County State Aid Highway 54 Reconstruction and Mississippi River Greenway Extension

Environmental Assessment Worksheet

April 2026

Prepared for:

Dakota County

Prepared by:

Kimley»Horn

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December 2022 Version

Environmental Assessment Worksheet

This most recent Environmental Assessment Worksheet (EAW) form and guidance documents are available at the Environmental Quality Board's (EQB'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

County State Aid Highway 54 Reconstruction and Mississippi River Greenway Extension

2. Proposer

Proposer: Dakota County
Contact Person: Imran Ahmed
Title: County Project Manager
Address: 14955 Galaxie Avenue
City, State, ZIP: Apple Valley, MN 55124
Phone: 952-891-7991
Email: Imran.ahmed@co.dakota.mn.us

3. RGU

RGU: Dakota County
Contact Person: Imran Ahmed
Title: County Project Manager
Address: 14955 Galaxie Avenue
City, State, ZIP: Apple Valley, MN 55124
Phone: 952-891-7991
Email: Imran.ahmed@co.dakota.mn.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):
Minnesota Administrative Rules, 4410.4500 Discretionary EAW

5. Project Location

County: Dakota County
City/Township: Hastings
PLS Location (¼, ¼, Section, Township, Range):

Section	Township	Range
35, 36	115N	17W
31	115N	16W
6, 5, 8, 17, 16, 21	114N	16W

Watershed (81 major watershed scale): Mississippi River – Lake Pepin
GPS Coordinates: 44.663545, -92.739790 to 44.730275, -92.829813
Tax Parcel Number: Not applicable
At a minimum, attach each of the following to the EAW:

- **Site plans showing all significant project and natural features. Pre-construction site plan and post-construction site plan (see Figure 3 to Figure 8 and Appendix A)**
- **County map showing the general location of the project (see Figure 1)**
- **US Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (see Figure 2)**
- **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)**

