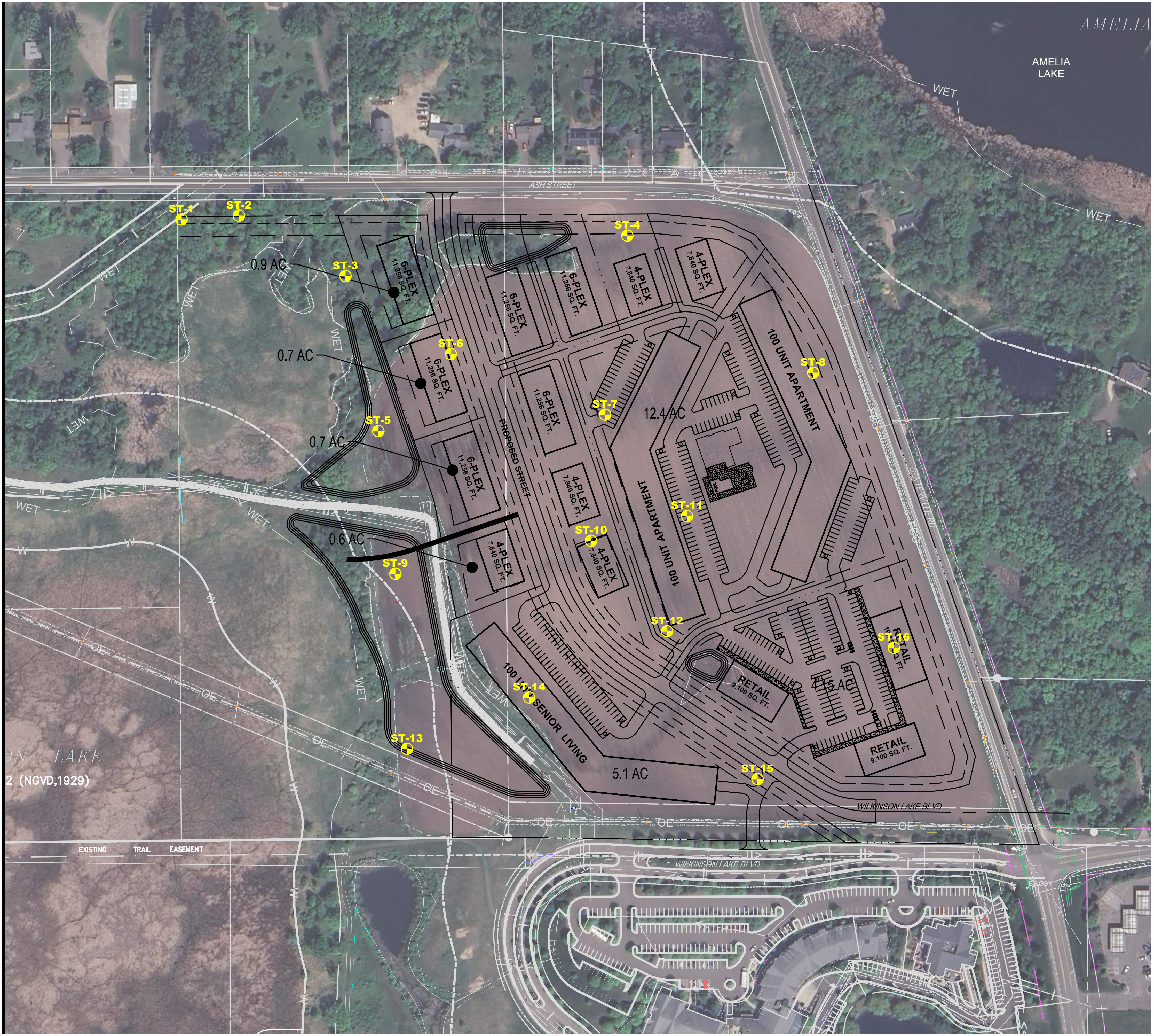
E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix



F:\2024\B2402335\CAD\B2402335.dwg,Geotech,6/27/2024 7:56:50 PM

DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

100' 0 200'

SCALE: 1"= 200'

BRAUN INTERTEC
The Science You Build On.

11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Drawing Information

Project No:	B2402335
Drawing No:	B2402335
Drawn By:	JAG
Date Drawn:	3/19/24
Checked By:	JTC
Last Modified:	6/27/24

Project Information

Proposed Lino Lakes Development

320 Acres Southwest of Ash Street W. and Centerville Road

Lino Lakes, Minnesota

Soil Boring Location Sketch

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-3**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	133590.8	EASTING:	552777.4
START DATE:	04/15/24	END DATE:	04/15/24
SURFACING:	Field	WEATHER:	Sun, 60°F

DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson
SURFACE ELEVATION:	905.4 ft	RIG: 7505	METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
904.7 0.7		SILTY SAND (SM), fine-grained, with roots, dark brown, moist (TOPSOIL)					
		SILTY SAND (SM), fine-grained, contains lenses of Poorly Graded Sand, brown, moist to wet, very loose to loose (ALLUVIUM)	⧗	2-2-2 (4)			
			⧗	3-4-6 (10)		15	
			⧗	3-5-4 (9)			
	▽		⧗	2-3-3 (6)			
			⧗	2-3-3 (6)			
890.9 14.5		END OF BORING Boring then backfilled with auger cuttings					Water observed at 9.0 feet while drilling.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-4**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	133672.4	EASTING:	553346.0
START DATE:	03/26/24	END DATE:	03/26/24
SURFACING:	Field	WEATHER:	Snow, 30°F

DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson
SURFACE ELEVATION:	917.5 ft	RIG: 7505	METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	qₚ tsf	MC %	Tests or Remarks
917.2 0.3		SILTY SAND (SM), fine-grained, trace roots, dark brown, moist (TOPSOIL)					
907.5 10.0	▼ ▽	SILTY SAND (SM), fine-grained, trace Gravel, with lenses of Poorly Graded Sand, brown, moist to wet, loose (ALLUVIUM)	⧖ ⧖ ⧖	1-2-4 (6) 16" 3-4-5 (9) 16" 3-4-6 (10) 14"		13	
903.0 14.5		LEAN CLAY (CL), with lenses of Poorly Graded Sand and Silty Sand, brownish gray, moist, medium to stiff (GLACIAL TILL)	⧖ ⧖	4-3-3 (6) 16" 5-6-8 (14) 16"			
		END OF BORING Boring then backfilled with auger cuttings					Water observed at 7.5 feet while drilling. Water observed at 6.0 feet at end of drilling.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-5**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	133278.3	EASTING:	552843.5
START DATE:	04/15/24	END DATE:	04/15/24
SURFACING:	Field	WEATHER:	Sun, 60°F

DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson		
SURFACE ELEVATION:	905.8 ft	RIG:	7505	METHOD:	3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
905.2 0.5		SILTY SAND (SM), fine to medium-grained, dark brown, moist (TOPSOIL)					
901.8 4.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, brown, moist, loose (ALLUVIUM)	⧖	3-4-6 (10) 14"			
898.8 7.0		SILTY SAND (SM), fine-grained, brownish gray, moist, medium dense (ALLUVIUM)	⧖	6-6-7 (13) 16"			
896.8 9.0		FAT CLAY (CH), gray, moist, soft (ALLUVIUM)	⧖	1-1-1 (2) 18"			
892.8 13.0	▽	POORLY GRADED SAND with SILT (SP-SM), fine-grained, gray, wet, very loose (ALLUVIUM)	⧖	1-2-1 (3) 16"		19	P200=8%
891.2 14.5		SANDY LEAN CLAY (CL), trace Gravel, gray, moist, medium (GLACIAL TILL)	⧖	2-3-5 (8) 16"			Water observed at 9.5 feet while drilling.
		END OF BORING Boring then backfilled with auger cuttings					

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-6**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	133433.6	EASTING:	552989.8
START DATE:	03/26/24	END DATE:	03/26/24
SURFACING:	Field	WEATHER:	Snow

DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson		
SURFACE ELEVATION:	915.2 ft	RIG:	7505	METHOD:	3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	qp tsf	MC %	Tests or Remarks
914.9 0.3		SILTY SAND (SM), fine-grained, trace roots, dark brown, moist (TOPSOIL)					
		SILTY SAND (SM), fine-grained, trace Gravel, with lenses of Poorly Graded Sand, light brown to brown, moist to wet, very loose to medium dense (ALLUVIUM)	⧖	1-2-4 (6) 14"			
		5	⧖	5-6-7 (13) 16"		12	
	▽		⧖	4-5-4 (9) 18"			
		10	⧖	3-3-3 (6) 15"			
			⧖	1-1-1 (2) 16"			
900.7 14.5		END OF BORING Boring then backfilled with auger cuttings					Water observed at 7.0 feet while drilling.
		15					
		20					
		25					
		30					

BRAUN
INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-7**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	133311.5	EASTING:	553301.3
START DATE:	03/26/24	END DATE:	03/26/24
SURFACING:	Field	WEATHER:	Snow

DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson
SURFACE ELEVATION:	920.9 ft	RIG: 7505	METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	qₚ tsf	MC %	Tests or Remarks
919.7 1.2		SILTY SAND (SM), fine-grained, dark brown, moist (TOPSOIL)					
	▽	SILTY SAND (SM), fine-grained, trace Gravel, with lenses of Poorly Graded Sand, brown, moist to wet, medium dense to loose (ALLUVIUM)	⧖	3-7-8 (15) 16"			
913.9 7.0			⧖	4-4-2 (6) 15"			
		SANDY LEAN CLAY (CL), trace Gravel, gray, moist, medium to stiff (GLACIAL TILL)	⧖	1-3-3 (6) 16"			
			⧖	2-3-5 (8) 16"		13	
906.4 14.5			⧖	5-6-6 (12) 18"			
		END OF BORING Boring then backfilled with auger cuttings					Water observed at 2.0 feet while drilling. Water not observed immediately after withdrawal of auger.

Depth scale: 5, 10, 15, 20, 25, 30

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING: **ST-8**

LOCATION: Captured with RTK GPS.

DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)

NORTHING: 133396.2

EASTING: 553720.9

DRILLER: S Hull / A Tross

LOGGED BY: J Carlson

START DATE: 03/26/24

END DATE: 03/26/24

SURFACE ELEVATION: 923.8 ft

RIG: 7505

METHOD: 3 1/4" HSA

SURFACING: Field

WEATHER: Snow

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	qp tsf	MC %	Tests or Remarks
923.5 0.3		SANDY SILT (ML), trace roots, dark brown, moist (TOPSOIL)					
910.8 13.0	▽	SILTY SAND (SM), fine-grained, trace Gravel, with lenses of Poorly Grade Sand, brown to grayish brown, moist to wet, loose to medium dense, rust staining (ALLUVIUM)	⧖ ⧖ ⧖ ⧖	1-2-3 (5) 16" 4-6-6 (12) 16" 7-6-4 (10) 16" 2-1-2 (3) 16"		14	
909.3 14.5		LEAN CLAY (CL), with lenses of Poorly Graded Sand, brownish gray, moist, stiff (GLACIAL TILL)	⧖	2-4-5 (9) 16"			Water observed at 5.0 feet while drilling. Water not observed immediately after withdrawal of auger.

END OF BORING

Boring then backfilled with auger cuttings

5

10

15

20

25

30

BRAUN
INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING: **ST-9**
LOCATION: Captured with RTK GPS.
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)
NORTHING: 132990.8 EASTING: 552877.8
DRILLER: S Hull / A Tross LOGGED BY: J Carlson
START DATE: 04/15/24 END DATE: 04/15/24
SURFACE ELEVATION: 903.9 ft RIG: 7505 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Sun, 60°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
903.2 0.7		SILTY SAND (SM), fine-grained, trace roots, dark brown, moist (TOPSOIL)					
899.9 4.0		SILTY SAND (SM), fine-grained, trace Gravel, dark brown, moist, loose (ALLUVIUM)	⊠	4-4-5 (9) 14"			
896.9 7.0		CLAYEY SAND (SC), grayish brown, moist, soft (ALLUVIUM)	⊠	4-2-2 (4) 16"			
891.9 12.0	∇	POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, trace Gravel, brownish gray, moist to wet, loose (ALLUVIUM)	⊠	2-3-3 (6) 16"			
			⊠	2-2-3 (5) 16"		24	P200=11%
889.4 14.5		SILTY SAND (SM), fine-grained, grayish brown, wet, loose (ALLUVIUM)	⊠	2-3-4 (7) 16"			Water observed at 9.0 feet while drilling.
		END OF BORING Boring then backfilled with auger cuttings					

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-10**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	133057.2	EASTING:	553272.7
START DATE:	03/25/24	END DATE:	03/25/24
SURFACING:	Field	WEATHER:	Snow, Rain, 35°F

DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson		
SURFACE ELEVATION:	924.1 ft	RIG:	7505	METHOD:	3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	qp tsf	MC %	Tests or Remarks
923.4 0.7		SILTY SAND (SM), fine-grained, trace roots, dark brown, moist (TOPSOIL)					
		POORLY GRADED SAND with SILT (SP-SM), fine-grained, with lenses of Poorly Graded Sand, brown, moist to wet, loose, rust staining (ALLUVIUM)	⊠	1-3-3 (6) 14"			
917.1 7.0	▽		⊠	4-4-5 (9) 16"			
		CLAYEY SAND (SC), fine-grained, trace Gravel, with lenses of Silty Sand, brownish gray to gray, moist, soft to medium, rust staining (GLACIAL TILL)	⊠	2-2-2 (4) 16"		16	
			⊠	2-2-3 (5) 16"			
910.1 14.0			⊠	1-2-2 (4) 17"			
		SANDY LEAN CLAY (CL), trace Gravel, gray, moist, soft to medium (GLACIAL TILL)	⊠	2-2-2 (4) 18"			
903.1 21.0			⊠	2-3-5 (8) 18"			
		END OF BORING Boring immediately grouted					Water observed at 5.0 feet while drilling. Water not observed immediately after withdrawal of auger.

Depth scale: 5, 10, 15, 20, 25, 30

BRAUN
INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-11**
LOCATION: Captured with RTK GPS.	
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)	
NORTHING: 133107.1	EASTING: 553466.5
START DATE: 03/25/24	END DATE: 03/25/24
SURFACING: Field	WEATHER: Snow, Rain

DRILLER: S Hull / A Tross	LOGGED BY: J Carlson		
SURFACE ELEVATION: 923.8 ft	RIG: 7505	METHOD: 3 1/4" HSA	

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Depth	Sample	Blows (N-Value) Recovery	qₚ tsf	MC %	Tests or Remarks
923.1		SILTY SAND (SM), fine-grained, trace roots, dark brown, moist (TOPSOIL)						
0.7		SILTY SAND (SM), fine-grained, with lenses of Poorly Graded Sand, brown, moist to wet, loose (ALLUVIUM)		⧖	1-3-4 (7) 15"		13	
	▽		5	⧖	3-4-4 (8) 16"			
916.8								
7.0		CLAYEY SAND (SC), fine-grained, trace Gravel, with lenses of Poorly Graded Sand, grayish brown, moist, medium (GLACIAL TILL)		⧖	1-3-3 (6) 18"			
			10	⧖	1-3-5 (8) 18"			
911.8								
12.0		SANDY LEAN CLAY (CL), trace Gravel, with lenses of Silty Sand, gray, moist, medium (GLACIAL TILL)		⧖	2-4-4 (8) 18"			
			15	⧖	3-3-5 (8) 12"			
			20	⧖	2-3-5 (8) 18"			
902.8								
21.0		END OF BORING Boring immediately grouted						Water observed at 5.0 feet while drilling. Water not observed immediately after withdrawal of auger.
			25					
			30					

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-12**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	132874.9	EASTING:	553426.3
START DATE:	03/25/24	END DATE:	03/25/24
SURFACING:	Field	WEATHER:	Snow, Rain

DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson
SURFACE ELEVATION:	924.1 ft	RIG: 7505	METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	qₚ tsf	MC %	Tests or Remarks
923.2 0.8		SILTY SAND (SM), fine-grained, trace roots, dark brown, moist (TOPSOIL)					
		SILTY SAND (SM), fine to medium-grained, trace Gravel, with lenses of Poorly Graded Sand, brown, moist to wet, loose to medium dense (ALLUVIUM)	☒	2-4-4 (8) 15"			
	▽		5 ☒	4-6-6 (12) 16"			
917.1 7.0		SANDY LEAN CLAY (CL), trace Gravel, with lenses of Poorly Graded Sand, brownish gray to gray, moist, soft to medium (GLACIAL TILL)	☒	1-1-3 (4) 15"			
			10 ☒	2-3-5 (8) 16"		14	
			☒	1-3-4 (7) 18"			
			15 ☒	2-2-3 (5) 18"			
			20 ☒	3-4-4 (8) 18"			
903.1 21.0		END OF BORING Boring immediately grouted					Water observed at 5.0 feet while drilling. Water not observed immediately after withdrawal of auger.
			25				
			30				

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-13**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	132637.8	EASTING:	552901.3
START DATE:	04/15/24	END DATE:	04/15/24
SURFACING:	Field	WEATHER:	Sun, 60°F

DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson		
SURFACE ELEVATION:	904.1 ft	RIG:	7505	METHOD:	3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	qp tsf	MC %	Tests or Remarks
903.4 0.7		SILTY SAND (SM), fine-grained, trace roots, dark brown, moist (TOPSOIL)					
895.1 9.0	▽	SILTY SAND (SM), fine-grained, contains lenses of Poorly Graded Sand with Silt, grayish brown, moist to wet, loose (ALLUVIUM)	⧖ ⧖ ⧖	3-4-4 (8) 16" 4-3-4 (7) 12" 5-4-5 (9) 15"			
891.1 13.0		POORLY GRADED SAND with SILT (SP-SM), fine-grained, grayish brown, wet, loose	⧖	4-5-5 (10) 15"		19	P200=10%
889.6 14.5		LEAN CLAY (CL), contains lenses of Silty Sand, gray, moist, stiff (GLACIAL TILL)	⧖	4-5-7 (12) 16"			Water observed at 8.5 feet while drilling.
		END OF BORING Boring then backfilled with auger cuttings					

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-14**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	132741.4	EASTING:	553147.8
START DATE:	04/15/24	END DATE:	04/15/24
SURFACING:	Field	WEATHER:	Sun, 60°F
DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson
SURFACE ELEVATION:	917.7 ft	RIG: 7505	METHOD: 3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	qp tsf	MC %	Tests or Remarks
916.9 0.8		SILTY SAND (SM), fine to medium-grained, trace roots, brown, moist (TOPSOIL)					
913.7 4.0		SILTY SAND (SM), fine-grained, contains seams of Clayey Sand, brown, moist, loose (ALLUVIUM)	⊠	2-3-5 (8) 14"			
910.7 7.0		SILTY SAND (SM), fine-grained, trace Gravel, grayish brown, moist, loose (ALLUVIUM)	⊠	3-4-5 (9) 16"		17	
903.2 14.5	▽	POORLY GRADED SAND with SILT (SP-SM), fine-grained, light brown, wet, medium dense (ALLUVIUM)	⊠ ⊠ ⊠	4-7-7 (14) 15" 4-6-6 (12) 14" 7-7-7 (14) 17"			Water observed at 7.5 feet while drilling.
		END OF BORING Boring then backfilled with auger cuttings					

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335 **Geotechnical Evaluation** **Proposed Wilkinson Waters Development** **County Road J & Centerville Road** **Lino Lakes, Minnesota**	BORING: **ST-15**	
	LOCATION: Captured with RTK GPS.	
	DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)	
	NORTHING: 132576.7	EASTING: 553608.4
DRILLER: S Hull / A Tross — LOGGED BY: J Carlson	START DATE: 03/25/24	END DATE: 03/25/24
SURFACE ELEVATION: 925.3 ft — RIG: 7505 — METHOD: 3 1/4" HSA	SURFACING: Field	WEATHER: Snow, Rain

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
924.6 0.7		SILTY SAND (SM), fine-grained, with roots, dark brown, moist (TOPSOIL)					
		SILTY SAND (SM), fine to medium-grained, with lenses of Poorly Graded Sand, brown, moist, loose to medium dense (ALLUVIUM)		2-3-4 (7) 16"			
				4-6-6 (12) 18"			
918.3 7.0	▽	SANDY LEAN CLAY (CL), trace Gravel, with lenses of Poorly Graded Sand, brownish gray to gray, moist, soft to stiff (GLACIAL TILL)		2-2-2 (4) 18"		15	
				1-3-5 (8) 18"			
				4-4-5 (9) 16"			
				2-3-4 (7) 18"			
				3-4-4 (8) 18"			
904.3 21.0		END OF BORING Boring immediately grouted					Water observed at 7.0 feet while drilling. Water not observed immediately after withdrawal of auger.

BRAUN INTERTEC
The Science You Build On.

LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2402335
Geotechnical Evaluation
Proposed Wilkinson Waters Development
County Road J & Centerville Road
Lino Lakes, Minnesota

BORING:	**ST-16**		
LOCATION: Captured with RTK GPS.			
DATUM: NAD 1983 HARN Adj MN Anoka (US Feet)			
NORTHING:	132841.7	EASTING:	553883.6
START DATE:	03/25/24	END DATE:	03/25/24
SURFACING:	Field	WEATHER:	Snow, Rain

DRILLER:	S Hull / A Tross	LOGGED BY:	J Carlson		
SURFACE ELEVATION:	929.6 ft	RIG:	7505	METHOD:	3 1/4" HSA

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	qₚ tsf	MC %	Tests or Remarks
928.9 0.7		SILTY SAND (SM), fine to medium-grained, trace roots, dark brown, moist (TOPSOIL)					
		CLAYEY SAND (SC), trace Gravel, with lenses of Poorly Graded Sand, brown to grayish brown, moist, medium to very stiff, rust staining (GLACIAL TILL)	⊠	2-3-2 (5) 16"			
			⊠	3-4-4 (8) 16"			
			⊠	3-3-4 (7) 16"		15	
			⊠	6-6-7 (13) 18"			
915.1 14.5			⊠	5-7-10 (17) 18"			
		END OF BORING Boring then backfilled with auger cuttings					Water not observed while drilling. Water not observed immediately after withdrawal of auger.

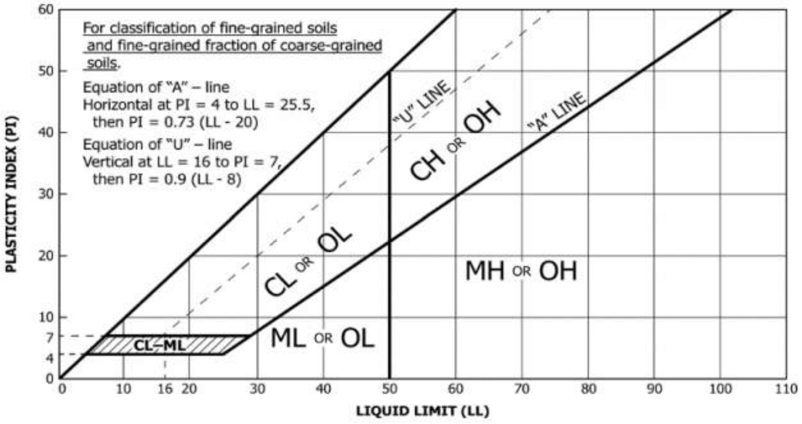
BRAUN INTERTEC
The Science You Build On.

Descriptive Terminology of Soil

Based on Standards ASTM D2487/2488
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests^{A}				Soil Classification	
				Group Symbol	Group Name^{B}
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	**Gravels** (More than 50% of coarse fraction retained on No. 4 sieve)	**Clean Gravels** (Less than 5% fines^{C})	$C_u \geq 4$ and $1 \leq C_c \leq 3^{D}$	GW	Well-graded gravel^{E}
			$C_u < 4$ and/or $(C_c < 1$ or $C_c > 3)^{D}$	GP	Poorly graded gravel^{E}
		Gravels with Fines (More than 12% fines^{C})	Fines classify as ML or MH	GM	Silty gravel$^{E F G}$
			Fines Classify as CL or CH	GC	Clayey gravel$^{E F G}$
	Sands (50% or more coarse fraction passes No. 4 sieve)	**Clean Sands** (Less than 5% fines^{H})	$C_u \geq 6$ and $1 \leq C_c \leq 3^{D}$	SW	Well-graded sand^{I}
			$C_u < 6$ and/or $(C_c < 1$ or $C_c > 3)^{D}$	SP	Poorly graded sand^{I}
		Sands with Fines (More than 12% fines^{H})	Fines classify as ML or MH	SM	Silty sand$^{F G I}$
			Fines classify as CL or CH	SC	Clayey sand$^{F G I}$
Fine-grained Soils (50% or more passes the No. 200 sieve)	**Silts and Clays** (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line^{J}	CL	Lean clay$^{K L M}$
			PI < 4 or plots below "A" line^{J}	ML	Silt$^{K L M}$
		Organic	$\frac{\text{Liquid Limit – oven dried}}{\text{Liquid Limit – not dried}} < 0.75$	OL	Organic clay$^{K L M N}$ Organic silt$^{K L M O}$
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay$^{K L M}$
			PI plots below "A" line	MH	Elastic silt$^{K L M}$
		Organic	$\frac{\text{Liquid Limit – oven dried}}{\text{Liquid Limit – not dried}} < 0.75$	OH	Organic clay$^{K L M P}$ Organic silt$^{K L M Q}$
Highly Organic Soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

A. Based on the material passing the 3-inch (75-mm) sieve.
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C. Gravels with 5 to 12% fines require dual symbols:
   GW-GM well-graded gravel with silt
   GW-GC well-graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
D. $C_u = D_{60} / D_{10}$ $\quad C_c = (D_{30})^2 / (D_{10}\ x\ D_{60})$
E. If soil contains ≥ 15% sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. Sands with 5 to 12% fines require dual symbols:
   SW-SM well-graded sand with silt
   SW-SC well-graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
I. If soil contains ≥ 15% gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
L. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
M. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
N. PI ≥ 4 and plots on or above "A" line.
O. PI < 4 or plots below "A" line.
P. PI plots on or above "A" line.
Q. PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	**q_p**	Pocket penetrometer strength, tsf
WD	Wet density, pcf	**q_U**	Unconfined compression test, tsf
P200	% Passing #200 sieve	**LL**	Liquid limit
MC	Moisture content, %	**PL**	Plastic limit
OC	Organic content, %	**PI**	Plasticity index

Particle Size Identification

Boulders............. over 12"
Cobbles............... 3" to 12"
Gravel
   Coarse............ 3/4" to 3" (19.00 mm to 75.00 mm)
   Fine................ No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
   Coarse............. No. 10 to No. 4 (2.00 mm to 4.75 mm)
   Medium........... No. 40 to No. 10 (0.425 mm to 2.00 mm)
   Fine................. No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt....................... No. 200 (0.075 mm) to .005 mm
Clay..................... < .005 mm

Relative Proportions$^{L, M}$

trace............................ 0 to 5%
little............................. 6 to 14%
with............................. ≥ 15%

Inclusion Thicknesses

lens.............................. 0 to 1/8"
seam............................ 1/8" to 1"
layer............................. over 1"

Apparent Relative Density of Cohesionless Soils

Very loose .... 0 to 4 BPF
Loose .... 5 to 10 BPF
Medium dense............. 11 to 30 BPF
Dense........................... 31 to 50 BPF
Very dense................... over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft..................	0 to 1 BPF..................	< 0.25 tsf
Soft..........................	2 to 4 BPF..................	0.25 to 0.5 tsf
Medium...................	5 to 8 BPF	0.5 to 1 tsf
Stiff..........................	9 to 15 BPF................	1 to 2 tsf
Very Stiff..................	16 to 30 BPF..............	2 to 4 tsf
Hard.........................	over 30 BPF...............	> 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

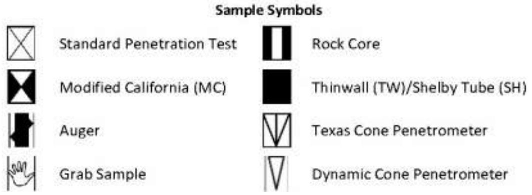
Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (▽), at the end of drilling (▼), or at some time after drilling (⯆).



Appendix E – Ecological Resources

DEPARTMENT OF
NATURAL RESOURCES

Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

June 21, 2024

Kelly Herfendal
ISG

RE: Natural Heritage Review of the proposed North Oaks Mixed Use Development,
T31N R22W Sections 33-35; Anoka County

Dear Kelly Herfendal,

For all correspondence regarding the Natural Heritage Review of this project please include the project ID **MCE-2024-00460** in the email subject line.

As requested, the Minnesota Natural Heritage Information System has been reviewed to determine if the proposed project has the potential to impact any rare species or other significant natural features. Based on the project details provided with the request, the following rare features may be impacted by the proposed project:

Ecologically Significant Areas

The Minnesota Biological Survey (MBS) has identified a Site of *Outstanding* Biodiversity Significance in a wetland immediately south of the proposed project. Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as *Outstanding* contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes present in the state. There are mapped examples of two Native Plant Communities in this Site. They are Northern Mixed Cattail Marsh (MRn83), which has a state conservation rank of Imperiled (S2), and Willow – Dogwood Shrub Swamp (WMn82a), which has a state conservation rank of Secure (S5). The DNR recommends that the project be designed to avoid impacts to these ecologically significant areas. Actions to avoid or minimize disturbance include, but are not limited to, the following recommendations:

- ○ As much as possible, operate within already-disturbed areas.
- ○ Retain a buffer between proposed activities and the MBS Site.

  - When possible, conduct work under frozen ground conditions.
  - Use effective erosion prevention and sediment control measures.
  - Inspect and clean equipment prior to operation and follow recommendations to prevent the spread of invasive species.
  - Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.
  - Use only weed-free mulches, topsoils, and seed mixes. Of particular concern are birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas.

  MBS Sites of Biodiversity Significance and DNR Native Plant Communities can be viewed using the Explore page in Minnesota Conservation Explorer or their GIS shapefiles can be downloaded from the MN Geospatial Commons. Please contact the NH Review Team if you need assistance accessing the data. Reference the MBS Site Biodiversity Significance and Native Plant Community websites for information on interpreting the data. To receive a list of MBS Sites of Biodiversity Significance and DNR Native Plant Communities in the vicinity of your project, create a Conservation Planning Report using the Explore Tab in Minnesota Conservation Explorer.

- If the Wetland Conservation Act (WCA) is applicable to this project, please note that native plant communities with a Conservation Status Rank of S1 through S3 or wetlands within *High* or *Outstanding* MBS Sites of Biodiversity Significance may qualify as Rare Natural Communities (RNC) under WCA. Minnesota Rules, part 8420.0515, subpart 3 states that a wetland replacement plan for activities that modify a RNC must be denied if the local government unit determines the proposed activities will permanently adversely affect the RNC. If the proposed project includes a wetland replacement plan under WCA, please contact your DNR Regional Ecologist for further evaluation. Please visit WCA Program Guidance and Information for additional information, including the Rare Natural Communities Technical Guidance.

State-listed Species

- Blanding's turtles (*Emydoidea blandingii*), a state-listed threatened species, have been documented in the direct vicinity of the proposed project. Blanding's turtles use upland areas up to and over a mile distant from wetlands, waterbodies, and watercourses. Uplands are used for nesting, basking, periods of dormancy, and traveling between wetlands. Factors believed to contribute to the decline of this species include collisions with vehicles, wetland drainage and degradation, and the development of upland habitat. Any added mortality can be detrimental to populations of Blanding's turtles, as these turtles have a low reproduction rate that depends upon a high survival rate to maintain population levels.

  This project has the potential to impact this rare turtle through direct fatalities and habitat disturbance/destruction due to excavation, fill, and other construction activities associated with the project. Minnesota’s Endangered Species Statute (Minnesota Statutes, section 84.0895) and associated Rules (Minnesota Rules, part 6212.1800 to 6212.2300 and 6134) prohibit the take of threatened or endangered species without a permit. **Given the project details and the potential for a take of a Blanding’s turtle, an avoidance plan is required.**

We do not currently have a template for avoidance plans. The plan needs to:

  - Provide a description of the project activities and construction methods,
  - Identify measures that will be taken to avoid take and minimize disturbance to the species, and
  - Include a map of disturbance areas. This can include a map of potential Blanding’s turtle summer, winter, and nesting habitat overlayed with timing of project impacts.

Measures to avoid or minimize disturbance include, but are not limited to, the following:

  - Avoidance of suitable habitat,
  - Timing the impacts to avoid incidental take,
  - The recommendations listed in the Blanding’s turtle fact sheet,
  - Training for construction crew.

Please submit the completed avoidance plan to the NH Review Team (Reports.NHIS@state.mn.us).

- Forster’s tern (*Sterna forsteri*), a bird species of special concern has been documented nesting in the vicinity of the proposed project. Forster’s terns are found in wetlands with a mixture of emergent vegetation and open water. They nest in colonies on floating vegetation or muskrat houses. Potential concerns include construction disturbance during the breeding season and loss or degradation of habitat. The DNR recommends that initial disturbance to suitable habitat is avoided from April 15-July 15.

- The tricolored bat (*Perimyotis subflavus*), state-listed as a species special concern, has been documented in the vicinity of the proposed project. During the active season (approximately April-November) bats roost underneath bark, in cavities, or in crevices of both live and dead trees. Tree removal can negatively impact bats by destroying roosting habitat, especially during the pup rearing season when females are forming maternity roosting colonies and the pups cannot yet fly. To minimize these impacts, **the DNR recommends that tree removal be avoided from June 1 through August 15.**

- Please visit the DNR Rare Species Guide for more information on the habitat use of these species and recommended measures to avoid or minimize impacts.

Federally Protected Species

- The area of interest overlaps with a U.S Fish and Wildlife Service (USFWS) Rusty Patched Bumble Bee High Potential Zone. The rusty patched bumble bee *(Bombus affinis)* is federally listed as endangered and is likely to be present in suitable habitat within High Potential Zones. From April through October this species uses underground nests in upland grasslands, shrublands, and forest edges, and forages where nectar and pollen are available. From October through April the species overwinters under tree litter in upland forests and woodlands. The rusty patched bumble bee may be impacted by a variety of land management activities including, but not limited to, prescribed fire, tree-removal, haying, grazing, herbicide use, pesticide use, land-clearing, soil disturbance or compaction, or use of non-native bees. If applicable, **the DNR recommends reseeding disturbed soils with native species of grasses and forbs using** BWSR Seed Mixes **or** MnDOT Seed Mixes**.**

  To ensure compliance with federal law, please conduct a federal regulatory review using the U.S. Fish and Wildlife Service's online Information for Planning and Consultation (IPaC) tool**.** Please note that all projects, regardless of whether there is a federal nexus, are subject to federal take prohibitions. The IPaC review will determine if prohibited take is likely to occur and, if not, will generate an automated letter. The USFWS RPBB guidance provides guidance on avoiding impacts to rusty patched bumble bee and a key for determining if actions are likely to affect the species; the determination key can be found in the appendix.

Environmental Review and Permitting

- The Environmental Assessment Worksheet should address whether the proposed project has the potential to adversely affect the above rare features and, if so, it should identify specific measures that will be taken to avoid or minimize disturbance. Sufficient information should be provided so the DNR can determine whether a takings permit will be needed for any of the above protected species.

- Please include a copy of this letter and the MCE-generated Final Project Report in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota’s rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location and project description provided with the request. If project details change or the project has not occurred within one year, please resubmit the project for review within one year of initiating project activities.

The Natural Heritage Review does not constitute project approval by the Department of Natural Resources. Instead, it identifies issues regarding known occurrences of rare features and potential impacts to these rare features. Visit the Natural Heritage Review website for additional information regarding this process, survey guidance, and other related information. For information on the environmental review process or other natural resource concerns, you may contact your DNR Regional Environmental Assessment Ecologist.

Thank you for consulting us on this matter and for your interest in preserving Minnesota's rare natural resources.

Sincerely,

James Drake

Natural Heritage Review Specialist
James.F.Drake@state.mn.us

Cc: Melissa Collins, Jennie Skancke, Amanda Weise

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793

In Reply Refer To: 10/09/2024 15:07:50 UTC
Project Code: 2025-0003787
Project Name: North Oaks Mixed Use Development EAW

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

This response has been generated by the Information, Planning, and Conservation (IPaC) system to provide information on natural resources that could be affected by your project. The U.S. Fish and Wildlife Service (Service) provides this response under the authority of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), the Migratory Bird Treaty Act (16 U.S.C. 703-712), and the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*).

Threatened and Endangered Species

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance

Please refer to refer to our Section 7 website for guidance and technical assistance, including step-by-step instructions for making effects determinations for each species that might be present and for specific guidance on the following types of projects: projects in developed areas, HUD, CDBG, EDA, USDA Rural Development projects, pipelines, buried utilities, telecommunications, and requests for a Conditional Letter of Map Revision (CLOMR) from FEMA.

We recommend running the project (if it qualifies) through our **Minnesota-Wisconsin Federal Endangered Species Determination Key (Minnesota-Wisconsin ("D-key"))**. A demonstration video showing how-to access and use the determination key is available. Please note that the Minnesota-Wisconsin D-key is the third option of 3 available d-keys. D-keys are tools to help Federal agencies and other project proponents determine if their proposed action has the potential to adversely affect federally listed species and designated critical habitat. The Minnesota-Wisconsin D-key includes a structured set of questions that assists a project proponent in determining whether a proposed project qualifies for a certain predetermined consultation outcome for all federally listed species found in Minnesota and Wisconsin (except for the northern long-eared bat- see below), which includes determinations of “no effect” or “may affect, not likely to adversely affect." In each case, the Service has compiled and analyzed the best available information on the species’ biology and the impacts of certain activities to support these determinations.

If your completed d-key output letter shows a "No Effect" (NE) determination for all listed species, print your IPaC output letter for your files to document your compliance with the Endangered Species Act.

For Federal projects with a “Not Likely to Adversely Affect” (NLAA) determination, our concurrence becomes valid if you do not hear otherwise from us after a 30-day review period, as indicated in your letter.

If your d-key output letter indicates additional coordination with the Minnesota-Wisconsin Ecological Services Field Office is necessary (i.e., you get a “May Affect” determination), you will be provided additional guidance on contacting the Service to continue ESA coordination outside of the key; ESA compliance cannot be concluded using the key for “May Affect” determinations unless otherwise indicated in your output letter.

Note: Once you obtain your official species list, you are not required to continue in IPaC with d-keys, although in most cases these tools should expedite your review. If you choose to make an effects determination on your own, you may do so. If the project is a Federal Action, you may want to review our section 7 step-by-step instructions before making your determinations.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of “There are no listed species found within the vicinity of the project,” then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **no effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.
2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project – other than bats (see below) – then project proponents must determine if proposed activities will have **no effect** on or **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain Life History Information for Listed and Candidate Species on our office website. If no impacts will occur to a species on the IPaC species list (e.g., there is no habitat present in the project area), the appropriate determination is **no effect**. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.

3. Should you determine that project activities **may affect** any federally listed, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header. Electronic submission is preferred.

Northern Long-Eared Bats
Northern long-eared bats occur throughout Minnesota and Wisconsin and the information below may help in determining if your project may affect these species.

Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥3 inches dbh for northern long-eared bat that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat and evaluated for use by bats. If your project will impact caves or mines or will involve clearing forest or woodland habitat containing suitable roosting habitat, northern long-eared bats could be affected. For bat activity dates, please review Appendix L in the Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines.

Examples of unsuitable habitat include:

- Individual trees that are greater than 1,000 feet from forested or wooded areas,
- Trees found in highly developed urban areas (e.g., street trees, downtown areas),
- A pure stand of less than 3-inch dbh trees that are not mixed with larger trees, and
- A monoculture stand of shrubby vegetation with no potential roost trees.

If IPaC returns a result that northern long-eared bats are potentially present in the action area of the proposed project, project proponents can conclude the proposed activities **may affect** this species **IF** one or more of the following activities are proposed:

- Clearing or disturbing suitable roosting habitat, as defined above, at any time of year,
- Any activity in or near the entrance to a cave or mine,
- Mining, deep excavation, or underground work within 0.25 miles of a cave or mine,
- Construction of one or more wind turbines, or
- Demolition or reconstruction of human-made structures that are known to be used by bats based on observations of roosting bats, bats emerging at dusk, or guano deposits or stains.

If none of the above activities are proposed, project proponents can conclude the proposed activities will have **no effect** on the northern long-eared bat. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.

If any of the above activities are proposed, and the northern long-eared bat appears on the user's species list, the federal project user will be directed to either the range-wide northern long-eared bat D-key or the Federal Highways Administration, Federal Railways Administration, and Federal Transit Administration Indiana bat/ Northern long-eared bat D-key, depending on the type of project and federal agency involvement. Similar to the Minnesota-Wisconsin D-key, these d-keys helps to determine if prohibited take might occur and, if not, will generate an automated verification letter. Additional information about available tools can be found on the Service's northern long-eared bat website.

Whooping Crane

Whooping crane is designated as a non-essential experimental population in Wisconsin and consultation under Section 7(a)(2) of the Endangered Species Act is only required if project activities will occur within a National Wildlife Refuge or National Park. If project activities are proposed on lands outside of a National Wildlife Refuge or National Park, then you are not required to consult. For additional information on this designation and consultation requirements, please review "Establishment of a Nonessential Experimental Population of Whooping Cranes in the Eastern United States."

Other Trust Resources and Activities

Bald and Golden Eagles **-** Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. It is the responsibility of the project proponent to survey the area for any migratory bird nests. If there is an eagle nest on-site while work is on-going, eagles may be disturbed. We recommend avoiding and minimizing disturbance to eagles whenever practicable. If you cannot avoid eagle disturbance, you may seek a permit. A nest take permit is always required for removal, relocation, or obstruction of an eagle nest. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds **-** The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers **-** Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed voluntary guidelines for minimizing impacts.

Transmission Lines **-** Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to guidelines developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow the Service’s Wind Energy Guidelines. In addition, please refer to the Service's Eagle Conservation Plan Guidance, which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

State Department of Natural Resources Coordination
While it is not required for your Federal section 7 consultation, please note that additional state endangered or threatened species may also have the potential to be impacted. Please contact the Minnesota or Wisconsin Department of Natural Resources for information on state listed species that may be present in your proposed project area.

Minnesota
Minnesota Department of Natural Resources - Endangered Resources Review Homepage
Email: Review.NHIS@state.mn.us

Wisconsin
Wisconsin Department of Natural Resources - Endangered Resources Review Homepage
Email: DNRERReview@wi.gov

We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
(952) 858-0793

PROJECT SUMMARY

Project Code: 2025-0003787
Project Name: North Oaks Mixed Use Development EAW
Project Type: Mixed-Use Construction
Project Description: The North Oaks Company LLC is proposing construction of a mixed-use development located at in the City of Lino Lakes, Anoka County, Minnesota. The project will include the construction of senior housing, market-rate apartments, affordable housing, commercial space, and single-family lots.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@45.12605105,-93.06444056335064,14z

Counties: Anoka and Ramsey counties, Minnesota

ENDANGERED SPECIES ACT SPECIES

There is a total of 5 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

BIRDS

NAME	STATUS
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential

CLAMS

NAME	STATUS
Salamander Mussel *Simpsonaias ambigua* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6208	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate
Rusty Patched Bumble Bee *Bombus affinis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9383 General project design guidelines: https://ipac.ecosphere.fws.gov/project/7E5PWDWKSZFCFNAIJCK3TBXOQU/documents/generated/5967.pdf	Endangered
Western Regal Fritillary *Argynnis idalia occidentalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/12017	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

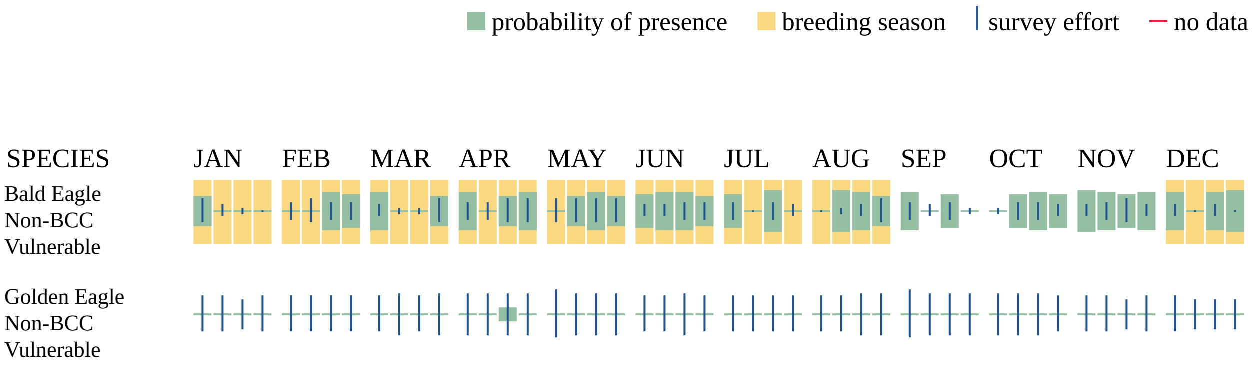
Probability of Presence (🟩)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (🟨)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Black Tern *Chlidonias niger surinamenisis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3093	Breeds May 15 to Aug 20
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25

NAME	BREEDING SEASON
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Grasshopper Sparrow *Ammodramus savannarum perpallidus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8329	Breeds Jun 1 to Aug 20
Henslow's Sparrow *Centronyx henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds May 1 to Aug 31
Le Conte's Sparrow *Ammospiza leconteii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9469	Breeds Jun 1 to Aug 15
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-eared Owl *asio otus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3631	Breeds Mar 1 to Jul 15
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere

NAME	BREEDING SEASON
Semipalmated Sandpiper *Calidris pusilla* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9603	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (🟩)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (🟨)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

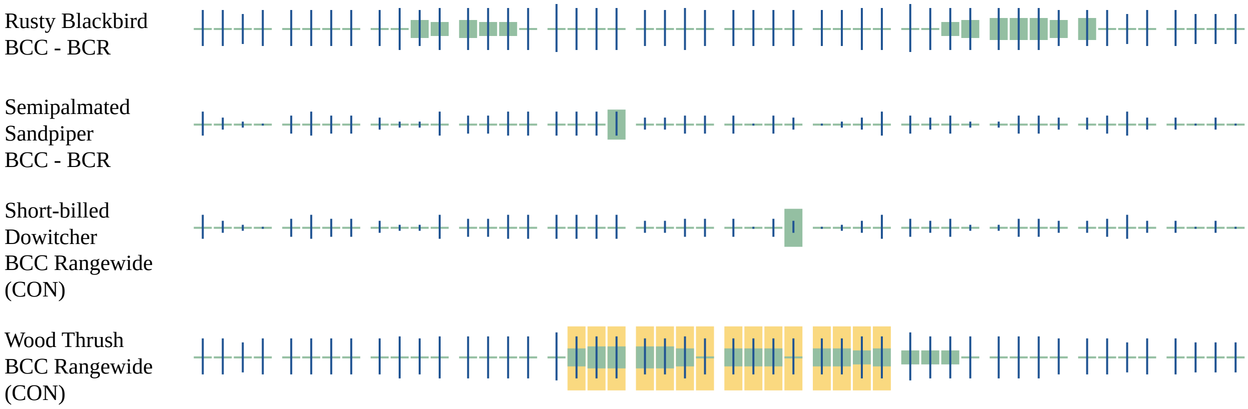
Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

🟩 probability of presence 🟨 breeding season | survey effort – no data

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC


Bald Eagle
Non-BCC
Vulnerable
Black Tern
BCC Rangewide
(CON)
Black-billed
Cuckoo
BCC Rangewide
(CON)
Bobolink
BCC Rangewide
(CON)
Canada Warbler
BCC Rangewide
(CON)
Chimney Swift
BCC Rangewide
(CON)
Golden Eagle
Non-BCC
Vulnerable
Golden-winged
Warbler
BCC Rangewide
(CON)
Grasshopper
Sparrow
BCC - BCR
Henslow's Sparrow
BCC Rangewide
(CON)
Le Conte's Sparrow
BCC Rangewide
(CON)
Lesser Yellowlegs
BCC Rangewide
(CON)
SPECIES
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Long-eared Owl
BCC Rangewide
(CON)
Pectoral Sandpiper
BCC Rangewide
(CON)
Red-headed
Woodpecker
BCC Rangewide
(CON)



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER EMERGENT WETLAND

- PEM1C
- PEM1A
- PEM1F

FRESHWATER FORESTED/SHRUB WETLAND

- PSS1/EM1C

IPAC USER CONTACT INFORMATION

Agency:	ISG
Name:	Jeremy Groskreutz
Address:	115 East Hickory Street, Suite 300
City:	Mankato
State:	MN
Zip:	56001
Email	jeremy.groskreutz@isginc.com
Phone:	5073876651

Appendix F – SHPO Correspondence

From: Kelly Herfendal
Sent: Monday, June 24, 2024 9:27 AM
To: Jeremy Groskreutz
Subject: FW: North Oaks Mixed Use Development - Request for Project Review

---

From: Kelly Herfendal <Kelly.Herfendal@ISGInc.com>
Sent: Thursday, June 13, 2024 11:45 AM
To: Nick McCabe <Nick.McCabe@ISGInc.com>; Paul Marston <Paul.Marston@ISGInc.com>
Subject: FW: North Oaks Mixed Use Development - Request for Project Review

I received this email in response to the SHPO request for the North Oaks EAW: SHPO will no longer be sending official responses to our project review requests. I emailed DataRequestsSHPO@state.mn.us to get a different response which has been used previously for search requests, but this is the response I received:

Thank you for reaching out to the SHPO Research Request Email. Our research request procedures have recently changed because we have launched the Minnesota Statewide Historic Inventory Portal (MnSHIP)! Please visit MnSHIP and the OSA Portal to perform research yourself. You can also visit https://npgallery.nps.gov/nrhp to obtain National Register of Historic Places nominations and information.