Figure 1: County Map

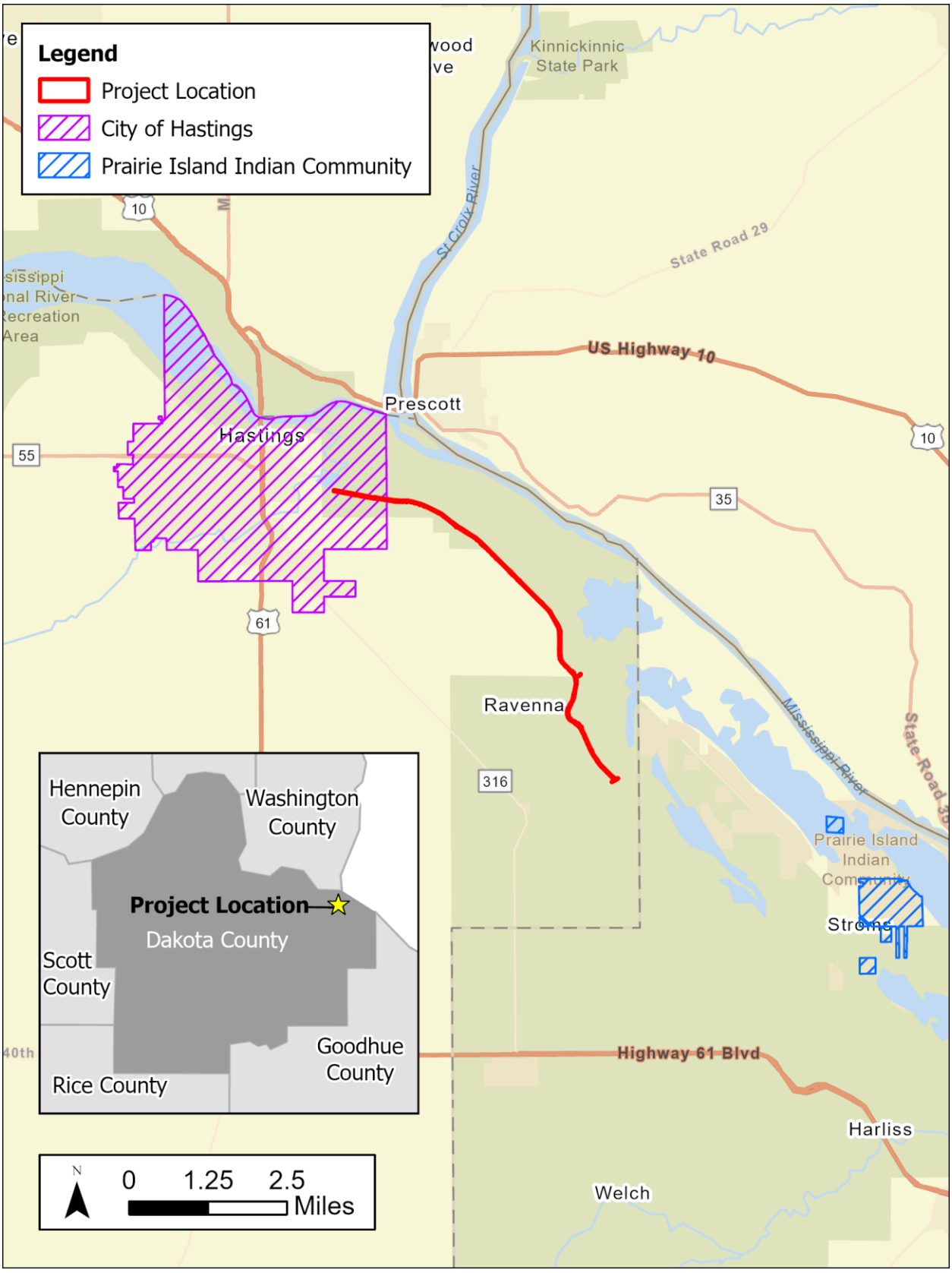
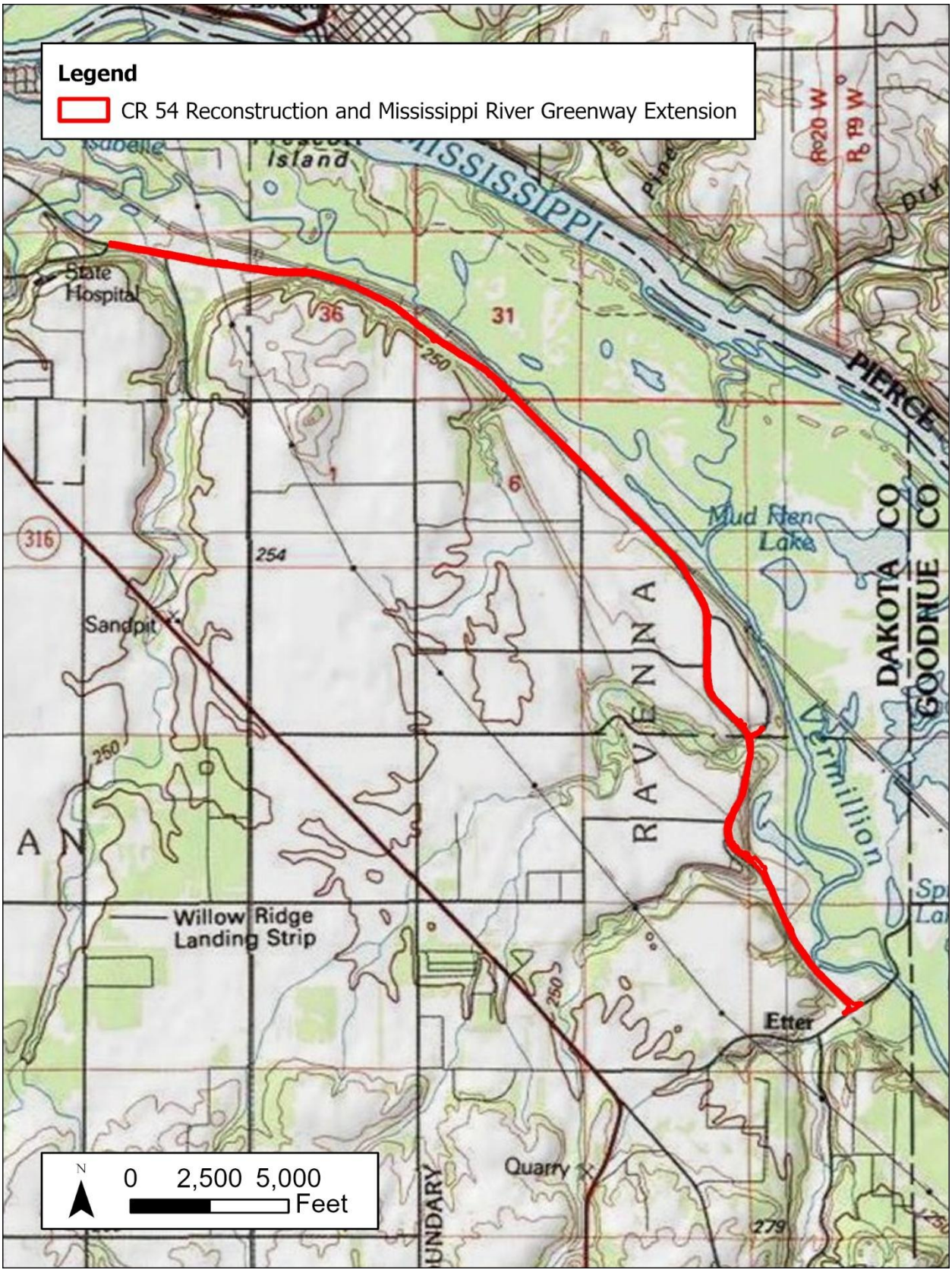


Figure 2: USGS Map



6. Project Description

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

The project will reconstruct seven miles of County State Aid Highway (CSAH) 54 from 18th Street in Hastings to CSAH 68. Improvements include correcting substandard curves, widening the roadway, and adding a roundabout at the current intersection of CSAH 54 and CSAH 68. Dakota County has included a 10-foot-wide multi-use trail to extend the Mississippi River Greenway and link Hastings to the Prairie Island Indian Community in this EAW to ensure impacts from the maximum disturbance alternative are appropriately evaluated. However, per County Board direction on June 16, 2026, it has been determined that this project would not include a multi-use trail.

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 and 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 CSAH 54 Reconstruction and Mississippi River Greenway Extension (referred to as the "project") will reconstruct seven miles of CSAH 54 from 18th Street in Hastings to CSAH 68 in Dakota County, Minnesota. Additionally, Dakota County has explored constructing a multi-use trail along CSAH 54 to expand the Mississippi River Greenway trail system and advance the 2009 Hastings to Red Wing Trail Master Plan priorities.[1] The study area includes the roadway and the trail in the highway right-of-way.

The project includes the following elements:

- Reconstructing seven curves to meet a 55 miles per hour (mph) design speed (one curve will meet 50 mph design speed)
- Adding consistent eight-foot shoulders and rumble strips along the highway
- Installing left and right turn lanes at the following public road intersections:
    - Glendale Avenue
    - Polk Avenue
    - Blackbird Trail (two intersections)
    - 175th Street East
    - 185th Street East
- Raising the profile where the roadway is within the 100-year floodplain from CSAH 91 to CSAH 68 to alleviate flooding concerns

[1] Parks and Trails Council of Minnesota. *Hastings to Red Wing Trail Master Plan*. 2009. Available at https://goodhuecountymn.gov/files/ordinances/hastings_to_red_wing_trail_master_plan.pdf.

- Constructing a roundabout at CSAH 68
- Replacing aging bridges and drainage infrastructure at the end of their useful life
- Building a 10-foot wide multi-use trail designated as the Mississippi River Greenway

This EAW has used the maximum disturbance alternative footprint including a multi-use trail to ensure impacts are appropriately evaluated and opportunities for mitigation are identified. However, per Dakota County Board direction on June 16, 2026, it has been determined that this project would not include a multi-use trail.

The project would not include any structure removal/demolition. Construction is tentatively planned to begin in 2029 or 2030.

c. Project magnitude

Table 1: Project Magnitude

Measure	Magnitude
Total Project Acreage	87.5
Linear Project Length	7 miles
Number and Type of Residential Units	N/A
Residential Building Area (square feet)	N/A
Commercial/Retail Building Area (square feet)	N/A
Industrial Building Area (square feet)	N/A
Institutional Building Area (square feet)	N/A
Other Uses – specify (square feet)	N/A
Structure Height(s)	N/A

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

The purpose of the project is to improve safety and mobility along CSAH 54 from 18th Street in Hastings to CSAH 68.

The existing CSAH 54 corridor, posted at 55 mph, has a documented history of high crash rates—approximately 200 crashes, including four fatalities, over the past decade. Most crashes involve single-vehicle run-off-road incidents, with intersection crashes concentrated at CSAH 91 (Glendale Road) and CSAH 68. Key deficiencies include:

- Three miles without shoulders
- Seven of eight intersections lacking turn lanes
- Eight curves that do not meet design standards for the posted speed
- Four segments below the 100-year floodplain, causing periodic closures, most recently in June 2024
- Four aging bridges at the end of their useful life

The project will address these issues by:

- Reconstructing seven curves to meet a 55-mph design speed (one curve at 50 mph)

- Adding left and right turn lanes at public intersections
- Constructing consistent shoulders and rumble strips
- Building a roundabout at CSAH 68

Additionally, this segment of CSAH 54 was identified as the preferred route for extending the Dakota County Mississippi River Greenway trail system. The project will include a 10-foot-wide multiuse trail, improving safety and connectivity for non-motorized users between Hastings, the Prairie Island Indian Community, and Red Wing.

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.

Not applicable.

f. Is this project a subsequent stage of an earlier project? ☐ Yes ☒ No

If yes, briefly describe the past development, timeline, and past environmental review.

Not applicable.

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.

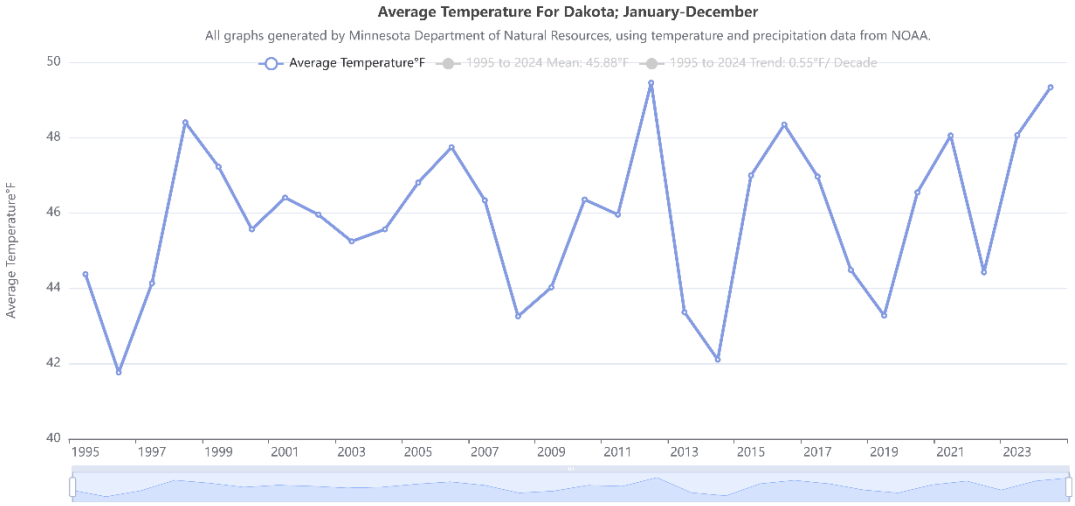
Trends in temperature, precipitation, flood risk, and cooling degree days are described below for the general project location. Some of the climate projections summarized below use shared socioeconomic pathways (SSPs) or Representative Concentration Pathways (RCPs), which are greenhouse gas concentration scenarios used by the Intergovernmental Panel on Climate Change. SSP 245 and RCP 4.5 are intermediate scenarios in which emissions decline after peaking around 2040, and SSP 370 and RCP 8.5 are high-emissions scenarios in which emissions continue to rise through the century.[2]