If you are a qualified archaeologist requesting other information, please send a new request titled to reflect your request type. Other information that can be requested from SHPO includes: archaeological site eligibility status/determinations, survey reports (architecture-history and archaeology), and restricted property information. You can visit our Research @ SHPO webpage to learn more about how to obtain information you may need for your research: https://mn.gov/admin/shpo/surveyandinventory/research/

Research requests will now be done ourselves through the provided links.

From: GraggJohnson, Kelly (ADM) <kelly.graggjohnson@state.mn.us>
Sent: Tuesday, June 11, 2024 6:25 PM
To: Kelly Herfendal <Kelly.Herfendal@ISGInc.com>
Subject: RE: North Oaks Mixed Use Development - Request for Project Review

Due to limited staff and resources, the Minnesota State Historic Preservation Office is no longer able to provide formal responses to technical assistance requests.

Instead, we encourage you to use Minnesota's Statewide Historic Inventory Portal (MnSHIP), which is an online tool that can help you identify any previously identified above-ground historic resources that may be located within your project area. For more information on MnSHIP, please see this link: Minnesota's Statewide Historic Inventory Portal (mn.gov)

We also encourage you to visit the Office of the State Archaeologist's online portal to access the Public Map which may help you identify if there are any previously identified archaeological sites located in your general project area. Archaeological site information is protected, so detailed information on archaeological sites is reserved for qualified archaeologists and historic preservation professionals, tribal historic preservation officers, and the Minnesota Indian Affairs

Council. For more information regarding the OSA portal, please see this link:
https://osaportal.gisdata.mn.gov/

Qualified archaeologists can request additional information from SHPO about archaeological site eligibility status/determinations, survey reports (architecture-history and archaeology), and restricted property information. You can visit the Research @ SHPO webpage to learn more about how to obtain information you may need for your research to identify historic properties that may be affected by your project: https://mn.gov/admin/shpo/surveyandinventory/research/

It is our understanding that the goal of the EAW is to describe how a proposed project may affect the environment, which includes historic resources. An archaeological assessment of the project (a Phase Ia) will help determine whether the project has the potential to affect known or suspected archaeological sites. A Phase I archaeological survey will provide more information regarding whether known or previously unknown archaeological sites are located within the proposed project area. These studies should be developed and structured to best inform the project's effects on archaeological resources. For a list of consultants who have expressed an interest in undertaking such surveys, please visit the website **https://www.mnhs.org/preservation/directory**, and select "Archaeologists" in the "Specialties" box.

If the proposed project will use federal funds, occur on federal land, or will require a federal permit (such as a USACE 404 permit), it may be subject to review under Section 106 of the National Historic Preservation Act. If the project becomes a federal undertaking, additional consultation between the federal agency and the SHPO will be necessary in order to define an appropriate area of potential effect (APE) for the federal undertaking as well as the necessary historic property identification and evaluation efforts required for a federal review, and this information will be helpful to help the project move forward.

DEPARTMENT OF
ADMINISTRATION
STATE HISTORIC PRESERVATION OFFICE

Kelly Gragg-Johnson (she/her/hers) **| Environmental Review Program Specialist**
50 Sherburne Avenue, Suite 203
Saint Paul, MN 55155
(651) 201-3285 | kelly.graggjohnson@state.mn.us

Please reference this SHPO Environmental Review Program Update regarding current project review timelines and staffing changes for the Environmental Review Program.

From: Kelly Herfendal <Kelly.Herfendal@ISGInc.com>
Sent: Tuesday, May 21, 2024 8:49 AM
To: MN_ADM_ENV Review SHPO <ENReviewSHPO@state.mn.us>
Subject: North Oaks Mixed Use Development - Request for Project Review

---

Good morning,

Please see the attached request for project review for an EAW for the North Oaks Mixed Use Development project located in Lino Lakes, Anoka County, MN. Let me know if additional information is needed.

Thank you,

ISG

Kelly Herfendal
Environmental Scientist
Employee Owner

P 507.387.6651
E Kelly.Herfendal@ISGInc.com
W ISGInc.com

From: Kelly Herfendal
Sent: Monday, June 24, 2024 9:28 AM
To: Jeremy Groskreutz
Subject: FW: Search Request

From: MN_MNIT_Data Request SHPO <DataRequestSHPO@state.mn.us>
Sent: Thursday, June 13, 2024 11:34 AM
To: Kelly Herfendal <Kelly.Herfendal@ISGInc.com>
Subject: RE: Search Request

Thank you for reaching out to the SHPO Research Request Email. Our research request procedures have recently changed because we have launched the Minnesota Statewide Historic Inventory Portal (MnSHIP)! Please visit MnSHIP and the OSA Portal to perform research yourself. You can also visit https://npgallery.nps.gov/nrhp to obtain National Register of Historic Places nominations and information.

If you are a qualified archaeologist requesting other information, please send a new request titled to reflect your request type. Other information that can be requested from SHPO includes: archaeological site eligibility status/determinations, survey reports (architecture-history and archaeology), and restricted property information. You can visit our Research @ SHPO webpage to learn more about how to obtain information you may need for your research: https://mn.gov/admin/shpo/surveyandinventory/research/

Thank you,
Lucy H.

SHPO Research Requests
Minnesota State Historic Preservation Office
50 Sherburne Avenue, Suite 203
Saint Paul, MN 55155
datarequestshpo@state.mn.us

DEPARTMENT OF
ADMINISTRATION
STATE HISTORIC PRESERVATION OFFICE

From: Kelly Herfendal <Kelly.Herfendal@ISGInc.com>
Sent: Thursday, June 13, 2024 10:51 AM
To: MN_MNIT_Data Request SHPO <DataRequestSHPO@state.mn.us>
Subject: Search Request

Good morning,

I am writing to inquire about a database search of any archaeological, historical, or architectural resources at the site of a proposed housing development. The site is located within Section 34 of Lino Lakes Township (T31N, R22W) in the City of Lino Lakes, Anoka County, MN. I have attached a shapefile for your reference. Thank you for your assistance.

Sincerely,
Kelly Herfendal

Kelly Herfendal
Environmental Scientist
Employee Owner

P 507.387.6651
E Kelly.Herfendal@ISGInc.com
W ISGInc.com

Appendix G – Greenhouse Gas Calculations

ISGHG Calculator
Verion 0.1
Last Updated: 8/3/22

Project Name	North Oaks Mixed Use Development
Reviewer	Jeremy Groskreutz
Date	10/14/2024
State	MN
County	Anoka
Project Lifespan	50

Emission Sources	Greenhouse Gases Emitted	CO2e TPY Emitted
Stationary Sources	-/-	-/-
Mobile Sources	CO2, CH4, and N20	6,829.24
Off-Site Purchased Energy	CO2, CH4, and N20	1,577.82
Purchased Steam/Heat	-/-	-/-
Waste Management	CO2	386.34
Purchased Gases	-/-	-/-

Mitigation Sources	Greenhouse Gases Mitigated	CO2e TPY Mitigated
Land-Use Mititgation	-/-	-/-
Renewable Energy Credits	-/-	-/-

	Total CO2e TPY Emitted
Emissions - Mitigations =	8,793.40

>25,000 TPY CO2e Emitted?	No
>100,000 TPY CO2e Emitted?	No

Emission Source	Project Phase	Emissions Scope
Stationary Sources	-/-	-/-
Mobile Sources	Operations, , , ConstructionConstruct	Scope-1
Off-Site Purchased Energy	Operations	Scope-2
Purchased Steam/Heat	-/-	-/-
Waste Management	Operations	Scope-3
Purchased Gases	-/-	-/-
Mitigation Source	Project Phase	Emissions Scope
Land-Use Mititgation	-/-	-/-
Renewable Energy Credits	-/-	-/-

Known Gases Emitted	kg Emitted Yearly	Short Tons Emitted Yearly
CO2	7,605,873.41	8,384.08
CH4	244.75	0.27
N2O	49.41	0.05

Stationary Source Emissions

ID	Phase	Fuel Type	Generator Type	Hours Operated	Fuel Spent Daily	mmBtu Output
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

ID	Phase	kg CO2 Produced	kg CH4 Emitted	kg N2O Emitted	kg CO2e Daily	CO2e TPY
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Federal Register EPA; 40 CFR Part 98; e-CFR. Table C-1, Table C-2 (as amended at 81 FR 89252, Dec. 9, 2016), Table AA-1 (78 FR 71965, Nov. 29, 2013).

Total Stationary Source Emissions	

Mobile Source Emissions

ID	Phase	Vehicle Type	Fuel Type	Year	Yearly mi	MPG	Ga Used (Off-Road)
1	Const.	Construction/Mining Equipment	Diesel	2019	10,950.00	2.5	
2	Const.	Heavy-Duty Vehicles	Diesel	2019	6,480.00	6	
3	Const.	Light-Duty Trucks	Gasoline	2019	10,950.00	25	
4	Op.	Passenger Cars	Gasoline	2019	12,045.00	25	
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

ID	# Veh.	kg CO2 Emitted	kg CH4 Emitted	kg N20 Emitted	kg CO2e Yearly	CO2e TPY
1	62	55,452.55	-	-	55,452.55	61.13
2	9	1,984.82	0.01	0.05	2,000.08	2.20
3	30	2,187.94	0.05	0.01	2,191.80	2.42
4	1527	6,125,141.95	93.80	27.59	6,135,708.56	6,763.50
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Total Mobile Source Emissions	6,829.24

Offsite Purchased Energy Emissions

eGRID Subregion	Yrly. Energy Usage	kg CO2e Emitted	kg CH4 Emitted	kg N2O Emitted
MROW (MRO West)	3199.23	1,421,106.14	150.89	21.76

kg CO2e Emitted	CO2e TPY
1,431,363.64	1,577.82

Offsite Steam and Heat Emissions

mmBtu Purchased Yrly.	kg CO2 Emitted	kg CH4 Emitted	kg N2O Emitted	kg CO2e Emitted

CO2e TPY

Waste Management Emissions

ID	Waste Type	Disposal Method	Tons Disposed Yrly	CO2e TPY
1	Mixed MSW	Landfilled	674	386.34
2				
3				
4				
5				
6				
7				
8				
9				
10				

Total CO2e TPY
386.34

General/Refidgerative Gases

ID	Gas	Gas (lb)	GWP	CO2e (lb)	CO2e (Tons)
1					
2					
3					
4					
5					

100yr GWPs from IPCC 4th Assessment Rerport (AR4), 2007.

Blended Refridgerative Gases

ID	Gas	Gas (lb)	GWP	CO2e (lb)	CO2e (Tons)
1					
2					
3					
4					
5					

100yr GWPs from IPCC 4th Assessment Rerport (AR4), 2007.

Tot. CO2e TPY

Land-based Mitigation

ID	Restoration	Acreage	Sequest. Rate (Mton/Acre/Yr)	Total Seques. (MTon/Yr)	CO2e TPY
1					
2					
3					
4					
5					

Tot. CO2e TPY

Renewable Energy Credits

Credits Bought	eGrid Subregion	kg CO2 Mitigated	kg CH4 Mitigated	kg N2O Mitigated
	MROW (MRO West)			

kg CO2e Mitigated	CO2e TPY Mitig.

Appendix H – Traffic Impact Study

Ash Street Traffic Impact Study

Prepared by: ISG

Prepared for: North Oaks Company LLC

Submitted to: Anoka County, Minnesota

Project No. 24-30671

October 14th, 2024

PREPARED FOR:
North Oaks Company LLC
Lauren Grouws
VP Development
5959 Centerville Road, Suite 200
North Oaks, MN 55127
Lauren@northoaks.com

PREPARED BY:
ISG
Corona Woychik, PE, PTOE
Project Engineer
201 Main Street, Suite 1020
La Crosse, WI 54601
Corona.Woychik@ISGInc.com

SIGNATURE SHEET

I HEREBY CERTIFY THAT THESE CALCULATIONS WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

Corona V. Woychik, PE, PTOE
Project Engineer
License No. 59049
Documents covered by this seal:
Ash Street Traffic Impact Study

ISG
201 Main Street, Suite 1020
La Crosse, WI 54601

Ash Street Traffic Impact Study
Lino Lakes, Minnesota

Engineer's Project Number: 24-30671

Dated this 14th day of October 2024

TABLE OF CONTENTS

APPENDICES

TABLE OF TABLES

EXECUTIVE SUMMARY, CONCLUSIONS, + RECOMMENDATIONS

Summary

This study has been prepared in anticipation of two proposed mixed used and residential developments along Ash Street in Lino Lakes, MN. The proposed sites, 116 acres total, are currently vacant and anticipated to be developed in two major phases. The sites are located west of Centerville Road along Ash Street between Centerville Road and Holly Drive. The proposed development will consist of the Wilkinson development and the North Oaks Farms development and will include townhomes, retail, apartments, senior adult housing, and single-family residences.

The Wilkinson area, consisting of townhomes, retail, apartments, and senior adult housing, would be the first phase and is anticipated to be fully operational in 2025. The North Oaks Farms area, consisting of single-family residences, would be the next phase, and areas would be fully developed by 2045, the Design Year. See **Appendix A** for a preliminary site plan for the proposed Wilkison development and a preliminary concept for the North Oaks Farms area.

This Traffic Impact Study (TIS) studied current, projected, and future traffic conditions at several locations in the City of Lino Lakes, Anoka County, Minnesota. These locations included in the study area are:

- Intersection 1 – The intersection of CSAH 21/Centerville Road and CSAH J/Ash Street
- Intersection 2 – The intersection of CSAH 21/Centerville Road and CSAH 32/Ash Street
- Intersection 3 – The intersection of CSAH 32/Ash Street and Monarch Way / the North Oaks Farms area's South Access
- Intersection 4 – The intersection of CSAH 32/Ash Street and Rapp Farm Blvd
- Intersection 5 – The intersection of CSAH 32/Ash Street and Holly Drive N
- Intersection 6 – The intersection of Wilkinson Lake Blvd and the Wilkinson area's South Access
- Intersection 7 – The intersection of CSAH 32/Ash Street and the Wilkinson area's North Access
- Intersection 8 – The intersection of CSAH 32/Ash Street and the North Oaks Farms area's East Access

Turning movement traffic count data was collected at Intersections 1-5 above from 6:00AM - 9:00AM, and from 3:30PM – 6:30PM on Thursday, July 18th, 2024. Traffic was analyzed based on collected data.

Findings

In the existing condition, the southbound approach at Intersection 1 operates at a level of service F. All other movements operate at a level of service D or better at the study intersections during the Weekday AM and the Weekday PM peak hours. In the existing condition, all existing major intersections operate as stop-controlled. Reconstruction of major intersections is planned for 2025, and Intersection 1 and Intersection 2 are proposed to be converted to roundabouts.

Historical traffic volumes in the area have held steady or decreased over the past 20 years; however, traffic forecasts completed in the last 5 years indicate that traffic growth is expected. The proposed developments will account for much of the traffic growth anticipated over the next 20 years, and growth rates were selected to account for background traffic growth separate from traffic growth attributed to the proposed developments. The assumed average annual traffic growth rates used for the future scenarios were the following:

- 0.5% along CSAH 21/Centerville Road south of Intersection 1,
- 1.0% along CSAH 21/Centerville Road between Intersections 1 and 2,
- 1.0% for CSAH J/Ash Street east of Intersection 1,
- 0.8% for CSAH 21/Centerville Road north of Intersection 2, and
- 0% for CSAH 32/Ash Stret west of Intersection 2.

In the design year, 2045, with construction of the proposed development, all movements are expected to operate at a level of service C or better for the Weekday AM and Weekday PM peak hours.

From the completed study, it is found that the proposed mixed used and residential developments along Ash Street will increase vehicular volumes and average delays at the studied intersections, and the planned roadway geometry is able to accommodate the changes in traffic volumes and distribution patterns. Vehicle queue lengths will generally increase but are not expected to impact development site circulation.

Conclusions + Recommendations

The proposed residential and mixed-use developments along Ash Street are slated to begin operations by 2025, with full completion expected by 2045. Currently, traffic conditions on the southbound approach of the CSAH 21/Centerville Rd and CSAH J/Ash Street intersection are poor, operating at a level of service F. However, planned improvements, including the conversion to roundabouts, are anticipated to enhance traffic flow to a level of service C or better regardless of proposed development construction. While no new right- or left-turn lanes are warranted due to the developments, a left-turn lane at the CSAH 32/Ash Street and Holly Drive intersection is indicated, although safety data shows no significant need for its construction. Additionally, higher-than-average crash rates along CSAH 32/Ash Street suggest a need for roadway geometry changes between Monarch Way and CSAH 21/Centerville Rd. A proposed realignment should meet AASHTO standards and a suggested design speed of 45 MPH. Recommended for the proposed developments, sidewalks and shared-use paths should be incorporated within the developments to enhance pedestrian and bicyclist connectivity. Finally, while the planned intersection geometry and traffic control should accommodate anticipated traffic demands, re-evaluation is recommended if growth projections change.

INTRODUCTION

Purpose of Report

The purpose of this report is to document the methodologies, findings, recommendations, and conclusions of the Ash Street traffic impact analysis study, including the basis for all assumptions, traffic parameters, and conclusions. This report presents data in a logical format including tables and figures to convey the data and its meaning accurately and clearly.

Study Objectives

The objectives of this study include the following:

- Identify the impacts to the transportation system and immediate area projected for the proposed development.
- Recommend necessary improvements to the adjacent transportation system to minimize crash risk and maintain a safe and efficient system.
- Protect the safety and functionality of the transportation system while providing sufficient access for the proposed development.

ANALYSIS OF EXISTING CONDITIONS

Location, Zoning, and Land Use

This report studies the projected impacts of two proposed developments in the City of Lino Lakes, Anoka County, Minnesota. Preliminary site plans and concepts can be found in **Appendix A**, and a project location map is included in **Appendix B**. The site is currently vacant and will be developed in two phases. Phase 1 consists of Wilkinson development situated northeast of the intersection of CSAH 21/Centerville Road and CSAH J/Ash Street. Phase 2 includes the North Oaks Farms development located east of Parcel 3 (Phase 1) between the Wilkinson development and Monarch Way.

Intersections 1 – 8, were studied:

- Intersection 1 – The intersection of CSAH 21/Centerville Road and CSAH J/Ash Street
- Intersection 2 – The intersection of CSAH 21/Centerville Road and CSAH 32/Ash Street
- Intersection 3 – The intersection of CSAH 32/Ash Street and Monarch Way
- Intersection 4 – The intersection of CSAH 32/Ash Street and Rapp Farm Blvd
- Intersection 5 – The intersection of CSAH 32/Ash Street and Holly Drive N
- Intersection 6 – The intersection of Wilkinson Lake Blvd and the Wilkinson area’s South Access
- Intersection 7 – The intersection of CSAH 32/Ash Street and the Wilkinson area’s North Access
- Intersection 8 – The intersection of CSAH 32/Ash Street and the North Oaks Farms area’s East Access

The figure in **Appendix C** identifies these intersections and shows their location within the City of Lino Lakes, which has a population of 21,399 (US Census 2020). Surrounding properties are residential (south) and agricultural (north, east, and west). The proposed sites and surrounding areas are zoned as Rural per the City of Lino Lake’s most recent zoning map (updated January 2023). The proposed sites and surrounding areas are shown as Low Density Residential, Medium Density Residential, High

Density Residential, and Signature Gateway District per the City of Lino Lakes Future Land Use Map from the 2040 Comprehensive Plan. The Existing Zoning and Future Land Use maps are provided in **Appendix E**.

Area Roadway System

Through the study area:

- CSAH J/Ash Street functionally classified as a minor arterial
- CSAH 21/Centerville Road classified as a minor arterial
- CSAH 32/Ash Street classified as a minor arterial
- Monarch Way classified as a local street
- Rapp Farm Blvd classified as a local street
- Holly Drive N classified as a minor collector
- Wilkinson Lake Blvd classified as a local street

ROADWAY GEOMETRY

Through the study area, Centerville Road also known as CSAH 21, is a north-south highway with a posted speed limit of 50 MPH. The typical roadway section is a two-lane undivided roadway with a northbound right-turn lane at the intersection with CSAH J/Ash Street. It is an asphalt roadway with 7-foot right shoulders and 9-foot left shoulders, and no sidewalk. The existing paved shoulders are suitable bicycle accommodations as they meet the minimum required width of 8' for this roadway per MnDOT's Bicycle Facility Design Manual.

Within the study area, Ash Street also known as CSAH J, is an east-west street with a posted speed limit of 40 MPH. The typical roadway section consists of a two-lane undivided roadway with a westbound right-turn lane at the intersection with CSAH 21/Centerville Road. It is an asphalt roadway with 8-foot shoulders on both sides, and no sidewalk. The existing paved shoulders are suitable bicycle accommodations as they meet the minimum required width of 8' for this roadway per MnDOT's Bicycle Facility Design Manual. Ash Street, also known as CSAH 32, is an east-west street with a posted speed limit of 45 MPH. Similarly CSAH J/Ash Street, has a typical roadway section and a two-lane undivided asphalt roadway with 5-foot shoulders on both sides, without sidewalks or bicycle accommodations.

Wilkinson Lake Blvd is the west approach on the intersection of CSAH J/Ash Street and CSAH 21/Centerville Road, Wilkinson Lake Blvd is an east-west street local street that continues the CSAH J segment through the city. The typical roadway section consists of a divided two-lane roadway with variations on the median widths along the segment. It is an asphalt roadway with gutters on both sides, but no sidewalk or bicycle accommodations.

Within the study area, Monarch Way is a north-south asphalt roadway with a typical roadway section of two-lane undivided roadway with curb and gutter. It serves the residential area south of the development with no sidewalk or bicycle accommodations.

Rapp Farm Blvd is a north-south asphalt roadway serving the residential area south of the development. The typical roadway section consists of two-lane undivided roadway with curb and gutter. At the intersection with CSAH J/Ash Street, Rapp Farm Blvd is divided by 17-foot wide median. No sidewalk or bicycle accommodations are provided.

Holly Drive N is a north-south roadway with a posted speed limit of 45 MPH. The typical roadway section is an asphalt two-lane undivided roadway with no shoulders, sidewalk or bicycle accommodations.

TRAFFIC CONTROL

The intersection of CSAH J/Ash Street and CSAH 21/Centerville Rd is all-way-stop controlled. CSAH 32/Ash Street is stop-controlled at its intersection with CSAH 21/Centerville Road, and a northbound left-turn bypass is provided. Monarch Way, Rapp Farm Blvd, and Holly Drive N are stop controlled at their intersections with CSAH 32/Ash Street. There are plans to reconstruct the CSAH 21/Centerville Rd's intersections with CSAH J/Ash Street and CSAH 32/Ash Street from stop-controlled intersections into roundabouts, and this is anticipated to be completed in 2025. The intersection of CSAH J/Ash Street and CSAH 21/Centerville Rd (Intersection 1) will be a single lane roundabout with 10-foot shared use paths providing bicycle and pedestrian accommodations. The intersection of CSAH 32/Ash Street / CSAH 21/Centerville Rd (Intersection 2) will be a single lane roundabout with 8-foot and 10-foot shared use paths providing bicycle and pedestrian accommodations. Exhibits showing the existing and planned traffic control are provided in **Appendix E**.

VEHICLE CLASSIFICATION

Trucks are expected to use CSAH J/Ash Street and CSAH 32/Ash Street to access the study area, then use the development driveways to reach the commercial area. Pedestrians and bicyclists, mainly residents in the proposed developments, are anticipated to use any available pedestrian and bicycle accommodations.

Existing Traffic Volumes and Analysis Assumptions

Traffic count data was collected through video at Intersections 1 through 5 on Thursday July 18th, 2024 from 6:00AM - 9:00AM, and from 3:30PM – 6:30PM. The actual High and Low temperatures for the collection day were 55° and 81°. All roadways were clear and dry. The morning (AM) peak hour of traffic for the study area occurred from 7:30 AM to 8:30 AM. The evening (PM) peak hour of traffic for the study area occurred from 4:15 PM to 5:15 PM. About 60% higher traffic volumes were observed during the weekday PM peak hour than the AM peak hour within the study boundary. Some cyclists and no pedestrians were recorded during the peak hours of traffic. Summary diagrams of the network's peak hour vehicular traffic counts are provided in **Appendix F**.

Using Synchro version 11.1, multiple delay computation methods are available, including the Percentile Delay Method, the Highway Capacity Manual 6th Edition methodology, Highway Capacity Manual 2010 Edition methodology, and Highway Capacity Manual 2000 Edition methodology. To analyze the traffic conditions within the study area for this report, Synchro version 11.1's Highway Capacity Manual 6th Edition delay method was utilized for all intersections.

Intersections 1 – 5 were modeled. The resulting Synchro analysis worksheets were prepared for the existing conditions and are provided in **Appendix G**. **Tables 1 – 5** show the existing level of service (LOS) and delay for Intersections 1 – 5 for both peak hour periods.

In the existing condition, the southbound approach of Intersection 1 operate at a level of service F in both the AM and PM peak hours and all other movements operate at level of service D or better during the AM and PM peak hours.

Table 1: Existing (2024) LOS and Delay for Intersection 1

INTERSECTION 1	**WEEKDAY AM PEAK**												
	2024 EXISTING												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		1	8	3	97	18	141	13	75	26	356	210	10
Queue (ft)		41			58		46	46		41	187		
Mvmt Delay (sec)					12.4		10.8	10.8		8.6			
Mvmt LOS					B		B	B		A			
Delay (sec)	**40.5**	10.5			11.5			10.3			60.0		
LOS	E	B			B			B			F		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 1	**WEEKDAY PM PEAK**												
	2024 EXISTING												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		18	30	9	54	13	354	19	238	174	329	189	11
Queue (ft)		40			41		117	86		62	404		
Mvmt Delay (sec)					12.8		27	20.2		13.3			
Mvmt LOS					B		D	C		B			
Delay (sec)	**57.3**	14.2			24.7			17.4			120.3		
LOS	F	B			C			C			F		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 2: Existing (2024) LOS and Delay for Intersection 2

INTERSECTION 2	**WEEKDAY AM PEAK**												
	2024 EXISTING												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		25		193				73	139			385	19
Queue (ft)		50		101				75				14	
Mvmt Delay (sec)		15.4		13.8				8.7	0.2				
Mvmt LOS		C		B				A	A				
Delay (sec)	**4.4**	14.0						3.1			0.0		
LOS	**A**	B						A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 2	**WEEKDAY PM PEAK**												
	2024 EXISTING												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		51		295				192	405			282	22
Queue (ft)		87		142				70				0	
Mvmt Delay (sec)		28.2		13.9				8.5	0.5				
Mvmt LOS		D		B				A	A				
Delay (sec)	**5.9**	16.0						3.1			0.0		
LOS	**A**	C						A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 3: Existing (2024) LOS and Delay for Intersection 3

INTERSECTION 3	**WEEKDAY AM PEAK**												
	2024 EXISTING												
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			200	5	7	80		9		20			
Queue (ft)					22			48					
Mvmt Delay (sec)					7.8	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.1**	0.0			0.6			9.9					
LOS	**A**	A			A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 3	**WEEKDAY PM PEAK**												
	2024 EXISTING												
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			339	14	13	197		6		11			
Queue (ft)					29			37					
Mvmt Delay (sec)					8.1	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.5**	0.0			0.5			11.6					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 4: Existing (2024) LOS and Delay for Intersection 4

INTERSECTION 4	**WEEKDAY AM PEAK**												
	2024 EXISTING												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			190	18	11	75		35		19			
Queue (ft)					8			51		51			
Mvmt Delay (sec)					7.9	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.9**	0.0			1.0			10.5					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 4	**WEEKDAY PM PEAK**												
	2024 EXISTING												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			336	32	9	194		14		17			
Queue (ft)					13			36		36			
Mvmt Delay (sec)					8.3	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.8**	0.0			0.4			12.0					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 5: Existing (2024) LOS and Delay for Intersection 5

INTERSECTION 5	**WEEKDAY AM PEAK**												
	2024 EXISTING												
CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		17	192			107	5				12		26
Queue (ft)		8									53		53
Mvmt Delay (sec)		7.5	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.4**	0.6			0.0						9.8		
LOS	**A**	A			A						A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 5	**WEEKDAY PM PEAK**												
	2024 EXISTING												
CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		79	353			194	16				14		18
Queue (ft)		35									37		37
Mvmt Delay (sec)		7.8	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.5**	1.4			0.0						12.6		
LOS	**A**	A			A						B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 6: Existing (2024) LOS and Delay for Intersection 6

INTERSECTION 6	**WEEKDAY AM PEAK**												
	2024 EXISTING												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)					41					12			
Queue (ft)										31			
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**7.4**				7.3			8.4					
LOS	**A**				A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 6	**WEEKDAY PM PEAK**												
	2024 EXISTING												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)					43					57			
Queue (ft)										41			
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**7.9**				7.3			8.5					
LOS	**A**				A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Peak Hourly Factor

For the area roadway system of this report, a single Peak Hourly Factor (PHF) was determined for each intersection with traffic count data. PHF was calculated by evaluating the collected traffic counts and comparing the intersection volume during the busiest 15-minutes of the peak hour with the total intersection volume during the peak hour. The PHF was applied to each intersection within Synchro 11 for all existing and future scenarios.

Crash Analysis

Crash data was obtained from Anoka County for the study area from 2019 to 2024, with the reports provided in **Appendix H**. A total of twenty-six crashes were recorded during this period. **Table 7** summarizes these crashes. No crashes were recorded south of Intersection 2 or west of Intersection 3.

Table 7: Crash Locations

	Location	Date	Time	Severity	Diagram
CSAH 32 (Ash St) & CSAH 21 (Centerville Rd)	CSAH 21	2/5/2019	17:30	N	Angle
	CSAH 21	8/20/2019	16:16	C	Other
	CSAH 21	2/4/2019	10:16	N	Other
	CSAH 21	10/1/2020	8:09	N	SSO
	CSAH 21	9/8/2023	11:57	C	Rear End
	CSAH 32	10/4/2019	16:00	N	SSO
	CSAH 32	5/12/2021	15:19	N	Angle
	CSAH 32	4/11/2022	17:34	N	Angle
	CSAH 32	9/27/2023	13:03	N	Other
CSAH 32 (Ash St) & CSAH 21 (Centerville Rd) to CSAH 32 (Ash St) & Monarch Way	CSAH 32	1/28/2019	5:30	N	SVROR
	CSAH 32	8/10/2019	12:37	N	Rear End
	CSAH 32	10/4/2019	16:00	N	SSO
	CSAH 32	5/2/2020	12:30	N	Angle
	CSAH 32	10/23/2020	0:02	N	SVROR
	CSAH 32	5/12/2021	15:19	N	Angle
	CSAH 32	8/7/2021	12:07	C	SSO
	CSAH 32	12/6/2021	10:20	N	SVROR
	CSAH 32	12/10/2021	17:18	N	SSO
	CSAH 32	1/22/2022	16:57	C	SVROR
	CSAH 32	4/11/2022	17:34	N	Angle
	CSAH 32	10/25/2022	5:19	N	Other
	CSAH 32	12/17/2022	10:00	N	SVROR
	CSAH 32	6/29/2023	20:35	N	Other
	CSAH 32	9/27/2023	13:53	N	Other
	CSAH 32	10/31/2023	2:30	N	SVROR
	CSAH 32	12/9/2023	3:18	N	SVROR

Most of the crashes occurred between 10:00AM to 6:00PM and were attributed to a variety of causes, including single vehicle run-off-road, rear end, other, and angle crash.

The average crash rate for the CSAH 32/Ash Street segment from Intersection 2 to Intersection 3 is 1.52 crashes per MVMT, which is about 40% higher than the statewide average crash rate Anoka County highways, 1.09 per MVMT (MnDOT Crash Data Toolkits, Crash rates – CSAH and CR by County). The recorded crash data indicates a current need for geometric changes for CSAH 32/Ash Street between Monarch Way and CSAH 21/Centerville Rd.

PROPOSED DEVELOPMENT

Existing traffic volumes were projected with the traffic forecast to create an Opening Year No Build (2025) future scenario and a Design Year No Build (2045) future scenario for the 6:30AM – 9:30AM and the 3:30PM – 6:30PM Weekday peak hours. Then, the proposed trip generation and trip distribution analyses were applied to No Build models to create an Opening Year Build (2025) future scenario and a Design Year Build (2045) future scenario for the Weekday AM and Weekday PM peak hours.

Site Traffic

TRIP GENERATION + SITE ACCESS

Wilkinson Waters

Development for the Wilkinson Waters area is anticipated to be complete in 2025. A preliminary plan has been provided for the Wilkinson Waters development. The Wilkinson Waters development plan was used to identify proposed access locations and to estimate trips generated by the parcel. The plan shows six 6-plex townhomes, four 4-plex townhomes, two 100-unit apartment buildings, one 100-unit senior housing facility, and three retail buildings with floor area ranging from 9,000 square feet to 11,000 square feet for each building. Parking lots are provided on-site for vehicular traffic, but no sidewalks or shared use paths are indicated in the preliminary and conceptual site plans. Internal development roadways would have low enough traffic volumes to allow for bicycles to share the roadway without on-street bicycle accommodations.

The traffic generated by the Wilkinson Waters area is expected to be primarily new trips with some internally captured trips. For this study, a trip is defined as a one-way movement between an origin and a destination. The expected number of trips the Wilkinson Waters area will generate was estimated using the *ITE Trip Generation Manual, 11th Edition*. The Wilkinson Area is best represented by the following ITE Trip Generation Manual's Land Use Codes:

- 215, Single-Family Attached Housing
- 221, Multifamily Housing (Low-Rise) – Not Close to Rail Transit
- 252, Senior Adult Housing – Multifamily
- 822, Strip Retail Plaza

This area would have one access to Wilkinson Lake Boulevard and one access to Ash Street. No access to CSAH 21/Centerville Road is proposed. The access to Wilkinson Lake Boulevard is aligned to complement existing intersections. The access to Ash Street is located approximately 730 feet from the t-shaped intersection of Centerville Road and Ash Street / CSAH 32. This access point does not meet Anoka County's access spacing criteria; however, due to the lower travel speeds anticipated in this section of Ash street, the presence of environmentally sensitive areas adjacent to the proposed access point, and the lack of desire to access the more heavily traveled CSAH 21/Centerville Road, the proposed access location is an appropriate location for this parcel.

The number of new trips introduced by the Wilkinson development are summarized in **Table 8** below.

Table 8: Wilkinson Development Trip Generation for Opening Year 2025

	Total New Trips	Entering	Exiting
Weekday AM (AM Peak Hour of Adj Street Traffic)	224	93	131
Weekday AM (AM Peak Hour of Generator)	350	149	201
Weekday PM (PM Peak Hour of Adj Street Traffic)	447	237	210
Weekday PM (PM Peak Hour of Generator)	532	295	237
Weekday	3054	1527	1527

Internal Capture

Because the Wilkinson development will contain multiple land uses, an internal capture analysis was performed for the Wilkinson residential and retail land uses. The internal capture rate is the percentage reduction that can be applied to the trip generation estimates for individual land uses to account for trips internally absorbed. The ITE Trip Generation Handbook, 3rd edition provides the methodology, and the internal capture rates for the AM and PM peak periods can be found in **Appendix I**.

The internal capture ratios were applied to the values in **Table 8** to create **Table 9**.

Table 9: Wilkinson Development Trip Generation for Opening Year 2025 - Adjusted for Internal Capture

	Total New Trips	Entering	Exiting
Weekday AM (AM Peak Hour of Adj Street Traffic)	222	92	130
Weekday AM (AM Peak Hour of Generator)	348	148	200
Weekday PM (PM Peak Hour of Adj Street Traffic)	343	185	158
Weekday PM (PM Peak Hour of Generator)	428	243	185
Weekday	3054	1527	1527

North Oaks Farms

Development for the North Oaks Farms area is anticipated to be complete by 2045. A concept plan has been prepared for the North Oaks Farms development, and the concept was used to estimate trips generated by the development. The concept shows detached single-family residences utilizing two access to Ash Street. The first access would be on the east side of the development where one new intersection between the two Ash Street 90-degree turns would provide access to 17 residences. The second access would be on the west side of the development and would add a north leg to the intersection of CSAH 21 / Ash Street and Monarch Way.

The expected number of trips the North Oaks Farms area will generate was estimated using the *ITE Trip Generation Manual, 11th Edition*. The North Oaks Farms area is best represented by the following ITE Trip Generation Manual's Land Use Code 210, Single-Family Detached Housing. The traffic generated by the North Oaks Farms area is expected to be all new trips. The number of new trips introduced by the North Oaks Farms development is summarized in **Table 10** below.

Table 10: North Oaks Farms Trip Generation

	Total New Trips	Entering	Exiting
Weekday AM (AM Peak Hour of Adj Street Traffic)	55	14	41
Weekday AM (AM Peak Hour of Generator)	58	15	43
Weekday PM (PM Peak Hour of Adj Street Traffic)	72	45	27
Weekday PM (PM Peak Hour of Generator)	76	49	27
Weekday	736	368	368

Combined Trip Generation

The number of new trips introduced by the North Oaks Farms development was added to the Wilkinson development's new trips adjusted for internal capture to create a combined trip generation for 2045, summarized in **Table 11** below.

Table 11: Trip Generation for Design Year 2045

	Total New Trips	Entering	Exiting
Weekday AM (AM Peak Hour of Adj Street Traffic)	279	107	172
Weekday AM (AM Peak Hour of Generator)	408	164	244
Weekday PM (PM Peak Hour of Adj Street Traffic)	519	282	237
Weekday PM (PM Peak Hour of Generator)	608	344	264
Weekday	3790	1895	1895

TRIP DISTRIBUTION AND ASSIGNMENT

It is assumed that the proposed development's trips would follow similar traffic patterns as the existing traffic within the study area. Proposed traffic is expected to be distributed similar to the existing traffic distribution with variations between the two developments. The existing traffic distribution is comparable during both the AM and the PM peak hours for each development with minor variations. A visual of the anticipated trip distribution for entering and exiting new trips for the developments is provided in **Appendix J.**

These trip distributions were applied to the expected traffic generated by the proposed development. A visual summary of the trip assignment for the Opening Year (2025) and Design Year (2045) is provided in **Appendix K.** The proposed development is expected to increase traffic for many left- and right-turn movements at Intersections 1 – 3 and through movements at Intersections 4 and 5.

MODAL SPLIT

Some cyclists and no pedestrians were recorded during the peak hour of traffic. Bicyclists and pedestrians, mainly development residents, are anticipated to use available bicycle and pedestrian accommodations. Pedestrians and bicyclists who are not residents of the proposed developments may be attracted the proposed developments in the future if pedestrian and bicyclist friendly design elements are incorporated into site plans for area development and once a sidewalk or shared use path network is constructed by the City of Lino Lakes along Ash Street.

Growth Rate

Selected growth rates vary by segment. Several sources were considered when selecting the study growth rates, including historical roadway traffic, historical population growth, historical household growth, and recently completed background growth rate calculations for intersection control evaluation reports. These sources are explored below.

ROADWAY HISTORICAL TRAFFIC GROWTH RATE

Average annual daily traffic (AADT) estimates are available through the MNDOT Traffic Mapping Application. Existing AADT counts from various years between 2003 and 2022 along CSAH 32 and CSAH 21 were analyzed. This data was reviewed for variability and growth trends. It should be noted that traffic counts reflecting changes related to the pandemic of 2020 were not included in the analysis.

The growth rate was back calculated using the historical traffic counts along Ash Street in the study area using the following equation:

Equation 1

$$F = C(1+i)^n$$
$$where: C = the\ current\ AADT$$
$$F = the\ future\ AADT$$
$$i = percent\ growth\ in\ decimal\ form$$
$$n = number\ of\ years\ between\ C\ and\ F$$

The results are shown in bellow in **Figure 1 and 2** and **Table 12 and 13**. In the past 20 years, traffic volumes have varied on both highways, increasing overall by 0.7% annually along CSAH 21 and decreasing overall by -0.2% annually along CSAH 32.

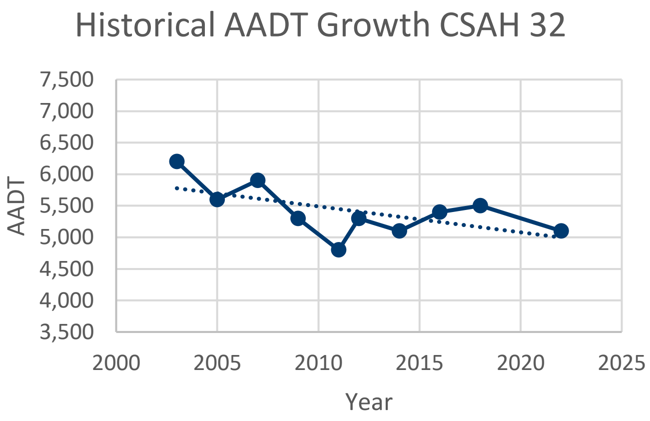


Figure 1: Historical AADT along CSAH 32 / Ash Street

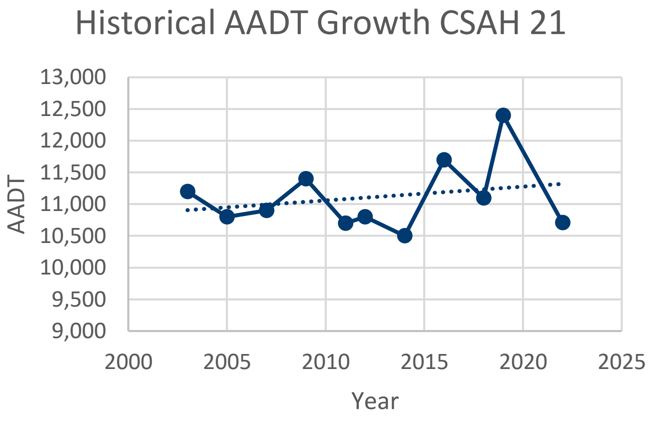


Figure 2: Historical AADT along CSAH 21 / Centerville Rd

Table 12: Historical AADT along CSAH 21 / Centerville Rd

Historical AADT Growth

CSAH 32 / Ash St (West of Intersection 2)

Year	AADT	Annualized Growth
2003	6,200	
2005	5,600	-5.0%
2007	5,900	2.6%
2009	5,300	-5.2%
2011	4,800	-4.8%
2012	5,300	10.4%
2014	5,100	-1.9%
2016	5,400	2.9%
2018	5,500	0.9%
2022	5,100	-1.9%
	Average Growth	**-0.2%**

Table 13: Historical AADT along CSAH 32 / Ash Street

Historical AADT Growth

CSAH 21/Centerville Rd (Between Intersections 1 & 2)

Year	AADT	Annualized
2003	11,200	
2005	10,800	-1.8%
2007	10,900	0.5%
2009	11,400	2.3%
2011	10,700	-3.1%
2012	10,800	0.9%
2014	10,500	-1.4%
2016	11,700	5.6%
2018	11,100	-2.6%
2019	12,400	11.7%
2022	10,707	-4.8%
	Average Growth	-0.2%

CITY OF LINO LAKES POPULATION GROWTH

The City of Lino Lakes Comprehensive Plan for 2040 study reviewed the City of Lino Lake's population growth for variability and trends. US Census data, recorded every 10 years from 1990 through 2020, was used to calculate the city's annualized growth rate, which averaged 1.43% annually between 2000 and 2020. According to the "City of Lino Lakes Comprehensive Plan," adopted in 2020, the population is projected to increase by approximately 3,800 people between 2020 and 2030 and by an additional 4,900 people between 2030 and 2040. Future population estimates vary; however, a conservative future population growth rate of 1.68% annually is being used by the City of Lino Lakes Comprehensive Plan for 2040.

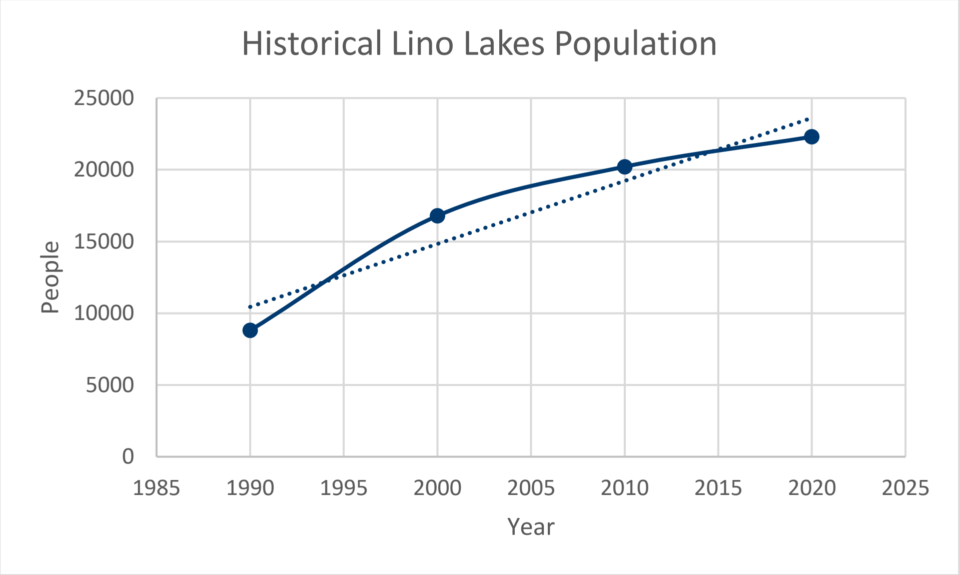


Figure 3. Historical Lino Lakes Population

Table 14: Historical Lino Lakes Population Growth

Population Growth Lino Lakes

Year	People	Annualized Growth
1990	8807	6.7%
2000	16791	1.9%
2010	20216	1.0%
2020	22300	
Average Growth (1990-2020)		3.15%
Average Growth (2000-2020)		1.43%

CITY OF LINO LAKES HOUSEHOLD GROWTH

The "City of Lino Lakes Comprehensive Plan" study also analyzed the household growth. The City of Lino Lakes' household has grown about 1.84% annually between 2000 and 2020. Future population estimates vary; however, a conservative future household growth rate of 2.10% annually is being used by the City of Lino Lakes Comprehensive Plan for 2040. According to the City of Lino Lakes Comprehensive Plan and included 2040 Utility Stating Plan, much of the growth will follow sanitary sewer and municipal water service extensions planned along Ash Street within the project area and to the west and along Main Street / CSAH 14 in the northwest part of the City.

Table 15: Historical Lino Lakes Household

Household Growth Lino Lakes

Year	People	Annualized Growth
1990	2603	6.4%
2000	4857	2.4%
2010	6174	1.3%
2020	7000	
Average Growth (1990-2020)		3.35%
Average Growth (2000-2020)		1.84%

INTERSECTION CONTROL EVALUATIONS

Average annual daily traffic (AADT) estimates and the Intersection Control Evaluation (ICE) reports for Intersections 1 and 2 were provided by Anoka County. In the ICE reports, 2019 traffic was projected to 2040 and then reported as 2045 volumes. The growth rates for used in the report, calculating using

Equation 1, were selected for study roadways:

- 1.0% for CSAH 21/Centerville Road south of Intersection 1 (Existing AADT: 5,200; Build 2045 AADT: 7,100)
- 1.4% for CSAH 21/Centerville Road between Intersections 1 and 2 (Existing AADT: 12,400; Build 2045 AADT: 17,600)
- 1.4% for CSAH J/Ash Street east of Intersection 1 (Existing AADT: 12,000; Build 2045 AADT: 17,100)
- 0.9% for CSAH 21/Centerville Road north of Intersection 2 (Existing AADT: 7,100; Build 2045 AADT: 9,000)
- 1.5% for CSAH 32/Ash Street west of Intersection 2 (Existing AADT: 5,500; Build 2045 AADT: 8,000)

The ICE reports, completed in November 2023, assessed the 2026 construction of roundabouts for each intersection. The reports attached a traffic forecasts memorandum, which summarizes methodology, assumptions, and daily traffic forecast results for the study area's major roadways. The traffic forecasts were developed based on MET Council's Activity Based Model. The Wilkinson and North Oaks Farms developments both lie within Metro Council TAZ 165. Metro Council TAZs 165 and 1755 both influence the selected traffic growth rate at the intersection of CSAH 32 and Centerville Road. The details of both Metro TAZs are reported below.

	Households			Retail Jobs			Non-Retail Jobs			Total Jobs		
TAZ	**2018**	**2040**	**Change %**	**2018**	**2040**	**Change %**	**2018**	**2040**	**Change %**	**2018**	**2040**	**Change %**
165	366	726	98%	0	17	N/A	37	45	22%	37	62	68%
1755	394	352	-11%	0	10	N/A	25	50	100%	25	60	140%
Total	760	1078	42%	0	27	N/A	62	95	53%	62	122	51%

This Metro Council data was compared to the anticipated number of households and retail jobs introduced to the area as a result of proposed development.

	Households	Total Jobs
Metro Council Data TAZ 165 + TAZ 1755 (Total) 2040	1078	122
After Proposed Development TAZ 165 + TAZ 1755 (Total) 2018 + Proposed Development	760 + 427 = 1187	62 + 35 = 97

The proposed development would introduce more households and less jobs to the area than anticipated by the Metro Council by 2045. Much of the traffic growth generated by the proposed development has been captured in the growth rates identified in the traffic forecast memorandum. This would warrant reducing growth rates reported in the ICE reports, with the most reduction to the growth rate for CSAH 32 / Ash Street.

SELECTED BACKGROUND GROWTH RATES

The background growth rates for this report is used to add traffic to the roadways. Several sources, including the Comprehensive Plan 2040 and ICE reports, considers development of the proposed site in forecasts. The background growth rate was selected considering all available sources, adjusting where needed when area development has previously been built into forecasts. A review of available sources is provided in **Table 16**, and a table of selected growth rates is provided as **Table 17** .

Table 16: Growth Rate Sources

	Source	Growth Rate
Historical Traffic Growth	CSAH 21 / Centerville Road (south of Intersection 1)	0.1%
	CSAH 21 / Centerville Road (between Intersections 1 and 2)	-0.2%
	CSAH J / Ash Street (east of intersection 1)	1.9%
	CSAH 21 / Centerville Road (north of Intersection 2)	-0.2%
	CSAH 32 / Ash Street (west of Intersection 2)	-0.2%
Comprehensive Plan 2040	Anticipated Population Growth	1.68%
	Anticipated Household Growth	2.10%
ICE Reports	CSAH 21 / Centerville Road (south of Intersection 1)	1.0%
	CSAH 21 / Centerville Road (between Intersections 1 and 2)	1.4%
	CSAH J / Ash Street (east of intersection 1)	1.4%
	CSAH 21 / Centerville Road (north of Intersection 2)	0.9%
	CSAH 32 / Ash Street (west of Intersection 2)	1.5%

Table 17: Selected Growth Rates

Roadway	Growth Rate
CSAH 21 / Centerville Road (south of Intersection 1)	0.5%
CSAH 21 / Centerville Road (between Intersections 1 and 2)	1.0%
CSAH J / Ash Street (east of intersection 1)	1.0%
CSAH 21 / Centerville Road (north of Intersection 2)	0.8%
CSAH 32 / Ash Street (west of Intersection 2)	0%

ANALYSIS OF FUTURE CONDITIONS

Capacity and Level of Service at Studied Intersections – AM and PM Peak Hours

The existing traffic was analyzed to estimate the trip distribution of the generated trips for the proposed development, including pass-by and non-pass-by trips. The expected proposed trip distribution was applied to the anticipated trip generation for the development. The assigned trips, represented in an exhibit in **Appendix K**, were added to future No Build scenarios to create future Build scenarios. Each intersection was analyzed within Synchro (HCM 6th Edition delay method) for capacity and LOS for the following future scenarios:

- Opening Year No Build (2025)
- Opening Year Build (2025)
- Design Year No Build (2045)
- Design Year Build (2045)

The tables on the following pages summarize the movement volumes, level of service, and delay for each of the above future scenario. Diagrams of anticipated turning movement volumes for the future scenarios are provided in **Appendix L** as visual reference, and Synchro analysis modeling results for each of the above future scenarios are provided in **Appendices M – P.**

OPENING YEAR NO BUILD (2025) CONDITION

Table 18: Opening Year No Build (2025) LOS and Delay for Intersection 1

INTERSECTION 1	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		1	8	3	98	18	142	13	75	26	360	212	10
Queue (ft)		40			63			46			70		
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**7.9**	7.4			5.3			5.6			9.6		
LOS	**A**	A			A			A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 1	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		18	30	9	55	13	358	19	139	175	332	191	11
Queue (ft)		34			79			133			68		
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**9.2**	6.0			9.0			11.1			8.0		
LOS	**A**	A			A			B			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 19: Opening Year No Build (2025) LOS and Delay for Intersection 2

INTERSECTION 2	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		25		193				74	140			388	19
Queue (ft)		78		78				19				48	
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**6.1**	7.3						4.4			6.4		
LOS	**A**	A						A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 2	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		51		295				194	409			284	22
Queue (ft)		127		127				57				66	
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**7.6**	7.8						8.3			6.2		
LOS	**A**	A						A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 20: Opening Year No Build (2025) LOS and Delay for Intersection 3

INTERSECTION 3	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			200	5	7	80		9		20			
Queue (ft)					6			46					
Mvmt Delay (sec)					7.8	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.1**	0.0			0.6			10.1					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 3	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			39	14	13	197		6		11			
Queue (ft)					31			39					
Mvmt Delay (sec)					8.1	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.5**	0.0			0.5			12.0					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 21: Opening Year No Build (2025) LOS and Delay for Intersection 4

INTERSECTION 4	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			190	18	11	75		35		19			
Queue (ft)					26			52		52			
Mvmt Delay (sec)					7.9	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.9**	0.0			1.0			10.5					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 4	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			336	32	9	194		14		17			
Queue (ft)					19			38		38			
Mvmt Delay (sec)					8.3	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.8**	0.0			0.4			12.0					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 22: Opening Year No Build (2025) LOS and Delay for Intersection 5

INTERSECTION 5	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		17	192			107	5				12		26
Queue (ft)		18									53		53
Mvmt Delay (sec)		7.5	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.4**	0.6			0.0						9.8		
LOS	**A**	A			A						A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 5	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR NO BUILD												
CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		79	353			194	16				14		18
Queue (ft)		73									44		44
Mvmt Delay (sec)		7.8	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.5**	1.4			0.0						12.6		
LOS	**A**	A			A						B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 23: Opening Year No Build (2025) LOS and Delay for Intersection 6

INTERSECTION 6	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR NO BUILD												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)					41					12			
Queue (ft)										30			
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**7.4**				7.3			8.4					
LOS	**A**				A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 6	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR NO BUILD												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)					43					57			
Queue (ft)										43			
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**7.9**				7.3			8.5					
LOS	**A**				A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

OPENING YEAR BUILD (2025) CONDITION

Table 24: Opening Year Build (2025) LOS and Delay for Intersection 1

INTERSECTION 1	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		7	59	43	98	55	142	44	75	26	360	212	19
Queue (ft)		41			70			50			74		
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**9.3**	9.8			6.0			6.8			11.5		
LOS	**A**	A			A			A			B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 1	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		48	93	40	55	66	358	70	239	175	332	191	39
Queue (ft)		34			79			133			68		
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**12.1**	8.3			11.9			15.8			10.3		
LOS	**B**	A			B			C			B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 25: Opening Year Build (2025) LOS and Delay for Intersection 2

INTERSECTION 2	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		29		193				74	146			397	20
Queue (ft)		84		84				21				64	
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**6.2**	7.4						4.5			6.5		
LOS	**A**	A						A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 2	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		57		295				194	439			312	28
Queue (ft)		127		127				57				66	
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**8.1**	8.3						8.8			6.6		
LOS	**A**	A						A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 26: Opening Year Build (2025) LOS and Delay for Intersection 3

INTERSECTION 3	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			213	5	7	106		9		20			
Queue (ft)					0			45					
Mvmt Delay (sec)					7.9	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.0**	0.0			0.5			10.3					
LOS	**A**	B			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 3	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			384	14	13	224		6		11			
Queue (ft)					31			39					
Mvmt Delay (sec)					8.2	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.5**	0.0			0.4			12.7					
LOS	**A**	A			B			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 27: Opening Year Build (2025) LOS and Delay for Intersection 4

INTERSECTION 4	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			190	18	11	75		35		19			
Queue (ft)					25			50		50			
Mvmt Delay (sec)					7.9	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.9**	0.0			1.0			10.5					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 4	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			336	32	9	194		14		17			
Queue (ft)					19			38		38			
Mvmt Delay (sec)					8.3	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.8**	0.0			0.4			12.0					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 28: Opening Year Build (2025) LOS and Delay for Intersection 5

INTERSECTION 5	WEEKDAY AM PEAK												
	2025 OPENING YEAR BUILD												
CSAH 32/Ash St & Holly Drive N	Overall	Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh)		17	192			107	5				12		26
Queue (ft)		21									58		58
Mvmt Delay (sec)		7.5	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.4**	0.6			0.0						9.8		
LOS	**A**	B			A						A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 5	WEEKDAY PM PEAK												
	2025 OPENING YEAR BUILD												
CSAH 32/Ash St & Holly Drive N	Overall	Eastbound			Westbound			Northbound			Southbound		
		L	T	R	L	T	R	L	T	R	L	T	R
Volume (veh)		79	353			194	16				14		18
Queue (ft)		73									44		44
Mvmt Delay (sec)		7.8	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.5**	1.4			0.0						12.6		
LOS	**A**	A			A						B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 29: Opening Year Build (2025) LOS and Delay for Intersection 6

INTERSECTION 6	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR BUILD												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			97	0	41	77		0		12			
Queue (ft)								32		32			
Mvmt Delay (sec)					7.5	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.8**	0.0			2.6			8.8					
LOS	**A**	A			A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 6	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR BUILD												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			124	0	43	132		0		57			
Queue (ft)								43		43			
Mvmt Delay (sec)					7.6	0.0							
Mvmt LOS					A	A							
Delay (sec)	**2.4**	0.0			1.9			9.2					
LOS	**A**	A			A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 30: Opening Year Build (2025) LOS and Delay for Intersection 7

INTERSECTION 7	**WEEKDAY AM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 32/Ash St & North Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			218	0	1	92		0		4			
Queue (ft)													
Mvmt Delay (sec)					7.7	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.2**	0.0			0.1			9.5					
LOS	**A**	A			A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 7	**WEEKDAY PM PEAK**												
	2025 OPENING YEAR BUILD												
CSAH 32/Ash St & North Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			346	0	6	214		0		6			
Queue (ft)													
Mvmt Delay (sec)					8.1	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.2**	0.0			0.2			10.4					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

DESIGN YEAR NO BUILD (2045) CONDITION

Table 31: Design Year No Build (2045) LOS and Delay for Intersection 1

INTERSECTION 1	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		1	8	3	120	22	174	14	83	29	439	259	10
Queue (ft)		22			60			60			110		
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**10.6**	8.8			6.0			6.4			13.5		
LOS	**B**	A			A			A			B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 1	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		18	30	9	67	16	436	21	264	193	405	233	14
Queue (ft)		40			121			147			106		
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**11.9**	7.0			11.7			14.8			10.3		
LOS	**B**	A			B			B			B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 32: Design Year No Build (2045) LOS and Delay for Intersection 2

INTERSECTION 2	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		25		193				90	171			455	22
Queue (ft)		76		76				16				67	
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**6.9**	8.0						4.8			7.4		
LOS	**A**	A						A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 2	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		51		295				237	499			333	26
Queue (ft)		107		107				56				50	
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**9.2**	8.5						10.5			7.4		
LOS	**A**	A						B			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 33: Design Year No Build (2045) LOS and Delay for Intersection 3

INTERSECTION 3	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			200	5	7	80		9		20			
Queue (ft)					9			44					
Mvmt Delay (sec)					7.8	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.1**	0.0			0.6			10.1					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 3	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			339	14	13	197		6		11			
Queue (ft)					23			51					
Mvmt Delay (sec)					8.1	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.5**	0.0			0.5			12.0					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 34: Design Year No Build (2045) LOS and Delay for Intersection 4

INTERSECTION 4	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			190	18	11	75		35		19			
Queue (ft)					14			44		44			
Mvmt Delay (sec)					7.9	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.9**	0.0			1.0			10.5					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 4	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			336	32	9	194		14		17			
Queue (ft)					13			52		52			
Mvmt Delay (sec)					8.3	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.8**	0.0			0.4			12.0					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 35: Design Year No Build (2045) LOS and Delay for Intersection 5

INTERSECTION 5	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		17	192			107	5				12		26
Queue (ft)		11									43		43
Mvmt Delay (sec)		7.5	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.4**	0.6			0.0						9.8		
LOS	**A**	A			A						A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 5	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR NO BUILD												
CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		79	353			194	16				14		18
Queue (ft)		45									41		41
Mvmt Delay (sec)		7.8	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.5**	1.4			0.0						12.6		
LOS	**A**	A			A						B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 36: Design Year No Build (2045) LOS and Delay for Intersection 6

INTERSECTION 6	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR NO BUILD												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)					46					12			
Queue (ft)										33			
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**7.4**				7.3			8.4					
LOS	**A**				A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 6	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR NO BUILD												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)					51					57			
Queue (ft)										44			
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**7.9**				7.3			8.5					
LOS	**A**				A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

DESIGN YEAR BUILD (2045) CONDITION

Table 37: Design Year Build (2045) LOS and Delay for Intersection 1

INTERSECTION 1	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		7	59	43	120	59	178	45	84	29	452	265	19
Queue (ft)		22			60			60			110		
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**13.7**	12.5			6.8			8.0			18.3		
LOS	**A**	B			A			A			C		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 1	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 21/Centerville Rd & CSAH J/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		48	93	40	67	69	445	72	269	193	414	238	42
Queue (ft)		54			127			133			133		
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**17.8**	10.4			17.2			24.8			14.8		
LOS	**C**	B			C			C			B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 38: Design Year Build (2045) LOS and Delay for Intersection 2

INTERSECTION 2	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		31		212				95	177			464	24
Queue (ft)		76		76				16				67	
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**7.1**	8.7						4.9			7.6		
LOS	**A**	A						A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 2	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 21/Centerville Rd & CSAH 32/Ash St	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		58		309				251	529			361	35
Queue (ft)		113		113				79				70	
Mvmt Delay (sec)													
Mvmt LOS													
Delay (sec)	**10.2**	9.3						11.6			8.1		
LOS	**B**	A						B			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 39: Design Year Build (2045) LOS and Delay for Intersection 3

INTERSECTION 3	**WEEKDAY AM PEAK**													
	2045 DESIGN YEAR BUILD													
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		6	215	5	7	110	5	9	0	20	17	0	16
Queue (ft)					9			44					
Mvmt Delay (sec)		7.5	0.0		7.9	0.0							
Mvmt LOS		A	A		A	A							
Delay (sec)	**1.8**	0.2			0.5			10.4			10.6		
LOS	**A**	A			A			B			B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 3	**WEEKDAY PM PEAK**													
	2045 DESIGN YEAR BUILD													
CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		23	390	14	13	226	13	6	0	11	12	0	9
Queue (ft)					9			44					
Mvmt Delay (sec)		7.8	0.0		8.2	0.0							
Mvmt LOS		A	A		A	A							
Delay (sec)	**1.1**	0.4			0.4			13.3			14.3		
LOS	**A**	A			A			B			B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 40: Design Year Build (2045) LOS and Delay for Intersection 4

INTERSECTION 4	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			198	18	11	95		35		19			
Queue (ft)					14			44		44			
Mvmt Delay (sec)					7.9	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.7**	0.0			0.8			10.6					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 4	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			365	32	9	205		14		17			
Queue (ft)					14			38		38			
Mvmt Delay (sec)					8.4	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.7**	0.0			0.4			12.4					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 41: Design Year Build (2045) LOS and Delay for Intersection 5

INTERSECTION 5	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		17	200			126	6				12		26
Queue (ft)		11									43		43
Mvmt Delay (sec)		7.6	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.3**	0.6			0.0						10.0		
LOS	**A**	A			A						B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 5	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)		79	381			204	17				15		18
Queue (ft)		50									43		43
Mvmt Delay (sec)		7.9	0.0										
Mvmt LOS		A	A										
Delay (sec)	**1.5**	1.4			0.0						13.2		
LOS	**A**	A			A						B		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 42: Design Year Build (2045) LOS and Delay for Intersection 6

INTERSECTION 6	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR BUILD												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			97	0	46	77		0		12			
Queue (ft)								33		33			
Mvmt Delay (sec)					7.5	0.0							
Mvmt LOS					A	A							
Delay (sec)	**1.9**	0.0			2.8			8.8					
LOS	**A**	A			A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 6	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR BUILD												
Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			124	0	51	132		0		57			
Queue (ft)								43		43			
Mvmt Delay (sec)					7.6	0.0							
Mvmt LOS					A	A							
Delay (sec)	**2.5**	0.0			2.1			9.2					
LOS	**A**	A			A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 43: Design Year Build (2045) LOS and Delay for Intersection 7

INTERSECTION 7	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 32/Ash St & North Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			239	0	1	98		0		4			
Queue (ft)													
Mvmt Delay (sec)					7.8	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.1**	0.0			0.1			9.6					
LOS	**A**	A			A			A					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 7	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 32/Ash St & North Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)			361	0	6	231		0		6			
Queue (ft)													
Mvmt Delay (sec)					8.1	0.0							
Mvmt LOS					A	A							
Delay (sec)	**0.2**	0.0			0.2			10.5					
LOS	**A**	A			A			B					

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

Table 44: Design Year Build (2045) LOS and Delay for Intersection 8

INTERSECTION 8	**WEEKDAY AM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 32/Ash St & East Access North Oaks Farms	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)					4		4		237	2	1	92	
Queue (ft)					0		0						
Mvmt Delay (sec)											7.8	0.0	
Mvmt LOS											A	A	
Delay (sec)	**0.3**				10.2			0.0			0.1		
LOS	**A**				B			A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

INTERSECTION 8	**WEEKDAY PM PEAK**												
	2045 DESIGN YEAR BUILD												
CSAH 32/Ash St & East Access North Oaks Farms	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
		L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Volume (veh)					2		3		362	6	4	223	
Queue (ft)					0		0						
Mvmt Delay (sec)											8.1	0.0	
Mvmt LOS											A	A	
Delay (sec)	**0.1**				11.7			0.0			0.1		
LOS	**A**				B			A			A		

Source: Data was analyzed using Synchro (HCM 6th Edition) and Sim Traffic (queue).

LEVEL OF SERVICE AND DELAY COMPARISON

Table 45: Intersection 1 Scenario Comparison

<table>
<tr><th rowspan="3"></th><th>Intersection 1</th><th colspan="13">WEEKDAY AM PEAK</th></tr>
<tr><th rowspan="2">CSAH 21/Centerville Rd
&
CSAH J/Ash St</th><th rowspan="2">Overall</th><th colspan="3">Eastbound</th><th colspan="3">Westbound</th><th colspan="3">Northbound</th><th colspan="3">Southbound</th></tr>
<tr><th>L</th><th>T</th><th>R</th><th>L</th><th>T</th><th>R</th><th>L</th><th>T</th><th>R</th><th>L</th><th>T</th><th>R</th></tr>
<tr><td rowspan="2">Existing (2024)</td><td>Delay (sec)</td><td>40.5</td><td colspan="3">40.5</td><td colspan="3">11.5</td><td colspan="3">10.3</td><td colspan="3">60.0</td></tr>
<tr><td>LOS</td><td>E</td><td colspan="3">E</td><td colspan="3">B</td><td colspan="3">B</td><td colspan="3">F</td></tr>
<tr><td rowspan="2">2025 Opening Year No Build</td><td>Delay (sec)</td><td>7.9</td><td colspan="3">7.9</td><td colspan="3">5.3</td><td colspan="3">5.6</td><td colspan="3">9.6</td></tr>
<tr><td>LOS</td><td>A</td><td colspan="3">A</td><td colspan="3">A</td><td colspan="3">A</td><td colspan="3">A</td></tr>
<tr><td rowspan="2">2025 Opening Year Build</td><td>Delay (sec)</td><td>9.3</td><td colspan="3">9.3</td><td colspan="3">6.0</td><td colspan="3">6.8</td><td colspan="3">11.5</td></tr>
<tr><td>LOS</td><td>A</td><td colspan="3">A</td><td colspan="3">A</td><td colspan="3">A</td><td colspan="3">B</td></tr>
<tr><td rowspan="2">2045 Design Year No Build</td><td>Delay (sec)</td><td>10.6</td><td colspan="3">10.6</td><td colspan="3">6.0</td><td colspan="3">6.4</td><td colspan="3">13.5</td></tr>
<tr><td>LOS</td><td>B</td><td colspan="3">B</td><td colspan="3">A</td><td colspan="3">A</td><td colspan="3">B</td></tr>
<tr><td rowspan="2">2045 Design Year Build</td><td>Delay (sec)</td><td>13.7</td><td colspan="3">13.7</td><td colspan="3">6.8</td><td colspan="3">8.0</td><td colspan="3">18.3</td></tr>
<tr><td>LOS</td><td>A</td><td colspan="3">A</td><td colspan="3">A</td><td colspan="3">A</td><td colspan="3">C</td></tr>
</table>

<table>
<tr><th rowspan="3"></th><th>Intersection 1</th><th colspan="13">WEEKDAY PM PEAK</th></tr>
<tr><th rowspan="2">CSAH 21/Centerville Rd
&
CSAH J/Ash St</th><th rowspan="2">Overall</th><th colspan="3">Eastbound</th><th colspan="3">Westbound</th><th colspan="3">Northbound</th><th colspan="3">Southbound</th></tr>
<tr><th>L</th><th>T</th><th>R</th><th>L</th><th>T</th><th>R</th><th>L</th><th>T</th><th>R</th><th>L</th><th>T</th><th>R</th></tr>
<tr><td rowspan="2">Existing (2024)</td><td>Delay (sec)</td><td>57.3</td><td colspan="3">57.3</td><td colspan="3">24.7</td><td colspan="3">17.4</td><td colspan="3">120.3</td></tr>
<tr><td>LOS</td><td>F</td><td colspan="3">F</td><td colspan="3">C</td><td colspan="3">C</td><td colspan="3">F</td></tr>
<tr><td rowspan="2">2025 Opening Year No Build</td><td>Delay (sec)</td><td>9.2</td><td colspan="3">9.2</td><td colspan="3">9.0</td><td colspan="3">11.1</td><td colspan="3">8.0</td></tr>
<tr><td>LOS</td><td>A</td><td colspan="3">A</td><td colspan="3">A</td><td colspan="3">B</td><td colspan="3">A</td></tr>
<tr><td rowspan="2">2025 Opening Year Build</td><td>Delay (sec)</td><td>12.1</td><td colspan="3">12.1</td><td colspan="3">11.9</td><td colspan="3">15.8</td><td colspan="3">10.3</td></tr>
<tr><td>LOS</td><td>B</td><td colspan="3">B</td><td colspan="3">B</td><td colspan="3">C</td><td colspan="3">B</td></tr>
<tr><td rowspan="2">2045 Design Year No Build</td><td>Delay (sec)</td><td>11.9</td><td colspan="3">11.9</td><td colspan="3">11.7</td><td colspan="3">14.8</td><td colspan="3">10.3</td></tr>
<tr><td>LOS</td><td>B</td><td colspan="3">B</td><td colspan="3">B</td><td colspan="3">B</td><td colspan="3">B</td></tr>
<tr><td rowspan="2">2045 Design Year Build</td><td>Delay (sec)</td><td>17.8</td><td colspan="3">17.8</td><td colspan="3">17.2</td><td colspan="3">24.8</td><td colspan="3">14.8</td></tr>
<tr><td>LOS</td><td>C</td><td colspan="3">C</td><td colspan="3">C</td><td colspan="3">C</td><td colspan="3">B</td></tr>
</table>

Table 46: Intersection 2 Scenario Comparison

	Intersection 2	WEEKDAY AM PEAK												
	CSAH 21/Centerville Rd & CSAH 32/Ash St	Overall	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
Existing (2024)	**Delay (sec)**	**4.4**	14.0						3.1			0.0		
	LOS	**A**	B						A			A		
2025 Opening Year No Build	**Delay (sec)**	**6.1**	7.3						4.4			6.4		
	LOS	**A**	A						A			A		
2025 Opening Year Build	**Delay (sec)**	**6.2**	7.4						4.5			6.5		
	LOS	**A**	A						A			A		
2045 Design Year No Build	**Delay (sec)**	**6.9**	8.0						4.8			7.4		
	LOS	**A**	A						A			A		
2045 Design Year Build	**Delay (sec)**	**7.1**	8.7						4.9			7.6		
	LOS	**A**	A						A			A		

	Intersection 2	WEEKDAY PM PEAK												
	CSAH 21/Centerville Rd & CSAH 32/Ash St	Overall	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
Existing (2024)	**Delay (sec)**	**5.9**	16.0						3.1			0.0		
	LOS	**A**	C						A			A		
2025 Opening Year No Build	**Delay (sec)**	**7.6**	7.8						8.3			6.2		
	LOS	**A**	A						A			A		
2025 Opening Year Build	**Delay (sec)**	**8.1**	8.3						8.8			6.6		
	LOS	**A**	A						A			A		
2045 Design Year No Build	**Delay (sec)**	**9.2**	8.5						10.5			7.4		
	LOS	**A**	A						B			A		
2045 Design Year Build	**Delay (sec)**	**10.2**	9.3						11.6			8.1		
	LOS	**B**	A						B			A		

Table 47: Intersection 3 Scenario Comparison

	Intersection 3	**WEEKDAY AM PEAK**												
	CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**	**1.1**		0.0			0.6			9.9				
	LOS	**A**		A			A			A				
2025 Opening Year No Build	**Delay (sec)**	**1.1**		0.0			0.6			10.1				
	LOS	**A**		A			A			B				
2025 Opening Year Build	**Delay (sec)**	**1.0**		0.0			0.5			10.3				
	LOS	**A**		B			A			B				
2045 Design Year No Build	**Delay (sec)**	**1.1**		0.0			0.6			10.1				
	LOS	**A**		A			A			B				
2045 Design Year Build	**Delay (sec)**	**1.8**		0.2			0.5			10.4			10.6	
	LOS	**A**		A			A			B			B	

	Intersection 3	**WEEKDAY PM PEAK**												
	CSAH 32/Ash St & Monarch Way	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**	**0.5**		0.0			0.5			11.6				
	LOS	**A**		A			A			B				
2025 Opening Year No Build	**Delay (sec)**	**0.5**		0.0			0.5			12.0				
	LOS	**A**		A			A			B				
2025 Opening Year Build	**Delay (sec)**	**0.5**		0.0			0.4			12.7				
	LOS	**A**		A			B			A				
2045 Design Year No Build	**Delay (sec)**	**0.5**		0.0			0.5			12.0				
	LOS	**A**		A			A			B				
2045 Design Year Build	**Delay (sec)**	**1.1**		0.4			0.4			13.3			14.3	
	LOS	**A**		A			A			B			B	

Table 48: Intersection 4 Scenario Comparison

	Intersection 4	**WEEKDAY AM PEAK**												
	CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**	**1.9**		1.9			1.0			10.5				
	LOS	**A**		A			A			B				
2025 Opening Year No Build	**Delay (sec)**	**1.9**		1.9			1.0			10.5				
	LOS	**A**		A			A			B				
2025 Opening Year Build	**Delay (sec)**	**1.9**		1.9			1.0			10.5				
	LOS	**A**		A			A			B				
2045 Design Year No Build	**Delay (sec)**	**1.9**		1.9			1.0			10.5				
	LOS	**A**		A			A			B				
2045 Design Year Build	**Delay (sec)**	**1.7**		1.7			0.8			10.6				
	LOS	**A**		A			A			B				

	Intersection 4	**WEEKDAY PM PEAK**												
	CSAH 32/Ash St & Rapp Farm Blvd	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**	**0.8**		0.8			0.4			12.0				
	LOS	**A**		A			A			B				
2025 Opening Year No Build	**Delay (sec)**	**0.8**		0.8			0.4			12.0				
	LOS	**A**		A			A			B				
2025 Opening Year Build	**Delay (sec)**	**0.8**		0.8			0.4			12.0				
	LOS	**A**		A			A			B				
2045 Design Year No Build	**Delay (sec)**	**0.8**		0.8			0.4			12.0				
	LOS	**A**		A			A			B				
2045 Design Year Build	**Delay (sec)**	**0.7**		0.7			0.4			12.4				
	LOS	**A**		A			A			B				

Table 49: Intersection 5 Scenario Comparison

	Intersection 5	**WEEKDAY AM PEAK**												
	CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**	**1.4**	0.6			0.0						9.8		
	LOS	**A**	A			A						A		
2025 Opening Year No Build	**Delay (sec)**	**1.4**	0.6			0.0						9.8		
	LOS	**A**	A			A						A		
2025 Opening Year Build	**Delay (sec)**	**1.4**	0.6			0.0						9.8		
	LOS	**A**	B			A						A		
2045 Design Year No Build	**Delay (sec)**	**1.4**	0.6			0.0						9.8		
	LOS	**A**	A			A						A		
2045 Design Year Build	**Delay (sec)**	**1.3**	0.6			0.0						10.0		
	LOS	**A**	A			A						B		

	Intersection 5	**WEEKDAY PM PEAK**												
	CSAH 32/Ash St & Holly Drive N	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**	**1.5**	1.4			0.0						12.6		
	LOS	**A**	A			A						B		
2025 Opening Year No Build	**Delay (sec)**	**1.5**	1.4			0.0						12.6		
	LOS	**A**	A			A						B		
2025 Opening Year Build	**Delay (sec)**	**1.5**	1.4			0.0						12.6		
	LOS	**A**	A			A						B		
2045 Design Year No Build	**Delay (sec)**	**1.5**	1.4			0.0						12.6		
	LOS	**A**	A			A						B		
2045 Design Year Build	**Delay (sec)**	**1.5**	1.4			0.0						13.2		
	LOS	**A**	A			A						B		

Table 50: Intersection 6 Scenario Comparison

	Intersection 6	**WEEKDAY AM PEAK**												
	Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**													
	LOS													
2025 Opening Year No Build	**Delay (sec)**													
	LOS													
2025 Opening Year Build	**Delay (sec)**	**1.8**	0.0			2.6			8.8					
	LOS	**A**	A			A			A					
2045 Design Year No Build	**Delay (sec)**													
	LOS													
2045 Design Year Build	**Delay (sec)**	**1.9**	0.0			2.8			8.8					
	LOS	**A**	A			A			A					

	Intersection 6	**WEEKDAY PM PEAK**												
	Wilkinson Lake Blvd & South Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**													
	LOS													
2025 Opening Year No Build	**Delay (sec)**													
	LOS													
2025 Opening Year Build	**Delay (sec)**	**2.4**	0.0			1.9			9.2					
	LOS	**A**	A			A			A					
2045 Design Year No Build	**Delay (sec)**													
	LOS													
2045 Design Year Build	**Delay (sec)**	**2.5**	0.0			2.1			9.2					
	LOS	**A**	A			A			A					

Table 51: Intersection 7 Scenario Comparison

	Intersection 7	**WEEKDAY AM PEAK**												
	CSAH 32/Ash St & North Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**													
	LOS													
2025 Opening Year No Build	**Delay (sec)**													
	LOS													
2025 Opening Year Build	**Delay (sec)**	**0.2**	0.0			0.1			9.5					
	LOS	**A**	A			A			A					
2045 Design Year No Build	**Delay (sec)**													
	LOS													
2045 Design Year Build	**Delay (sec)**	**0.1**	0.0			0.1			9.6					
	LOS	**A**	A			A			A					

	Intersection 7	**WEEKDAY PM PEAK**												
	CSAH 32/Ash St & North Access Wilkinson	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**													
	LOS													
2025 Opening Year No Build	**Delay (sec)**													
	LOS													
2025 Opening Year Build	**Delay (sec)**	**0.2**	0.0			0.2			10.4					
	LOS	**A**	A			A			B					
2045 Design Year No Build	**Delay (sec)**													
	LOS													
2045 Design Year Build	**Delay (sec)**	**0.2**	0.0			0.2			10.5					
	LOS	**A**	A			A			B					

Table 52: Intersection 8 Scenario Comparison

	Intersection 8	**WEEKDAY AM PEAK**												
	CSAH 32/Ash St & East Access North Oaks Farms	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**													
	LOS													
2025 Opening Year No Build	**Delay (sec)**													
	LOS													
2025 Opening Year Build	**Delay (sec)**													
	LOS													
2045 Design Year No Build	**Delay (sec)**													
	LOS													
2045 Design Year Build	**Delay (sec)**	**0.3**				10.2			0.0			0.1		
	LOS	**A**				B			A			A		

	Intersection 8	**WEEKDAY PM PEAK**												
	CSAH 32/Ash St & East Access North Oaks Farms	**Overall**	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
			L	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**	**L**	**T**	**R**
Existing (2024)	**Delay (sec)**													
	LOS													
2025 Opening Year No Build	**Delay (sec)**													
	LOS													
2025 Opening Year Build	**Delay (sec)**													
	LOS													
2045 Design Year No Build	**Delay (sec)**													
	LOS													
2045 Design Year Build	**Delay (sec)**	**0.1**				11.7			0.0			0.1		
	LOS	**A**				B			A			A		

Principal Findings

As background traffic volumes, calculated using existing traffic volumes and assumed growth rates, increase, delay for most movements is expected to increase. The construction of the planned roundabouts improves operations at Intersections 1 and 2. All movements will experience a level of service of C or better at the study intersections in the future scenarios.

RIGHT-TURN WARRANT

NCHRP 457 methodology is utilized for the right-turn bay analysis. The warrant determines the need for a right-turn lane based on the major roadway speed, the number of travel lanes, the volume along the major roadway, and the total amount of right-turning vehicles from the major roadway. The need for the following right-turn lanes were evaluated:

- Eastbound right-turn lane at the Wilkinson area's North Access (Intersection 7)

- Northbound right-turn lane at the North Oaks Farms area's East Access (Intersection 8)
- Westbound right-turn lane at Monarch Way (Intersection 3)
- Eastbound right-turn lane at Monarch Way (Intersection 3)
- Westbound right-turn lane at Holly Drive (Intersection 5)

None of the above additional right-turn lanes are warranted. Right-turn lane warrant figures that plot expected traffic conditions against warrant curves are provided in the **Appendix Q**.

LEFT-TURN WARRANT

NCHRP 457 methodology is also utilized for the left-turn bay analysis. The warrant determines the need of a left-turn lane base on the major roadway speed, the number of travel lanes, the volume along the major roadway, and the total amount of left-turning vehicles from the major roadway. The need for the following left-turn lanes were evaluated:

- Westbound left-turn lane at the Wilkinson area's North Access (Intersection 7)
- Southbound left-turn lane at the North Oaks Farms area's East Access (Intersection 8)
- Westbound left-turn lane at Monarch Way (Intersection 3)
- Eastbound left-turn lane at Monarch Way (Intersection 3)
- Eastbound left-turn lane at Holly Drive (Intersection 5)

The results of the warrant analysis is summarized in **Table 53** below, and left-turn lane warrant figures that plot expected traffic conditions against warrant curves are provided in the **Appendix R**.

Table 53: Left-Turn Lane Warrant Summary

	Existing 2024	Design Year 2045 Build
Westbound left-turn at Intersection 7	N/A	Not Warranted
Southbound left-turn at Intersection 8	N/A	Not Warranted
Westbound left-turn at Intersection 3	N/A	Not Warranted
Eastbound left-turn at Intersection 3	Not Warranted	Not Warranted
Eastbound left-turn at Intersection 5	**Warranted**	**Warranted**

CONCLUSIONS + RECOMMENDATIONS

The proposed residential and mixed-use developments along Ash Street in Anoka County may start operations as early as 2025 and is anticipated to be fully developed by 2045. The development area, 116 acres total, includes the Wilkinson development and the North Oaks Farms development. The proposed development will include new accesses to the CSAH 32/Ash Street and one access point to Wilkinson Lake Boulevard, a private roadway.

In the existing condition the southbound approach to the intersection CSAH 21 / Centerville Rd and CSAH J/Ash Street is operating at a level of service F. All other movements are operation at a level of service D or better during the AM and PM peak hours. With the planned reconstructions of CSH 21/Centerville Rd's intersections with CSAH J/Ash Street and CSAH 32/Ash Street from stop-controlled intersections to roundabouts, level of service improves. Level of service at all approaches in the future scenarios are a level of service C or better during the AM and PM peak hours.

An eastbound left-turn lane at the intersection of CSAH 32/Ash Street and Holly Drive is warranted in all scenarios, including the existing scenario. Although a left-turn lane is warranted, there have been no recorded crashes at that intersection during the time periods reviewed, and therefore constructing a left-turn lane at the Holly Drive is not required due to safety. No other right- or left-turn lanes are warranted.

Anoka County is considering Ash Street for realignment. Higher than average crash rates along CSAH 32/Ash Street between Monarch Way and CSAH 21/Centerville Road indicates a need for roadway geometry changes. Roadway realignment should be designed with horizontal geometry, vertical geometry, and superelevation meeting standards provided in AASHTO's A Policy on Geometric Design of Highways and Streets, current edition. A suggested design speed is 45 MPH to provide a transition between the 50 MPH posted speed limit section to the west on CSAH 32/Ash Street and the roundabout at the intersection of CSAH 32/Ash Street and CSAH 21/Centerville Road. This suggested speed limit would also be consistent with the current speed zone per the Anoka County highway speed zone map. A suggested maximum design superelevation rate (e_{max}) is 6%. Highway easements should be incorporated into proposed development plans for the County's future use for roadway realignment.

The proposed developments should incorporate sidewalks and/or shared use paths within the developments to provide pedestrian and bicyclist connectivity between residences, retail, the planned sidewalk and trail network along CSAH 32/Ash Street and CSAH 21/Centerville Rd, and the future CSAH 32/Ash Street roadway.

The planned intersection geometry and traffic control is sufficient to accommodate the opening year and design year vehicular traffic. After the construction of the development, this report recommends that the study area be re-evaluated if growth projections change.

Appendix A: Wilkinson Preliminary Plan and North Oaks Farms Site Concept

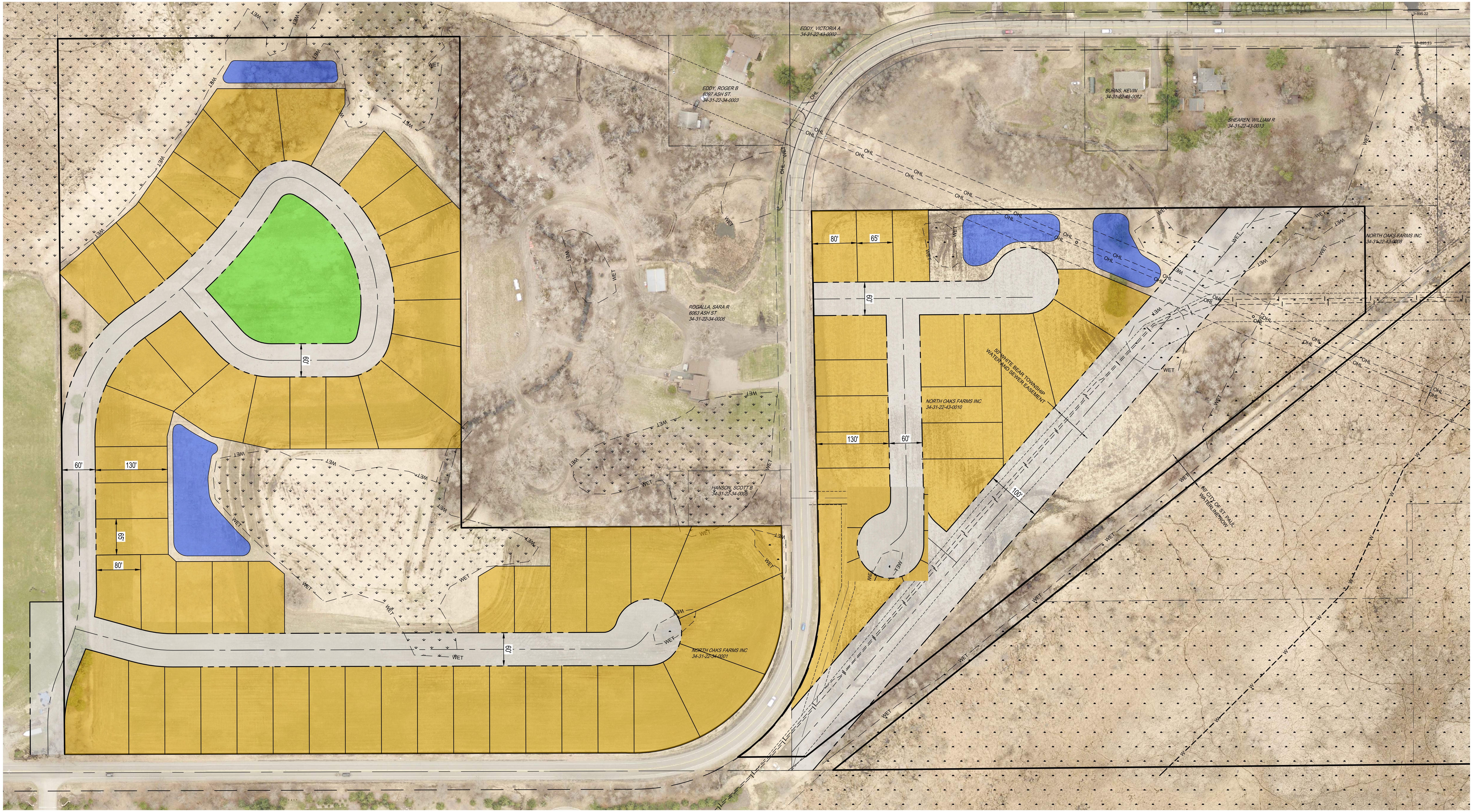
CONCEPT 7A

ISG

Architecture + Engineering + Environmental + Planning

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 07/22/2024
ISG PROJECT NO. 24-30671

ISGInc.com



CONCEPT 1

ISG

Architecture + Engineering + Environmental + Planning

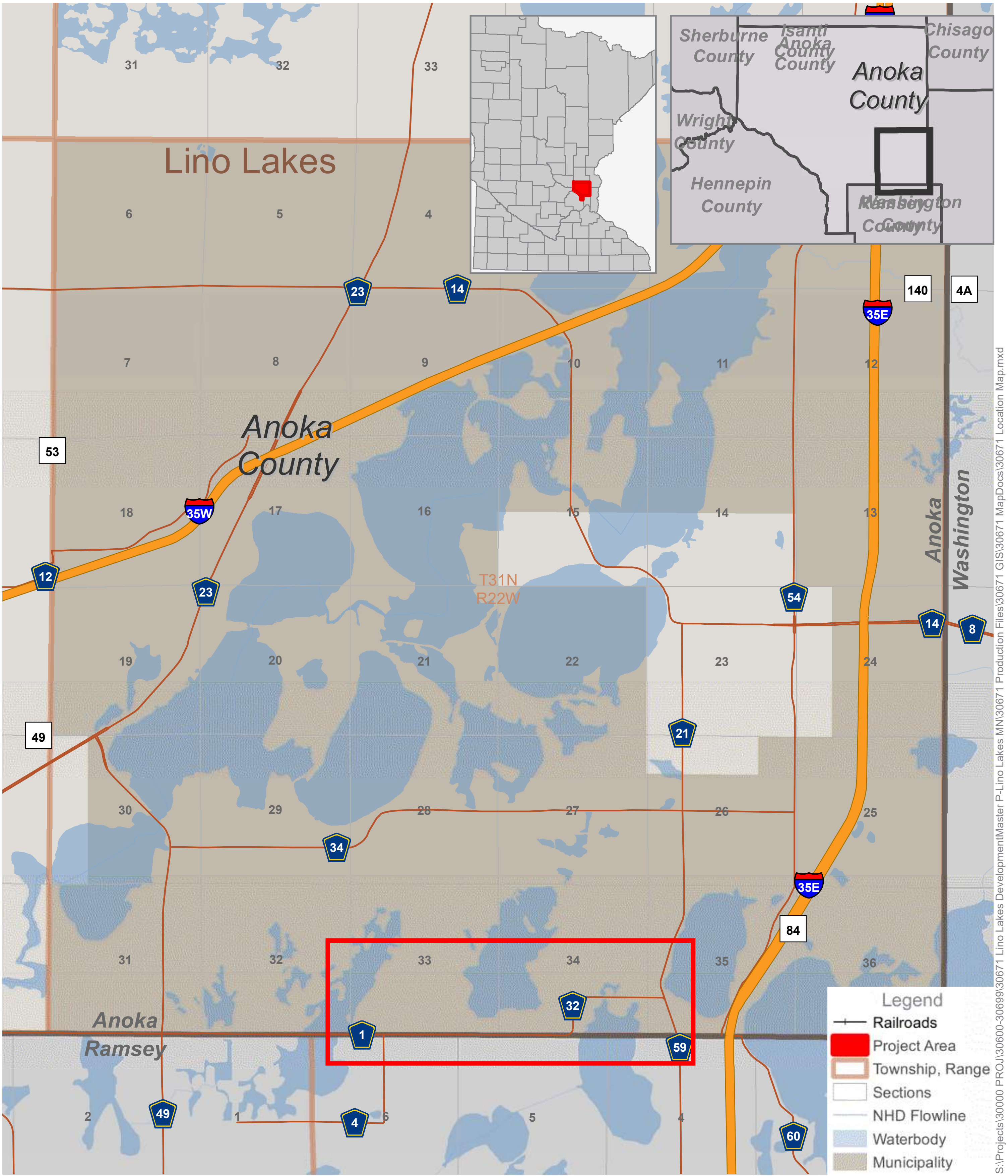
NORTH OAKS FARMS DEVELOPMENT

LINO LAKES, MINNESOTA - 10/02/24

ISG PROJECT NO. 24-30671

ISGInc.com

Appendix B: Project Location Map



Thursday, July 11, 2024

Project Number 24-30671

0 0.45 0.9
Miles
1 in = 1 miles

N

Project Location Map

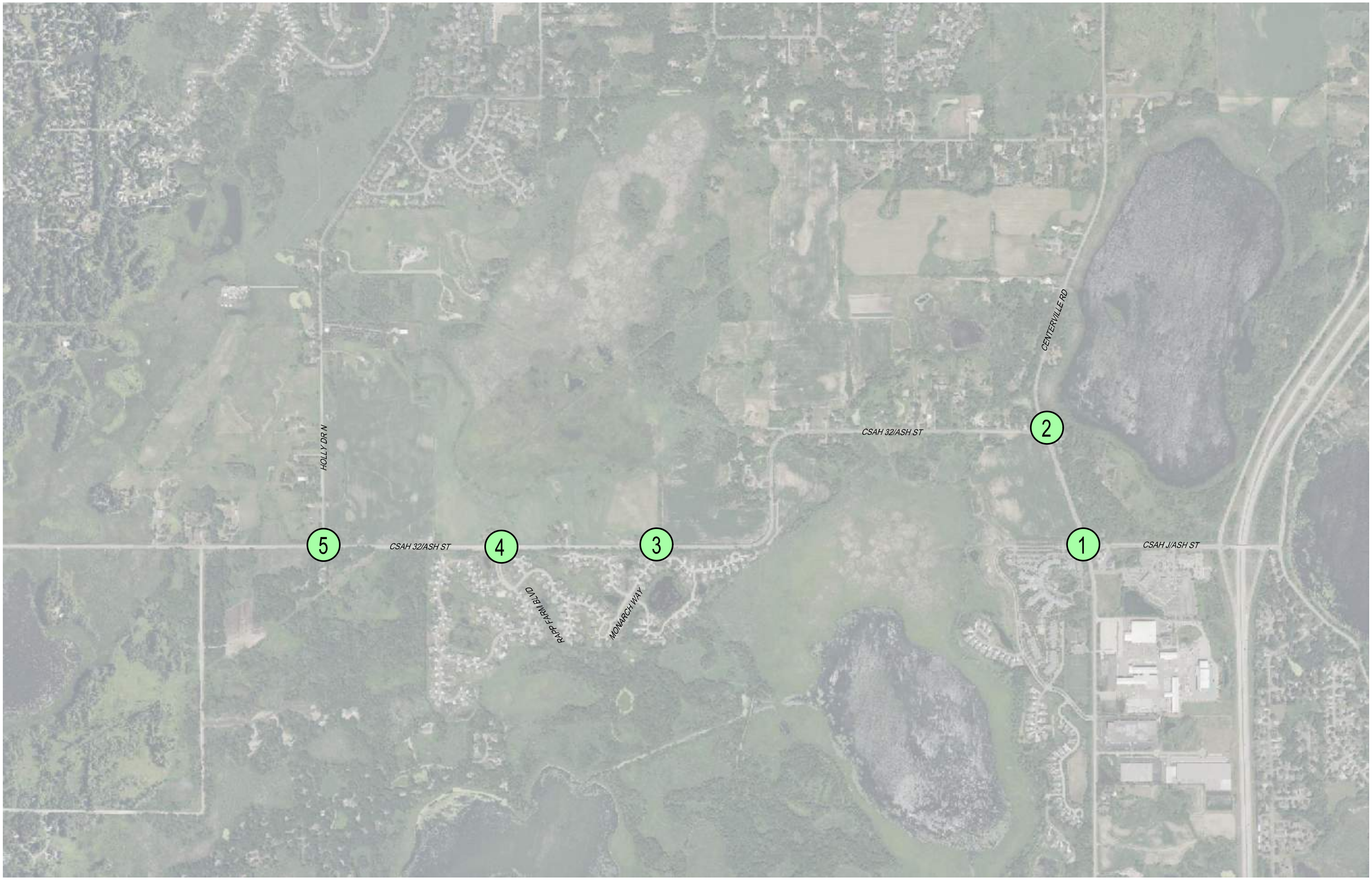
Wilkinson Water Development

Anoka County, Minnesota

Source(s):
Municipalities (MN DOT, 6/24/2016)
Lakes (MN DNR, July, 2008)
Counties (MN DNR, July 2013)
PLSS (MnGeo/USGS)

ISG

Appendix C: Intersection Map



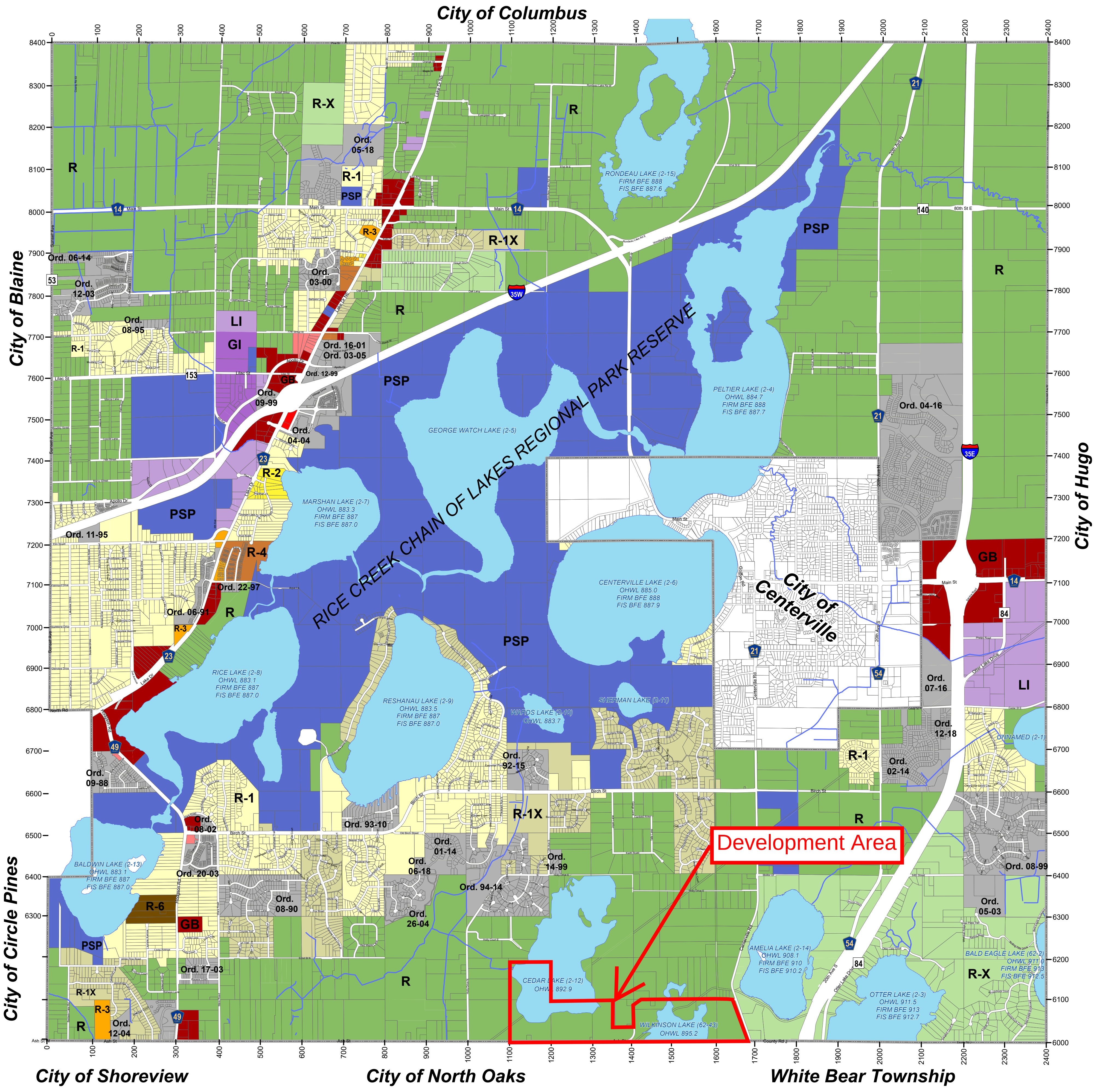
INTERSECTION MAP

ISG

Architecture + Engineering + Environmental + Planning
ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671

Appendix D: Existing Zoning and Future Land Use Maps



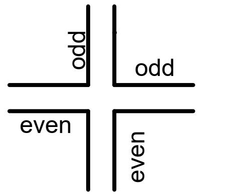
CITY OF LINO LAKES

Zoning Map of Lino Lakes

Legend

ZONING

R	Rural
R-X	Rural Executive
R-1	Single Family Residential
R-1X	Single Family Executive
R-2	Two Family Residential
R-3	Medium Density Residential
R-4	High Density Residential
R-5	High Density Residential and Business
R-6	Manufactured Home Park
NB	Neighborhood Business
LB	Limited Business
GB	General Business
LI	Light Industrial
GI	General Industrial
BC	Business Campus
PSP	Public Semi-Public
PUD	Planned Unit Development



HOUSE NUMBERING SYSTEM

Lino Lakes
Community Development
600 Town Center Parkway
Lino Lakes, Minnesota 55014

Phone (651) 982-2400

Maps are for illustrative purposes only.
Recent changes may not be included.
Land Use and Zoning Information
should be verified with City Staff.