Temperature

According to the Minnesota Climate Mapping and Analysis Tool (CliMAT), the annual daily average temperature in the study area from 1995 to 2014 was 45.6°F.[3] The annual daily average temperature in the site is projected to increase to 49.4°F from 2040 to 2059 under an intermediate emissions pathway (SSP 245). In 2080-2099, annual daily average temperature is projected to further increase to 52.4°F and 54.7°F under an intermediate (SSP 245) and high emissions pathway (SSP 370), respectively.

[2] University of Minnesota Climate Adaptation Partnership. *Climate modeling: an introductory primer for practitioners*. May 2023. Available at https://climate.umn.edu/sites/climate.umn.edu/files/2023-06/ClimateProjectionPrimer_Compiled_CoverPage.pdf.
[3] University of Minnesota. *Minnesota CliMAT*. Available at https://app.climate.umn.edu/?output_type=modelVal&scenario=ssp370_2080-2099&model=ensemble&variable=tmax-degF&time_frame=yearly&aoi=none#intro_pane.

Minnesota Climate Explorer – Average Temperature Trends for Dakota County



Urban Heat Island

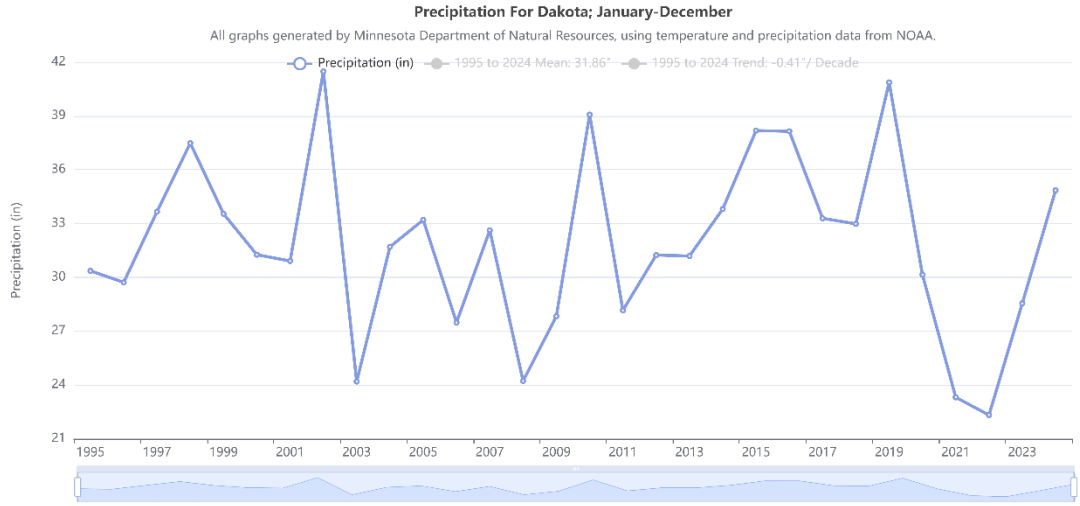
Surfaces and structures such as roads, parking lots, and buildings absorb and re-emit more heat from the sun than natural landscapes. This can significantly raise air temperature and overall extreme heat vulnerability in urban areas where there are dense concentrations of these surfaces. This is referred to as the urban heat island effect. According to the Metropolitan Council's Extreme Heat Map Tool, based on the land surface temperature at the study area during a heatwave in 2022, the study area is susceptible to extreme heat.[4]

Precipitation

According to the EPA Climate Resilience Evaluation and Awareness Tool (CREAT) Climate Change Scenarios Projection Map, there is a projected 2.8% to 13.4% increase in 100-year storm intensity by 2035 and a projected 5.4% to 26.1% increase in 100-year storm intensity by 2060 for the study area.[5]

[4] Metropolitan Council. *Extreme Heat Map Tool*. Accessed August 2025. Available at https://metrocouncil.org/Communities/Planning/Local-Planning-Assistance/CVA/Tools-Resources.aspx.
[5] US EPA. *CREAT Climate Change Scenarios Projection Map*. September 2022. Available at https://www.arcgis.com/home/item.html?id=3805293158d54846a29f750d63c6890e.

Minnesota Climate Explorer – Average Precipitation for Dakota County



Localized Flood Risk

The site is within 100-year and 500-year Federal Emergency Management Area (FEMA) flood zones at numerous points throughout the site. Dakota County administers floodplain zoning within Ravenna Township, and the City of Hastings administers floodplain zoning within the City's boundaries.