Coordinate System: *Anoka County NAD83 Feet Lambert Conformal Conic*

Anoka County Parcel Data: *April 2023 Release*

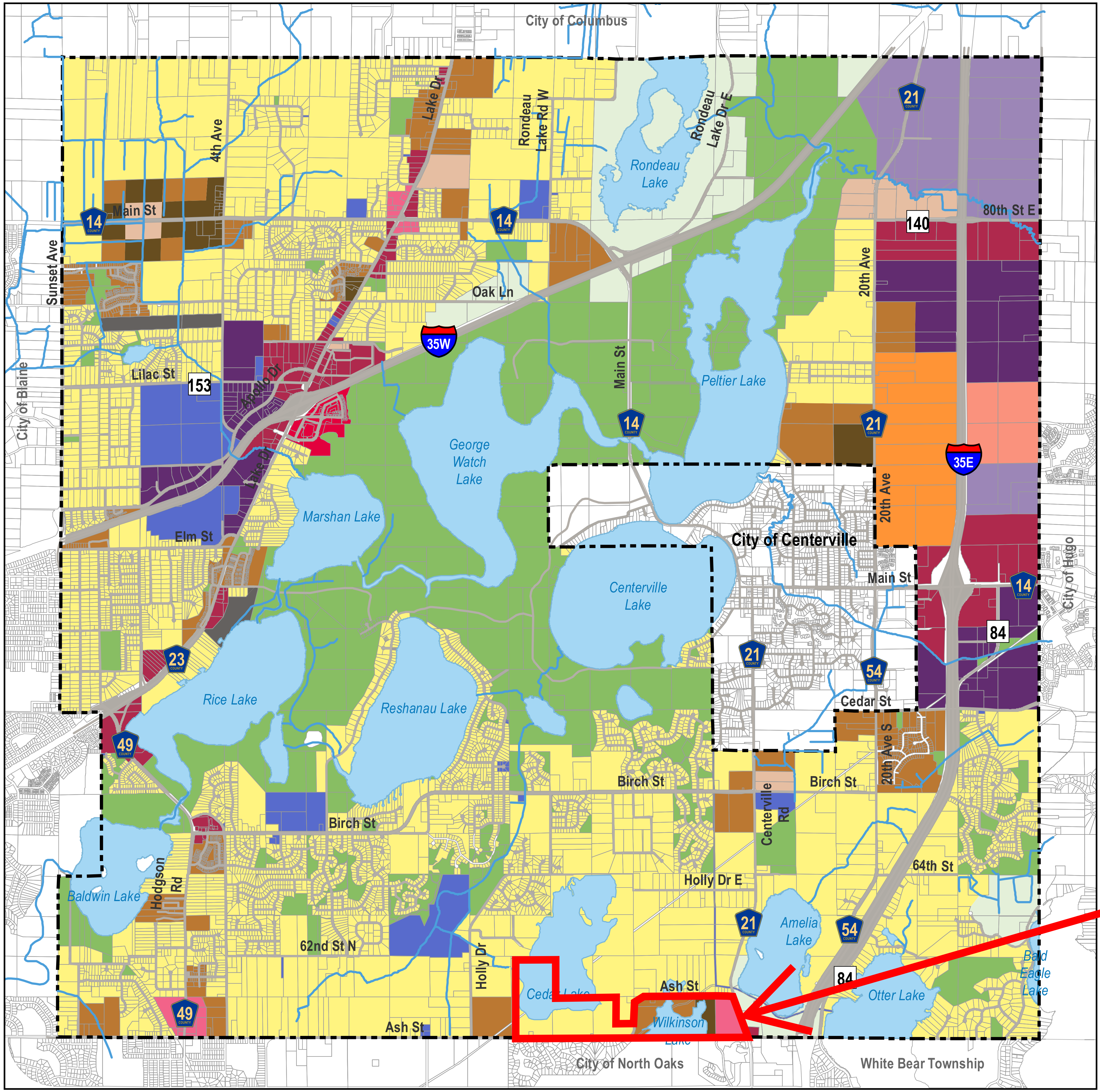
DRAWING SCALE IN FEET

0 1,000 2,000 4,000

Updated Through Ord. No. 08-22
Effective January 5, 2023

CITY OF LINO LAKES
2040 COMP PLAN

Figure 3-1
Full Build Out Land Use



Development Area

Legend

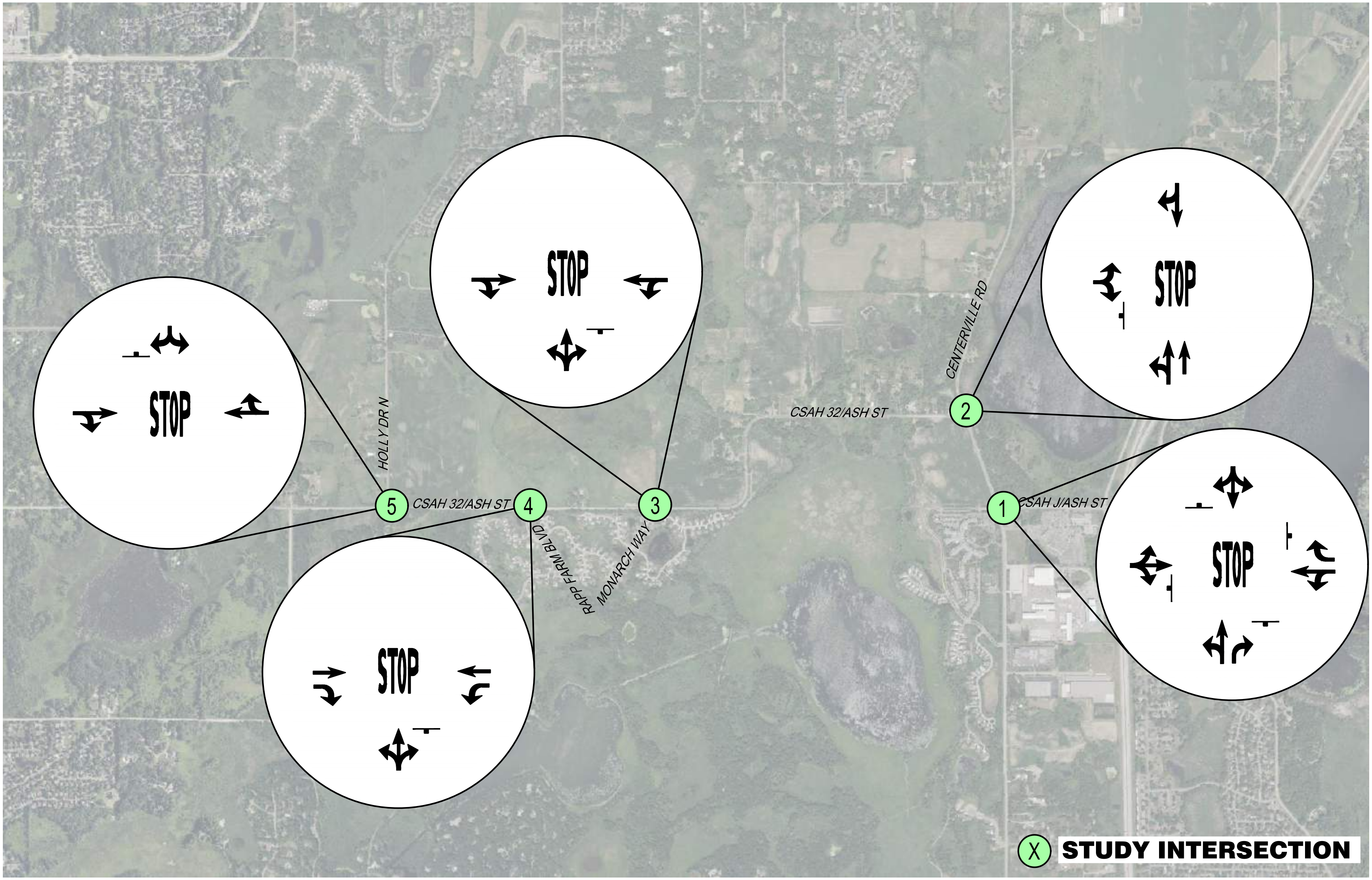
- Permanent Rural
- Low Density Residential
- Low Density Mixed Residential
- Medium Density Residential
- High Density Residential
- Planned Residential / Commercial
- Office Residential
- Signature Gateway District
- Commercial
- Town Center
- Business Campus
- Industrial
- Civic and Institutional
- Parks and Open Space
- Private Airfield
- Open Water
- Right-of-Way
- Municipal Boundary
- Parcels
- Streams

3,500 1,750 0 3,500 Feet

N

Date: 11/9/2020

Appendix E: Existing and Planned Intersection Control Exhibits



EXISTING INTERSECTION CONTROL

ISG

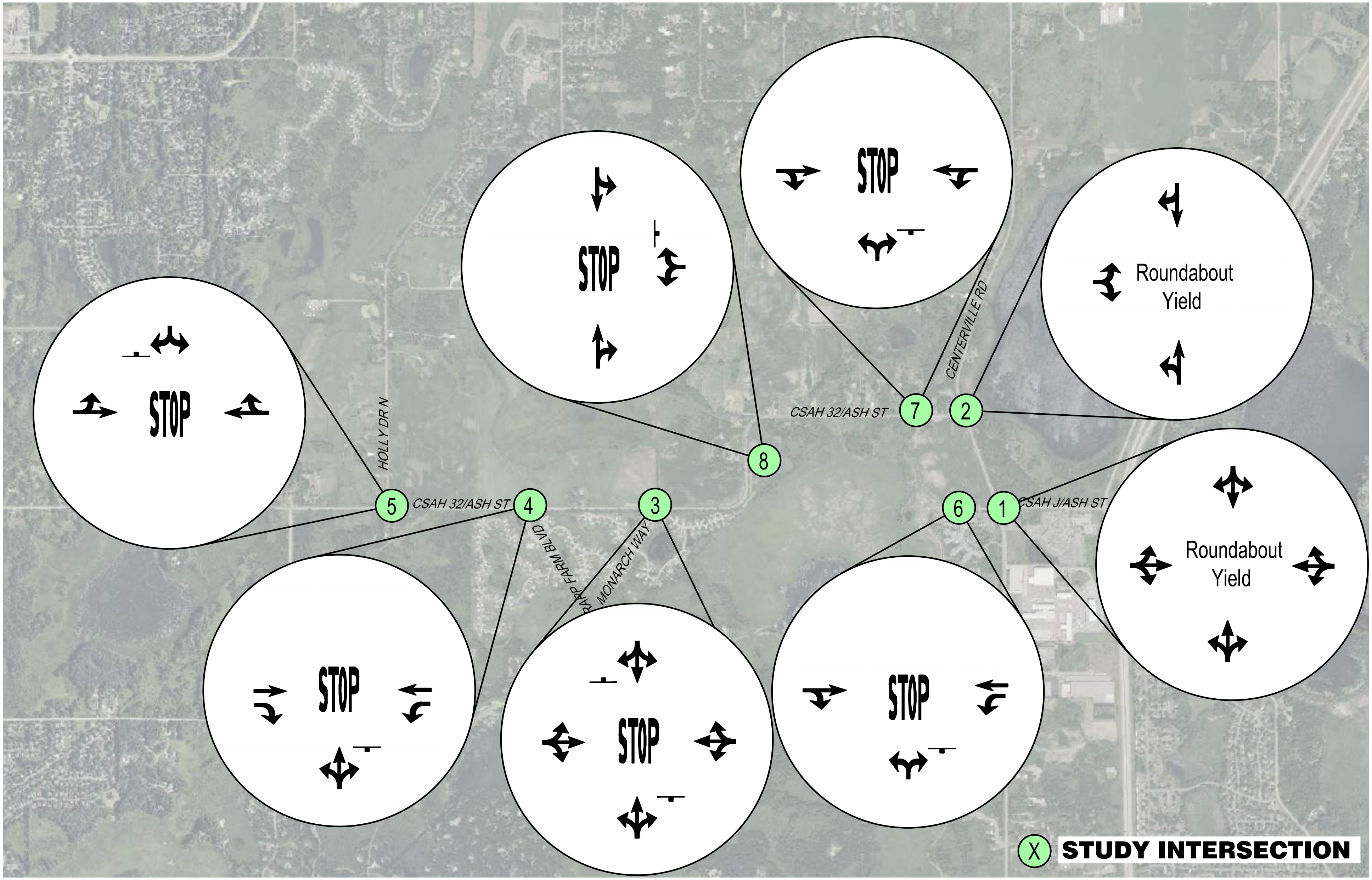
Architecture + Engineering + Environmental + Planning

ISGInc.com

WILKINSON WATERS DEVELOPMENT

LINO LAKES, MINNESOTA - 10/14/2024

ISG PROJECT NO. 24-30671



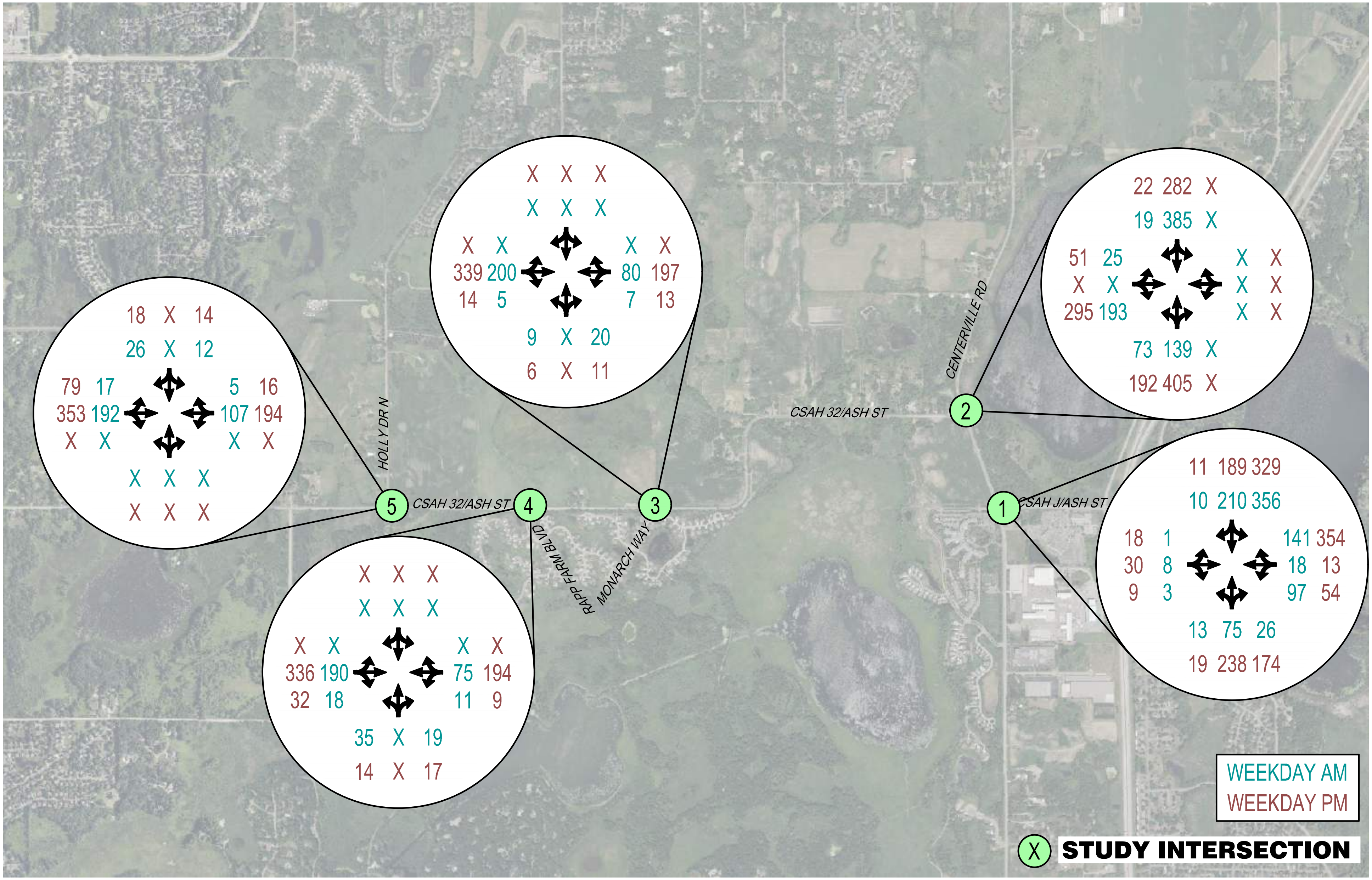
PROPOSED INTERSECTION CONTROL

ISG

Architecture + Engineering + Environmental + Planning
ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671

Appendix F: Existing (2024) Peak Hour Turning Movement Volume Diagrams



EXISTING TURNING MOVEMENT DIAGRAM

0 2000 4000
SCALE IN FEET
N

ISG

Architecture + Engineering + Environmental + Planning
ISGInc.com

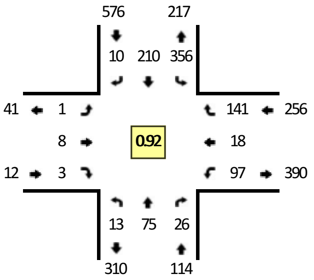
WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

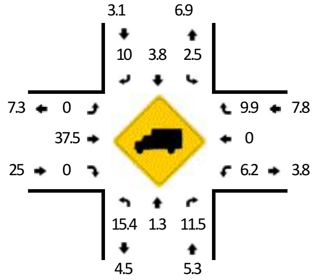
LOCATION: CSAH 21/Centerville Rd -- CSAH J/Ash St
CITY/STATE: Lino Lakes, MN

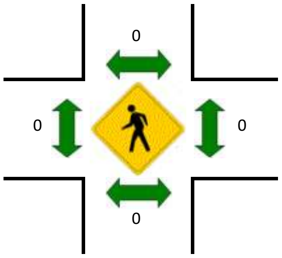
QC JOB #: 16678403
DATE: Thu, Jul 18 2024

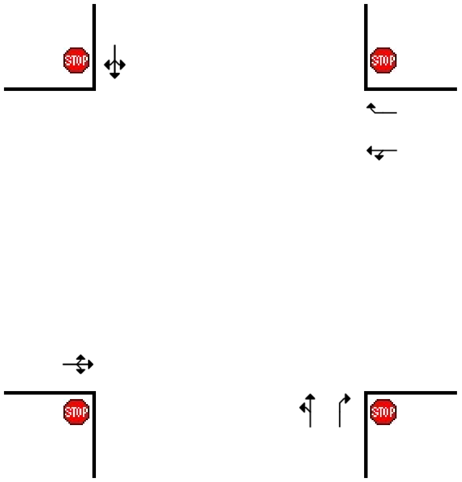


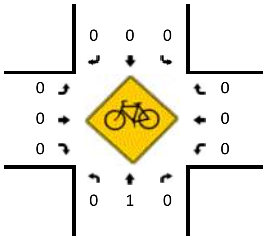
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

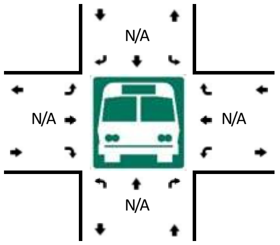
TRUE DATA TO IMPROVE MOBILITY

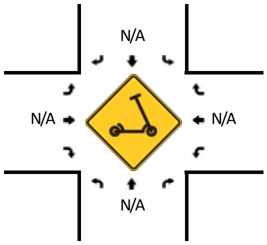












15-Min Count Period Beginning At	CSAH 21/Centerville Rd (Northbound)				CSAH 21/Centerville Rd (Southbound)				CSAH J/Ash St (Eastbound)				CSAH J/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	11	5	0	48	31	2	0	1	5	1	0	5	3	11	0	123	
6:15 AM	3	9	2	0	60	24	3	0	0	2	0	0	18	0	11	0	132	
6:30 AM	1	8	6	0	80	36	2	0	1	0	0	0	33	0	13	0	180	
6:45 AM	3	19	2	0	86	44	2	0	0	0	0	0	43	2	22	0	223	658
7:00 AM	2	13	5	0	98	41	1	0	0	4	1	0	21	4	23	0	213	748
7:15 AM	2	10	9	0	100	24	5	0	0	3	0	0	15	4	19	0	191	807
7:30 AM	2	17	11	0	107	50	0	0	1	1	0	0	25	3	32	0	249	876
7:45 AM	4	14	7	0	88	61	3	0	0	3	1	0	29	8	42	0	260	913
8:00 AM	4	18	3	0	73	54	6	0	0	2	1	0	18	5	35	0	219	919
8:15 AM	3	26	5	0	88	45	1	0	0	2	1	0	25	2	32	0	230	958
8:30 AM	1	24	9	0	95	37	0	0	2	1	1	0	10	3	35	0	218	927
8:45 AM	3	30	8	0	68	45	2	0	0	0	1	0	16	2	25	0	200	867

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	56	28	0	352	244	12	0	0	12	4	0	116	32	168	0	1040
Heavy Trucks	4	0	4		0	12	4		0	4	0		8	0	20		56
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 7/22/2024 9:00 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

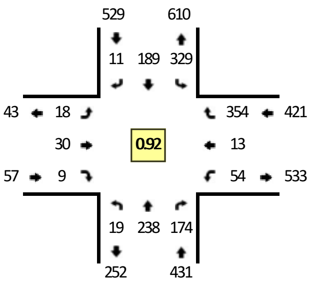
Method for determining peak hour: Total Entering Volume

LOCATION: CSAH 21/Centerville Rd -- CSAH J/Ash St

QC JOB #: 16678404

CITY/STATE: Lino Lakes, MN

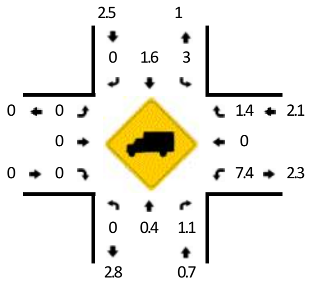
DATE: Thu, Jul 18 2024

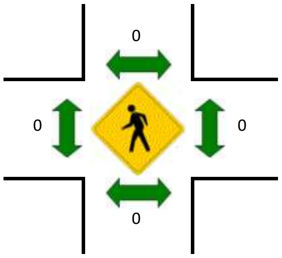


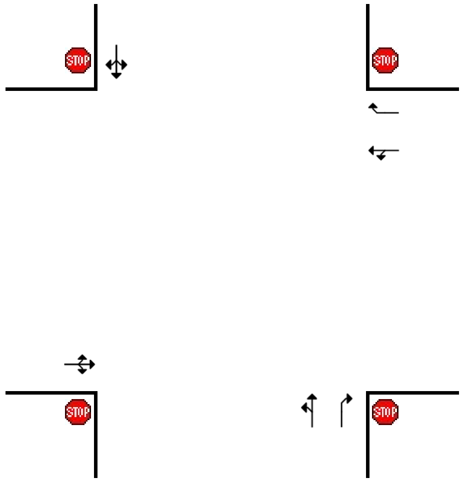
Peak-Hour: 4:15 PM -- 5:15 PM

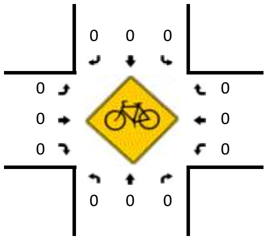
Peak 15-Min: 4:30 PM -- 4:45 PM

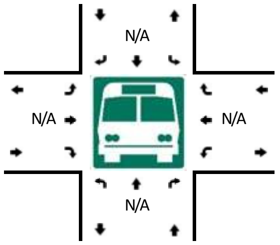
TRUE DATA TO IMPROVE MOBILITY

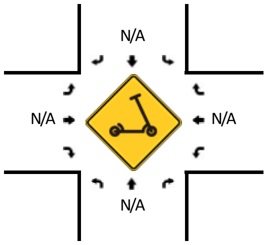












15-Min Count Period Beginning At	CSAH 21/Centerville Rd (Northbound)				CSAH 21/Centerville Rd (Southbound)				CSAH J/Ash St (Eastbound)				CSAH J/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	4	68	69	0	82	49	2	0	3	6	4	0	15	1	84	0	387	
3:45 PM	4	61	32	0	84	50	3	0	2	4	2	0	14	5	87	0	348	
4:00 PM	5	63	39	0	81	35	0	0	7	7	8	0	13	7	79	0	344	
4:15 PM	5	59	43	0	79	32	1	0	6	9	3	0	13	2	100	0	352	1431
4:30 PM	5	70	59	0	87	45	2	0	5	9	2	0	15	2	89	0	390	1434
4:45 PM	5	46	41	0	83	55	3	0	3	7	3	0	17	4	83	0	350	1436
5:00 PM	4	63	31	0	80	57	5	0	4	5	1	0	9	5	82	0	346	1438
5:15 PM	2	62	19	0	90	61	3	0	1	3	2	0	6	3	88	0	340	1426
5:30 PM	7	54	18	0	85	47	3	0	2	3	1	0	10	4	84	0	318	1354
5:45 PM	6	60	22	0	75	52	8	0	5	6	4	0	9	6	92	0	345	1349
6:00 PM	4	44	18	0	63	37	1	0	3	8	3	0	6	4	67	0	258	1261
6:15 PM	3	34	17	0	76	34	5	0	2	6	1	0	10	7	65	0	260	1181

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	20	280	236	0	348	180	8	0	20	36	8	0	60	8	356	0	1560
Heavy Trucks	0	0	8		8	8	0		0	0	0		4	0	8		36
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

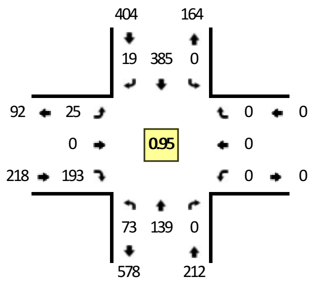
Comments:

Report generated on 7/22/2024 9:00 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

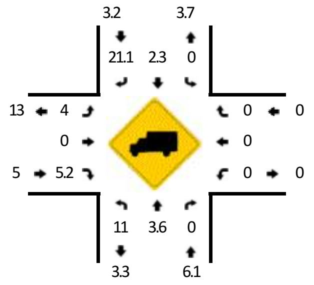
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

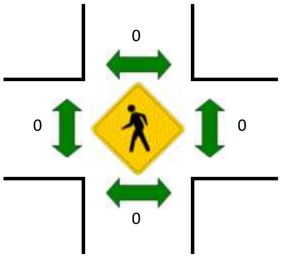
LOCATION: CSAH 21/Centerville Rd -- CSAH 32/Ash St | **QC JOB #:** 16678401
CITY/STATE: Lino Lakes, MN | **DATE:** Thu, Jul 18 2024

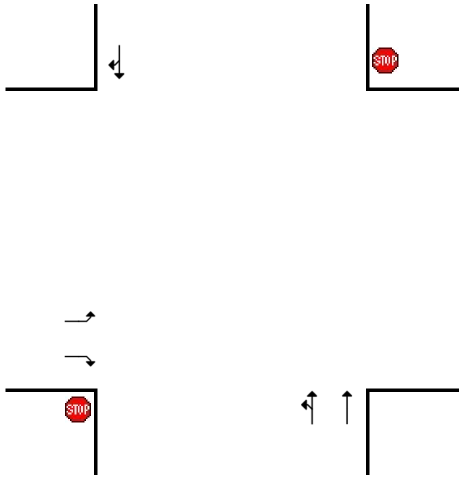


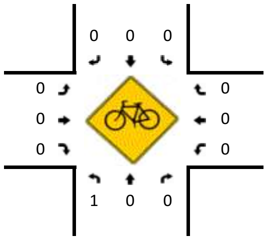
Peak-Hour: 7:30 AM -- 8:30 AM
Peak 15-Min: 7:30 AM -- 7:45 AM

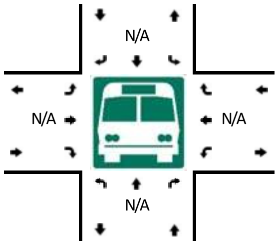
TRUE DATA TO IMPROVE MOBILITY

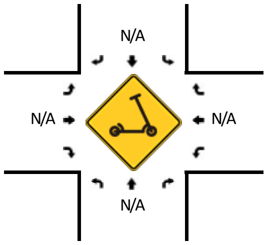












15-Min Count Period Beginning At	CSAH 21/Centerville Rd (Northbound)				CSAH 21/Centerville Rd (Southbound)				CSAH 32/Ash St (Eastbound)				CSAH 32/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	7	15	0	0	0	53	0	0	1	0	26	0	0	0	0	0	102	
6:15 AM	5	17	0	0	0	69	1	0	4	0	22	0	0	0	0	0	118	
6:30 AM	4	16	0	0	0	82	3	0	11	0	40	0	0	0	0	0	156	
6:45 AM	13	30	0	0	0	79	1	0	9	0	49	0	0	0	0	0	181	557
7:00 AM	12	23	0	0	0	94	1	0	3	0	45	0	0	0	0	0	178	633
7:15 AM	7	25	0	0	0	84	3	0	11	0	42	0	0	0	0	0	172	687
7:30 AM	12	35	0	0	0	114	5	0	6	0	48	0	0	0	0	0	220	751
7:45 AM	23	30	0	0	0	98	5	0	6	0	51	0	0	0	0	0	213	783
8:00 AM	15	40	0	0	0	83	2	0	4	0	52	0	0	0	0	0	196	801
8:15 AM	23	34	0	0	0	90	7	0	9	0	42	0	0	0	0	0	205	834
8:30 AM	18	44	0	0	0	86	3	0	16	0	41	0	0	0	0	0	208	822
8:45 AM	20	32	0	0	0	72	3	0	12	0	41	0	0	0	0	0	180	789

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	48	140	0	0	0	456	20	0	24	0	192	0	0	0	0	0	880
Heavy Trucks	4	4	0		0	4	0		0	0	12		0	0	0		24
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

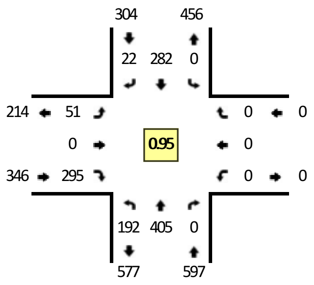
Comments:

Report generated on 7/22/2024 9:00 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

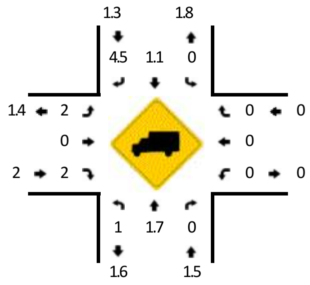
Type of peak hour being reported: Intersection Peak
Method for determining peak hour: Total Entering Volume

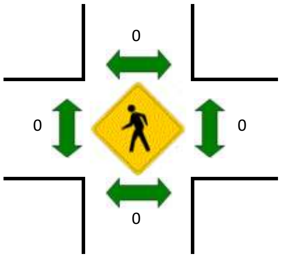
LOCATION: CSAH 21/Centerville Rd -- CSAH 32/Ash St
QC JOB #: 16678402
CITY/STATE: Lino Lakes, MN
DATE: Thu, Jul 18 2024

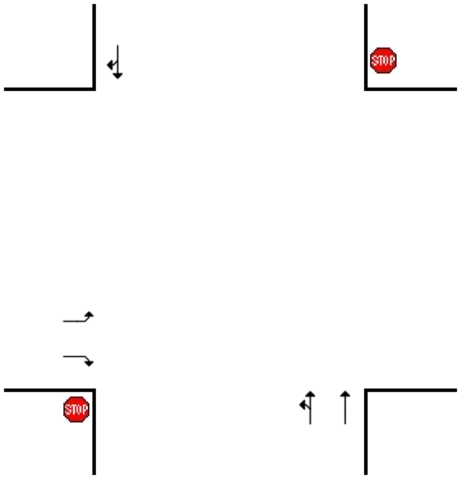


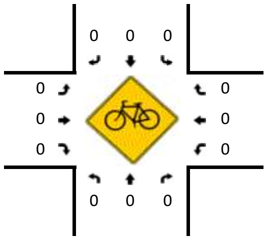
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

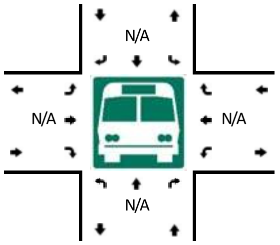
TRUE DATA TO IMPROVE MOBILITY

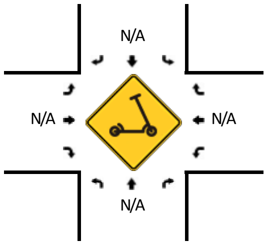












15-Min Count Period Beginning At	CSAH 21/Centerville Rd (Northbound)				CSAH 21/Centerville Rd (Southbound)				CSAH 32/Ash St (Eastbound)				CSAH 32/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	48	107	0	0	0	72	6	0	14	0	65	0	0	0	0	0	312	
3:45 PM	48	104	0	0	0	73	5	0	14	0	58	0	0	0	0	0	302	
4:00 PM	50	98	0	0	0	54	4	0	5	0	66	0	0	0	0	0	277	
4:15 PM	41	118	0	0	0	50	7	0	16	0	59	0	0	0	0	0	291	1182
4:30 PM	45	117	0	0	0	64	7	0	13	0	83	0	0	0	0	0	329	1199
4:45 PM	52	82	0	0	0	56	6	0	15	0	70	0	0	0	0	0	281	1178
5:00 PM	44	106	0	0	0	84	7	0	11	0	77	0	0	0	0	0	329	1230
5:15 PM	51	100	0	0	0	78	2	0	12	0	65	0	0	0	0	0	308	1247
5:30 PM	34	106	0	0	0	64	6	0	21	0	74	0	0	0	0	0	305	1223
5:45 PM	45	111	0	0	0	72	8	0	15	0	53	0	0	0	0	0	304	1246
6:00 PM	32	85	0	0	0	55	6	0	11	0	48	0	0	0	0	0	237	1154
6:15 PM	27	75	0	0	0	68	3	0	10	0	49	0	0	0	0	0	232	1078

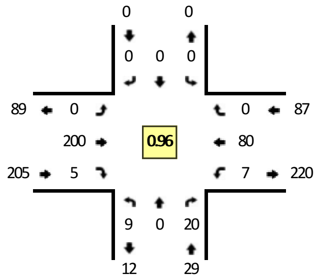
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	180	468	0	0	0	256	28	0	52	0	332	0	0	0	0	0	1316
Heavy Trucks	0	8	0		0	8	0		4	0	8		0	0	0		28
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 7/22/2024 9:00 AM
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

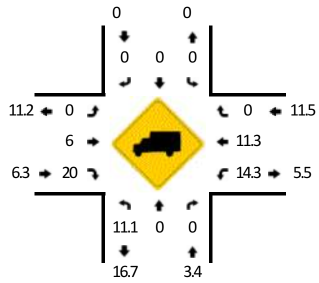
Type of peak hour being reported: Intersection Peak
Method for determining peak hour: Total Entering Volume

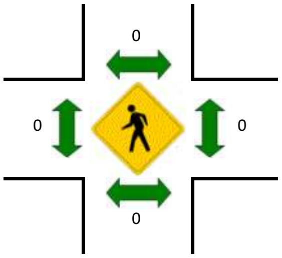
LOCATION: Monarch Way -- CSAH J/Ash St
QC JOB #: 16678405
CITY/STATE: North Oaks, MN
DATE: Thu, Jul 18 2024

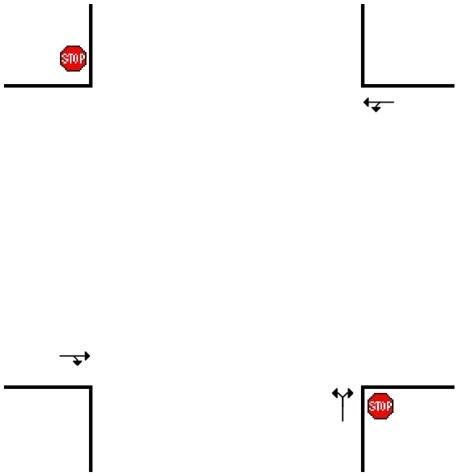


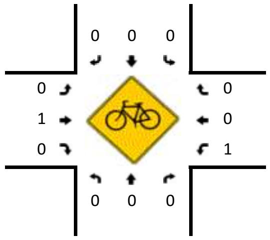
Peak-Hour: 8:00 AM -- 9:00 AM
Peak 15-Min: 8:45 AM -- 9:00 AM

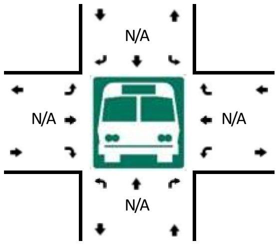
TRUE DATA TO IMPROVE MOBILITY

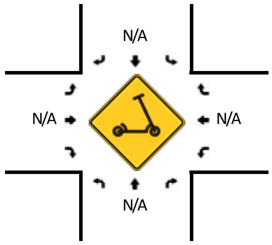












15-Min Count Period Beginning At	Monarch Way (Northbound)				Monarch Way (Southbound)				CSAH J/Ash St (Eastbound)				CSAH J/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	1	0	0	0	0	0	0	25	0	0	0	7	0	0	33	
6:15 AM	3	0	0	0	0	0	0	0	0	31	0	0	0	6	0	0	40	
6:30 AM	4	0	3	0	0	0	0	0	0	47	0	0	1	5	0	0	60	
6:45 AM	0	0	3	0	0	0	0	0	0	53	0	0	1	13	0	0	70	203
7:00 AM	0	0	2	0	0	0	0	0	0	47	1	0	0	12	0	0	62	232
7:15 AM	4	0	5	0	0	0	0	0	0	46	0	0	2	11	0	0	68	260
7:30 AM	6	0	4	0	0	0	0	0	0	48	0	0	0	16	0	0	74	274
7:45 AM	2	0	5	0	0	0	0	0	0	46	0	0	2	25	0	0	80	284
8:00 AM	0	0	5	0	0	0	0	0	0	54	1	0	1	16	0	0	77	299
8:15 AM	1	0	6	0	0	0	0	0	0	45	2	0	1	24	0	0	79	310
8:30 AM	4	0	3	0	0	0	0	0	0	51	1	0	2	20	0	0	81	317
8:45 AM	4	0	6	0	0	0	0	0	0	50	1	0	3	20	0	0	84	321

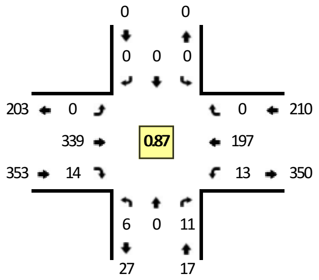
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	0	24	0	0	0	0	0	0	200	4	0	12	80	0	0	336
Heavy Trucks	0	0	0		0	0	0		0	16	0		0	4	0		20
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	4	0		0	0	0		4
Scooters																	

Comments:

Report generated on 7/22/2024 9:00 AM
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

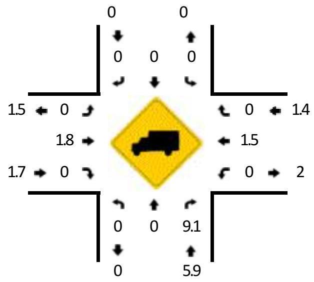
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

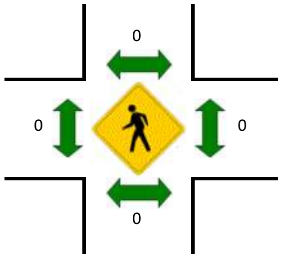
LOCATION: Monarch Way -- CSAH J/Ash St | **QC JOB #:** 16678406
CITY/STATE: North Oaks, MN | **DATE:** Thu, Jul 18 2024

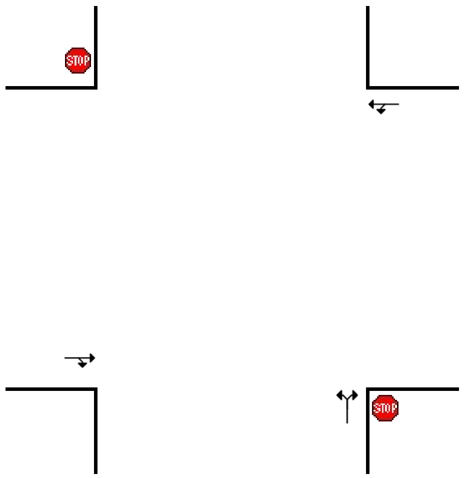


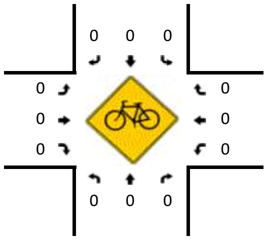
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

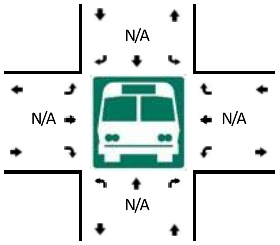
TRUE DATA TO IMPROVE MOBILITY

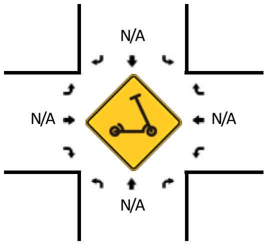












15-Min Count Period Beginning At	Monarch Way (Northbound)				Monarch Way (Southbound)				CSAH J/Ash St (Eastbound)				CSAH J/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	1	0	5	0	0	0	0	0	0	73	2	0	2	47	0	0	130	
3:45 PM	2	0	1	0	0	0	0	0	0	68	4	0	2	42	0	0	119	
4:00 PM	2	0	4	0	0	0	0	0	0	68	1	0	4	58	0	0	137	
4:15 PM	2	0	2	0	0	0	0	0	0	72	4	0	3	44	0	0	127	513
4:30 PM	1	0	4	0	0	0	0	0	0	105	3	0	2	51	0	0	166	549
4:45 PM	1	0	1	0	0	0	0	0	0	78	3	0	3	52	0	0	138	568
5:00 PM	1	0	2	0	0	0	0	0	0	80	5	0	2	50	0	0	140	571
5:15 PM	3	0	4	0	0	0	0	0	0	76	3	0	6	44	0	0	136	580
5:30 PM	4	0	3	0	0	0	0	0	0	89	3	0	4	36	0	0	139	553
5:45 PM	2	0	5	0	0	0	0	0	0	61	4	0	5	46	0	0	123	538
6:00 PM	2	0	1	0	0	0	0	0	0	54	4	0	3	36	0	0	100	498
6:15 PM	4	0	5	0	0	0	0	0	0	53	2	0	2	27	0	0	93	455

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	0	16	0	0	0	0	0	0	420	12	0	8	204	0	0	664
Heavy Trucks	0	0	0		0	0	0		0	8	0		0	0	0		8
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 7/22/2024 9:00 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