The Metropolitan Council's Localized Flood Map Screening Tool identifies localized flood hazards, referred to as Bluespots, which are broken into categories based on potential flood water depth. [6] This tool shows several Primary, Secondary, Tertiary, and Shallow Bluespots mapped throughout the site with maximum depths ranging from 0.25 feet to 14.58 feet. Primary Bluespots are the first areas to fill with water and are generally considered higher risk, while Shallow Bluespots are separate, isolated low areas generally considered low risk.

Cooling Degree Days

As defined by the National Weather Service, cooling degree days, which are often used as a proxy to estimate cooling needs for buildings, can be examined as a baseline and projected exposure indicator under the RCP 4.5 and RCP 8.5 scenarios. Cooling degree days are indexed units, not actual days, which roughly describe the demand to heat or cool a building. Cooling degree days accumulate on days warmer than 65°F when cooling is required. For example, if a weather station recorded an average daily temperature of 78°F, cooling degree days for that station would be 13.

According to Heat Vulnerability in Minnesota,[7] the number of cooling degree days in 2019 for Dakota County was 424. The number of cooling days in 2050 for Dakota County is projected to be 505 and 652 for RCP 4.5 and 8.5, respectively.

[6] Metropolitan Council. *Localized Flood Map Screening Tool*. Available at https://metrocouncil.org/Communities/Planning/Local-Planning-Assistance/CVA/Tools-Resources.aspx.
[7] Minnesota Department of Health and the University of Minnesota. *Heat Vulnerability in Minnesota*. Available at https://maps.umn.edu/climatehealthtool/heat_app/.

b. For each resource category in the table below, describe 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.

Table 2: Climate Considerations and Adaptations

Resource Category	Climate Considerations	Project Information: Climate Change Risks and Vulnerabilities	Project Information: Adaptations
Project Design	Risks and vulnerabilities associated with warming temperatures and increased frequency of high-heat days and freeze-thaw events include increased pavement cracking and road buckling. Additionally, extreme heat events and cracked or icy pavements can create hazards and challenges for pedestrian accessibility.	These impacts may affect the lifespan and maintenance of a project. According to the Minnesota Department of Transportation (MnDOT), more frequent (repeated) freeze/thaw cycles associated with climate change will result in detrimental impacts on pavement. High road surface temperatures associated with these events can jeopardize the integrity of bridge infrastructure, including creating additional stress on joints and potentially causing pavement to buckle.	MnDOT is studying the effects of increased freeze/thaw cycles on pavement; as design standards are updated to address negative effects, they would be implemented on projects at a statewide level.
Land Use	No 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 located within or near the study area.	Not applicable.	Not applicable.
Water Resources	Current climate trends and anticipated climate change in the general location of the project may influence water resources. Water resources in the general study area may become warmer, more polluted, and change in volume due to increased temperatures and runoff. There may be more	The project is anticipated to add approximately 10.8 acres of net new impervious surface through the reconstruction of CSAH 54, along with intersection improvements, shoulder widening, vertical and horizontal curve corrections, and an off-road multi-use trail to extend the Mississippi River Greenway.	Stormwater will be collected in an updated system and conveyed to stormwater management facilities for detention and rate control. The existing ditches will be expanded to effectively manage the stormwater runoff and meet water quality requirements. See Stormwater Section 12. b. ii. for more details.

Resource Category	Climate Considerations	Project Information: Climate Change Risks and Vulnerabilities	Project Information: Adaptations
	evaporation and water available when it rains, leading to an increase in flood potential.		
Contamination/ Hazardous Materials/ Wastes	The proposed project is not anticipated to generate hazardous waste or materials.	Not applicable.	Not applicable.
Fish, Wildlife, Plant Communities, and Sensitive Ecological Resources (Rare Features)	Current Minnesota climate trends and anticipated climate change in the general location of the project may influence the local species and suitable habitat. Suitable habitat for species may become unsuitable due to land use changes, increased temperature, and increased runoff.	The project does not represent a new barrier to wildlife passage nor prevent movement of species migrating due to shifts in suitable habitat range.	Not applicable.

8. Cover Types

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

Table 3: Cover Types

Cover Type	Before (Acres)	After (Acres)
Wetlands and Shallow Lakes (less than 2 meters deep)	2.3	0
Deep Lakes (more than 2 meters deep)	0	0
Rivers/Streams	<0.01	<0.01
Wooded/Forest	7.7	0
Brush/Grassland	40.6	37.7
Cropland	0	0
Livestock Rangeland/Pastureland	0	0
Lawn/Landscaping	0	0
Green Infrastructure	0	0
Impervious Surface	36.9	47.7
Stormwater Pond (wet sedimentation basin)	0	2.1
Other (describe)	0	0
Total	87.5	87.5

Table 4: Trees

Trees	Percent	Acres
Acres of Trees Removed During Development	8.8	9.1
Number of New Trees Planted	0	0

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.*

Table 5: Permits and Approvals Required

Unit of Government	Type of Application	Status
Local		
Dakota Soil and Water Conservation District	Wetland Conservation Act Wetland Replacement Plan Approval	To be applied for
City of Hastings	Wetland Conservation Act Wetland Replacement Plan Approval	To be applied for

Unit of Government	Type of Application	Status
	Stormwater/Drainage Plan Approval	To be applied for
	Municipal Project Approval	To be applied for
	MRCCA District Land Alteration Permit	To be applied for
	Floodplain Approval	To be applied for
	Water Quality Requirement Approval	To be applied for
Dakota County	Board Approval	To be applied for
	EIS Need Decision	In process
	Floodplain Approval	To be applied for
	Stormwater/Drainage Approval	To be applied for
State		
Minnesota Department of Health (MDH)	Watermain Extension Permit	To be applied for
Minnesota Pollution Control Agency (MPCA)	Section 401 Water Quality Certification	To be applied for, if needed
	National Pollutant Discharge Elimination Permit (NPDES)/SDS Construction Stormwater Permit	To be applied for
	Sanitary Sewer Installation Permit	To be applied for
Minnesota Department of Natural Resources (DNR)	Groundwater Appropriation Permit	To be applied for, if needed
	Scientific and Natural Area (SNA) Temporary Access Approval	To be applied for
	Wetland Conservation Act Wetland Replacement Plan Approval (SNA)	To be applied for, if needed
	Cut-leaf Water Parsnip Take Permit	To be applied for
Minnesota Department of Transportation (MnDOT)	Drainage and Utility Permit	To be applied for
	Project Memorandum (i.e. Categorical Exclusion) Approval from State Aid	To be applied for, if needed
Federal		
US Army Corps of Engineers	Section 404 Permit	To be applied for, if needed
MnDOT Cultural Resources Unit on Behalf of FHWA	Section 106 Finding	To be applied for, if needed
Minnesota State Historic Preservation Office (SHPO)	Section 106 Finding Concurrence	To be applied for, if needed

Unit of Government	Type of Application	Status
U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act Section 7 Determination	To be applied for, if needed
U.S. Department of Agriculture (USDA)	Form AD-1006	To be applied for, if needed

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, and prime or unique farmlands.

Existing Land Use

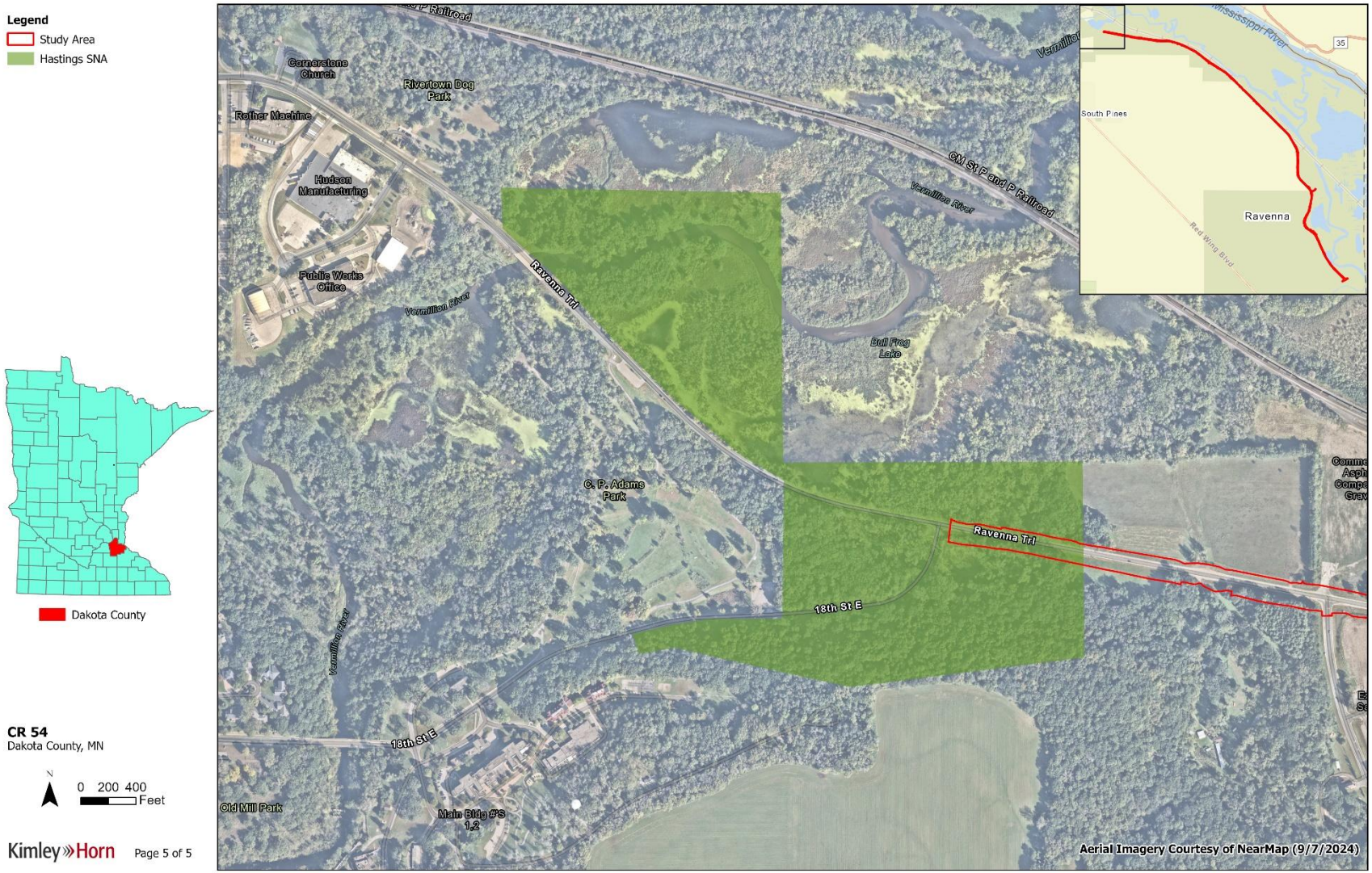
According to Figure 5.2: "2016 Land Use" in the Dakota County 2040 Comprehensive Plan, existing land use in the vicinity of the site is Agricultural, Farmstead, and Park, Recreational, or Preserve. There are also smaller quantities of Open Water and Undeveloped Land. [8]