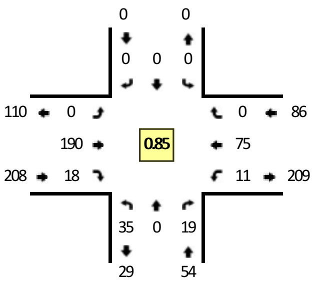
Method for determining peak hour: Total Entering Volume

LOCATION: Rapp Farm Blvd -- CSAH J/Ash St

CITY/STATE: North Oaks, MN

QC JOB #: 16678407

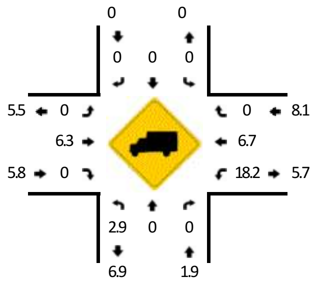
DATE: Thu, Jul 18 2024

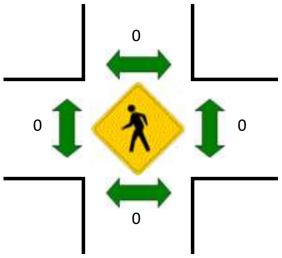


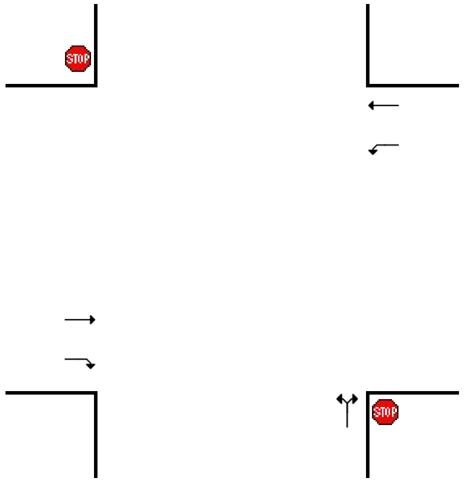
Peak-Hour: 8:00 AM -- 9:00 AM

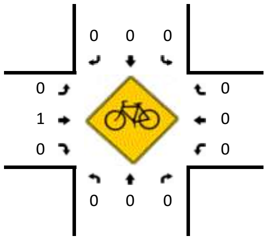
Peak 15-Min: 8:30 AM -- 8:45 AM

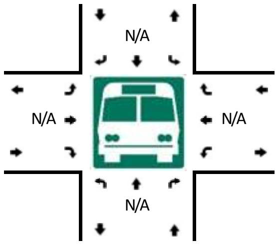
TRUE DATA TO IMPROVE MOBILITY

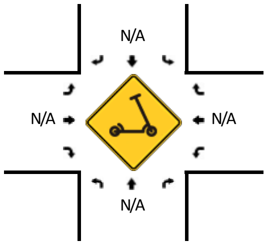












15-Min Count Period Beginning At	Rapp Farm Blvd (Northbound)				Rapp Farm Blvd (Southbound)				CSAH J/Ash St (Eastbound)				CSAH J/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	2	0	0	0	0	0	0	21	0	0	1	5	0	0	29	
6:15 AM	1	0	2	0	0	0	0	0	0	31	1	0	0	10	0	0	45	
6:30 AM	4	0	5	0	0	0	0	0	0	44	0	0	0	7	0	0	60	
6:45 AM	3	0	4	0	0	0	0	0	0	48	3	0	0	14	0	0	72	206
7:00 AM	5	0	3	0	0	0	0	0	0	44	2	0	1	13	0	0	68	245
7:15 AM	3	0	3	0	0	0	0	0	0	43	3	0	1	12	0	0	65	265
7:30 AM	5	0	4	0	0	0	0	0	0	45	1	0	1	19	0	0	75	280
7:45 AM	7	0	5	0	0	0	0	0	0	40	1	0	3	26	0	0	82	290
8:00 AM	7	0	7	0	0	0	0	0	0	49	3	0	1	14	0	0	81	303
8:15 AM	5	0	4	0	0	0	0	0	0	44	2	0	4	18	0	0	77	315
8:30 AM	17	0	6	0	0	0	0	0	0	48	5	0	3	23	0	0	102	342
8:45 AM	6	0	2	0	0	0	0	0	0	49	8	0	3	20	0	0	88	348

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	68	0	24	0	0	0	0	0	0	192	20	0	12	92	0	0	408
Heavy Trucks	0	0	0		0	0	0		0	8	0		0	4	0		12
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 7/22/2024 9:00 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

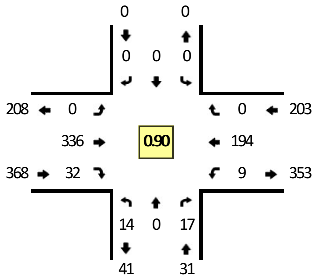
Method for determining peak hour: Total Entering Volume

LOCATION: Rapp Farm Blvd -- CSAH J/Ash St

QC JOB #: 16678408

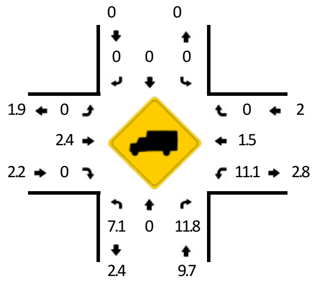
CITY/STATE: North Oaks, MN

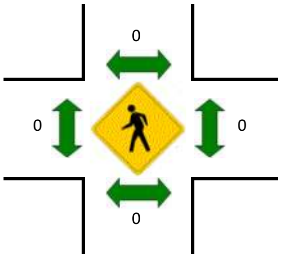
DATE: Thu, Jul 18 2024

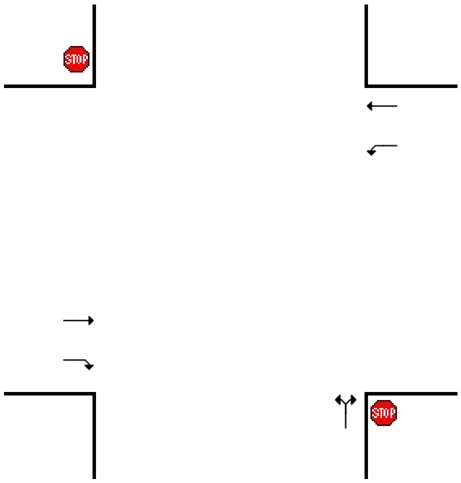


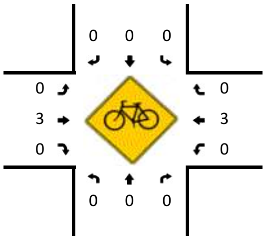
Peak-Hour: 4:15 PM -- 5:15 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

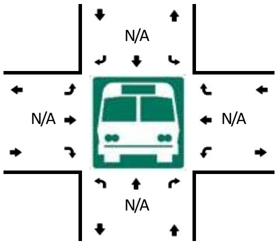
TRUE DATA TO IMPROVE MOBILITY

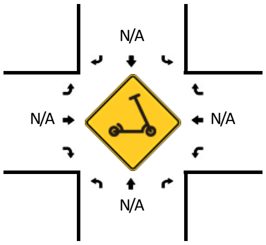












15-Min Count Period Beginning At	Rapp Farm Blvd (Northbound)				Rapp Farm Blvd (Southbound)				CSAH J/Ash St (Eastbound)				CSAH J/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	7	0	4	0	0	0	0	0	0	68	4	0	3	46	0	0	132	
3:45 PM	4	0	4	0	0	0	0	0	0	74	4	0	1	42	0	0	129	
4:00 PM	4	0	7	0	0	0	0	0	0	58	6	0	6	51	0	0	132	
4:15 PM	3	0	5	0	0	0	0	0	0	75	5	0	1	49	0	0	138	531
4:30 PM	2	0	2	0	0	0	0	0	0	105	7	0	2	50	0	0	168	567
4:45 PM	4	0	2	0	0	0	0	0	0	78	10	0	4	50	0	0	148	586
5:00 PM	5	0	8	0	0	0	0	0	0	78	10	0	2	45	0	0	148	602
5:15 PM	3	0	5	0	0	0	0	0	0	72	6	0	9	42	0	0	137	601
5:30 PM	7	0	4	0	0	0	0	0	0	87	7	0	3	38	0	0	146	579
5:45 PM	7	0	5	0	0	0	0	0	0	63	9	0	12	36	0	0	132	563
6:00 PM	5	0	4	0	0	0	0	0	0	54	5	0	8	33	0	0	109	524
6:15 PM	4	0	3	0	0	0	0	0	0	52	9	0	5	22	0	0	95	482

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	8	0	8	0	0	0	0	0	0	420	28	0	8	200	0	0	672
Heavy Trucks	0	0	0		0	0	0		0	8	0		0	0	0		8
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 7/22/2024 9:00 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

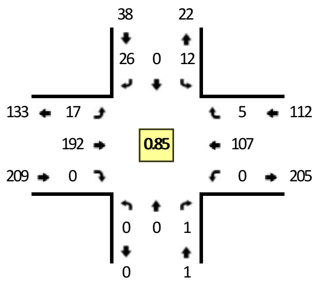
Method for determining peak hour: Total Entering Volume

LOCATION: Holly Dr -- CSAH J/Ash St

QC JOB #: 16678409

CITY/STATE: Saint Paul, MN

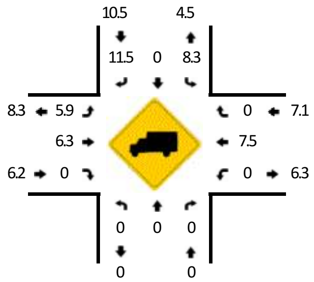
DATE: Thu, Jul 18 2024

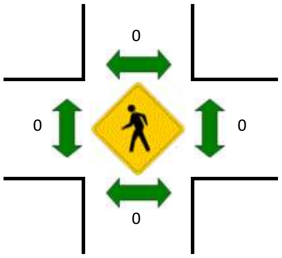


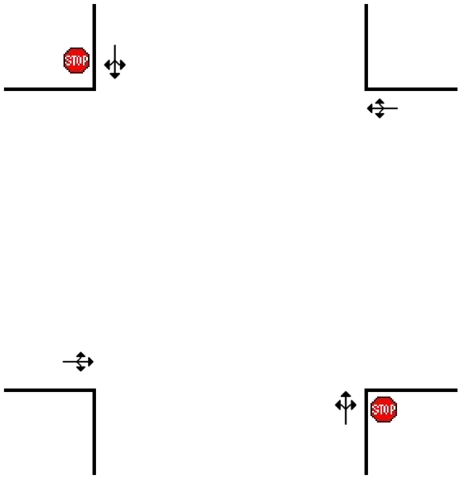
Peak-Hour: 8:00 AM -- 9:00 AM

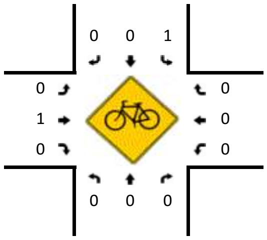
Peak 15-Min: 8:30 AM -- 8:45 AM

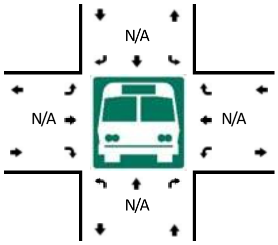
TRUE DATA TO IMPROVE MOBILITY

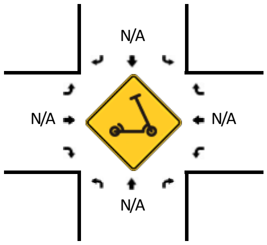












15-Min Count Period Beginning At	Holly Dr (Northbound)				Holly Dr (Southbound)				CSAH J/Ash St (Eastbound)				CSAH J/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	0	0	2	0	3	0	3	21	0	0	0	5	0	0	34	
6:15 AM	0	0	0	0	4	0	2	0	0	27	0	0	0	10	0	0	43	
6:30 AM	0	0	0	0	0	0	8	0	0	44	0	0	0	11	1	0	64	
6:45 AM	0	0	0	0	2	0	6	0	2	48	0	0	0	15	2	0	75	216
7:00 AM	0	0	1	0	4	0	9	0	3	44	0	0	0	15	2	0	78	260
7:15 AM	0	0	0	0	5	0	9	0	4	41	0	0	0	14	0	0	73	290
7:30 AM	0	0	0	0	5	0	14	0	3	45	0	0	0	24	1	0	92	318
7:45 AM	0	0	0	0	6	0	9	0	4	34	0	0	0	31	1	0	85	328
8:00 AM	0	0	0	0	3	0	9	0	0	44	0	0	0	22	2	0	80	330
8:15 AM	0	0	0	0	5	0	3	0	6	43	0	0	0	22	1	0	80	337
8:30 AM	0	0	0	0	4	0	9	0	5	49	0	0	0	38	1	0	106	351
8:45 AM	0	0	1	0	0	0	5	0	6	56	0	0	0	25	1	0	94	360

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	16	0	36	0	20	196	0	0	0	152	4	0	424
Heavy Trucks	0	0	0		0	0	8		4	8	0		0	4	0		24
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 7/22/2024 9:00 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

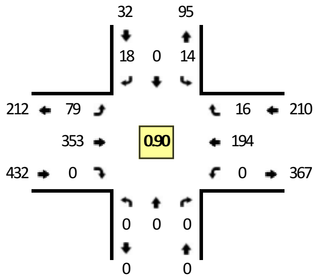
Method for determining peak hour: Total Entering Volume

LOCATION: Holly Dr -- CSAH J/Ash St

QC JOB #: 16678410

CITY/STATE: Saint Paul, MN

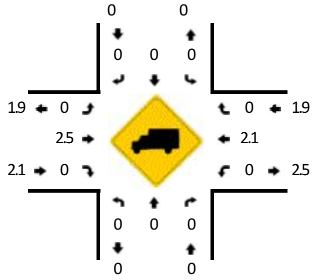
DATE: Thu, Jul 18 2024

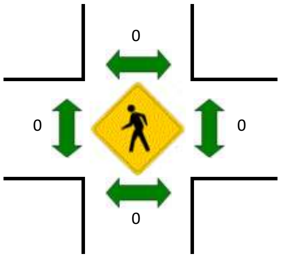


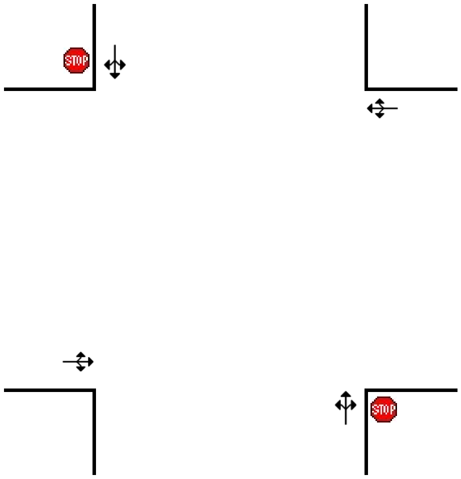
Peak-Hour: 4:15 PM -- 5:15 PM

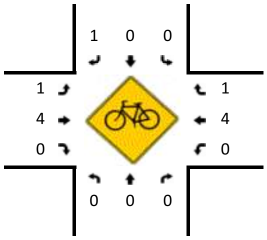
Peak 15-Min: 4:30 PM -- 4:45 PM

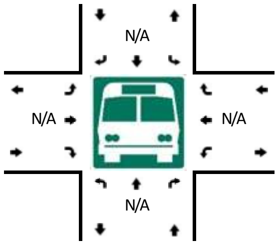
TRUE DATA TO IMPROVE MOBILITY

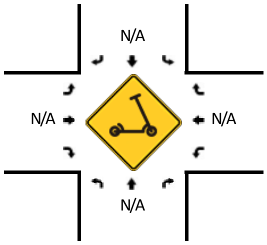












15-Min Count Period Beginning At	Holly Dr (Northbound)				Holly Dr (Southbound)				CSAH J/Ash St (Eastbound)				CSAH J/Ash St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	0	0	0	0	3	0	4	0	12	73	0	0	1	45	6	0	144	
3:45 PM	0	0	0	0	2	0	3	0	7	73	0	0	0	41	7	0	133	
4:00 PM	0	0	0	0	3	0	5	0	10	61	0	0	0	51	3	0	133	
4:15 PM	0	0	0	0	3	0	3	0	19	78	0	0	0	46	4	0	153	563
4:30 PM	0	0	0	0	5	0	6	0	17	106	0	0	0	49	4	0	187	606
4:45 PM	0	0	0	0	4	0	4	0	24	82	0	0	0	52	2	0	168	641
5:00 PM	0	0	0	0	2	0	5	0	19	87	0	0	0	47	6	0	166	674
5:15 PM	0	0	0	0	3	0	3	0	18	75	0	0	1	37	4	0	141	662
5:30 PM	0	0	0	0	5	0	4	0	18	88	0	0	0	39	6	0	160	635
5:45 PM	0	0	0	0	6	0	4	0	13	67	0	0	0	43	2	0	135	602
6:00 PM	0	1	0	0	1	0	4	0	8	58	1	0	0	37	2	0	112	548
6:15 PM	0	0	0	0	4	0	4	0	5	56	0	0	0	22	3	0	94	501

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	20	0	24	0	68	424	0	0	0	196	16	0	748
Heavy Trucks	0	0	0		0	0	0		0	8	0		0	0	0		8
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	4	0		0	4	4		12
Scooters																	

Comments:

Report generated on 7/22/2024 9:00 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Appendix G: Existing (2024) Synchro Analysis Worksheets

1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Intersection	
Intersection Delay, s/veh	40.5
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		↰	↱		✥	
Traffic Vol, veh/h	1	8	3	97	18	141	13	75	26	356	210	10
Future Vol, veh/h	1	8	3	97	18	141	13	75	26	356	210	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	38	0	6	0	10	15	1	12	2	4	10
Mvmt Flow	1	9	3	105	20	153	14	82	28	387	228	11
Number of Lanes	0	1	0	0	1	1	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	10.5	11.5	10.3	60
HCM LOS	B	B	B	F

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	15%	0%	8%	84%	0%	62%
Vol Thru, %	85%	0%	67%	16%	0%	36%
Vol Right, %	0%	100%	25%	0%	100%	2%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	88	26	12	115	141	576
LT Vol	13	0	1	97	0	356
Through Vol	75	0	8	18	0	210
RT Vol	0	26	3	0	141	10
Lane Flow Rate	96	28	13	125	153	626
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.175	0.044	0.026	0.251	0.255	1.001
Departure Headway (Hd)	6.602	5.57	7.228	7.241	5.996	5.753
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	543	642	493	495	598	632
Service Time	4.348	3.316	5.301	4.992	3.746	3.78
HCM Lane V/C Ratio	0.177	0.044	0.026	0.253	0.256	0.991
HCM Control Delay	10.8	8.6	10.5	12.4	10.8	60
HCM Lane LOS	B	A	B	B	B	F
HCM 95th-tile Q	0.6	0.1	0.1	1	1	15.3

Intersection	
Int Delay, s/veh	4.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱		↰↑ ↑	↑↱	
Traffic Vol, veh/h	25	193	73	139	385	19
Future Vol, veh/h	25	193	73	139	385	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	100	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	4	5	11	4	2	21
Mvmt Flow	27	210	79	151	418	21

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	663	429	439	0	-	0
Stage 1	429	-	-	-	-	-
Stage 2	234	-	-	-	-	-
Critical Hdwy	6.66	6.275	4.265	-	-	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.86	-	-	-	-	-
Follow-up Hdwy	3.538	3.3475	2.3045	-	-	-
Pot Cap-1 Maneuver	406	617	1065	-	-	-
Stage 1	651	-	-	-	-	-
Stage 2	778	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	373	617	1065	-	-	-
Mov Cap-2 Maneuver	373	-	-	-	-	-
Stage 1	598	-	-	-	-	-
Stage 2	778	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14	3.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1065	-	373	617	-	-
HCM Lane V/C Ratio	0.075	-	0.073	0.34	-	-
HCM Control Delay (s)	8.7	0.2	15.4	13.8	-	-
HCM Lane LOS	A	A	C	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	1.5	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	⅄	
Traffic Vol, veh/h	200	5	7	80	9	20
Future Vol, veh/h	200	5	7	80	9	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	20	14	11	11	0
Mvmt Flow	217	5	8	87	10	22

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	222	0	323	220
Stage 1	-	-	-	-	220	-
Stage 2	-	-	-	-	103	-
Critical Hdwy	-	-	4.24	-	6.51	6.2
Critical Hdwy Stg 1	-	-	-	-	5.51	-
Critical Hdwy Stg 2	-	-	-	-	5.51	-
Follow-up Hdwy	-	-	2.326	-	3.599	3.3
Pot Cap-1 Maneuver	-	-	1279	-	653	825
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	899	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1279	-	648	825
Mov Cap-2 Maneuver	-	-	-	-	648	-
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	893	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		0.6		9.9	
HCM LOS					A	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	761	-	-	1279	-
HCM Lane V/C Ratio	0.041	-	-	0.006	-
HCM Control Delay (s)	9.9	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

HCM 6th TWSC
4: Rapp Farm Blvd & CSAH 32/Ash St

10/10/2024

Intersection	
Int Delay, s/veh	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰↱	
Traffic Vol, veh/h	190	18	11	75	35	19
Future Vol, veh/h	190	18	11	75	35	19
Conflicting Peds, #/hr	0	0	1	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	0	18	7	3	0
Mvmt Flow	207	20	12	82	38	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	228	0	315	208
Stage 1	-	-	-	-	208	-
Stage 2	-	-	-	-	107	-
Critical Hdwy	-	-	4.28	-	6.43	6.2
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.362	-	3.527	3.3
Pot Cap-1 Maneuver	-	-	1251	-	676	837
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	915	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1250	-	668	836
Mov Cap-2 Maneuver	-	-	-	-	668	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	905	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	719	-	-	1250	-
HCM Lane V/C Ratio	0.082	-	-	0.01	-
HCM Control Delay (s)	10.5	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM 6th TWSC
5: CSAH 32/Ash St & Holly Dr

10/10/2024

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	17	192	107	5	12	26
Future Vol, veh/h	17	192	107	5	12	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	6	8	0	8	12
Mvmt Flow	18	209	116	5	13	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	121	0	-	0	364	119
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	245	-
Critical Hdwy	4.16	-	-	-	6.48	6.32
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.254	-	-	-	3.572	3.408
Pot Cap-1 Maneuver	1442	-	-	-	624	906
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	782	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1442	-	-	-	615	906
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	782	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1442	-	-	-	788
HCM Lane V/C Ratio	0.013	-	-	-	0.052
HCM Control Delay (s)	7.5	0	-	-	9.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	7.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Traffic Vol, veh/h	0	0	41	0	0	12
Future Vol, veh/h	0	0	41	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	45	0	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	91	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	909	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	934	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	884	1084
Mov Cap-2 Maneuver	-	-	-	-	884	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	908	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.012	-	-	0.027	-
HCM Control Delay (s)	8.4	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	WB	NB	NB	SB
Directions Served	LTR	LT	R	LT	R	LTR
Maximum Queue (ft)	40	60	46	43	38	202
Average Queue (ft)	13	29	25	23	17	101
95th Queue (ft)	41	58	46	46	41	187
Link Distance (ft)	174	1551		2074		904
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			160		440	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	EB	NB	SB
Directions Served	L	R	LT	TR
Maximum Queue (ft)	45	100	74	9
Average Queue (ft)	18	59	31	1
95th Queue (ft)	50	101	75	14
Link Distance (ft)	2914		298	1724
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		100		
Storage Blk Time (%)	0	1		
Queuing Penalty (veh)	0	0		

Intersection: 3: Monarch Way & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	20	43
Average Queue (ft)	2	17
95th Queue (ft)	22	48
Link Distance (ft)	1272	638
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	5	45
Average Queue (ft)	1	27
95th Queue (ft)	8	51
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	5	52
Average Queue (ft)	1	24
95th Queue (ft)	8	53
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	22
Average Queue (ft)	10
95th Queue (ft)	31
Link Distance (ft)	
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 0

HCM 6th AWSC
1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

10/10/2024

Intersection	
Intersection Delay, s/veh	57.3
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			↰	↱		↰	↱		✥	
Traffic Vol, veh/h	18	30	9	54	13	354	19	238	174	329	189	11
Future Vol, veh/h	18	30	9	54	13	354	19	238	174	329	189	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	7	0	1	0	0	1	3	2	0
Mvmt Flow	20	33	10	59	14	385	21	259	189	358	205	12
Number of Lanes	0	1	0	0	1	1	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	14.2	24.7	17.4	120.3
HCM LOS	B	C	C	F

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	7%	0%	32%	81%	0%	62%
Vol Thru, %	93%	0%	53%	19%	0%	36%
Vol Right, %	0%	100%	16%	0%	100%	2%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	257	174	57	67	354	529
LT Vol	19	0	18	54	0	329
Through Vol	238	0	30	13	0	189
RT Vol	0	174	9	0	354	11
Lane Flow Rate	279	189	62	73	385	575
Geometry Grp	5	5	4b	5	5	4b
Degree of Util (X)	0.57	0.347	0.152	0.163	0.729	1.166
Departure Headway (Hd)	7.74	6.978	9.539	8.497	7.235	7.3
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	469	518	379	425	504	494
Service Time	5.44	4.678	7.539	6.197	4.935	5.386
HCM Lane V/C Ratio	0.595	0.365	0.164	0.172	0.764	1.164
HCM Control Delay	20.2	13.3	14.2	12.8	27	120.3
HCM Lane LOS	C	B	B	B	D	F
HCM 95th-tile Q	3.5	1.5	0.5	0.6	6	20.5

HCM 6th TWSC
2: CSAH 21/Centerville Rd & CSAH 32/Ash St

10/10/2024

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱		↰↑	↱	
Traffic Vol, veh/h	51	295	192	405	282	22
Future Vol, veh/h	51	295	192	405	282	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	100	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	1	2	1	4
Mvmt Flow	55	321	209	440	307	24

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	957	319	331	0	-	0
Stage 1	319	-	-	-	-	-
Stage 2	638	-	-	-	-	-
Critical Hdwy	6.63	6.23	4.115	-	-	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	2.2095	-	-	-
Pot Cap-1 Maneuver	270	721	1233	-	-	-
Stage 1	736	-	-	-	-	-
Stage 2	489	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	210	721	1233	-	-	-
Mov Cap-2 Maneuver	210	-	-	-	-	-
Stage 1	571	-	-	-	-	-
Stage 2	489	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	16	3.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1233	-	210	721	-	-
HCM Lane V/C Ratio	0.169	-	0.264	0.445	-	-
HCM Control Delay (s)	8.5	0.5	28.2	13.9	-	-
HCM Lane LOS	A	A	D	B	-	-
HCM 95th %tile Q(veh)	0.6	-	1	2.3	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	⇆	
Traffic Vol, veh/h	339	14	13	197	6	11
Future Vol, veh/h	339	14	13	197	6	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	0	2	0	9
Mvmt Flow	368	15	14	214	7	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	383	0	618	376
Stage 1	-	-	-	-	376	-
Stage 2	-	-	-	-	242	-
Critical Hdwy	-	-	4.1	-	6.4	6.29
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.381
Pot Cap-1 Maneuver	-	-	1187	-	456	655
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1187	-	450	655
Mov Cap-2 Maneuver	-	-	-	-	450	-
Stage 1	-	-	-	-	699	-
Stage 2	-	-	-	-	793	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	564	-	-	1187	-
HCM Lane V/C Ratio	0.033	-	-	0.012	-
HCM Control Delay (s)	11.6	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	Y	
Traffic Vol, veh/h	336	32	9	194	14	17
Future Vol, veh/h	336	32	9	194	14	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	11	2	7	12
Mvmt Flow	365	35	10	211	15	18

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	400	0	596	365
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	231	-
Critical Hdwy	-	-	4.21	-	6.47	6.32
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.299	-	3.563	3.408
Pot Cap-1 Maneuver	-	-	1111	-	458	658
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	796	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1111	-	454	658
Mov Cap-2 Maneuver	-	-	-	-	454	-
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	789	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	12
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	547	-	-	1111	-
HCM Lane V/C Ratio	0.062	-	-	0.009	-
HCM Control Delay (s)	12	-	-	8.3	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	79	353	194	16	14	18
Future Vol, veh/h	79	353	194	16	14	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	2	2	0	0	2
Mvmt Flow	86	384	211	17	15	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	228	0	-	0	776	220
Stage 1	-	-	-	-	220	-
Stage 2	-	-	-	-	556	-
Critical Hdwy	4.1	-	-	-	6.4	6.22
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.318
Pot Cap-1 Maneuver	1352	-	-	-	369	820
Stage 1	-	-	-	-	821	-
Stage 2	-	-	-	-	578	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1352	-	-	-	339	820
Mov Cap-2 Maneuver	-	-	-	-	339	-
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	578	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1352	-	-	-	506
HCM Lane V/C Ratio	0.064	-	-	-	0.069
HCM Control Delay (s)	7.8	0	-	-	12.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.2

Intersection	
Int Delay, s/veh	7.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	↰↱	
Traffic Vol, veh/h	0	0	43	0	0	57
Future Vol, veh/h	0	0	43	0	0	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	47	0	0	62

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	95	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	94	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	905	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	930	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	879	1084
Mov Cap-2 Maneuver	-	-	-	-	879	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	903	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.057	-	-	0.029	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	WB	NB	NB	SB
Directions Served	LTR	LT	R	LT	R	LTR
Maximum Queue (ft)	37	51	110	82	59	322
Average Queue (ft)	17	20	62	52	39	193
95th Queue (ft)	40	41	117	86	62	404
Link Distance (ft)	174	1551		2074		904
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)			160		440	
Storage Blk Time (%)			0			
Queuing Penalty (veh)			0			

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	EB	NB
Directions Served	L	R	LT
Maximum Queue (ft)	82	149	66
Average Queue (ft)	30	77	38
95th Queue (ft)	87	142	70
Link Distance (ft)	2914		298
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		100	
Storage Blk Time (%)		3	
Queuing Penalty (veh)		1	

Intersection: 3: Monarch Way & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	31	35
Average Queue (ft)	6	12
95th Queue (ft)	29	37
Link Distance (ft)	1272	638
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	6	31
Average Queue (ft)	2	15
95th Queue (ft)	13	36
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	37	28
Average Queue (ft)	10	17
95th Queue (ft)	35	37
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	28
Average Queue (ft)	20
95th Queue (ft)	41
Link Distance (ft)	
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 1

Appendix H: Map and Crash Detail Report

Crash Case Listing

Crash Area 1

Route System	Route Number	Measure	Co	City	Incident Number	Date	Time	Day of Week	Basic Type	Num Veh	Sev

Selection Filter:

WORK AREA: County('659447','2') - FILTER: Year('2019','2020','2021','2022','2023','2024') - SPATIAL FILTER APPLIED

Analyst:

Andrea Schmid

Notes:

CR J/Ash St @ CSAH 21 (Centerville Rd)

Crash Case Listing

Crash Area 2.5

Route System	Route Number	Measure	Co	City	Incident Number	Date	Time	Day of Week	Basic Type	Num Veh	Sev
04-CSAH	32	7.979	02	Lino Lakes	01140731	10/31/23	0230	TUE	SVROR	1	N
04-CSAH	32	7.982	02	Lino Lakes	01001003	01/22/22	1657	SAT	SVROR	1	C
04-CSAH	32	7.994	02	Lino Lakes	00977879	12/06/21	1020	MON	SVROR	1	N
04-CSAH	32	7.997	02	Lino Lakes	00979834	12/10/21	1718	FRI	SSO	2	N
04-CSAH	32	8.022	02	Lino Lakes	00849083	10/23/20	0002	FRI	SVROR	1	N
04-CSAH	32	8.025	02	Lino Lakes	01067900	12/17/22	1000	SAT	SVROR	1	N
04-CSAH	32	8.043	02	Lino Lakes	00932906	08/07/21	1207	SAT	SSO	2	C
04-CSAH	32	8.107	02	Lino Lakes	01149165	12/09/23	0318	SAT	SVROR	1	N
04-CSAH	32	8.111	02	Lino Lakes	00680160	01/28/19	0530	MON	SVROR	1	N
04-CSAH	32	8.310	02	Lino Lakes	01053870	10/25/22	0519	TUE	Other	1	N
04-CSAH	32	8.363	02	Lino Lakes	00739561	08/10/19	1237	SAT	Rear End	2	N
04-CSAH	32	8.607	02	Lino Lakes	01117465	06/29/23	2035	THU	Other	1	N
04-CSAH	32	8.773	02	Lino Lakes	00808901	05/02/20	1230	SAT	Angle	2	N
04-CSAH	32	8.842	02	Lino Lakes	00905478	05/12/21	1519	WED	Angle	2	N
04-CSAH	32	8.845	02	Lino Lakes	01017077	04/11/22	1734	MON	Angle	2	N
04-CSAH	32	8.849	02	Lino Lakes	00752249	10/04/19	1600	FRI	SSO	2	N
04-CSAH	32	8.850	02	Lino Lakes	01134192	09/27/23	1353	WED	Other	2	N

Selection Filter:

WORK AREA: County('659447','2') - FILTER: Year('2019','2020','2021','2022','2023','2024') - ROUTE FILTER APPLIED

Analyst: Andrea Schmid

Notes: Corridor Between Crash Areas 2 and 3

Crash Case Listing

Crash Area 2

Route System	Route Number	Measure	Co	City	Incident Number	Date	Time	Day of Week	Basic Type	Num Veh	Sev
04-CSAH	21	0.262	02	Lino Lakes	00684278	02/05/19	1730	TUE	Angle	3	N
04-CSAH	21	0.262	02	Lino Lakes	00741687	08/20/19	1616	TUE	Other	2	C
04-CSAH	21	0.267	02	Lino Lakes	01130479	09/08/23	1157	FRI	Rear End	2	C
04-CSAH	21	0.270	02	Lino Lakes	00843926	10/01/20	0809	THU	SSO	2	N
04-CSAH	21	0.294	02	Lino Lakes	00683030	02/04/19	1016	MON	Other	1	N
04-CSAH	32	8.842	02	Lino Lakes	00905478	05/12/21	1519	WED	Angle	2	N
04-CSAH	32	8.845	02	Lino Lakes	01017077	04/11/22	1734	MON	Angle	2	N
04-CSAH	32	8.849	02	Lino Lakes	00752249	10/04/19	1600	FRI	SSO	2	N
04-CSAH	32	8.850	02	Lino Lakes	01134192	09/27/23	1353	WED	Other	2	N

Selection Filter:

WORK AREA: County('659447','2') - FILTER: Year('2019','2020','2021','2022','2023','2024') - SPATIAL FILTER APPLIED

Analyst:

Andrea Schmid

Notes:

CSAH 32 (Ash St) @ CSAH 21 (Centerville Rd)

Crash Case Listing

Crash Area 3

Route System	Route Number	Measure	Co	City	Incident Number	Date	Time	Day of Week	Basic Type	Num Veh	Sev

Selection Filter:

WORK AREA: County('659447','2') - FILTER: Year('2019','2020','2021','2022','2023','2024') - SPATIAL FILTER APPLIED

Analyst:

Andrea Schmid

Notes:

CSAH 32 (Ash St) @ Monarch Way

Crash Case Listing

Crash Area 4

Route System	Route Number	Measure	Co	City	Incident Number	Date	Time	Day of Week	Basic Type	Num Veh	Sev

Selection Filter:

WORK AREA: County('659447','2') - FILTER: Year('2019','2020','2021','2022','2023','2024') - SPATIAL FILTER APPLIED

Analyst:

Andrea Schmid

Notes:

CSAH 32 (Ash St) @ Rapp Farm Blvd

Crash Case Listing

Crash Area 5

Route System	Route Number	Measure	Co	City	Incident Number	Date	Time	Day of Week	Basic Type	Num Veh	Sev

Selection Filter:

WORK AREA: County('659447','2') - FILTER: Year('2019','2020','2021','2022','2023','2024') - SPATIAL FILTER APPLIED

Analyst:

Andrea Schmid

Notes:

CSAH 32 (Ash St) @ Holly Dr

Appendix I: Internal Capture Charts

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND AM INTERNAL CAPTURE SUMMARY

LAND USE A **RESIDENTIAL**

ITE LU Code Varies

Size Varies

	Total	Internal	External
Enter	30	1	29
Exit	89	1	88
Total	119	1	118
	100%	1%	99%

LAND USE B **RETAIL**

ITE LU Code 822

Size <40K

	Total	Internal	External
Enter	63	1	62
Exit	42	1	41
Total	105	1	104
	100%	1%	99%

Net External Trips for Mulit-Use Development

	LAND USE A	LAND USE B	TOTAL	
Enter	29	62	92	
Exit	88	41	130	
Total	118	104	221	INTERNAL CAPTURE
Single-Use Trip Gen. Est.	119	105	224	1%

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND PM INTERNAL CAPTURE SUMMARY

LAND USE A **RESIDENTIAL**

ITE LU Code Varies
Size Varies

	Total	Internal	External
Enter	80	37	43
Exit	53	16	37
Total	133	53	81
	100%	39%	61%

Exit to External
37

Enter from External
43

46%	37	37	26%	41
42%	22	16	10%	16

LAND USE B **RETAIL**

ITE LU Code 822
Size <40K

	Total	Internal	External
Enter	157	16	141
Exit	157	37	120
Total	314	53	262
	100%	17%	83%

Enter from External
141

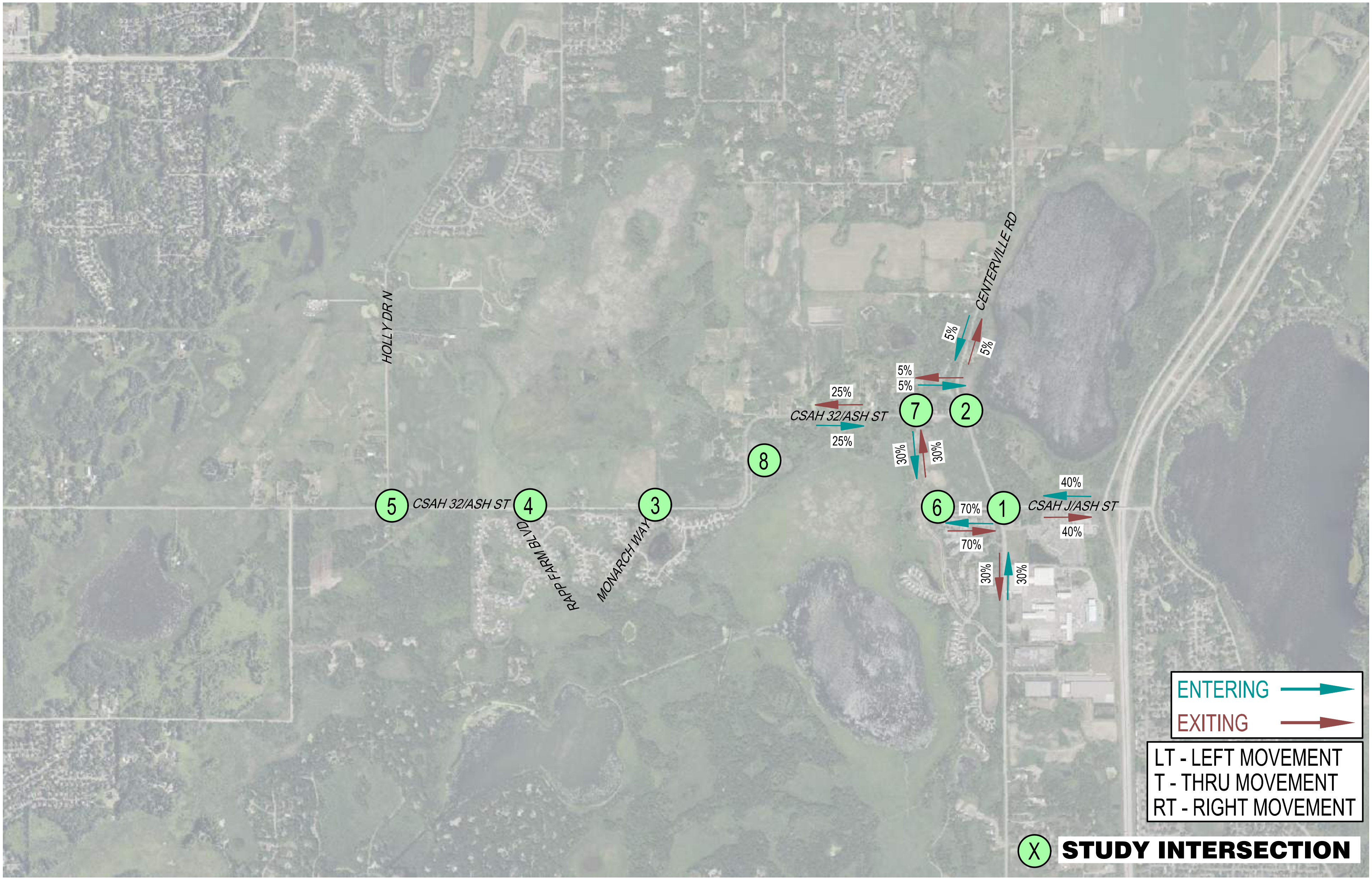
Exit to External
120

Net External Trips for Mulit-Use Development

	LAND USE A	LAND USE B	TOTAL
Enter	43	141	185
Exit	37	120	158
Total	81	262	342
Single-Use Trip Gen. Est.	133	314	447

INTERNAL CAPTURE
23%

Appendix J: Trip Distribution



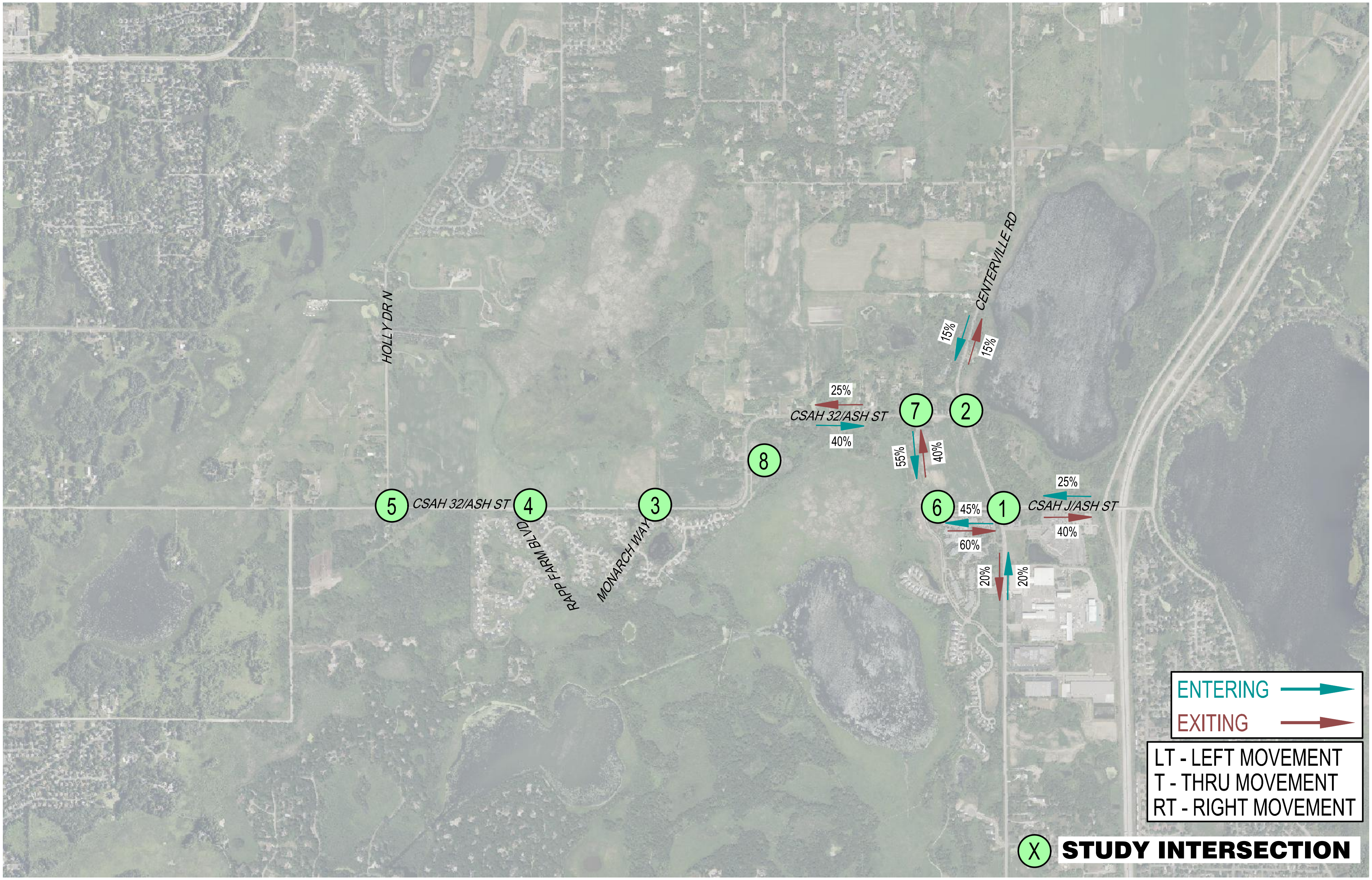
TRIP DISTRIBUTION - WILKINSON RESIDENTIAL AM

0 2000 4000
SCALE IN FEET

N

Architecture + Engineering + Environmental + Planning
ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671



TRIP DISTRIBUTION - WILKINSON RESIDENTIAL PM

ISG

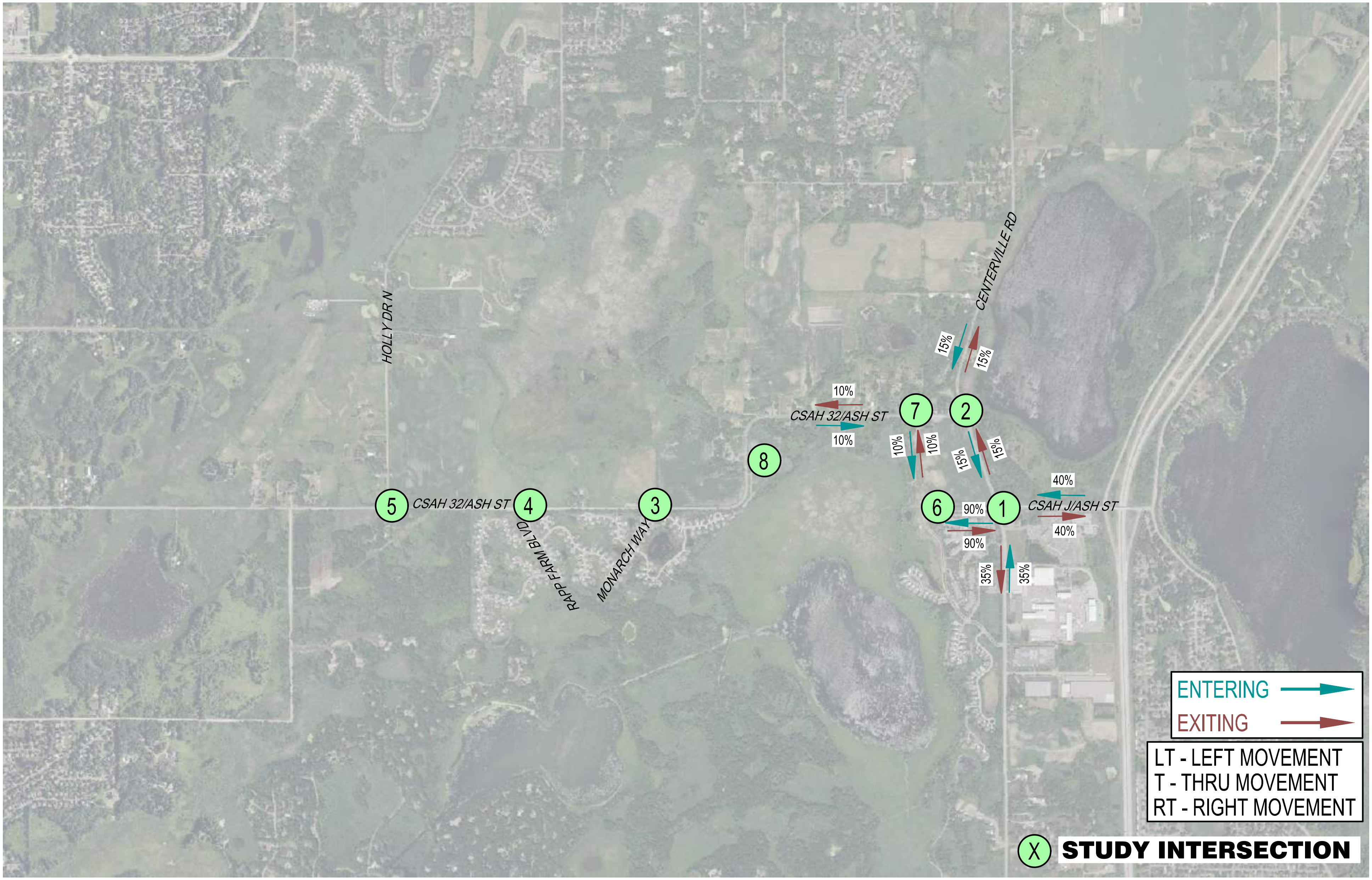
Architecture + Engineering + Environmental + Planning