Parkland and Trails

There are no existing trails in the corridor, and the site does not intersect any parkland. The northwestern approximately 0.1 mile of the project corridor crosses the Hastings Scientific and Natural Area (SNA), which is near the intersection of Ravenna Trail and Leduc Drive, see **Figure 3**. No trails or other recreational facilities are present on the Hastings SNA, although it is open to the public for bird and wildlife watching, hiking, photography, and snowshoeing and cross-country skiing.

[8] Dakota County. *Dakota County 2040 Comprehensive Plan*. Available at https://www.co.dakota.mn.us/Government/Planning/CompPlan/Documents/DakotaCounty2040ComprehensivePlan.pdf.

Figure 3: Hastings SNA



Prime or Unique Farmlands

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, 3 of the 30 soil types within the project construction limits are classified as farmland of statewide importance.[9] These soils represent approximately 9% of the soils within the construction limits.

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

According to the Dakota County 2040 Comprehensive Plan, planned land use from existing city comprehensive plans in the vicinity of the site includes Rural Residential, Agricultural, and Park and Recreation (See Appendix B for land use and zoning maps from comprehensive plans).[10]

According to the Dakota County 2040 Transportation plan, the CSAH 54 & CSAH 68 roundabout is a priority County Highway-to-County Highway intersection location.[11]

According to the December 2018 draft of the Dakota County Pedestrian & Bicycle Study, this segment of CSAH 54 is listed under "Planned County Greenway Trails" and Planned bicycle supportive shoulder."[12]

According to the City of Hastings 2040 Comprehensive Plan, future land use in the vicinity of the site includes Park, Upland Conservation Area, Agriculture, Institutional, and Floodplain & Wetland Protection.[13]

According to the draft 2026-2035 Vermillion River Watershed Management Plan, planned land use in the vicinity of the site includes Park, Recreational, Preserve; Open Water; Residential; and Agricultural or Developed.[14]

The Prairie Island Indian Community does not appear to have a publicly available comprehensive plan.

[9] Natural Resources Conservation Service. *Web Soil Survey*. Accessed August 2025. Available at https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.
[10] Dakota County. *2040 Comprehensive Plan*. Available at https://www.co.dakota.mn.us/Government/Planning/CompPlan/Documents/DakotaCounty2040ComprehensivePlan.pdf.
[11] Dakota County. *2040 Transportation Plan*. Available at https://www.co.dakota.mn.us/Transportation/PlanningPrograms/Documents/2040TransportationPlan.pdf.
[12] Dakota County. *Bicycle & Pedestrian Study*. Available at https://www.co.dakota.mn.us/Transportation/TransportationStudies/Past/Documents/PedestrianBicycleStudyAppendixC.pdf.
[13] City of Hastings. *2040 Comprehensive Plan*. Available at https://www.hastingsmn.gov/home/showpublisheddocument/9186/638556002403470000.
[14] Vermillion River Watershed Joint Powers Organization. *Draft 2026-2035 Vermillion River Watershed Management Plan*. Available at https://www.vermillionriverwatershed.org/watershed-management/watershed-management-plan/2026-2035-watershed-plan-development/.

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

Existing Zoning

According to the City of Hastings, existing zoning in the project vicinity is identified as Agriculture and Public Institution. According to Ravenna Township, Ravenna Township property is zoned as Rural Residential Single Family.[15]

FEMA National Flood Hazard

The site is within 100-year and 500-year FEMA flood zones and intersects those zones at numerous points throughout the site.[16] Dakota County administers floodplain zoning within Ravenna Township, and the City of Hastings administers floodplain zoning within the City's boundaries. Impacts to FEMA flood zones are discussed in Item 12.b., Water Resources.

Mississippi River Corridor Critical Area (MRCCA) Districts

According to the City of Hastings 2040 Comprehensive Plan, the site is in two MRCCA Districts: the CA-SR (Separated from River District) and CA-ROS (Rural and Open Space District).

The Separated from River District (CA-SR) is characterized by its physical and visual distance from the Mississippi River. The district includes land separated from the river by distance, topography, development, or a transportation corridor. The land in this district is not readily visible from the Mississippi River. The CA-SR district provides flexibility in managing development without negatively affecting the key resources and features of the river corridor. Minimizing negative impacts to primary conservation areas and minimizing erosion and flow of untreated storm water into the Mississippi River are priorities in the district.