ISGInc.com

WILKINSON WATERS DEVELOPMENT

LINO LAKES, MINNESOTA - 10/14/2024

ISG PROJECT NO. 24-30671



TRIP DISTRIBUTION - WILKINSON RETAIL AM

0 2000 4000
SCALE IN FEET

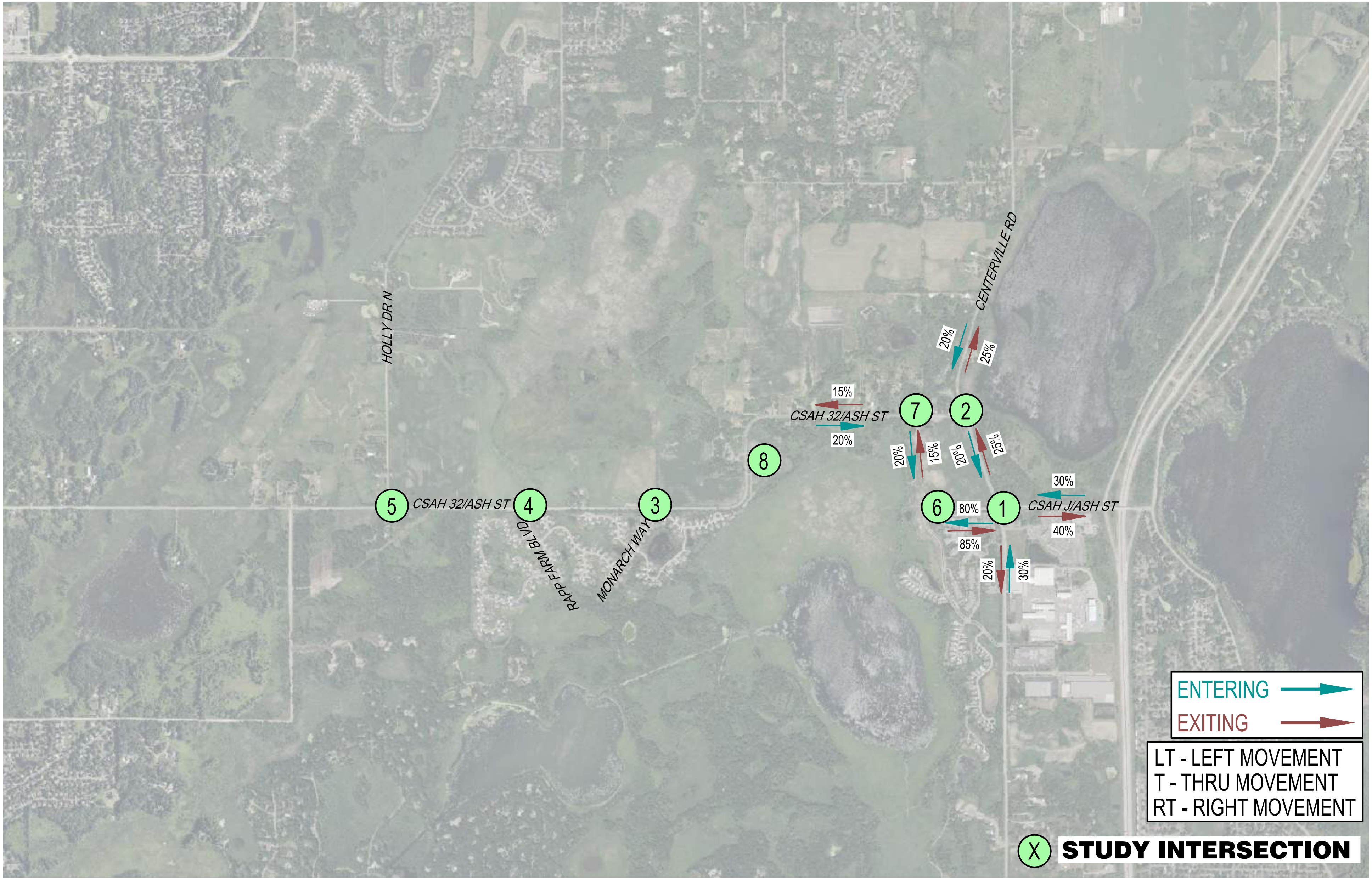
N

ISG

Architecture + Engineering + Environmental + Planning

ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671



TRIP DISTRIBUTION - WILKINSON RETAIL PM

ISG

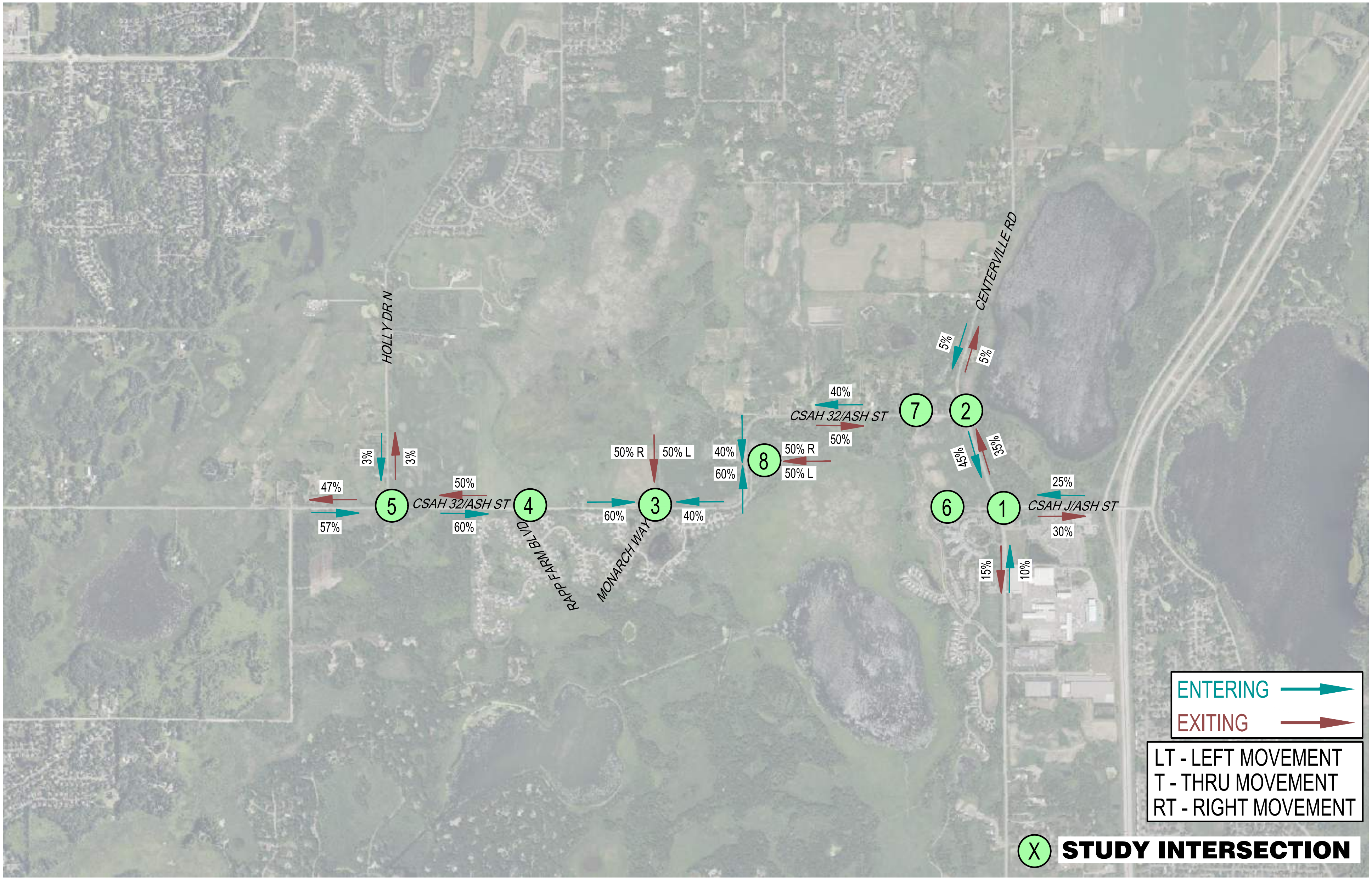
Architecture + Engineering + Environmental + Planning

ISGInc.com

WILKINSON WATERS DEVELOPMENT

LINO LAKES, MINNESOTA - 10/14/2024

ISG PROJECT NO. 24-30671



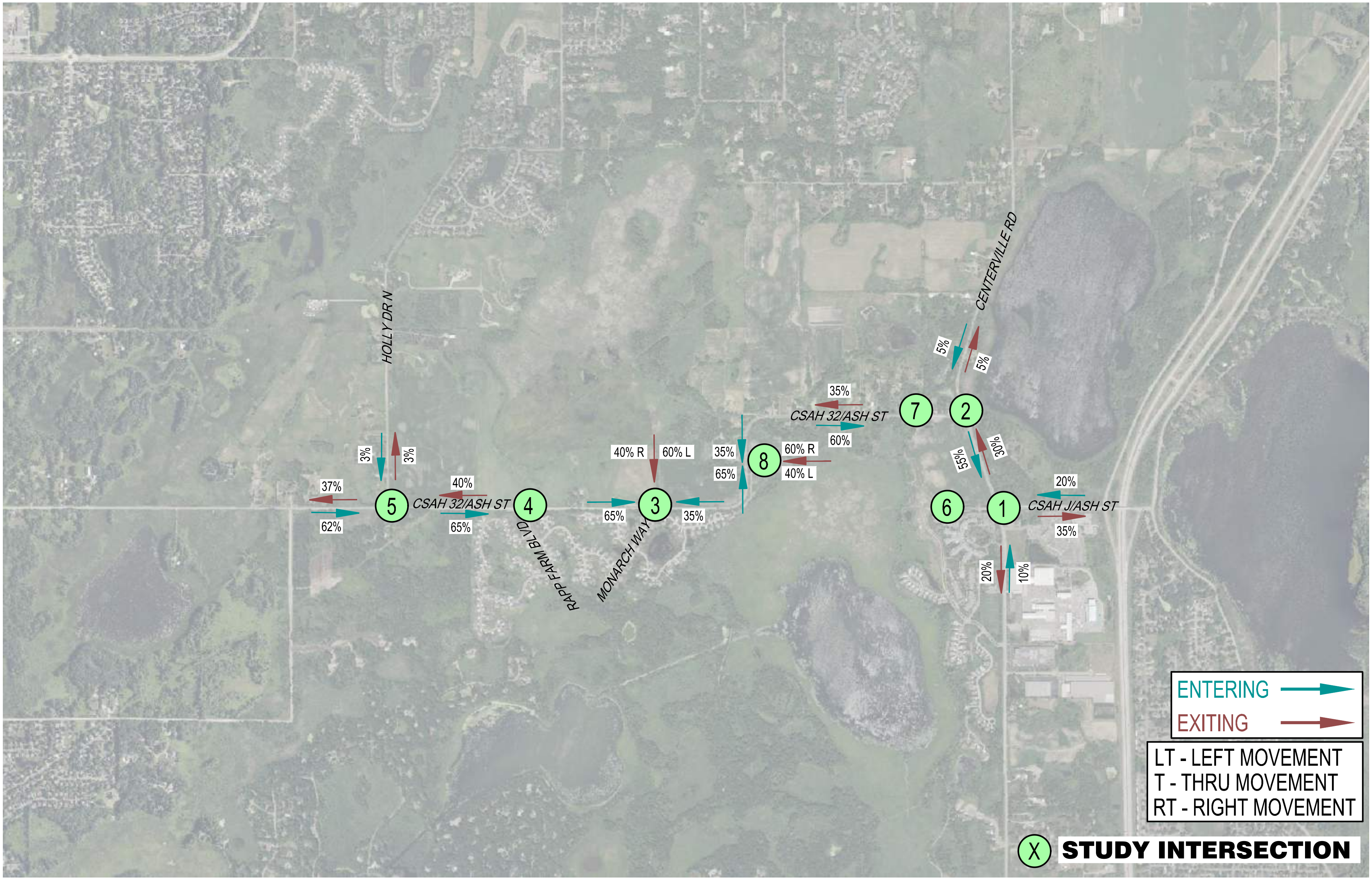
TRIP DISTRIBUTION - NORTH OAKS FARMS AM

ISG

Architecture + Engineering + Environmental + Planning

ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671



TRIP DISTRIBUTION - NORTH OAKS FARMS PM

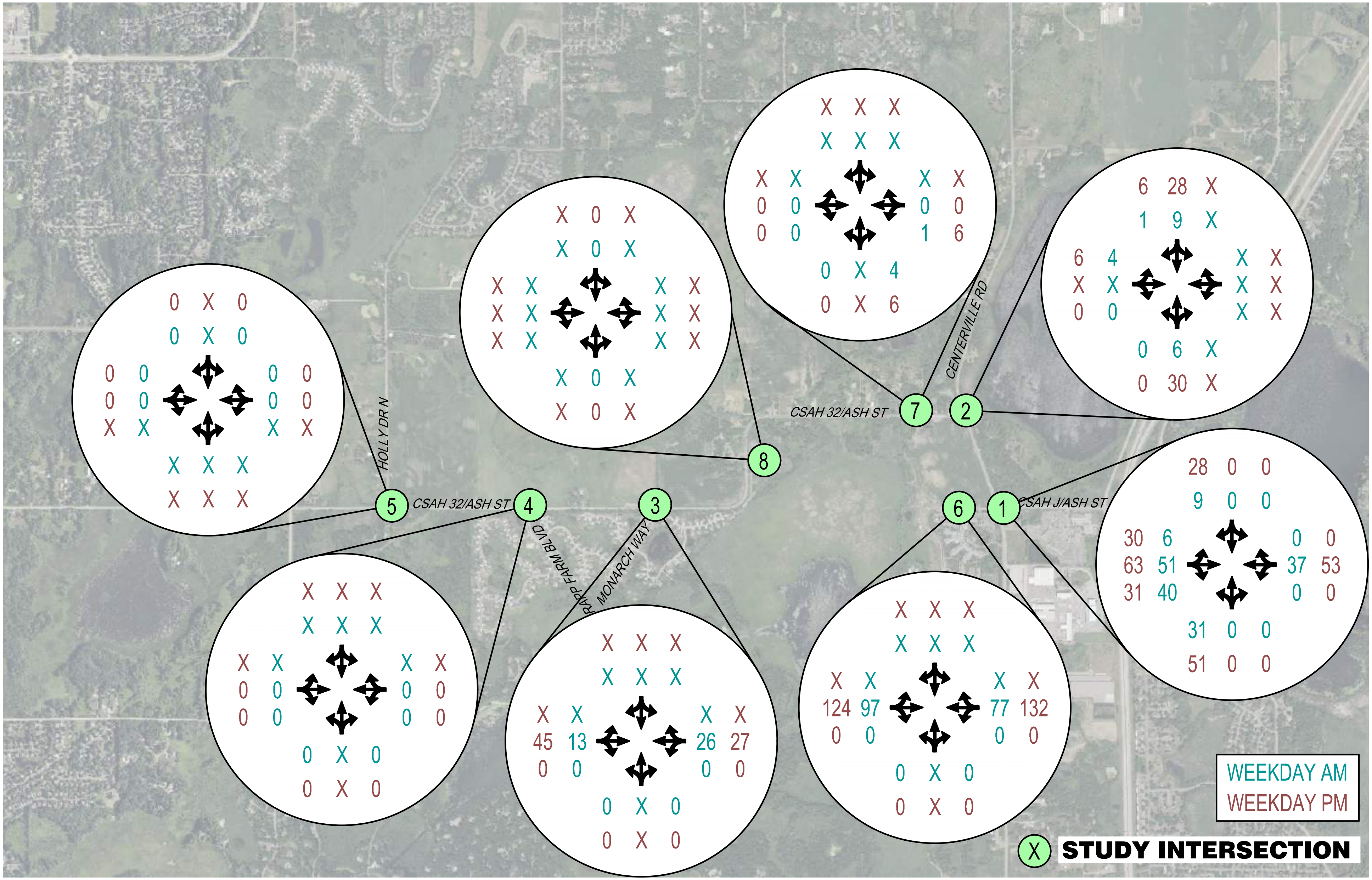
0 2000 4000
SCALE IN FEET
N

ISG

Architecture + Engineering + Environmental + Planning
ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671

Appendix K: Trip Assignment

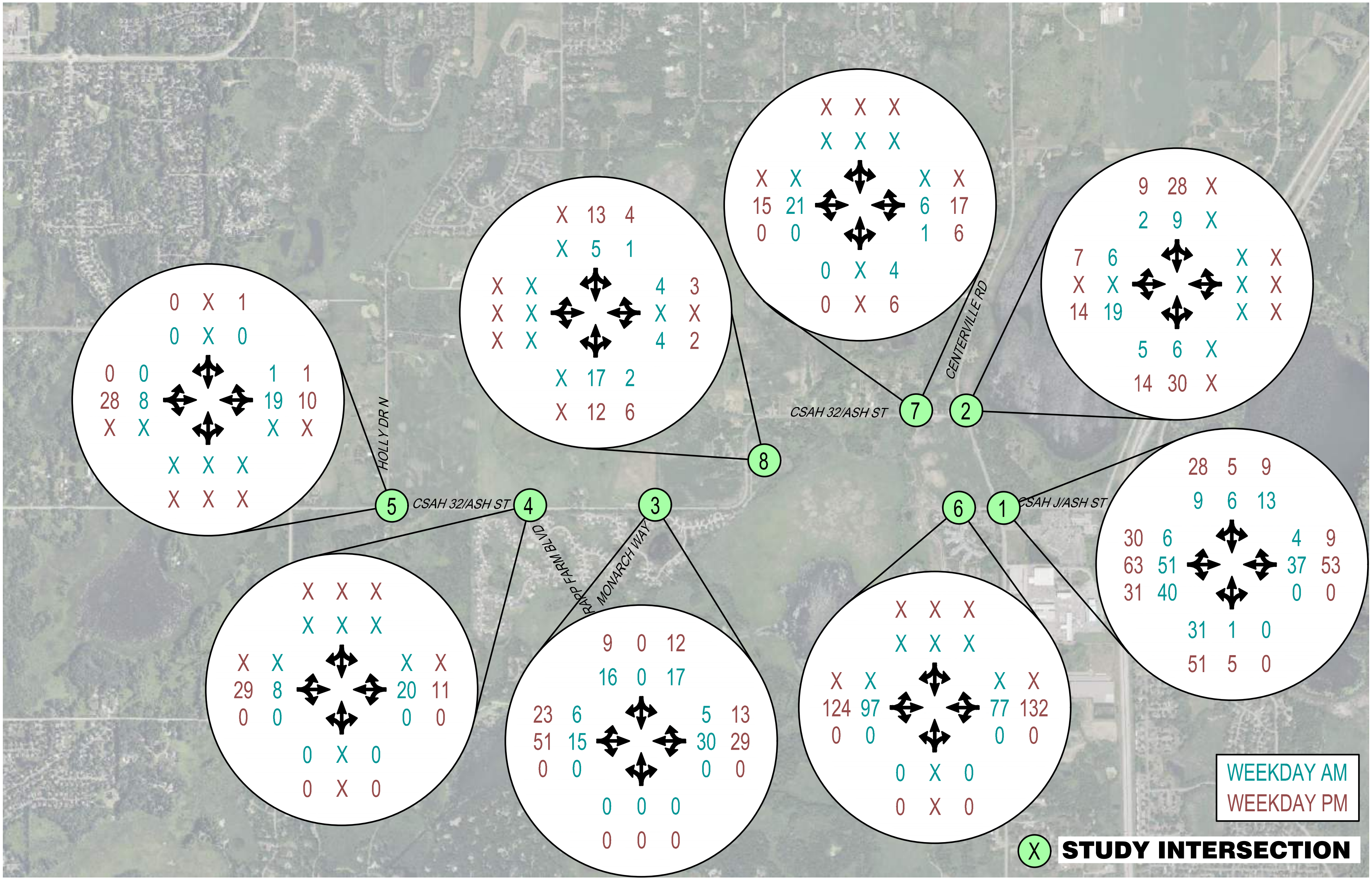


DEVELOPMENT 2025 - TURNING MOVEMENT DIAGRAM

ISG

Architecture + Engineering + Environmental + Planning
ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671



DEVELOPMENT 2045 - TURNING MOVEMENT DIAGRAM

0 2000 4000
SCALE IN FEET

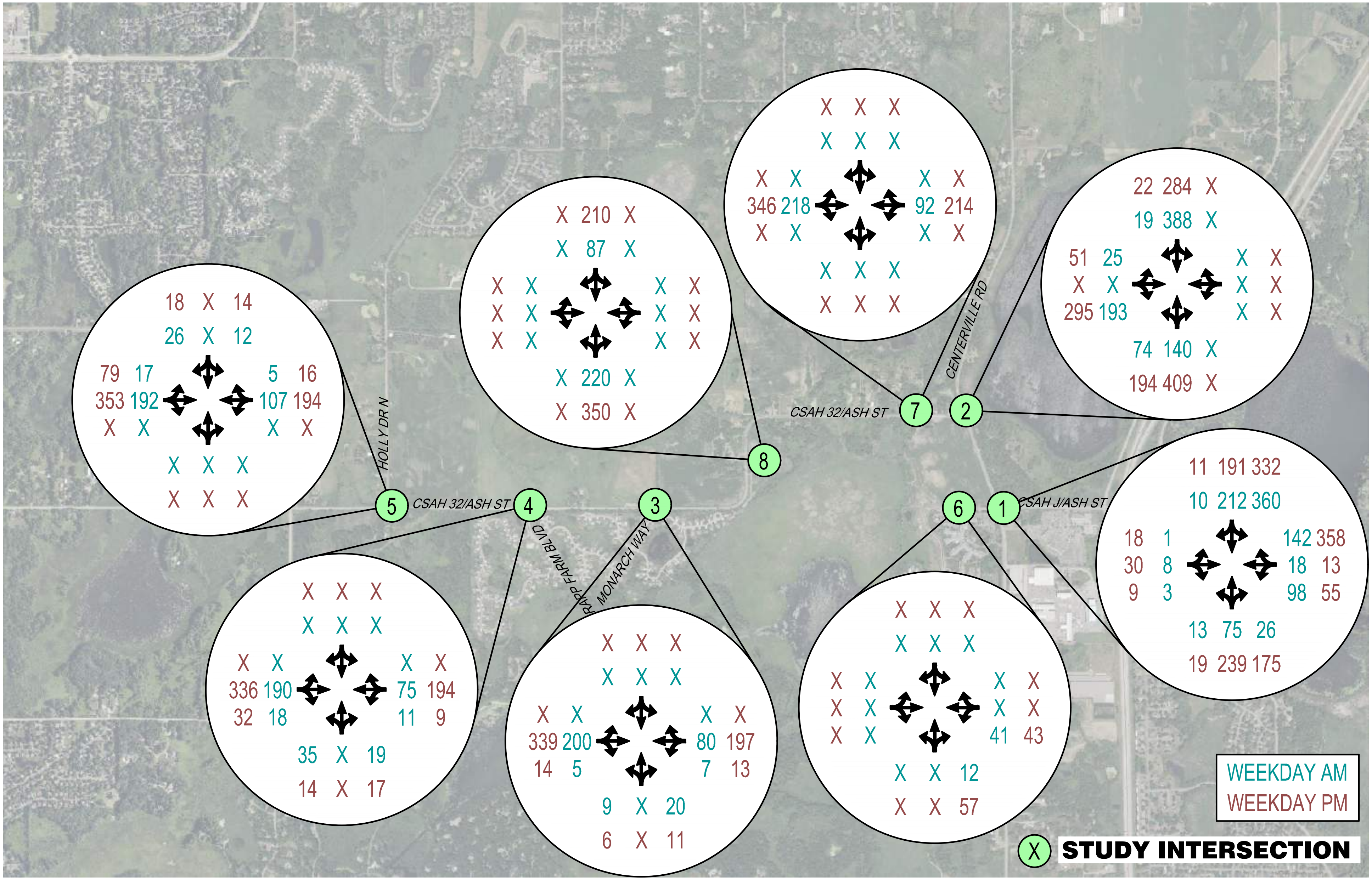
N

ISG

Architecture + Engineering + Environmental + Planning
ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671

Appendix L: Future Scenario Peak Hour Turning Movement Volume Diagrams



0 2000 4000
SCALE IN FEET

N

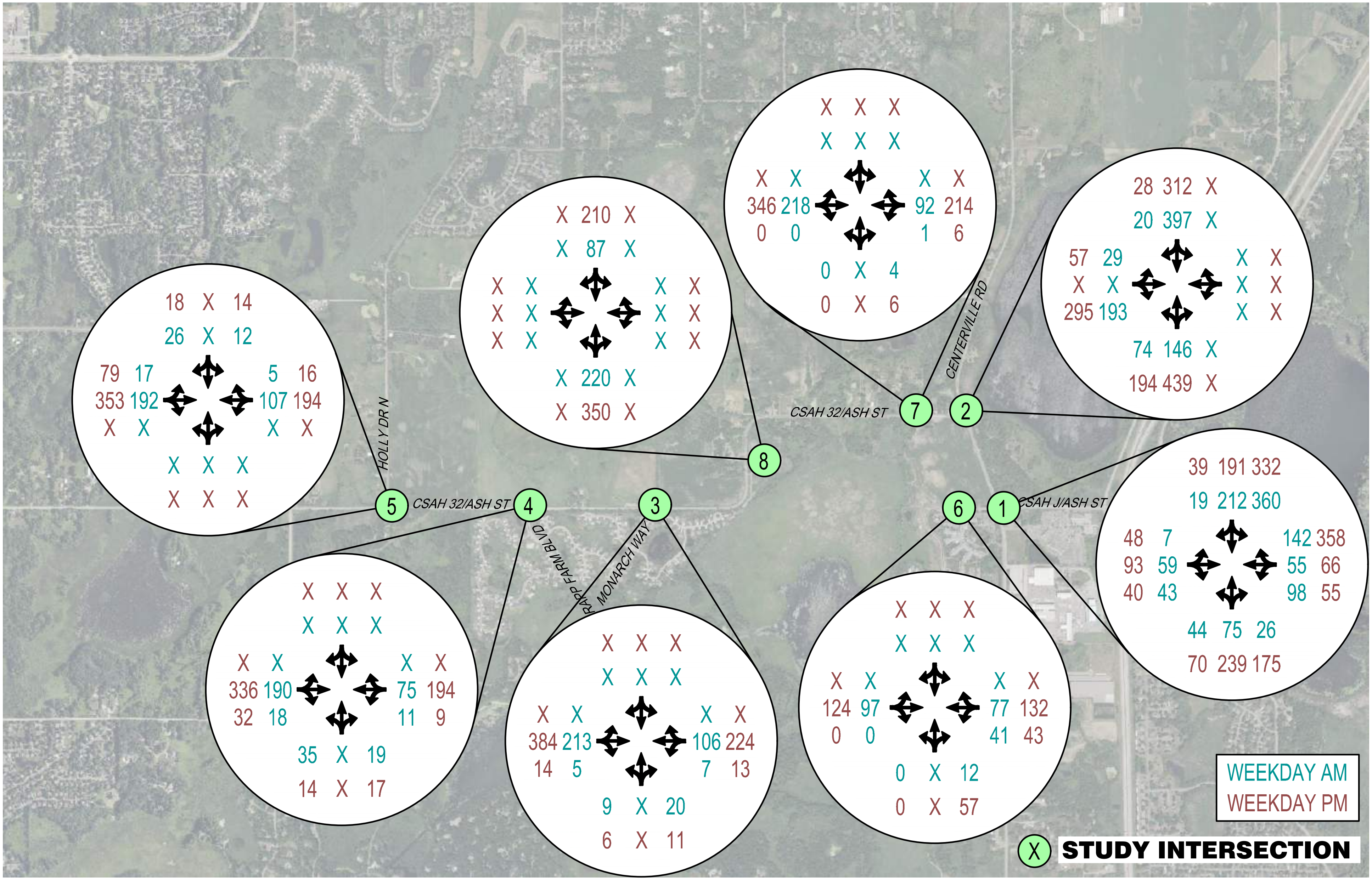
NO BUILD 2025 - TURNING MOVEMENT DIAGRAM

ISG

Architecture + Engineering + Environmental + Planning

ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671



0 2000 4000
SCALE IN FEET

N

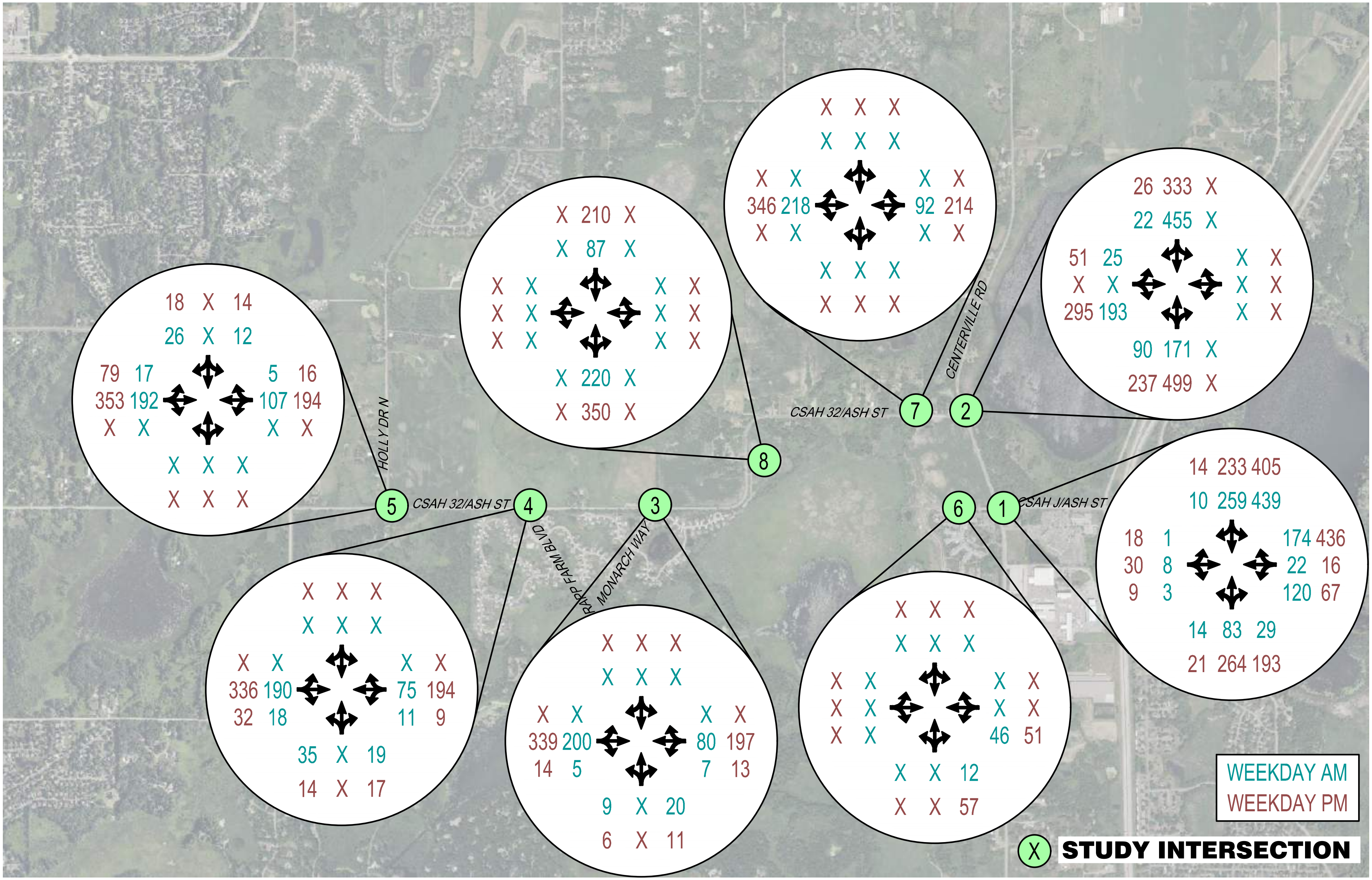
BUILD 2025 - TURNING MOVEMENT DIAGRAM

ISG

Architecture + Engineering + Environmental + Planning

ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671



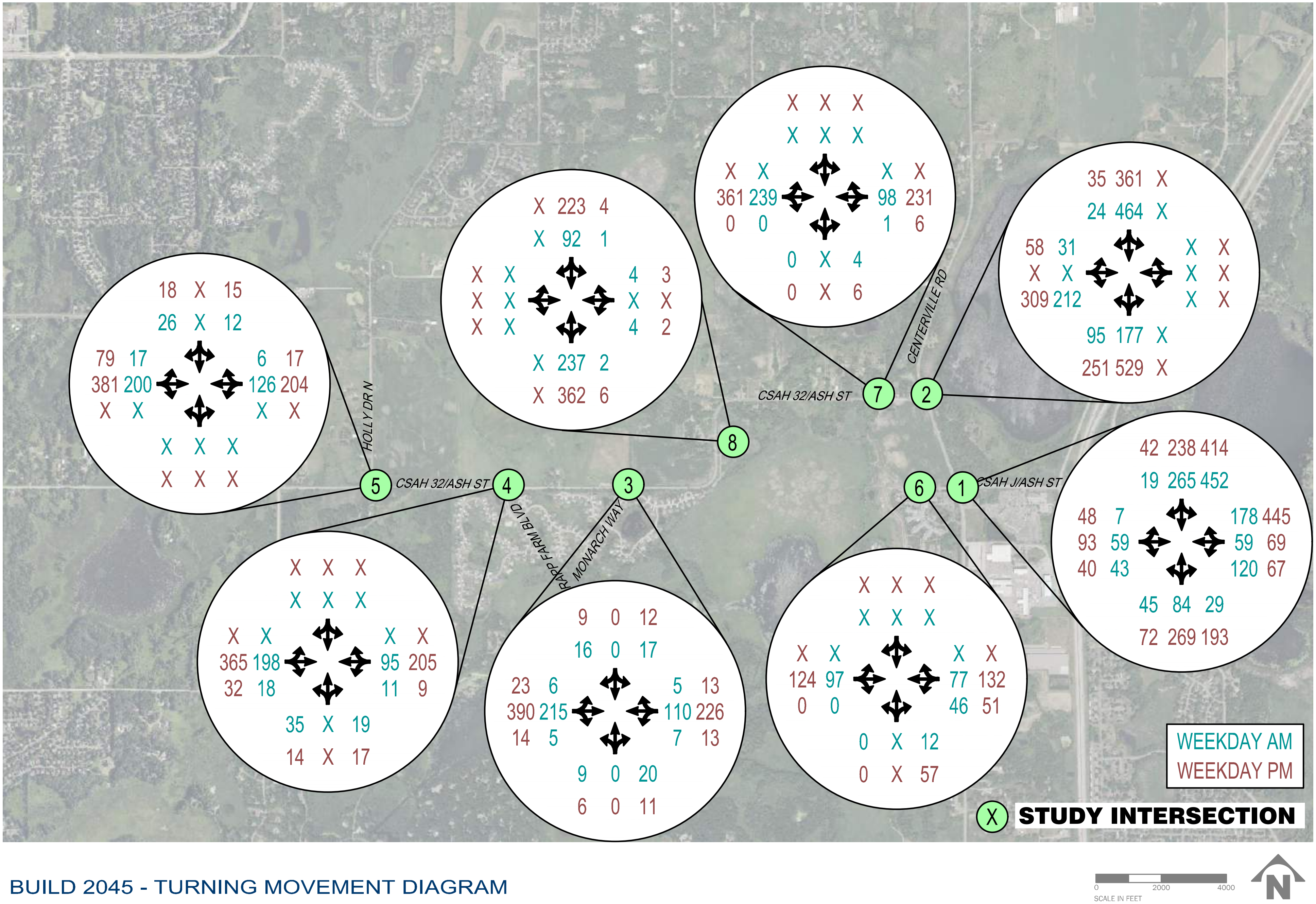
NO BUILD 2045 - TURNING MOVEMENT DIAGRAM

ISG

Architecture + Engineering + Environmental + Planning

ISGInc.com

WILKINSON WATERS DEVELOPMENT
LINO LAKES, MINNESOTA - 10/14/2024
ISG PROJECT NO. 24-30671



BUILD 2045 - TURNING MOVEMENT DIAGRAM

ISG

Architecture + Engineering + Environmental + Planning

ISGInc.com

WILKINSON WATERS DEVELOPMENT

LINO LAKES, MINNESOTA - 10/14/2024

ISG PROJECT NO. 24-30671

Appendix M: Opening Year No Build (2025) Synchro Analysis Worksheets

Intersection	
Intersection Delay, s/veh	7.9
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	13	281	124	632
Demand Flow Rate, veh/h	16	302	130	650
Vehicles Circulating, veh/h	751	100	412	149
Vehicles Exiting, veh/h	48	442	355	253
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.4	5.3	5.6	9.6
Approach LOS	A	A	A	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	16	302	130	650
Cap Entry Lane, veh/h	641	1246	906	1185
Entry HV Adj Factor	0.793	0.930	0.955	0.972
Flow Entry, veh/h	13	281	124	632
Cap Entry, veh/h	509	1159	866	1152
V/C Ratio	0.025	0.242	0.143	0.548
Control Delay, s/veh	7.4	5.3	5.6	9.6
LOS	A	A	A	A
95th %tile Queue, veh	0	1	0	3

Intersection	
Intersection Delay, s/veh	6.1
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	237	232	443
Demand Flow Rate, veh/h	248	247	455
Vehicles Circulating, veh/h	430	28	89
Vehicles Exiting, veh/h	114	650	186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.3	4.4	6.4
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	248	247	455
Cap Entry Lane, veh/h	890	1341	1260
Entry HV Adj Factor	0.956	0.939	0.973
Flow Entry, veh/h	237	232	443
Cap Entry, veh/h	850	1259	1226
V/C Ratio	0.279	0.184	0.361
Control Delay, s/veh	7.3	4.4	6.4
LOS	A	A	A
95th %tile Queue, veh	1	1	2

HCM 6th TWSC
3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	200	5	7	80	0	9	0	20	0	0	0
Future Vol, veh/h	0	200	5	7	80	0	9	0	20	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	6	20	14	11	2	11	2	0	2	2	2
Mvmt Flow	0	217	5	8	87	0	10	0	22	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	87	0	0	222	0	0	323	323	220	334	325	87
Stage 1	-	-	-	-	-	-	220	220	-	103	103	-
Stage 2	-	-	-	-	-	-	103	103	-	231	222	-
Critical Hdwy	4.12	-	-	4.24	-	-	7.21	6.52	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.21	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.21	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.326	-	-	3.599	4.018	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1509	-	-	1279	-	-	613	595	825	620	593	971
Stage 1	-	-	-	-	-	-	762	721	-	903	810	-
Stage 2	-	-	-	-	-	-	881	810	-	772	720	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1509	-	-	1279	-	-	610	591	825	600	589	971
Mov Cap-2 Maneuver	-	-	-	-	-	-	610	591	-	600	589	-
Stage 1	-	-	-	-	-	-	762	721	-	903	804	-
Stage 2	-	-	-	-	-	-	875	804	-	752	720	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	10.1	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	744	1509	-	-	1279	-	-	-
HCM Lane V/C Ratio	0.042	-	-	-	0.006	-	-	-
HCM Control Delay (s)	10.1	0	-	-	7.8	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

4: Rapp Farm Blvd & CSAH 32/Ash St

Intersection	
Int Delay, s/veh	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰↱	
Traffic Vol, veh/h	190	18	11	75	35	19
Future Vol, veh/h	190	18	11	75	35	19
Conflicting Peds, #/hr	0	0	1	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	0	18	7	3	0
Mvmt Flow	207	20	12	82	38	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	228	0	315	208
Stage 1	-	-	-	-	208	-
Stage 2	-	-	-	-	107	-
Critical Hdwy	-	-	4.28	-	6.43	6.2
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.362	-	3.527	3.3
Pot Cap-1 Maneuver	-	-	1251	-	676	837
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	915	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1250	-	668	836
Mov Cap-2 Maneuver	-	-	-	-	668	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	905	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	719	-	-	1250	-
HCM Lane V/C Ratio	0.082	-	-	0.01	-
HCM Control Delay (s)	10.5	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	17	192	107	5	12	26
Future Vol, veh/h	17	192	107	5	12	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	6	8	0	8	12
Mvmt Flow	18	209	116	5	13	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	121	0	-	0	364	119
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	245	-
Critical Hdwy	4.16	-	-	-	6.48	6.32
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.254	-	-	-	3.572	3.408
Pot Cap-1 Maneuver	1442	-	-	-	624	906
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	782	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1442	-	-	-	615	906
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	782	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1442	-	-	-	788
HCM Lane V/C Ratio	0.013	-	-	-	0.052
HCM Control Delay (s)	7.5	0	-	-	9.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

HCM 6th TWSC
6: South Access Wilkison/Wilkinson Lake Blvd

Intersection	
Int Delay, s/veh	7.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰↱	
Traffic Vol, veh/h	0	0	41	0	0	12
Future Vol, veh/h	0	0	41	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	47	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	45	0	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	91	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	909	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	934	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	884	1084
Mov Cap-2 Maneuver	-	-	-	-	884	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	908	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.012	-	-	0.027	-
HCM Control Delay (s)	8.4	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Queuing and Blocking Report

10/10/2024

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	37	62	41	66
Average Queue (ft)	7	23	18	33
95th Queue (ft)	40	63	46	70
Link Distance (ft)	151	1544	2058	882
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	72	16	52
Average Queue (ft)	37	2	15
95th Queue (ft)	78	19	48
Link Distance (ft)	685	270	1709
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LTR	LTR
Maximum Queue (ft)	4	34
Average Queue (ft)	1	20
95th Queue (ft)	6	46
Link Distance (ft)	1276	637
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	19	50
Average Queue (ft)	5	26
95th Queue (ft)	26	52
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	15	49
Average Queue (ft)	2	23
95th Queue (ft)	18	53
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: South Access Wilkison/Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	9
95th Queue (ft)	30
Link Distance (ft)	
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	63	463	471	581
Demand Flow Rate, veh/h	63	471	473	596
Vehicles Circulating, veh/h	648	301	425	99
Vehicles Exiting, veh/h	47	597	286	673
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.0	9.0	11.1	8.0
Approach LOS	A	A	B	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	63	471	473	596
Cap Entry Lane, veh/h	713	1015	895	1247
Entry HV Adj Factor	1.000	0.983	0.996	0.975
Flow Entry, veh/h	63	463	471	581
Cap Entry, veh/h	713	998	891	1216
V/C Ratio	0.088	0.464	0.529	0.478
Control Delay, s/veh	6.0	9.0	11.1	8.0
LOS	A	A	B	A
95th %tile Queue, veh	0	3	3	3

Intersection	
Intersection Delay, s/veh	7.6
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	376	656	333
Demand Flow Rate, veh/h	383	667	337
Vehicles Circulating, veh/h	312	56	213
Vehicles Exiting, veh/h	238	639	510
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.8	8.3	6.2
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	383	667	337
Cap Entry Lane, veh/h	1004	1303	1110
Entry HV Adj Factor	0.982	0.984	0.988
Flow Entry, veh/h	376	656	333
Cap Entry, veh/h	985	1282	1097
V/C Ratio	0.382	0.512	0.303
Control Delay, s/veh	7.8	8.3	6.2
LOS	A	A	A
95th %tile Queue, veh	2	3	1

HCM 6th TWSC
3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

10/10/2024

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	0	339	14	13	197	0	6	0	11	0	0	0
Future Vol, veh/h	0	339	14	13	197	0	6	0	11	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	0	0	2	2	0	2	9	2	2	2
Mvmt Flow	0	368	15	14	214	0	7	0	12	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	214	0	0	383	0	0	618	618	376	624	625	214
Stage 1	-	-	-	-	-	-	376	376	-	242	242	-
Stage 2	-	-	-	-	-	-	242	242	-	382	383	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.52	6.29	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4.018	3.381	3.518	4.018	3.318
Pot Cap-1 Maneuver	1356	-	-	1187	-	-	404	405	655	398	401	826
Stage 1	-	-	-	-	-	-	649	616	-	762	705	-
Stage 2	-	-	-	-	-	-	766	705	-	640	612	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1356	-	-	1187	-	-	400	400	655	387	396	826
Mov Cap-2 Maneuver	-	-	-	-	-	-	400	400	-	387	396	-
Stage 1	-	-	-	-	-	-	649	616	-	762	696	-
Stage 2	-	-	-	-	-	-	756	696	-	628	612	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	12	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	535	1356	-	-	1187	-	-	-
HCM Lane V/C Ratio	0.035	-	-	-	0.012	-	-	-
HCM Control Delay (s)	12	0	-	-	8.1	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰↱	
Traffic Vol, veh/h	336	32	9	194	14	17
Future Vol, veh/h	336	32	9	194	14	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	11	2	7	12
Mvmt Flow	365	35	10	211	15	18

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	400	0	596	365
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	231	-
Critical Hdwy	-	-	4.21	-	6.47	6.32
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.299	-	3.563	3.408
Pot Cap-1 Maneuver	-	-	1111	-	458	658
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	796	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1111	-	454	658
Mov Cap-2 Maneuver	-	-	-	-	454	-
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	789	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	12
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	547	-	-	1111	-
HCM Lane V/C Ratio	0.062	-	-	0.009	-
HCM Control Delay (s)	12	-	-	8.3	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⇆	
Traffic Vol, veh/h	79	353	194	16	14	18
Future Vol, veh/h	79	353	194	16	14	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	2	2	0	0	2
Mvmt Flow	86	384	211	17	15	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	228	0	-	0	776	220
Stage 1	-	-	-	-	220	-
Stage 2	-	-	-	-	556	-
Critical Hdwy	4.1	-	-	-	6.4	6.22
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.318
Pot Cap-1 Maneuver	1352	-	-	-	369	820
Stage 1	-	-	-	-	821	-
Stage 2	-	-	-	-	578	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1352	-	-	-	339	820
Mov Cap-2 Maneuver	-	-	-	-	339	-
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	578	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1352	-	-	-	506
HCM Lane V/C Ratio	0.064	-	-	-	0.069
HCM Control Delay (s)	7.8	0	-	-	12.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.2

Intersection	
Int Delay, s/veh	7.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰↱	
Traffic Vol, veh/h	0	0	43	0	0	57
Future Vol, veh/h	0	0	43	0	0	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	47	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	47	0	0	62

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	95	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	94	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	905	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	930	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	879	1084
Mov Cap-2 Maneuver	-	-	-	-	879	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	903	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		7.3		8.5	
HCM LOS					A	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.057	-	-	0.029	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Queuing and Blocking Report

10/10/2024

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	31	77	130	76
Average Queue (ft)	10	38	62	26
95th Queue (ft)	34	79	133	68
Link Distance (ft)	151	1544	2058	882
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	108	52	62
Average Queue (ft)	59	19	26
95th Queue (ft)	127	57	66
Link Distance (ft)	685	270	1709
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LTR	LTR
Maximum Queue (ft)	32	30
Average Queue (ft)	6	14
95th Queue (ft)	31	39
Link Distance (ft)	1276	637
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	13	34
Average Queue (ft)	2	18
95th Queue (ft)	19	38
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	59	41
Average Queue (ft)	21	19
95th Queue (ft)	73	44
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: South Access Wilkison/Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	32
Average Queue (ft)	21
95th Queue (ft)	43
Link Distance (ft)	
Upstream Blk Time (%)	3
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Appendix N: Opening Year Build (2025) Synchro Analysis Worksheets

Intersection	
Intersection Delay, s/veh	9.3
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	119	321	158	642
Demand Flow Rate, veh/h	143	342	169	661
Vehicles Circulating, veh/h	751	146	495	228
Vehicles Exiting, veh/h	138	518	399	260
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	9.8	6.0	6.8	11.5
Approach LOS	A	A	A	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	143	342	169	661
Cap Entry Lane, veh/h	641	1189	833	1094
Entry HV Adj Factor	0.831	0.939	0.936	0.971
Flow Entry, veh/h	119	321	158	642
Cap Entry, veh/h	533	1116	780	1062
V/C Ratio	0.223	0.288	0.203	0.604
Control Delay, s/veh	9.8	6.0	6.8	11.5
LOS	A	A	A	B
95th %tile Queue, veh	1	1	1	4

Intersection	
Intersection Delay, s/veh	6.2
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	242	239	454
Demand Flow Rate, veh/h	253	254	468
Vehicles Circulating, veh/h	441	33	89
Vehicles Exiting, veh/h	116	661	198
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.4	4.5	6.5
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	253	254	468
Cap Entry Lane, veh/h	880	1334	1260
Entry HV Adj Factor	0.957	0.940	0.971
Flow Entry, veh/h	242	239	454
Cap Entry, veh/h	842	1254	1223
V/C Ratio	0.287	0.190	0.371
Control Delay, s/veh	7.4	4.5	6.5
LOS	A	A	A
95th %tile Queue, veh	1	1	2

HCM 6th TWSC
3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

10/10/2024

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	200	5	7	80	0	9	0	20	0	0	0
Future Vol, veh/h	0	213	5	7	106	0	9	0	20	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	6	20	14	11	2	11	2	0	2	2	2
Mvmt Flow	0	232	5	8	115	0	10	0	22	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	115	0	0	237	0	0	366	366	235	377	368	115
Stage 1	-	-	-	-	-	-	235	235	-	131	131	-
Stage 2	-	-	-	-	-	-	131	131	-	246	237	-
Critical Hdwy	4.12	-	-	4.24	-	-	7.21	6.52	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.21	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.21	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.326	-	-	3.599	4.018	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1474	-	-	1263	-	-	574	562	809	580	561	937
Stage 1	-	-	-	-	-	-	748	710	-	873	788	-
Stage 2	-	-	-	-	-	-	851	788	-	758	709	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1474	-	-	1263	-	-	571	558	809	561	557	937
Mov Cap-2 Maneuver	-	-	-	-	-	-	571	558	-	561	557	-
Stage 1	-	-	-	-	-	-	748	710	-	873	782	-
Stage 2	-	-	-	-	-	-	845	782	-	738	709	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	10.3	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	716	1474	-	-	1263	-	-	-
HCM Lane V/C Ratio	0.044	-	-	-	0.006	-	-	-
HCM Control Delay (s)	10.3	0	-	-	7.9	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰↱	
Traffic Vol, veh/h	190	18	11	75	35	19
Future Vol, veh/h	190	18	11	75	35	19
Conflicting Peds, #/hr	0	0	1	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	0	18	7	3	0
Mvmt Flow	207	20	12	82	38	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	228	0	315	208
Stage 1	-	-	-	-	208	-
Stage 2	-	-	-	-	107	-
Critical Hdwy	-	-	4.28	-	6.43	6.2
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.362	-	3.527	3.3
Pot Cap-1 Maneuver	-	-	1251	-	676	837
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	915	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1250	-	668	836
Mov Cap-2 Maneuver	-	-	-	-	668	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	905	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	719	-	-	1250	-
HCM Lane V/C Ratio	0.082	-	-	0.01	-
HCM Control Delay (s)	10.5	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM 6th TWSC
5: CSAH 32/Ash St & Holly Dr

10/10/2024

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		↔	
Traffic Vol, veh/h	17	192	107	5	12	26
Future Vol, veh/h	17	192	107	5	12	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	6	8	0	8	12
Mvmt Flow	18	209	116	5	13	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	121	0	-	0	364	119
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	245	-
Critical Hdwy	4.16	-	-	-	6.48	6.32
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.254	-	-	-	3.572	3.408
Pot Cap-1 Maneuver	1442	-	-	-	624	906
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	782	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1442	-	-	-	615	906
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	782	-

Approach	EB		WB		SB
HCM Control Delay, s	0.6		0		9.8
HCM LOS					A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1442	-	-	-	788
HCM Lane V/C Ratio	0.013	-	-	-	0.052
HCM Control Delay (s)	7.5	0	-	-	9.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰↱	
Traffic Vol, veh/h	0	0	41	0	0	12
Future Vol, veh/h	97	0	41	77	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	47	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	105	0	45	84	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	105	0	279	105
Stage 1	-	-	-	-	105	-
Stage 2	-	-	-	-	174	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1486	-	711	949
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	856	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1486	-	690	949
Mov Cap-2 Maneuver	-	-	-	-	690	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	830	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	949	-	-	1486	-
HCM Lane V/C Ratio	0.014	-	-	0.03	-
HCM Control Delay (s)	8.8	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

7: North Access Wilkison & CSAH 32/Ash St

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	↰↱	
Traffic Vol, veh/h	218	0	0	92	0	0
Future Vol, veh/h	218	0	1	92	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	237	0	1	100	0	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	237	0	339	237
Stage 1	-	-	-	-	237	-
Stage 2	-	-	-	-	102	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1330	-	657	802
Stage 1	-	-	-	-	802	-
Stage 2	-	-	-	-	922	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1330	-	656	802
Mov Cap-2 Maneuver	-	-	-	-	656	-
Stage 1	-	-	-	-	802	-
Stage 2	-	-	-	-	921	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	802	-	-	1330	-
HCM Lane V/C Ratio	0.005	-	-	0.001	-
HCM Control Delay (s)	9.5	-	-	7.7	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

HCM 6th TWSC
8: CSAH 32/Ash St & East Access North Oaks Farms

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	0	0	220	0	0	87
Future Vol, veh/h	0	0	220	0	0	87
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	239	0	0	95

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	334	239	0	0	239	0
Stage 1	239	-	-	-	-	-
Stage 2	95	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	661	800	-	-	1328	-
Stage 1	801	-	-	-	-	-
Stage 2	929	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	661	800	-	-	1328	-
Mov Cap-2 Maneuver	661	-	-	-	-	-
Stage 1	801	-	-	-	-	-
Stage 2	929	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1328	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Queuing and Blocking Report

10/10/2024

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	37	68	47	71
Average Queue (ft)	8	28	19	33
95th Queue (ft)	41	70	50	74
Link Distance (ft)	151	1544	2058	882
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	83	22	69
Average Queue (ft)	32	3	18
95th Queue (ft)	84	21	64
Link Distance (ft)	685	270	1709
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LTR	LTR
Maximum Queue (ft)	4	34
Average Queue (ft)	0	18
95th Queue (ft)	0	45
Link Distance (ft)	1276	637
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	19	50
Average Queue (ft)	5	25
95th Queue (ft)	25	50
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	20	59
Average Queue (ft)	4	23
95th Queue (ft)	21	58
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: South Access Wilkison/Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	10
95th Queue (ft)	32
Link Distance (ft)	
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 7: North Access Wilkison & CSAH 32/Ash St

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 8: CSAH 32/Ash St & East Access North Oaks Farms

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 0

Intersection	
Intersection Delay, s/veh	12.1
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	196	521	526	611
Demand Flow Rate, veh/h	196	529	528	626
Vehicles Circulating, veh/h	648	388	525	212
Vehicles Exiting, veh/h	190	665	319	705
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.3	11.9	15.8	10.3
Approach LOS	A	B	C	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	196	529	528	626
Cap Entry Lane, veh/h	713	929	808	1112
Entry HV Adj Factor	1.000	0.985	0.996	0.976
Flow Entry, veh/h	196	521	526	611
Cap Entry, veh/h	713	915	805	1085
V/C Ratio	0.275	0.569	0.654	0.563
Control Delay, s/veh	8.3	11.9	15.8	10.3
LOS	A	B	C	B
95th %tile Queue, veh	1	4	5	4

Intersection	
Intersection Delay, s/veh	8.1
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	383	688	369
Demand Flow Rate, veh/h	390	700	373
Vehicles Circulating, veh/h	342	63	213
Vehicles Exiting, veh/h	244	669	550
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.3	8.8	6.6
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	390	700	373
Cap Entry Lane, veh/h	974	1294	1110
Entry HV Adj Factor	0.982	0.984	0.988
Flow Entry, veh/h	383	688	369
Cap Entry, veh/h	956	1273	1097
V/C Ratio	0.401	0.541	0.336
Control Delay, s/veh	8.3	8.8	6.6
LOS	A	A	A
95th %tile Queue, veh	2	3	1

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	0	339	14	13	197	0	6	0	11	0	0	0
Future Vol, veh/h	0	384	14	13	224	0	6	0	11	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	0	0	2	2	0	2	9	2	2	2
Mvmt Flow	0	417	15	14	243	0	7	0	12	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	243	0	0	432	0	0	696	696	425	702	703	243
Stage 1	-	-	-	-	-	-	425	425	-	271	271	-
Stage 2	-	-	-	-	-	-	271	271	-	431	432	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.52	6.29	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4.018	3.381	3.518	4.018	3.318
Pot Cap-1 Maneuver	1323	-	-	1138	-	-	359	365	615	353	362	796
Stage 1	-	-	-	-	-	-	611	586	-	735	685	-
Stage 2	-	-	-	-	-	-	739	685	-	603	582	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1323	-	-	1138	-	-	355	360	615	342	357	796
Mov Cap-2 Maneuver	-	-	-	-	-	-	355	360	-	342	357	-
Stage 1	-	-	-	-	-	-	611	586	-	735	675	-
Stage 2	-	-	-	-	-	-	729	675	-	591	582	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	12.7	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	489	1323	-	-	1138	-	-	-
HCM Lane V/C Ratio	0.038	-	-	-	0.012	-	-	-
HCM Control Delay (s)	12.7	0	-	-	8.2	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

HCM 6th TWSC
4: Rapp Farm Blvd & CSAH 32/Ash St

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰↱	
Traffic Vol, veh/h	336	32	9	194	14	17
Future Vol, veh/h	336	32	9	194	14	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	11	2	7	12
Mvmt Flow	365	35	10	211	15	18

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	400	0	596	365
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	231	-
Critical Hdwy	-	-	4.21	-	6.47	6.32
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.299	-	3.563	3.408
Pot Cap-1 Maneuver	-	-	1111	-	458	658
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	796	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1111	-	454	658
Mov Cap-2 Maneuver	-	-	-	-	454	-
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	789	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	12
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	547	-	-	1111	-
HCM Lane V/C Ratio	0.062	-	-	0.009	-
HCM Control Delay (s)	12	-	-	8.3	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

HCM 6th TWSC
5: CSAH 32/Ash St & Holly Dr

10/10/2024

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	79	353	194	16	14	18
Future Vol, veh/h	79	353	194	16	14	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	2	2	0	0	2
Mvmt Flow	86	384	211	17	15	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	228	0	-	0	776	220
Stage 1	-	-	-	-	220	-
Stage 2	-	-	-	-	556	-
Critical Hdwy	4.1	-	-	-	6.4	6.22
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.318
Pot Cap-1 Maneuver	1352	-	-	-	369	820
Stage 1	-	-	-	-	821	-
Stage 2	-	-	-	-	578	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1352	-	-	-	339	820
Mov Cap-2 Maneuver	-	-	-	-	339	-
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	578	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1352	-	-	-	506
HCM Lane V/C Ratio	0.064	-	-	-	0.069
HCM Control Delay (s)	7.8	0	-	-	12.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.2

Intersection	
Int Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰↱	
Traffic Vol, veh/h	0	0	43	0	0	57
Future Vol, veh/h	124	0	43	132	0	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	47	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	135	0	47	143	0	62

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	135	0	372	135
Stage 1	-	-	-	-	135	-
Stage 2	-	-	-	-	237	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1449	-	629	914
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	802	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1449	-	609	914
Mov Cap-2 Maneuver	-	-	-	-	609	-
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	776	-

Approach	EB		WB		NB
HCM Control Delay, s	0		1.9		9.2
HCM LOS					A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	914	-	-	1449	-
HCM Lane V/C Ratio	0.068	-	-	0.032	-
HCM Control Delay (s)	9.2	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

7: North Access Wilkison & CSAH 32/Ash St

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Traffic Vol, veh/h	346	0	0	214	0	0
Future Vol, veh/h	346	0	6	214	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	376	0	7	233	0	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	376	0	623	376
Stage 1	-	-	-	-	376	-
Stage 2	-	-	-	-	247	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1182	-	450	670
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	794	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1182	-	447	670
Mov Cap-2 Maneuver	-	-	-	-	447	-
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	788	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	10.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	670	-	-	1182	-
HCM Lane V/C Ratio	0.01	-	-	0.006	-
HCM Control Delay (s)	10.4	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	0	0	350	0	0	210
Future Vol, veh/h	0	0	350	0	0	210
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	380	0	0	228

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	608	380	0	0	380	0
Stage 1	380	-	-	-	-	-
Stage 2	228	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	459	667	-	-	1178	-
Stage 1	691	-	-	-	-	-
Stage 2	810	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	459	667	-	-	1178	-
Mov Cap-2 Maneuver	459	-	-	-	-	-
Stage 1	691	-	-	-	-	-
Stage 2	810	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	-	1178	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	-	-	0	0	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Queuing and Blocking Report

10/10/2024

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	31	77	130	76
Average Queue (ft)	10	38	62	26
95th Queue (ft)	34	79	133	68
Link Distance (ft)	151	1544	2058	882
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	108	52	62
Average Queue (ft)	59	19	26
95th Queue (ft)	127	57	66
Link Distance (ft)	685	270	1709
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LTR	LTR
Maximum Queue (ft)	32	30
Average Queue (ft)	6	14
95th Queue (ft)	31	39
Link Distance (ft)	1276	637
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	13	34
Average Queue (ft)	2	18
95th Queue (ft)	19	38
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	59	41
Average Queue (ft)	21	19
95th Queue (ft)	73	44
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: South Access Wilkison/Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	32
Average Queue (ft)	21
95th Queue (ft)	43
Link Distance (ft)	
Upstream Blk Time (%)	3
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 7: North Access Wilkison & CSAH 32/Ash St

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 8: CSAH 32/Ash St & East Access North Oaks Farms

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 0

Appendix O: Design Year No Build (2045) Synchro Analysis Worksheets

Intersection	
Intersection Delay, s/veh	10.6
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	13	343	137	770
Demand Flow Rate, veh/h	16	370	144	792
Vehicles Circulating, veh/h	918	109	500	179
Vehicles Exiting, veh/h	53	535	434	300
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.8	6.0	6.4	13.5
Approach LOS	A	A	A	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	16	370	144	792
Cap Entry Lane, veh/h	541	1235	829	1150
Entry HV Adj Factor	0.793	0.927	0.952	0.972
Flow Entry, veh/h	13	343	137	770
Cap Entry, veh/h	429	1145	789	1117
V/C Ratio	0.030	0.300	0.174	0.689
Control Delay, s/veh	8.8	6.0	6.4	13.5
LOS	A	A	A	B
95th %tile Queue, veh	0	1	1	6

Intersection	
Intersection Delay, s/veh	6.9
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	237	284	519
Demand Flow Rate, veh/h	248	302	534
Vehicles Circulating, veh/h	505	28	109
Vehicles Exiting, veh/h	138	725	221
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.0	4.8	7.4
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	248	302	534
Cap Entry Lane, veh/h	824	1341	1235
Entry HV Adj Factor	0.956	0.939	0.972
Flow Entry, veh/h	237	284	519
Cap Entry, veh/h	788	1259	1200
V/C Ratio	0.301	0.225	0.433
Control Delay, s/veh	8.0	4.8	7.4
LOS	A	A	A
95th %tile Queue, veh	1	1	2

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	200	5	7	80	0	9	0	20	0	0	0
Future Vol, veh/h	0	200	5	7	80	0	9	0	20	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	6	20	14	11	2	11	2	0	2	2	2
Mvmt Flow	0	217	5	8	87	0	10	0	22	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	87	0	0	222	0	0	323	323	220	334	325	87
Stage 1	-	-	-	-	-	-	220	220	-	103	103	-
Stage 2	-	-	-	-	-	-	103	103	-	231	222	-
Critical Hdwy	4.12	-	-	4.24	-	-	7.21	6.52	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.21	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.21	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.326	-	-	3.599	4.018	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1509	-	-	1279	-	-	613	595	825	620	593	971
Stage 1	-	-	-	-	-	-	762	721	-	903	810	-
Stage 2	-	-	-	-	-	-	881	810	-	772	720	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1509	-	-	1279	-	-	610	591	825	600	589	971
Mov Cap-2 Maneuver	-	-	-	-	-	-	610	591	-	600	589	-
Stage 1	-	-	-	-	-	-	762	721	-	903	804	-
Stage 2	-	-	-	-	-	-	875	804	-	752	720	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	10.1	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	744	1509	-	-	1279	-	-	-
HCM Lane V/C Ratio	0.042	-	-	-	0.006	-	-	-
HCM Control Delay (s)	10.1	0	-	-	7.8	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰↱	
Traffic Vol, veh/h	190	18	11	75	35	19
Future Vol, veh/h	190	18	11	75	35	19
Conflicting Peds, #/hr	0	0	1	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	0	18	7	3	0
Mvmt Flow	207	20	12	82	38	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	228	0	315	208
Stage 1	-	-	-	-	208	-
Stage 2	-	-	-	-	107	-
Critical Hdwy	-	-	4.28	-	6.43	6.2
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.362	-	3.527	3.3
Pot Cap-1 Maneuver	-	-	1251	-	676	837
Stage 1	-	-	-	-	824	-
Stage 2	-	-	-	-	915	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1250	-	668	836
Mov Cap-2 Maneuver	-	-	-	-	668	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	905	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	719	-	-	1250	-
HCM Lane V/C Ratio	0.082	-	-	0.01	-
HCM Control Delay (s)	10.5	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

HCM 6th TWSC
5: CSAH 32/Ash St & Holly Dr

10/10/2024

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⋎	
Traffic Vol, veh/h	17	192	107	5	12	26
Future Vol, veh/h	17	192	107	5	12	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	6	8	0	8	12
Mvmt Flow	18	209	116	5	13	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	121	0	-	0	364	119
Stage 1	-	-	-	-	119	-
Stage 2	-	-	-	-	245	-
Critical Hdwy	4.16	-	-	-	6.48	6.32
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.254	-	-	-	3.572	3.408
Pot Cap-1 Maneuver	1442	-	-	-	624	906
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	782	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1442	-	-	-	615	906
Mov Cap-2 Maneuver	-	-	-	-	615	-
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	782	-

Approach	EB		WB		SB	
HCM Control Delay, s	0.6		0		9.8	
HCM LOS					A	

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1442	-	-	-	788
HCM Lane V/C Ratio	0.013	-	-	-	0.052
HCM Control Delay (s)	7.5	0	-	-	9.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	7.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	Y	
Traffic Vol, veh/h	0	0	46	0	0	12
Future Vol, veh/h	0	0	46	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	47	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	50	0	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	101	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	100	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	898	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	924	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	870	1084
Mov Cap-2 Maneuver	-	-	-	-	870	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	895	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.012	-	-	0.031	-
HCM Control Delay (s)	8.4	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Queuing and Blocking Report

10/10/2024

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	17	56	56	101
Average Queue (ft)	3	20	25	56
95th Queue (ft)	22	60	60	110
Link Distance (ft)	151	1544	2058	882
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	71	12	74
Average Queue (ft)	30	3	25
95th Queue (ft)	76	16	67
Link Distance (ft)	685	270	1709
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LTR	LTR
Maximum Queue (ft)	8	34
Average Queue (ft)	1	21
95th Queue (ft)	9	44
Link Distance (ft)	1276	637
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	15	36
Average Queue (ft)	2	20
95th Queue (ft)	14	44
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	10	37
Average Queue (ft)	1	23
95th Queue (ft)	11	43
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: South Access Wilkison/Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	23
Average Queue (ft)	11
95th Queue (ft)	33
Link Distance (ft)	
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	63	564	520	708
Demand Flow Rate, veh/h	63	574	522	726
Vehicles Circulating, veh/h	789	330	506	118
Vehicles Exiting, veh/h	55	698	346	786
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.0	11.7	14.8	10.3
Approach LOS	A	B	B	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	63	574	522	726
Cap Entry Lane, veh/h	617	986	824	1223
Entry HV Adj Factor	1.000	0.983	0.996	0.975
Flow Entry, veh/h	63	564	520	708
Cap Entry, veh/h	617	968	820	1193
V/C Ratio	0.102	0.582	0.634	0.593
Control Delay, s/veh	7.0	11.7	14.8	10.3
LOS	A	B	B	B
95th %tile Queue, veh	0	4	5	4

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	376	800	390
Demand Flow Rate, veh/h	383	814	395
Vehicles Circulating, veh/h	366	56	261
Vehicles Exiting, veh/h	290	693	609
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.5	10.5	7.4
Approach LOS	A	B	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	383	814	395
Cap Entry Lane, veh/h	950	1303	1057
Entry HV Adj Factor	0.982	0.983	0.988
Flow Entry, veh/h	376	800	390
Cap Entry, veh/h	933	1281	1045
V/C Ratio	0.403	0.625	0.374
Control Delay, s/veh	8.5	10.5	7.4
LOS	A	B	A
95th %tile Queue, veh	2	5	2

HCM 6th TWSC
3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St
10/10/2024

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	0	339	14	13	197	0	6	0	11	0	0	0
Future Vol, veh/h	0	339	14	13	197	0	6	0	11	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	0	0	2	2	0	2	9	2	2	2
Mvmt Flow	0	368	15	14	214	0	7	0	12	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	214	0	0	383	0	0	618	618	376	624	625	214
Stage 1	-	-	-	-	-	-	376	376	-	242	242	-
Stage 2	-	-	-	-	-	-	242	242	-	382	383	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.52	6.29	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4.018	3.381	3.518	4.018	3.318
Pot Cap-1 Maneuver	1356	-	-	1187	-	-	404	405	655	398	401	826
Stage 1	-	-	-	-	-	-	649	616	-	762	705	-
Stage 2	-	-	-	-	-	-	766	705	-	640	612	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1356	-	-	1187	-	-	400	400	655	387	396	826
Mov Cap-2 Maneuver	-	-	-	-	-	-	400	400	-	387	396	-
Stage 1	-	-	-	-	-	-	649	616	-	762	696	-
Stage 2	-	-	-	-	-	-	756	696	-	628	612	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	12	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	535	1356	-	-	1187	-	-	-
HCM Lane V/C Ratio	0.035	-	-	-	0.012	-	-	-
HCM Control Delay (s)	12	0	-	-	8.1	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	Y	
Traffic Vol, veh/h	336	32	9	194	14	17
Future Vol, veh/h	336	32	9	194	14	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	11	2	7	12
Mvmt Flow	365	35	10	211	15	18

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	400	0	596	365
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	231	-
Critical Hdwy	-	-	4.21	-	6.47	6.32
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.299	-	3.563	3.408
Pot Cap-1 Maneuver	-	-	1111	-	458	658
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	796	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1111	-	454	658
Mov Cap-2 Maneuver	-	-	-	-	454	-
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	789	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	12
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	547	-	-	1111	-
HCM Lane V/C Ratio	0.062	-	-	0.009	-
HCM Control Delay (s)	12	-	-	8.3	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰↑	↑↱		↰↱	
Traffic Vol, veh/h	79	353	194	16	14	18
Future Vol, veh/h	79	353	194	16	14	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	2	2	0	0	2
Mvmt Flow	86	384	211	17	15	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	228	0	-	0	776	220
Stage 1	-	-	-	-	220	-
Stage 2	-	-	-	-	556	-
Critical Hdwy	4.1	-	-	-	6.4	6.22
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.318
Pot Cap-1 Maneuver	1352	-	-	-	369	820
Stage 1	-	-	-	-	821	-
Stage 2	-	-	-	-	578	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1352	-	-	-	339	820
Mov Cap-2 Maneuver	-	-	-	-	339	-
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	578	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1352	-	-	-	506
HCM Lane V/C Ratio	0.064	-	-	-	0.069
HCM Control Delay (s)	7.8	0	-	-	12.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.2

6: South Access Wilkison/Wilkinson Lake Blvd

Intersection	
Int Delay, s/veh	7.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰↱	
Traffic Vol, veh/h	0	0	51	0	0	57
Future Vol, veh/h	0	0	51	0	0	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	47	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	55	0	0	62

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	111	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	110	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	886	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	915	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	856	1084
Mov Cap-2 Maneuver	-	-	-	-	856	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	884	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		7.3		8.5	
HCM LOS					A	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.057	-	-	0.034	-
HCM Control Delay (s)	8.5	-	-	7.3	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Queuing and Blocking Report

10/10/2024

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	31	110	164	113
Average Queue (ft)	15	52	68	43
95th Queue (ft)	40	121	147	106
Link Distance (ft)	151	1544	2058	882
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	100	54	56
Average Queue (ft)	51	14	24
95th Queue (ft)	107	56	50
Link Distance (ft)	685	270	1709
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LTR	LTR
Maximum Queue (ft)	23	40
Average Queue (ft)	4	14
95th Queue (ft)	23	51
Link Distance (ft)	1276	637
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	10	58
Average Queue (ft)	2	18
95th Queue (ft)	13	52
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	38	33
Average Queue (ft)	15	21
95th Queue (ft)	45	41
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: South Access Wilkison/Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	37
Average Queue (ft)	27
95th Queue (ft)	44
Link Distance (ft)	
Upstream Blk Time (%)	4
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Appendix P: Design Year Build (2045) Synchro Analysis Worksheets

Intersection	
Intersection Delay, s/veh	13.7
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	119	387	172	800
Demand Flow Rate, veh/h	143	414	184	824
Vehicles Circulating, veh/h	939	156	597	258
Vehicles Exiting, veh/h	143	625	485	312
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.5	6.8	8.0	18.3
Approach LOS	B	A	A	C

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	143	414	184	824
Cap Entry Lane, veh/h	530	1177	751	1061
Entry HV Adj Factor	0.831	0.935	0.935	0.971
Flow Entry, veh/h	119	387	172	800
Cap Entry, veh/h	440	1100	702	1030
V/C Ratio	0.270	0.352	0.245	0.777
Control Delay, s/veh	12.5	6.8	8.0	18.3
LOS	B	A	A	C
95th %tile Queue, veh	1	2	1	8

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Approach	EB	NB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	264	295	530
Demand Flow Rate, veh/h	277	314	545
Vehicles Circulating, veh/h	514	35	114
Vehicles Exiting, veh/h	145	755	235
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	8.7	4.9	7.6
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	277	314	545
Cap Entry Lane, veh/h	817	1331	1228
Entry HV Adj Factor	0.953	0.940	0.972
Flow Entry, veh/h	264	295	530
Cap Entry, veh/h	779	1252	1194
V/C Ratio	0.339	0.236	0.444
Control Delay, s/veh	8.7	4.9	7.6
LOS	A	A	A
95th %tile Queue, veh	2	1	2

HCM 6th TWSC
3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	0	200	5	7	80	0	9	0	20	0	0	0
Future Vol, veh/h	6	215	5	7	110	5	9	0	20	17	0	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	6	20	14	11	2	11	2	0	2	2	2
Mvmt Flow	7	234	5	8	120	5	10	0	22	18	0	17

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	125	0	0	239	0	0	398	392	237	401	392	123
Stage 1	-	-	-	-	-	-	251	251	-	139	139	-
Stage 2	-	-	-	-	-	-	147	141	-	262	253	-
Critical Hdwy	4.12	-	-	4.24	-	-	7.21	6.52	6.2	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.21	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.21	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.326	-	-	3.599	4.018	3.3	3.518	4.018	3.318
Pot Cap-1 Maneuver	1462	-	-	1261	-	-	546	544	807	560	544	928
Stage 1	-	-	-	-	-	-	734	699	-	864	782	-
Stage 2	-	-	-	-	-	-	835	780	-	743	698	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1462	-	-	1261	-	-	531	537	807	539	537	928
Mov Cap-2 Maneuver	-	-	-	-	-	-	531	537	-	539	537	-
Stage 1	-	-	-	-	-	-	730	695	-	859	777	-
Stage 2	-	-	-	-	-	-	814	775	-	719	694	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.5	10.4	10.6
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	695	1462	-	-	1261	-	-	676
HCM Lane V/C Ratio	0.045	0.004	-	-	0.006	-	-	0.053
HCM Control Delay (s)	10.4	7.5	0	-	7.9	0	-	10.6
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.2

4: Rapp Farm Blvd & CSAH 32/Ash St

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰↱	
Traffic Vol, veh/h	190	18	11	75	35	19
Future Vol, veh/h	198	18	11	95	35	19
Conflicting Peds, #/hr	0	0	1	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	0	18	7	3	0
Mvmt Flow	215	20	12	103	38	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	236	0	344	216
Stage 1	-	-	-	-	216	-
Stage 2	-	-	-	-	128	-
Critical Hdwy	-	-	4.28	-	6.43	6.2
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.362	-	3.527	3.3
Pot Cap-1 Maneuver	-	-	1243	-	650	829
Stage 1	-	-	-	-	818	-
Stage 2	-	-	-	-	895	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1242	-	642	828
Mov Cap-2 Maneuver	-	-	-	-	642	-
Stage 1	-	-	-	-	817	-
Stage 2	-	-	-	-	885	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		0.8		10.6	
HCM LOS					B	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	697	-	-	1242	-
HCM Lane V/C Ratio	0.084	-	-	0.01	-
HCM Control Delay (s)	10.6	-	-	7.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		Y	
Traffic Vol, veh/h	17	192	107	5	12	26
Future Vol, veh/h	17	200	126	6	12	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	6	6	8	0	8	12
Mvmt Flow	18	217	137	7	13	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	144	0	-	0	394	141
Stage 1	-	-	-	-	141	-
Stage 2	-	-	-	-	253	-
Critical Hdwy	4.16	-	-	-	6.48	6.32
Critical Hdwy Stg 1	-	-	-	-	5.48	-
Critical Hdwy Stg 2	-	-	-	-	5.48	-
Follow-up Hdwy	2.254	-	-	-	3.572	3.408
Pot Cap-1 Maneuver	1414	-	-	-	599	881
Stage 1	-	-	-	-	871	-
Stage 2	-	-	-	-	775	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1414	-	-	-	591	881
Mov Cap-2 Maneuver	-	-	-	-	591	-
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	775	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1414	-	-	-	763
HCM Lane V/C Ratio	0.013	-	-	-	0.054
HCM Control Delay (s)	7.6	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

HCM 6th TWSC
6: South Access Wilkison/Wilkinson Lake Blvd

10/10/2024

Intersection	
Int Delay, s/veh	1.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰↱	
Traffic Vol, veh/h	0	0	46	0	0	12
Future Vol, veh/h	97	0	46	77	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	47	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	105	0	50	84	0	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	105	0	289	105
Stage 1	-	-	-	-	105	-
Stage 2	-	-	-	-	184	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1486	-	702	949
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	848	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1486	-	678	949
Mov Cap-2 Maneuver	-	-	-	-	678	-
Stage 1	-	-	-	-	919	-
Stage 2	-	-	-	-	819	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.8	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	949	-	-	1486	-
HCM Lane V/C Ratio	0.014	-	-	0.034	-
HCM Control Delay (s)	8.8	-	-	7.5	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	Y	
Traffic Vol, veh/h	218	0	0	92	0	0
Future Vol, veh/h	239	0	1	98	0	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	260	0	1	107	0	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	260	0	369	260
Stage 1	-	-	-	-	260	-
Stage 2	-	-	-	-	109	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1304	-	631	779
Stage 1	-	-	-	-	783	-
Stage 2	-	-	-	-	916	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1304	-	630	779
Mov Cap-2 Maneuver	-	-	-	-	630	-
Stage 1	-	-	-	-	783	-
Stage 2	-	-	-	-	915	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	779	-	-	1304	-
HCM Lane V/C Ratio	0.006	-	-	0.001	-
HCM Control Delay (s)	9.6	-	-	7.8	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

8: CSAH 32/Ash St & East Access North Oaks Farms

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↱		↱			↰
Traffic Vol, veh/h	0	0	220	0	0	87
Future Vol, veh/h	4	4	237	2	1	92
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	4	258	2	1	100

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	361	259	0	0	260	0
Stage 1	259	-	-	-	-	-
Stage 2	102	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	638	780	-	-	1304	-
Stage 1	784	-	-	-	-	-
Stage 2	922	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	637	780	-	-	1304	-
Mov Cap-2 Maneuver	637	-	-	-	-	-
Stage 1	784	-	-	-	-	-
Stage 2	921	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	10.2		0		0.1	
HCM LOS	B					

Minor Lane/Major Mvmt		NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)		-	-	701	1304	-
HCM Lane V/C Ratio		-	-	0.012	0.001	-
HCM Control Delay (s)		-	-	10.2	7.8	0
HCM Lane LOS		-	-	B	A	A
HCM 95th %tile Q(veh)		-	-	0	0	-

Queuing and Blocking Report

10/10/2024

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	17	56	56	101
Average Queue (ft)	3	20	25	56
95th Queue (ft)	22	60	60	110
Link Distance (ft)	151	1544	2058	882
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	71	12	74
Average Queue (ft)	30	3	25
95th Queue (ft)	76	16	67
Link Distance (ft)	685	270	1709
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LTR	LTR
Maximum Queue (ft)	8	34
Average Queue (ft)	1	21
95th Queue (ft)	9	44
Link Distance (ft)	1276	637
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	15	36
Average Queue (ft)	2	20
95th Queue (ft)	14	44
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	10	37
Average Queue (ft)	1	23
95th Queue (ft)	11	43
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: South Access Wilkison/Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	23
Average Queue (ft)	11
95th Queue (ft)	33
Link Distance (ft)	
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 7: North Access Wilkison & CSAH 32/Ash St

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 8: CSAH 32/Ash St & East Access North Oaks Farms

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 0

Intersection	
Intersection Delay, s/veh	17.8
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	196	632	580	755
Demand Flow Rate, veh/h	196	642	582	774
Vehicles Circulating, veh/h	806	422	617	231
Vehicles Exiting, veh/h	199	777	385	833
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	10.4	17.2	24.8	14.8
Approach LOS	B	C	C	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	196	642	582	774
Cap Entry Lane, veh/h	607	897	735	1090
Entry HV Adj Factor	1.000	0.984	0.997	0.975
Flow Entry, veh/h	196	632	580	755
Cap Entry, veh/h	607	883	733	1063
V/C Ratio	0.323	0.716	0.791	0.710
Control Delay, s/veh	10.4	17.2	24.8	14.8
LOS	B	C	C	B
95th %tile Queue, veh	1	6	8	6

Intersection				
Intersection Delay, s/veh	10.2			
Intersection LOS	B			

Approach		EB	NB	SB
Entry Lanes		1	1	1
Conflicting Circle Lanes		1	1	1
Adj Approach Flow, veh/h		399	848	430
Demand Flow Rate, veh/h		407	862	436
Vehicles Circulating, veh/h		396	64	276
Vehicles Exiting, veh/h		316	739	650
Ped Vol Crossing Leg, #/h		0	0	0
Ped Cap Adj		1.000	1.000	1.000
Approach Delay, s/veh		9.3	11.6	8.1
Approach LOS		A	B	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976
Entry Flow, veh/h	407	862	436
Cap Entry Lane, veh/h	921	1293	1041
Entry HV Adj Factor	0.980	0.983	0.986
Flow Entry, veh/h	399	848	430
Cap Entry, veh/h	903	1271	1027
V/C Ratio	0.442	0.667	0.419
Control Delay, s/veh	9.3	11.6	8.1
LOS	A	B	A
95th %tile Queue, veh	2	5	2

HCM 6th TWSC
3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

10/10/2024

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	0	339	14	13	197	0	6	0	11	0	0	0
Future Vol, veh/h	23	390	14	13	226	13	6	0	11	12	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	0	0	2	2	0	2	9	2	2	2
Mvmt Flow	25	424	15	14	246	14	7	0	12	13	0	10

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	260	0	0	439	0	0	768	770	432	769	770	253
Stage 1	-	-	-	-	-	-	482	482	-	281	281	-
Stage 2	-	-	-	-	-	-	286	288	-	488	489	-
Critical Hdwy	4.12	-	-	4.1	-	-	7.1	6.52	6.29	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.2	-	-	3.5	4.018	3.381	3.518	4.018	3.318
Pot Cap-1 Maneuver	1304	-	-	1132	-	-	321	331	609	318	331	786
Stage 1	-	-	-	-	-	-	569	553	-	726	678	-
Stage 2	-	-	-	-	-	-	726	674	-	561	549	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1304	-	-	1132	-	-	308	318	609	302	318	786
Mov Cap-2 Maneuver	-	-	-	-	-	-	308	318	-	302	318	-
Stage 1	-	-	-	-	-	-	555	539	-	708	669	-
Stage 2	-	-	-	-	-	-	707	665	-	536	535	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.4	13.3	14.3
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	453	1304	-	-	1132	-	-	410
HCM Lane V/C Ratio	0.041	0.019	-	-	0.012	-	-	0.056
HCM Control Delay (s)	13.3	7.8	0	-	8.2	0	-	14.3
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.2

4: Rapp Farm Blvd & CSAH 32/Ash St

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰↱	
Traffic Vol, veh/h	336	32	9	194	14	17
Future Vol, veh/h	365	32	9	205	14	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	300	300	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	11	2	7	12
Mvmt Flow	397	35	10	223	15	18

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	432	0	640	397
Stage 1	-	-	-	-	397	-
Stage 2	-	-	-	-	243	-
Critical Hdwy	-	-	4.21	-	6.47	6.32
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.299	-	3.563	3.408
Pot Cap-1 Maneuver	-	-	1081	-	432	631
Stage 1	-	-	-	-	668	-
Stage 2	-	-	-	-	786	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1081	-	428	631
Mov Cap-2 Maneuver	-	-	-	-	428	-
Stage 1	-	-	-	-	668	-
Stage 2	-	-	-	-	779	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	12.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	520	-	-	1081	-
HCM Lane V/C Ratio	0.065	-	-	0.009	-
HCM Control Delay (s)	12.4	-	-	8.4	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↰	↱		⅄	
Traffic Vol, veh/h	79	353	194	16	14	18
Future Vol, veh/h	79	381	204	17	15	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	2	2	0	0	2
Mvmt Flow	86	414	222	18	16	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	240	0	-	0	817	231
Stage 1	-	-	-	-	231	-
Stage 2	-	-	-	-	586	-
Critical Hdwy	4.1	-	-	-	6.4	6.22
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.318
Pot Cap-1 Maneuver	1339	-	-	-	349	808
Stage 1	-	-	-	-	812	-
Stage 2	-	-	-	-	560	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1339	-	-	-	320	808
Mov Cap-2 Maneuver	-	-	-	-	320	-
Stage 1	-	-	-	-	745	-
Stage 2	-	-	-	-	560	-

Approach	EB	WB	SB
HCM Control Delay, s	1.4	0	13.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1339	-	-	-	477
HCM Lane V/C Ratio	0.064	-	-	-	0.075
HCM Control Delay (s)	7.9	0	-	-	13.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.2

Intersection	
Int Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	Y	
Traffic Vol, veh/h	0	0	51	0	0	57
Future Vol, veh/h	124	0	51	132	0	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	47	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	135	0	55	143	0	62

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	135	0	388	135
Stage 1	-	-	-	-	135	-
Stage 2	-	-	-	-	253	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1449	-	616	914
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	789	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1449	-	593	914
Mov Cap-2 Maneuver	-	-	-	-	593	-
Stage 1	-	-	-	-	891	-
Stage 2	-	-	-	-	759	-

Approach	EB		WB		NB
HCM Control Delay, s	0		2.1		9.2
HCM LOS					A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	914	-	-	1449	-
HCM Lane V/C Ratio	0.068	-	-	0.038	-
HCM Control Delay (s)	9.2	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

7: North Access Wilkison & CSAH 32/Ash St

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱			↰	↰↱	
Traffic Vol, veh/h	346	0	0	214	0	0
Future Vol, veh/h	361	0	6	231	0	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	392	0	7	251	0	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	392	0	657	392
Stage 1	-	-	-	-	392	-
Stage 2	-	-	-	-	265	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1167	-	430	657
Stage 1	-	-	-	-	683	-
Stage 2	-	-	-	-	779	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1167	-	427	657
Mov Cap-2 Maneuver	-	-	-	-	427	-
Stage 1	-	-	-	-	683	-
Stage 2	-	-	-	-	774	-

Approach	EB		WB		NB	
HCM Control Delay, s	0		0.2		10.5	
HCM LOS					B	

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	657	-	-	1167	-
HCM Lane V/C Ratio	0.01	-	-	0.006	-
HCM Control Delay (s)	10.5	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↱			↰
Traffic Vol, veh/h	0	0	350	0	0	210
Future Vol, veh/h	2	3	362	6	4	223
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	3	393	7	4	242

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	647	397	0	0	400	0
Stage 1	397	-	-	-	-	-
Stage 2	250	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	436	652	-	-	1159	-
Stage 1	679	-	-	-	-	-
Stage 2	792	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	434	652	-	-	1159	-
Mov Cap-2 Maneuver	434	-	-	-	-	-
Stage 1	679	-	-	-	-	-
Stage 2	789	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.7	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	543	1159	-
HCM Lane V/C Ratio	-	-	0.01	0.004	-
HCM Control Delay (s)	-	-	11.7	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Queuing and Blocking Report

10/10/2024

Intersection: 1: CSAH 21/Centerville Rd & Wilkinson Lake Blvd/CSAH J/Ash St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	48	106	127	145
Average Queue (ft)	22	59	78	44
95th Queue (ft)	54	127	133	133
Link Distance (ft)	151	1544	2058	882
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: CSAH 21/Centerville Rd & CSAH 32/Ash St

Movement	EB	NB	SB
Directions Served	LR	LT	TR
Maximum Queue (ft)	118	82	67
Average Queue (ft)	56	24	33
95th Queue (ft)	113	79	70
Link Distance (ft)	685	270	1709
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: Monarch Way/West Access North Oaks Farms & CSAH 32/Ash St

Movement	WB	NB
Directions Served	LTR	LTR
Maximum Queue (ft)	4	37
Average Queue (ft)	1	16
95th Queue (ft)	9	44
Link Distance (ft)	1276	637
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Rapp Farm Blvd & CSAH 32/Ash St

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	15	34
Average Queue (ft)	2	14
95th Queue (ft)	14	38
Link Distance (ft)		352
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	300	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: CSAH 32/Ash St & Holly Dr

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	44	37
Average Queue (ft)	19	20
95th Queue (ft)	50	43
Link Distance (ft)	1395	3443
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: South Access Wilkison/Wilkinson Lake Blvd

Movement	NB
Directions Served	LR
Maximum Queue (ft)	32
Average Queue (ft)	24
95th Queue (ft)	43
Link Distance (ft)	
Upstream Blk Time (%)	3
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 7: North Access Wilkison & CSAH 32/Ash St

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 8: CSAH 32/Ash St & East Access North Oaks Farms

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 0

Appendix Q: Right-Turn Warrant Analyses

Right Turn Warrant - Intersection 3 EB - PM Peak Hour - Build Year

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

INPUT

Roadway geometry:	2-lane roadway

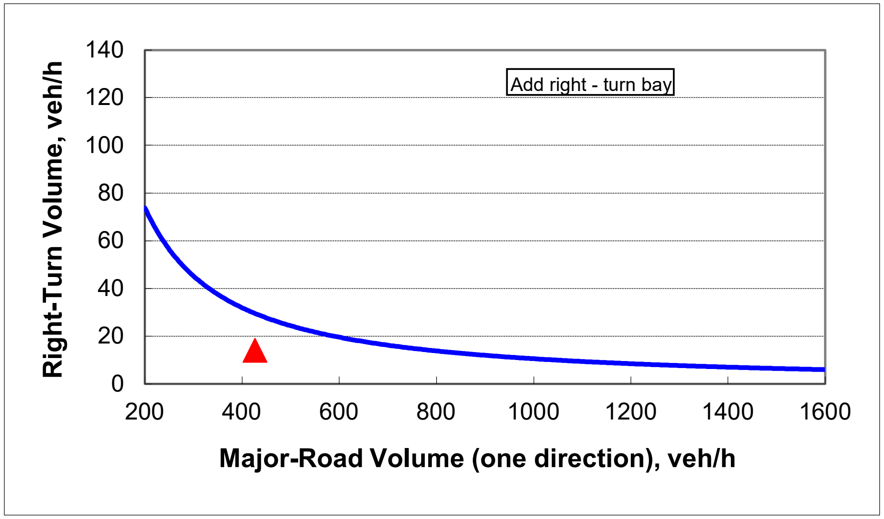
Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	427
Right-turn volume, veh/h:	14

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	29

Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:

Do NOT add right-turn bay.



Right Turn Warrant - Intersection 3 WB - PM Peak Hour - Build Year

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

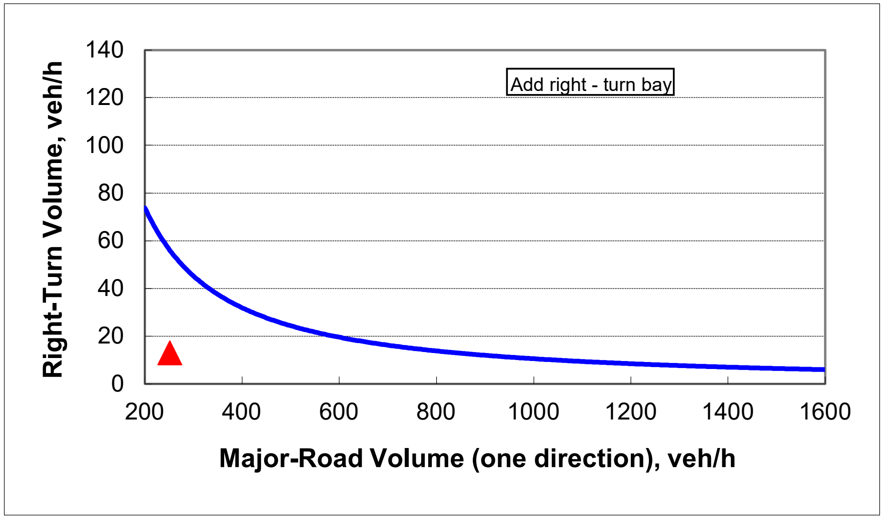
INPUT

Roadway geometry:	2-lane roadway ▾

Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	252
Right-turn volume, veh/h:	13

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	56
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Right Turn Warrant - Intersection 5 WB - PM Peak Hour - Build Year

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

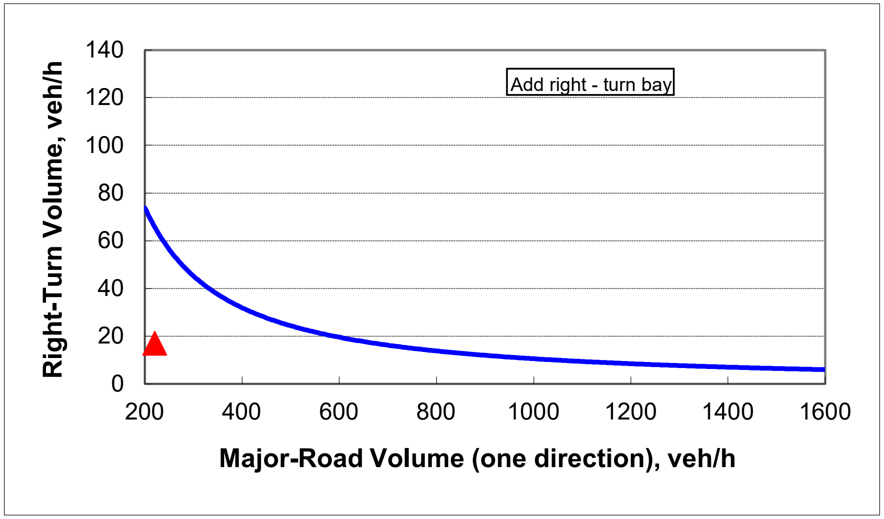
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	50
Major-road volume (one direction), veh/h:	221
Right-turn volume, veh/h:	17

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	65
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Right Turn Warrant - Intersection 7 EB - PM Peak Hour - Build Year

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

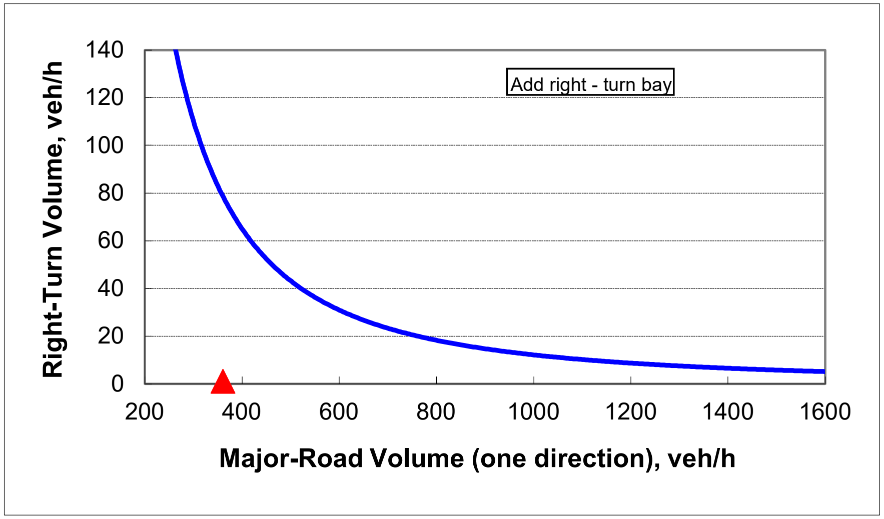
INPUT

Roadway geometry:	2-lane roadway

Variable	Value
Major-road speed, mph:	45
Major-road volume (one direction), veh/h:	361
Right-turn volume, veh/h:	1

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	78
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Right Turn Warrant - Intersection 8 NB - PM Peak Hour - Build Year

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

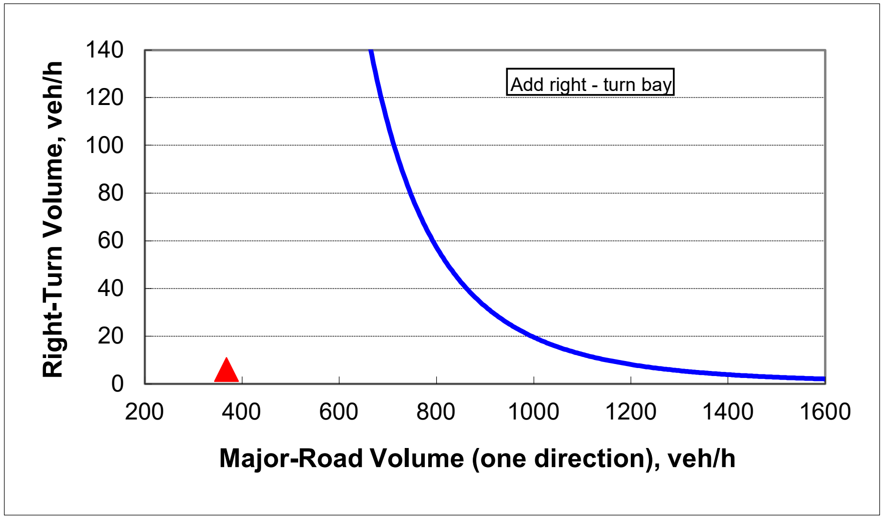
INPUT

Roadway geometry:	2-lane roadway ▼

Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	368
Right-turn volume, veh/h:	6

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	2416
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Appendix R: Left-Turn Warrant Analyses

Left Turn Warrant - Intersection 3 EB - PM Peak Hour - Build Year

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

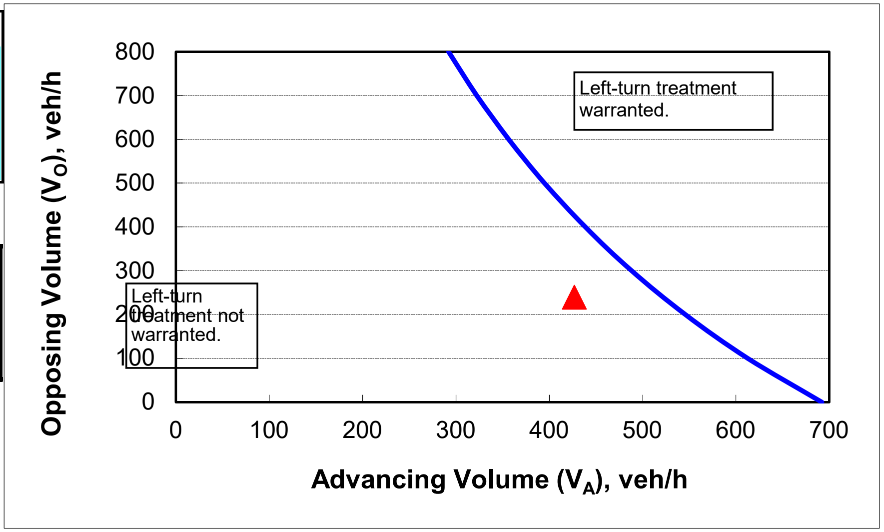
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	427
Opposing volume (V_O), veh/h:	239

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	522
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

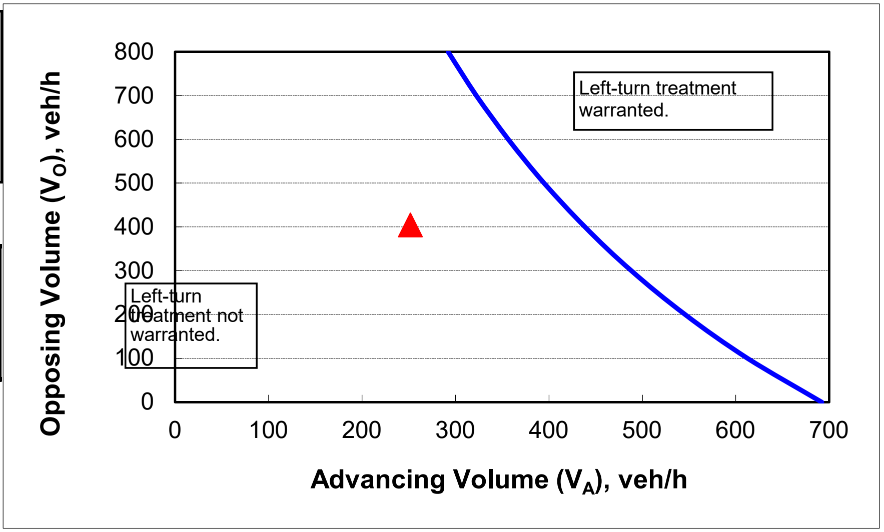
Left Turn Warrant - Intersection 3 WB - PM Peak Hour - Build Year

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	5%
Advancing volume (V_A), veh/h:	252
Opposing volume (V_O), veh/h:	404



OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	437
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

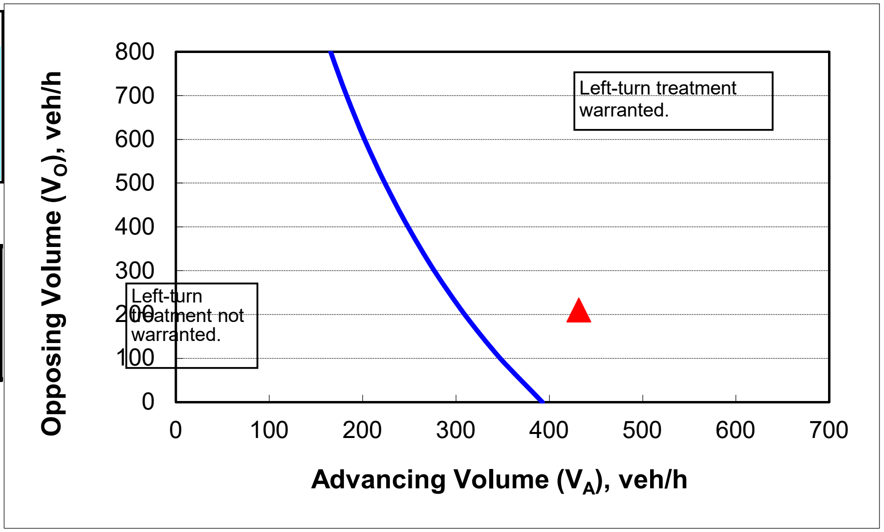
Left Turn Warrant - Intersection 5 EB - PM Peak Hour - Existing

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	18%
Advancing volume (V_A), veh/h:	432
Opposing volume (V_O), veh/h:	210



OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	306
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left Turn Warrant - Intersection 5 EB - PM Peak Hour - Build Year

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

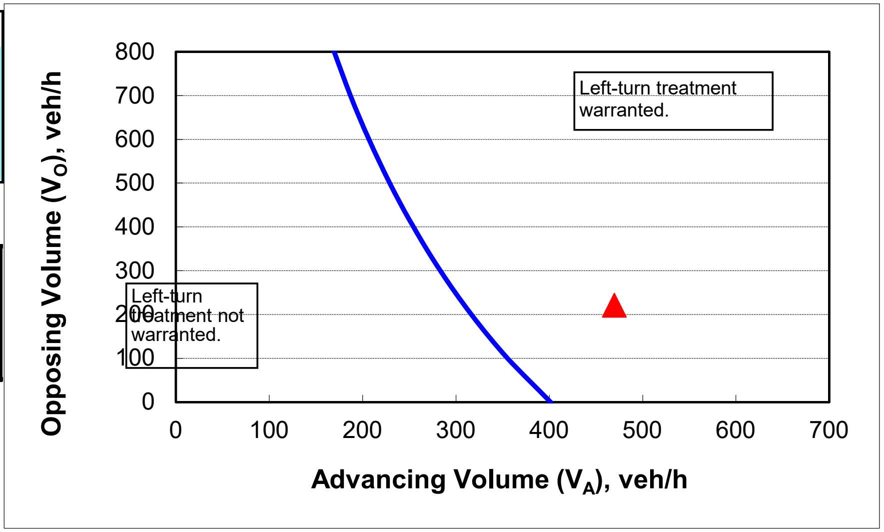
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	50
Percent of left-turns in advancing volume (V_A), %:	17%
Advancing volume (V_A), veh/h:	470
Opposing volume (V_O), veh/h:	221

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	309
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left Turn Warrant - Intersection 7 WB - PM Peak Hour - Build Year

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

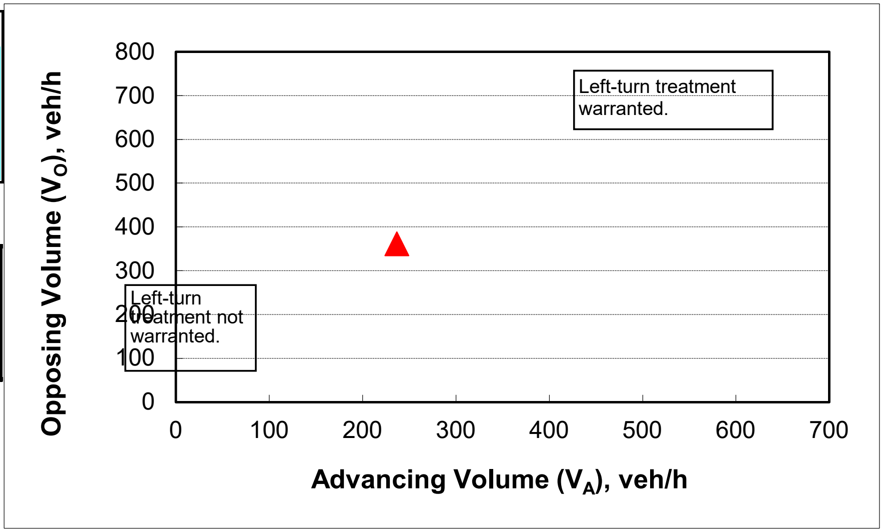
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	237
Opposing volume (V_O), veh/h:	361

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1176
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

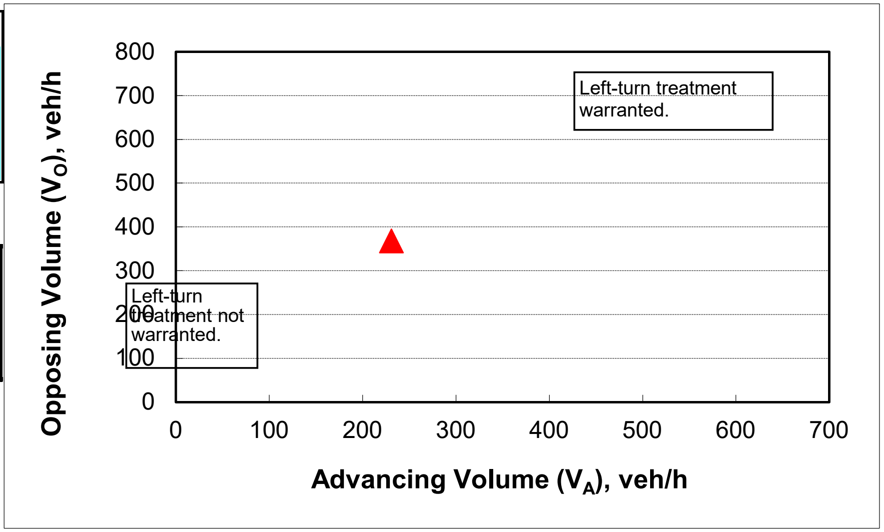
Left Turn Warrant - Intersection 8 SB - PM Peak Hour - Build Year

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	231
Opposing volume (V_O), veh/h:	368



OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1378
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	

CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

ENVIRONMENTAL BOARD
ITEM 6B

STAFF ORIGINATOR: Tom Hoffman, Environmental Coordinator

DATE: November 26, 2024

REQUEST: Peltier Ponds PUD Concept Plan Review

CASE NUMBER: PC2024-004
CR2024-004

APPLICANT: Lennar
Josh Metzer
16355 36th Ave N, Suite 100
Plymouth, MN 55127

OWNER: Hal & Pam Leibel
7566 Peltier Lake Drive
Lino Lakes, MN 55038

BACKGROUND:

The applicant, Lennar, is proposing a master planned development located on the West side of 20th Ave N (CSAH 54) just across from Watermark, East of Peltier Lake Drive, and North of the Centerville border. The development contains approximately 125.02 gross acres, 79.21 developable and consists of mix of residential housing The proposed development is called Peltier Ponds.

Future land use applications may include:

- Environmental Assessment Worksheet (EAW)
- Rezoning property from R, Rural to PUD, Planned Unit Development
- PUD Preliminary Plan/Preliminary Plat
- PUD Final Plan/Final Plat.

This staff report is based on a review of the following documents:

- Applicant Narrative prepared by Lennar dated November 12, 2024
- Peltier Ponds Development PUD Concept Plan prepared by James R Hill dated November 11, 2024

ANALYSIS

Current Zoning and Land Use

Current Zoning	R, Rural
Current Land Use	Agricultural
Future Land Use per 2040 Comp Plan	Medium Density, High Density, and Signature Gateway
Utility Staging Area	Stage 1A (2018-2025) Stage 1B (2025-2030)

Current Proposal

The attached applicant's narrative provides a detailed description of the project. Per the narrative, "The proposed land uses 74 (74) – CMA back to back townhome, 39 (39) CMS row townhome, 149 (149) single-family lots."

Residential

The applicant is proposing the following mix and number of housing types:

Housing Type	# Units
CMA back-to-back Townhomes =	74
CMS row Townhomes =	39
Single-Family =	149
	262

The residential development transitions from townhomes along 20th Avenue North and the SE corner of the proposed property to sing-family lots in the interior of the property heading west to Peltier Lake Dr. Trails, sidewalks and stormwater ponds are included throughout the development.

Commercial

No commercial use being proposed on site.

General Site Characteristics

The 125.02-acre site is predominately used for agricultural purposes or existing in a natural state with associated wetlands covering the site. The site is immediately west of Watermark development that consists of single family residential uses and park and open space amenities.

Land Cover

Pre-settlement land cover (Marschner) was forested big woods.

The Minnesota Land Cover Classification System (MLCCS) identifies the southeastern parcel as deciduous forest and cattail marsh. This area currently wetlands scattered throughout the site. Moving north the land transitions to cultivated herbaceous vegetation. This area of the site is currently agricultural and farmed for row crops.

Soils

The soils within the agricultural area consist of Nessel Fine sandy loam and Hayden fine sandy loam. These consist of a layer of silty sand and sandy lean clay. The top layer of silty sand is categorized as Hydrologic soil group B along with silty clay loam Group D.

Based on the soil boils provided onsite infiltration will be limited due to the layer of silty clay loam and sandy clay. Infiltration may be possible in soil group B where an adequate depth of soil exists for infiltration.

Groundwater was also observed throughout the site at an average depth of 8'. Peltier lake at the time of borings was at an elevation of 882-884' which would be consistent with the water levels found in the boring log. It is expected that the ground water in this area is tied into the NWL of Peltier Lake.

The sandy, well drained areas offer the potential for stormwater infiltration, provided groundwater separation requirements can be met.

Rare, Unique, or Significant Resources

A Rare plant survey was completed by Midwest Natural Resources on September 15, 2024. 16 potential rare species were identified using the DNR's online Rare Species Guide associated with wetland habitat.

During the site visit no state-listed plant species were found during the late-season rate plant survey. It is to be noted that the survey occurred outside the appropriate time window to search for early and mid-season rare species. Based on the disturbance and degradation of the existing habitat it is unlikely that any of these species are established on this site.

Stormwater Management

Peltier Lake is identified as an impaired water by the MPCA for excess nutrients. The project provides the opportunity to eliminate agricultural runoff from the site and create stormwater management systems that improve water quality entering the lake. With the conversion of agricultural land to residential development there will be a nutrient and sediment loading reduction. However, it is also imperative that the site meet the city and RCWD requirements for stormwater runoff to limit pollutant runoff.

The concept plan includes nine stormwater ponds. A stormwater management plan must be submitted at the Preliminary Plat phase. Larger ponds are proposed running parallel to the wetland areas. This will allow for treatment prior to discharge into the adjacent wetland complex.

Existing drainage flows from east to west. There is significant elevation change from the east side of the site to the west (change of elevation from 906’-890’). Opportunities exist to incorporate a stormwater treatment train that filters and treats stormwater runoff as it flows through the site. Any opportunities to incorporate natural treatment systems into the site should be encouraged. There is an existing waterway onsite that discharges directly to Peltier Lake, a stormwater management BMP should be installed prior to the start of the waterway to reduce sediment and pollutants leaving the site.

Options for infiltration should be evaluated and used where practicable. Capacity is limited to existing drainages and infiltration and water retention should be used where feasible.

Use of stormwater for irrigation purposes for the site should be evaluated and if feasible required as part of site development.

Flood Plain

The southeastern corner of the site falls within a Zone A floodplain. This is an area where the 100-year flood elevation has been determined by approximate means. No buildings are proposed to be in the floodplain area.

Grading and construction of storm water management best management practices (BMP’s) are permissible with the flood plain. Any filling of flood plain will require mitigation and FEMA approval.

Shoreland District

The subject property is located within the Shoreland Management Overlay District of Peltier Lake. Shoreland Districts extend 1,000’ from the Ordinance High Water Level of the water body. Peltier Lake is classified as Natural Environment lakes. Natural Environment Lakes are generally small, often shallow lakes with limited capacities for assimilating the impacts of development and recreational use.

City Code Section 1102.13 details additional Shoreland Planned Unit Development (PUD) requirements. PUD development allows the city and developer to work in partnership to achieve creative conservation design elements that preserve open space, and unique natural features and resources.

For purposes the Environmental Boards review priority considerations should be given to:

1) Amount of open space (50% minimum).

2) Building heights (36’ maximum).

3) Increased building setbacks from the Lake (150’ minimum). The concept shows approximately 170’ from Peltier.

4) Amount of impervious surface (35% maximum).

Wetlands

The Rice Creek Watershed District (RCWD) administers the Wetland Conservation Act (WCA) for this area. Any wetland impacts will need to be approved by RCWD. Wetlands preserved on site will need to meet RCWD and City buffer requirements.

There are nineteen wetlands identified on site. A majority of the wetlands (13) are shown within the currently farmed area of the parcel. These wetlands are considered degraded and have a lower biological value. Any wetlands that are impacted will need to meet mitigation requirements.

Larger wetlands on the south side of the parcel are within the RCDW wetland management corridor and will require a 50’ buffer. The extent of the wetlands and corridor will be evaluated with preliminary plans. It is likely additional wetlands will be included within these protected areas. Wetlands in these areas will be placed under a conservation easement with the project.

All wetlands that are preserved onsite should be managed and restored as possible. Mitigation and management to enhance wetland function and benefits should be fully investigated.

Opportunity exists on the site to establish and restore an upland buffer in excess of 40’ wide along the western edge of the “built” area. Stormwater ponds are allowed within buffer areas.

Greenway System, Parks and Trails

The 2040 Comprehensive Plan does show areas of value for natural resource conservation related to wetlands on the site. The greenway system consists of a

Natural Resource Conservation area running along the wetland and trunk storm sewer. Conservation easements should extend from the wetlands on the NE quandrant of the parcel to Peltier lake through the greenway.

Peltier Lake road should be realigned through the development and a trail system with public use will be incorporated into the existing lake frontage. Realigning the road will create the opportunity for public use, shoreline restoration, and extended trail system through this corridor.

Conservation easements should be provided over all open space and wetland areas. The goal of this project is to extend the greenway corridor and trail system by connecting it to existing infrastructure to the east. Watermark park and trail system is located directly east of this property. The ultimate goal is to connect these greenways with future development and acquisition of land creating a link between the open space corridor.

A future neighborhood park is also shown in this area. A future park is proposed along the greenway corridor and along the existing storm sewer outlet prior to Peltier Lake.

Tree Preservation

A Tree Preservation and Mitigation Plan will be required for existing trees that are proposed to be removed. The area has been farmed and few desirable trees exist within this area. On the northern end of the project tree removal should be limited to provide screening from existing houses on the south side of Rehbein St.

The southwest corner of the property has trees that are shown for removal. These areas appear to be outside of the basic use area and will require mitigation. Provide calculations in future submittals showing the basic use area for the property and areas of environmentally sensitive areas.

Tree preservation protection and mitigation will be required for trees that are remaining onsite.

Landscaping

Boulevard trees are required at the rate of one (1) tree per lot frontage for single family and two-family lots. Townhomes and multi-family properties require one tree per 70 feet of linear feet of road frontage. Open areas shall be landscaped. Landscape screening and buffers shall be installed along CSAH 54/20th Street.

Noise mitigation techniques and berms along CSAH 54/20th Street may be required at the time of development. The landscape plans shall comply with Section 1007.043 (17), Required Screening, Landscaping and Buffer Yards of the zoning ordinance.

Environmental Review Considerations

This area is part of the I-35 E Corridor AUAR. As part of the AUAR an Environmental Assessment Worksheet (EAW) will be required. The process operates according to rules adopted by the state's Environmental Quality Board (EQB). The EAW document is designed to provide a brief analysis and overview of the potential environmental impacts for a specific project and to help the City, referred to as the Responsible Government Unit (RGU), determine whether an Environmental Impact Statement (EIS) is necessary. The questions contained within the document are established by the EQB.

The EAW is not meant to approve or disapprove a project, but is simply a source of information to guide other approvals and permitting decisions. In fact it is one of the advantages to larger scale development projects. Preparation of the EAW will help inform the design of the project before the submittal of a formal development application.

The public comment period lasts for 30 days. During that period all interested parties may submit written comments to the City. At the end of the 30 day period, the City reviews all of the public comments, as well as the content of the EAW to determine whether the project needs further changes or analysis. The City will prepare a written response to all substantive comments received during the public comment period.

Once completed the City Council will determine if potential impacts of the project are significant enough to require the preparation of an Environmental Impact Statement. If not, the Council will adopt a finding of no significant impact and the environmental review process ends. The developer may then begin to prepare the design of the project and the land use application information.

Drinking Water Protection

The southern portion of the site is within the Lino Lakes Drinking Water Supply Management Area (DWSMA). This area is considered to be of moderate vulnerability and will need to be accounted for during development. A majority of the stormwater bmp's and development is proposed outside of the DWSMA.

The Minnesota Well Index indicated no known locations of a well on the property. Proof should be provided of the well sealing and septic system removal if a septic system existed.

RECOMMENDATIONS

Staff has the following recommendations for consideration by the board:

1. The buffer for wetland 10 appears to connect to the rear property line of lots 8 &9 block 12. Where possible ensure buffers are met and expanded prior to private property to limit future encroachment from adjacent property owners.
    a. Provide increased buffer widths around wetland where the trail is going past these locations. Buffers should be extended throughout the park land to provide pretreat of runoff before discharging to the wetlands.
    b. Show buffers in between the trail and existing channel shown on the proposed plans.
    c. All wetlands should be included in conservation easements.
    d. This area is included in the RCWD wetland corridor plan. With future submittals impacts and mitigation of wetlands will be required.
        i. Wetlands falling within the wetland corridor will require 50’ buffers

2. The project will disturb more than an acre of soil and will be required to obtain an NPDES permit. Proof of permit shall be required before construction.

    a. A SWPPP shall be required in additional submittals as required by the MPCA meeting sections 5.2-5.26
    b. Final erosion and sediment control will be reviewed with future submittals
    c. Redundant perimeter control will be required around all wetlands onsite where a 50’ natural buffer cannot be maintained during construction. Redundant perimeter control should be spaced 3-5’ apart.

3. Rice Creek Watershed District shows Anoka County Ditch 72 branch 1 running through the site. Verify the location and use of the ditch with the watershed. Ditch location and drainage should be shown on the plan set if it is required to be maintained.

4. The project site is located with the I-35 E corridor AUAR. As part of the planning the AUAR mitigation checklist should be used.

    a. This are is listed as an area of cultural significance and will need to be investigated.

5. Building setbacks to Peltier Lake should be shown on the plant set to confirm 150’ setback requirements are met.

6. Confirm building heights, open space, and impervious cover within the shoreland area to confirm all requirements are being met.

7. Building height should be limited to a maximum of 36’ or less in the shoreland zone. Confirm heights of buildings on future submittals.

8. Provide conservation easements over all wetland and open space in the development to ensure connectivity with existing and future development.

    a. A contiguous path should be created from the lake extending east to 35E and beyond.

9. Retain 50’ wide drainage & utility easement over trunk storm sewer.

10. Provide removal of dead ash trees within dedicated park and open space to limit maintenance required by the city once ownership is transferred.

11. Within the tree preservation plan break down the removals between the basic use area and where mitigation is required.

    a. Stormwater BMP’s are not included in the basic land use area. Currently removal of trees is being shown for stormwater ponding and would require mitigation.

12. Provide additional detail on stormwater management BMP’s. Infiltration should be proposed where feasible based on soil types and depth of groundwater.

13. A stormwater treatment train that filters and treats stormwater runoff as it flows through the site should be developed. Any opportunities to incorporate natural treatment systems into the project should be encouraged.

14. Use of stormwater for irrigation purposes for the site should be evaluated and if feasible required as part of site development. Larger stormwater ponds constructed for fill should be evaluated for water reuse.

15. The southern portion of the site is within the Lino Lakes drinking water supply management area.

    a. This area is considered moderately vulnerable, and considerations should be taken into account for the proposed project.

ATTACHMENTS

1. General Location Map
2. Project Narrative
3. Peltier Ponds PUD Concept Plan

LENNAR®

NARRATIVE: Peltier Ponds - Single-Family & Townhome Residential Community

U.S. Home, LLC, dba Lennar, is pleased to submit this request for Sketch Plat Review for a proposed single-family and townhome community composed of 262 homes.

Existing Conditions

The subject property is located on the west side of 20th Ave N (CSAH 54) just across from Watermark, east of Peltier Lake Drive, and north of the Centerville city border. The site is 125.02 gross acres (79.21 net developable acres) in size and is currently farmed agricultural land with wetlands and pockets of wooded upland and lowland. The site is currently guided Low Density Residential, Medium Density Residential, and High Density Residential. Nineteen wetlands have been delineated on the site totaling 15.66 acres in size.

Guided Land Uses and (current use of land) surrounding the subject property include:

- North – Guided Urban Reserve (single-family residential – Rehbein's Peltier View);
- West – Guided Low Density Residential, Medium Density Residential, and Open Water (two single-family homesteads and Peltier Lake);
- Southwest – Guided Medium Density Residential (50-acre single-family homestead)
- South – City of Centerville (single-family residential and open space);
- East – Guided Low Density Mixed Residential (20th Ave N & Watermark).

Description of Requests

Lennar is requesting Sketch Plat Review of the proposed single family and townhome community named Peltier Ponds. Eventually we will request a rezoning of the subject property from Rural to PUD to align with the guided Land Use of the property and will be submitting a Preliminary Plat application upon completion of the Sketch Plat process.

Proposed Homes and Architecture

Peltier Ponds will consist of single-family homes and townhomes with a similar variety to those built in Watermark.

	CMA back-to-back townhome	**CMS row townhome**	**55-foot single-family lots**	**65-foot single-family lots**	**80-foot single-family lots**	
Bedrooms	3	3	2 to 4	3 to 5	3 to 5	
Home Sq Ft	1770-1800	1800-1900	942-2400	1920-3876	1920-3876	
Garage Stalls	2	2	2 to 3	3	3 to 4	
Garage Sq Ft	405	379-388	396-744	634-731	634-951	
Price Range	TBD	TBD	TBD	TBD	TBD	
Unit Count	74	39	75	49	25	**262**

Infrastructure

Peltier Ponds is located adjacent to existing residential developments. As a result, infrastructure is readily available for extension to serve this development.

Access for the new neighborhood will be provided through the westward extension of Watermark Way and a southward extension of Gordon Ave. Access will also be provided from Peltier Lake Drive on the north, however, from this point Peltier Lake Drive will be moved away from the lake and redirected internally into the new neighborhood. The existing Peltier Lake Drive will be abandoned and possibly turned into a trail in the future.

The single-family homes and all but four of the row townhomes will be served by public streets with a curb-to-curb street width of 32 feet. The back-to-back townhomes will all be served by private streets.

Public Park, Open Space, Trails, and Sidewalks

Lennar is proposing the dedication of 11.14 acres of land in the central and west portions of the site intended for a City park. Approximately 7.7 acres of the site is being preserved in open space. When including the park, ponding areas, and wetlands 58.3 acres will be open space which constitutes 47% of the site. We intend to include a series of trails within the community, final locations and alignment will be determined as we move further along with grading and stormwater design, but at this point there are 1.08 miles of trails proposed. Sidewalks will be constructed on one side of each public street. The public park areas will be deeded to the City and trails within the park will be maintained by the City. Common open spaces will likely be owned by the HOA and trails outside of park maintained by the HOA.

Trees and Landscape Buffers

Given the long-term agricultural use of the property, and large presence of wetlands, much of the site is void of trees. There are, however, a few large clusters of trees in the southern wetlands, along the north property line, near the homesteads by the lake, and around the creek in the center of the site where the park is proposed to be located. There was a total of 2,190 trees were inventoried. As with most new residential developments Lennar is proposing the removal of 318 trees from the site, which means roughly 85.5% will be preserved. Lennar will be planting trees in accordance with City Code requirements.

Comprehensive Plan Land Use Goals

The Lino Lakes Comprehensive Plan guides the subject properties Low Density Residential, Medium Density Residential, and High Density Residential. This is a complicated site to design to meet density requirements given the scattered location of wetlands and the need to provide ponding, but PUD zoning would provide the flexibility to offer the proposed mix of townhomes and three base lot width standards for the single-family homes to achieve the density required by the Comp Plan. The proposed plan meets density requirements in the Low Density area but is below minimum density in the Medium Density area and High Density areas. However, as the tables below demonstrate, the overall minimum density range needed (3.0 units/acre) can be reached when combining Low, Medium, and High Density calculations together. This, along with 18.84 acres being preserved in park/open space, the preservation of wetlands and trees, and the creation of a public park, the proposed concept plan aligns with goals outlined in the Lino Lakes 2040 Comprehensive Plan.

Leibel Property				
Use	Net Acres	Density Unit Range	Proposed Units	Density
LDR (1.6 - 3.0 units/acre)	35.69	58 - 108	99	2.77 units/acre (within density requirements)
MDR (4.0 - 6.0 units/acre)	28.53	114 – 172	112	3.93 units/acre (below minimum density required)
HDR (6.0 - 8.0 units/acre)	15.00	90 - 120	51	3.40 units/acre (below density requirements)
	79.21	**222 - 344**	**262**	**3.31 units/acre**

Goal 1: Create a unified vision and future for the city, promote a well-planned community, prevent fragmented development, address the impacts of development and redevelopment on natural resources, aesthetics and view corridors, and provide balanced land use and connectivity that ensures the integration of both sides of the regional park.

- Preserving open space, providing park dedication and trails, and/or providing stormwater management areas, in excess of minimum standards to implement the Greenway System and Rice Creek Watershed District's Lino Lakes Resource Management Plan.
- Restoring/enhancing ecological systems.
- Managing stormwater using natural filtration and other ecologically based approaches.
- Providing life-cycle and affordable housing.

Peltier Ponds will be preserving 18.84 acres of upland open space (58.3 acres of open space if ponding and wetland areas were included) which is 47% of the site. This plan proposes the dedication of a 11.14-acre park at the west side of the community near Peltier Lake. Of the 15.58 acres of wetland located on the site 14.55 acres will be preserved along with the creation of 6.35 acres of wetland buffers. Five of the wetlands (2.44 acres combined) on site are being restored from their current farmed agricultural state to revitalized wetlands. As mentioned, there will be nine (9) stormwater ponds constructed which will treat stormwater runoff prior to it entering the natural systems of wetlands, creeks, and lakes. By offering two types of townhomes and the various floorplans that can be built on 55-foot, 65-foot, and 80-foot wide lots Peltier Ponds will certainly provide Lino Lakes residents options for life-cycle housing.

Goal 3: Ensure housing development is compatible with existing and adjacent land uses and provides accessibility to key community features and natural amenities.

- Link trails to parks, lakes, and schools.
- Encourage pedestrian activity in residential areas by providing sidewalks and trails as well as connections to existing and future pedestrian or transit facilities.

We are working to define the final layout for trails, but the goal will be to provide connections between the Peltier Ponds park, Peltier Lake, and 20thAve/Hwy 54 which would provide a connection to Watermark trails and Watermark Park. Sidewalks will also be provided on all public streets.

Goal 4: Maintain safe neighborhoods and community areas.

- Develop neighborhoods with mixed housing styles that promote diversity and attract all age groups.

The proposed mix of homes should attract buyers of all ages and demographics from young single first-time buyers, couples, families with children, empty-nesters, and retirees.

Goal 7: Sustain Lino Lakes' Natural Resources which make it such a desirable place to live.

- Protect and preserve the natural resources throughout the city.
- Continue to promote the use of Planned Unit Developments (PUD) as the city's preferred development process to implement the Greenway System.

Please see comments provided for Goal 1 and Goal 3 above. In addition, 1,872 trees will be preserved out of the 2,190 trees existing on site today. Many of which are located in the proposed park and open spaces.

Comprehensive Plan Parks, Open Space, and Trail Goals

Goal 1: Continue development and maintenance of an appropriate balance of active and passive recreational activities to serve the diverse needs of the community for people of all ages and abilities, including, where possible, neighborhood parks, larger multi-use community parks and the Rice Creek Chain of Lakes Park Reserve (Regional Park).

- Acquire, reserve, develop and maintain sufficient park and open space land to fulfill the identified and projected needs of the present and future populations.
- Continue, whenever possible, inclusion of neighborhood parks in future developments and planned redevelopments.
- Direct and manage activities in an appropriate manner by balancing the use of programming activities in the neighborhood parks.

As mentioned in the response for Land Use Goal 1, this plan proposes the dedication of an 11.14-acre park near the center and west area of the community.

Goal 2: Collaborate with Anoka County to guarantee and improve public access of the Rice Creek Chain of Lakes Park Reserve (Regional Park) waterways for recreational use and enjoyment of the community.

- Identify, develop and maintain new public access points to area lakes and waterways so that residents can enjoy these unique recreational opportunities.

There is an opportunity for the City to create and offer a new public access point to Peltier Lake at the western edge of the proposed park dedication area.

Goal 3: Develop, maintain and connect the current and proposed trails and greenway systems in the City of Lino Lakes and the Rice Creek Chain of Lakes Park Reserve (Regional Park) in a manner that preserves and sustains the natural environment.

- Preserve the open character of Lino Lakes through the preservation of natural open space and the establishment of greenway corridors.
- To the extent possible, require an interconnected trail system to be developed concurrently with the infrastructure of the subdivision or new development.

Please see comments provided for Land Use Goal 3 above.

Goal 4: Identify, protect and preserve the desirable natural areas and ecological and aquatic resources of the community.

- Where possible, restore damaged or misused natural and ecologically significant areas to their original state.
- Require natural space buffers, where appropriate, around wetlands to preserve their function and value.

Please see wetland comments provided for Land Use Goal 1 above.

Goal 5: To provide city residents with parks, trails, greenways and natural areas for protection of the natural environment, recreational uses, as visual/physical diversions from the hard surfacing of urban development, and as a means to maintain the character, ambiance, appearance and history of the community.

- The city shall reserve the right to acquire land within all development areas for park, natural open space, greenways and trail purposes.
- Parkland dedication policies and ordinances shall be used by the city to require each developer (of all land use categories) to dedicate land, or at the discretion of the city provide a payment in lieu for all or part, for parks, trails, greenways and open space acquisition and development.
- Alternatives to direct acquisition of property, such as conservation easements, shall be used where appropriate to set aside land for park and open space purposes.

  Please see comments provided for Land Use Goal 1 and Goal 3 above. The proposed open spaces would be placed under conservation easements.

Goal 7: Identify important existing natural resources for protection and work cooperatively with developers and landowners to encourage healthy natural resource systems to retain the existing natural character of the community through education.

- Encourage the preservation of natural vegetation including plants of oak savannas, prairies, woodlands, wetlands and aquatic vegetation to be a design consideration for new subdivisions.

  As mentioned above, this plan will restore and preserve 2.44 acres of wetlands, preserve trees, and create new open spaces for natural vegetation to grow.

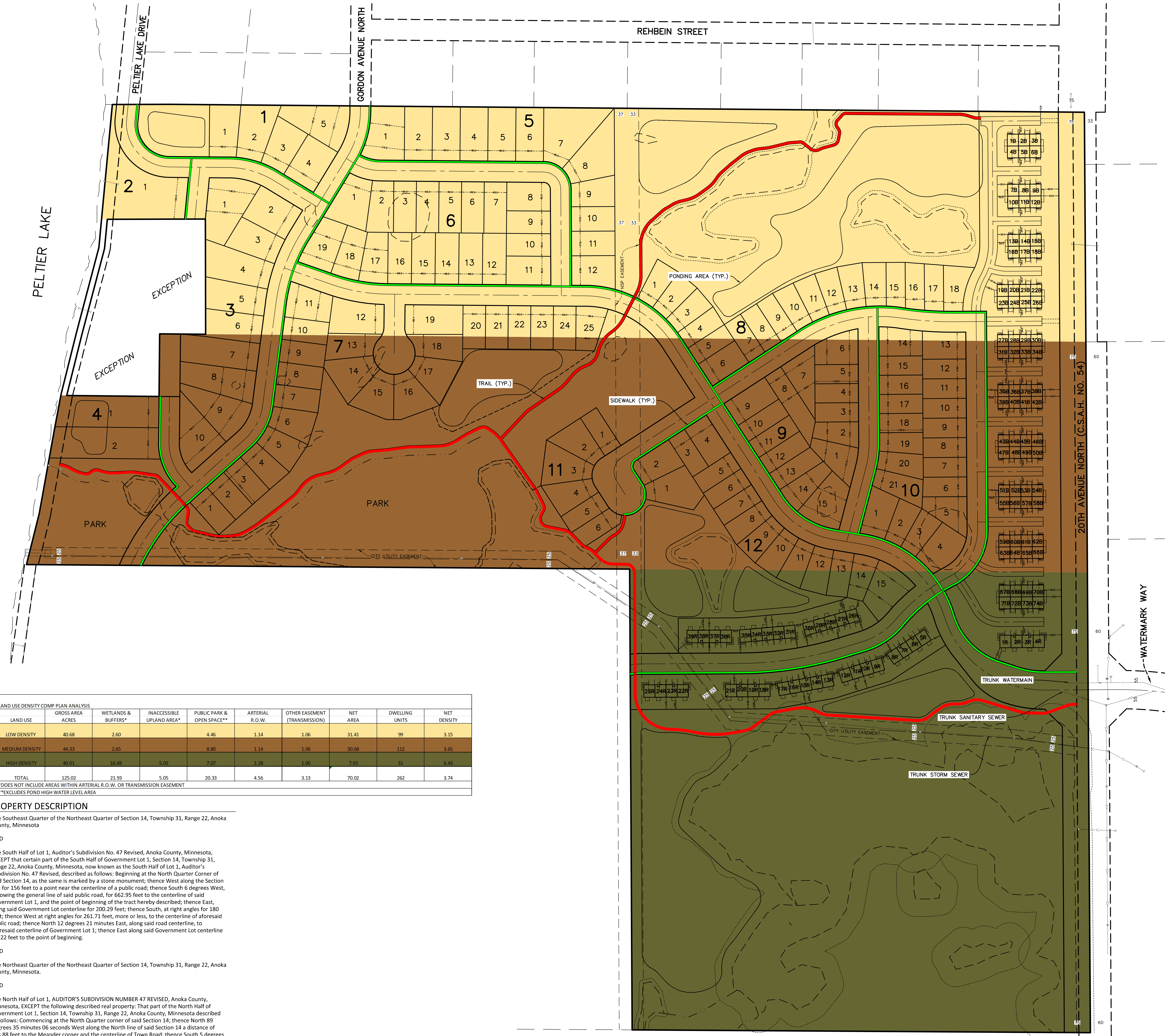
Schedule

Land development work (grading) would begin in Spring 2025 with continued grading and utility/street construction getting started in Summer 2025. The overall project will likely be developed in four phases. Lennar estimates full occupancy of the community will occur approximately 5 years from the date sales begin.

Lennar has a long-standing history of building successful communities throughout the Twin Cities, including similar such as Watermark (Lino Lakes), North Meadows (Blaine), and Willowbrooke (Oakdale). We invite you to visit any of these communities and our website at lennar.com/new-homes/minnesota/minneapolis-st-paul. We look forward to this opportunity to continue working with the City of Lino Lakes and thank the City for its support.

Regards,

Josh Metzer
Land Entitlement Manager
Lennar Minnesota



LAND USE DENSITY COMP PLAN ANALYSIS									
LAND USE	GROSS AREA ACRES	WETLANDS & BUFFERS*	INACCESSIBLE UPLAND AREA*	PUBLIC PARK & OPEN SPACE**	ARTERIAL R.O.W.	OTHER EASEMENT (TRANSMISSION)	NET AREA	DWELLING UNITS	NET DENSITY
LOW DENSITY	40.68	2.60		4.46	1.14	1.06	31.41	99	3.15
MEDIUM DENSITY	44.33	2.65		8.80	1.14	1.06	30.68	112	3.65
HIGH DENSITY	40.01	16.69	5.05	7.07	2.28	1.00	7.93	51	6.43
TOTAL	125.02	21.93	5.05	20.33	4.56	3.13	70.02	262	3.74

*DOES NOT INCLUDE AREAS WITHIN ARTERIAL R.O.W. OR TRANSMISSION EASEMENT

**EXCLUDES POND HIGH WATER LEVEL AREA

PROPERTY DESCRIPTION

The Southeast Quarter of the Northeast Quarter of Section 14, Township 31, Range 22, Anoka County, Minnesota

AND

The South Half of Lot 1, Auditor's Subdivision No. 47 Revised, Anoka County, Minnesota, EXCEPT that certain part of the South Half of Government Lot 1, Section 14, Township 31, Range 22, Anoka County, Minnesota, now known as the South Half of Lot 1, Auditor's Subdivision No. 47 Revised, described as follows: Beginning at the North Quarter Corner of said Section 14, as the same is marked by a stone monument; thence West along the Section line for 156 feet to a point near the centerline of a public road; thence South 6 degrees West, following the general line of said public road, for 662.95 feet to the centerline of said Government Lot 1, and the point of beginning of the tract hereby described; thence East, along said Government Lot centerline for 200.29 feet; thence South, at right angles for 180 feet; thence West at right angles for 261.71 feet, more or less, to the centerline of aforesaid public road; thence North 12 degrees 21 minutes East, along said road centerline, to aforesaid centerline of Government Lot 1; thence East along said Government Lot centerline for 22 feet to the point of beginning.

AND

The Northeast Quarter of the Northeast Quarter of Section 14, Township 31, Range 22, Anoka County, Minnesota.

AND

The North Half of Lot 1, AUDITOR'S SUBDIVISION NUMBER 47 REVISED, Anoka County, Minnesota, EXCEPT the following described real property: That part of the North Half of Government Lot 1, Section 14, Township 31, Range 22, Anoka County, Minnesota described as follows: Commencing at the North Quarter corner of said Section 14; thence North 89 degrees 35 minutes 06 seconds West along the North line of said Section 14 a distance of 148.88 feet to the Meander corner and the centerline of Town Road; thence South 5 degrees 57 minutes 00 seconds West along said centerline of Town Road a distance of 331.55 feet to the actual point of beginning of the tract to be hereby described; thence continuing South 5 degrees 57 minutes 00 seconds West a distance of 84.40 feet; thence South 15 degrees 18 minutes 48 seconds West along said centerline a distance of 251.26 feet to its intersection with the South line of said North Half of Government Lot 1 as monumented; thence South 88 degrees 58 minutes 52 seconds East along said South line a distance of 354.76 feet; thence North 0 degrees 24 minutes 54 seconds East a distance of 330.56 feet; thence North 89 degrees 35 minutes 06 seconds West a distance of 282.00 feet to the actual point of beginning. Also known as a part of Lot 1, AUDITOR'S SUBDIVISION NO. 47 REVISED, Anoka County, Minnesota.

SITE DATA

EXISTING ZONING – LOW/MEDIUM/HIGH DENSITY
PROPOSED ZONING – P.U.D.

TOTAL AREA – 125.02 ACRES

PUBLIC STREETS – 10,383 LF
PRIVATE STREETS – 2,064 LF

RESIDENTIAL AREA – 46.92 AC
NON–RESIDENTIAL AREA – 78.10 AC
SINGLE–FAMILY AREA – 36.35 AC
MULTI–FAMILY AREA – 10.57 AC
COMMON OPEN SPACE AREA – 7.70 AC
PUBLIC OPEN SPACE AREA – 11.14 AC
STREET AREA – 20.35 AC

TOTAL LOTS	**262 LOTS**
SINGLE FAMILY – 80'	25 LOTS
(BLOCKS 1–4, LOTS 1–7, BLOCK 5)	
MINIMUM LOT WIDTH	80 FEET
MINIMUM LOT WIDTH (CORNER)	100 FEET
MINIMUM LOT DEPTH	135 FEET
MINIMUM SETBACKS	
FRONT	30 FEET
SIDE (HOUSE)	10 FEET
SIDE (GARAGE)	10 FEET
SIDE (STREET)	30 FEET
REAR	30 FEET
MINIMUM LOT SIZE	10,800 S.F.
SINGLE FAMILY – 65'	49 LOTS
(BLOCKS 6–7, LOTS 8–12, BLOCK 5)	
MINIMUM LOT WIDTH	65 FEET
MINIMUM LOT WIDTH (CORNER)	82.5 FEET
MINIMUM LOT DEPTH	125 FEET
MINIMUM SETBACKS	
FRONT	25 FEET
SIDE (HOUSE)	7.5 FEET
SIDE (GARAGE)	7.5 FEET
SIDE (STREET)	25 FEET
REAR	25 FEET
MINIMUM LOT SIZE	8,125 S.F.
SINGLE FAMILY – 55'	75 LOTS
(BLOCKS 8–12)	
MINIMUM LOT WIDTH	55 FEET
MINIMUM LOT WIDTH (CORNER)	72.5 FEET
MINIMUM LOT DEPTH	125 FEET
MINIMUM SETBACKS	
FRONT	25 FEET
SIDE (HOUSE)	7.5 FEET
SIDE (GARAGE)	7.5 FEET
SIDE (STREET)	25 FEET
REAR	25 FEET
SMALLEST LOT	6,875 S.F.
ROW TOWNHOMES	39 LOTS
(BLOCK R)	
(*FRONT AND REAR STOOPS/CANTILEVER PORTIONS/DECKS/PATIOS OF BUILDING ARE ALLOWED EXCEPTIONS INTO SETBACK)	
FRONT (GARAGE TO PUBLIC RIGHT OF WAY)	30 FEET
FRONT (GARAGE TO BACK OF CURB (PRIVATE))	25 FEET
SIDE (BUILDING TO BUILDING)	20 FEET
SIDE (BUILDING TO BACK OF CURB (PRIVATE))	20 FEET
SIDE (BUILDING TO PUBLIC RIGHT OF WAY)	30 FEET
BACK TO BACK TOWNHOMES	74 LOTS
(BLOCK B)	
(*FRONT AND REAR STOOPS/CANTILEVER PORTIONS/DECKS/PATIOS OF BUILDING ARE ALLOWED EXCEPTIONS INTO SETBACK)	
FRONT (GARAGE TO PUBLIC RIGHT OF WAY)	30 FEET
FRONT (GARAGE TO BACK OF CURB (PRIVATE))	25 FEET
SIDE (BUILDING TO BUILDING)	20 FEET
SIDE (BUILDING TO BACK OF CURB (PRIVATE))	20 FEET
SIDE (BUILDING TO PUBLIC RIGHT OF WAY)	30 FEET

James R. Hill, Inc.
PLANNERS / ENGINEERS / SURVEYORS
2999 WEST C.R. 42, SUITE 100, BURNSVILLE, MN 55306
PHONE: 952.890.6044 www.jrhinc.com

PELTIER PONDS
LINO LAKES, MINNESOTA
CONCEPT PLAN
FOR
LENNAR

DRAWN BY
PLM

DATE
7/29/24

REVISIONS
A. 8/14/24: Updated layout
B. 8/27/24: Updated layout
C. 8/28/24: Density table
D. 11/11/24: Concept Revision

CAD FILE
24205cp.dwg

PROJECT NO.
24205-00

SHEET 1 OF 1