CA-SR dimensional standards are as follows:

- Height: Underlying zoning
- River setback: N/A
- Bluff setback: 40 feet

The Rural and Open Space District (CA-ROS) is characterized by rural and low-density development patterns and land uses and includes land that is riparian or visible from the river, as well as large, undeveloped tracts of high ecological and scenic value, floodplain, and undeveloped islands. Many primary conservation areas exist in the district. The CA-ROS district must be managed to sustain and restore the rural and natural character of the corridor and to protect and enhance habitat, parks and open space, public river corridor views, and scenic, natural, and historic areas.

CA-ROS dimensional standards are as follows:

[15] Ravenna Township. *FAQ*. Available at https://ravennatownship.org/faqs/what-is-the-zoning-for-a-property-in-the-township/.
[16] FEMA. *National Flood Hazard Layer (NFHL) Viewer*. Available at https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd.

- Height: 35 feet
- River setback: 200 feet
- Bluff setback: 100 feet

New permits are required for certain land alteration activities. A permit would be required for land alteration for any activity that disturbs more than 10 cubic yards or 1,000 square feet of soil within the shore impact zone or within 50 feet of a public water, wetland, or natural drainage way, whichever is greater.

A permit would be required for vegetation removal in the following areas:

- Shore impact zone - 50% of the required structure setback from the river
- Areas within 50 feet of a wetland or natural drainage way
- Bluff impact zone - areas on and within 20 feet of slopes averaging 18% or greater
- Areas of native plant communities anywhere in the MRCCA
- Other areas of significant vegetation stands identified in local government plans

In these areas, a permit would not be required for selective vegetation removal, only for intensive vegetation clearing. Selective vegetation removal is the removal of isolated individual trees or shrubs that are not in a contiguous patch, strip, row, or block and that does not substantially reduce the tree canopy or understory cover. Intensive vegetation clearing is the removal of all or a majority of the trees or shrubs in a contiguous patch, strip, row, or block.

The purpose of the MRCCA is to maintain the natural and scenic character and minimize negative impacts to riparian areas and bluffs. This is accomplished by additional development regulations beyond Zoning, Floodplain, and Shoreland Management ordinances.

Other Critical Areas

The project corridor crosses the Hastings SNA, which is managed by the Minnesota Department of Natural Resources (MnDNR). According to the MnDNR, a wide diversity of plant species has been documented on this site, including kittentails and a population of snow trillium first documented in 1905. At least seventeen state-listed threatened and endangered species are found within a mile of this SNA, including at least one federally-endangered species, the winged mapleleaf mussel. A special use permit may be required for work upon Scientific and Natural Areas.[17]

The project corridor is located within the Vermillion River watershed.

There are no other special overlays or zoning, including wild and scenic rivers and agricultural preserves.

See **Appendix B** for land use and zoning maps from comprehensive plans.

[17] MnDNR. *Hastings SNA*. Available at https://www.dnr.state.mn.us/snas/detail.html?id=sna00954.

iv. **If any critical facilities (i.e., facilities necessary for public health and safety, those storing hazardous materials, or those 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.**

There are no critical facilities proposed in floodplain areas and other areas identified as at risk for localized flooding located within the study area.

b. Discuss the project's compatibility with nearby land uses, zoning, and plans listed in Item 10a above, concentrating on implications for environmental effects.

As mentioned above, the proposed improvements are consistent with local zoning and the goals of the comprehensive plans described above. The project will not alter the existing land uses nor require zoning changes.

The project will require a land alteration permit because activity will occur within 50 feet of a public water, wetland, or natural drainage way in a MRCCA District.

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

Not applicable.

11. Geology, Soils, and Topography/Landforms

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.

According to the Geologic Atlas of Dakota County, the majority of the project vicinity is dominated by a thick layer of carbonate rock, the dolostone of the Prairie du Chien group.[18] Also present are Jordan Sandstone and dolomitic shale and siltstone of the St. Lawrence and Franconia Formations. The surficial soils within the study area are classified as moderately well sorted sediments deposited by modern streams during flood stage, clean sand and gravel, and thinly covered bedrock.

According to the MnDNR Karst Feature Inventory, there is one known sinkhole, Apple Orchard Sink, near the study area, see **Figure 4**. There are no shallow limestone formations, unconfined shallow aquifers, or karst features present within or near the study area.[19]

[18] Minnesota Geological Survey. *Geologic Atlas of Dakota County*. Available at https://conservancy.umn.edu/handle/11299/58494.
[19] MnDNR. *Karst Feature Inventory*. Available at https://arcgis.dnr.state.mn.us/portal/apps/webappviewer/index.html?id=9df792d8f86546f2aafc98b3e31adb62.

Figure 4: MnDNR Karst Feature Inventory

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 soil limitations, such as steep slopes or 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.

Soil data was obtained from the NRCS Web Soil Survey.[20] There are 30 soil types within the study area. The two soil types that make up the largest portions of the study area (approximately 40 percent) are Sparta loamy fine sand, 1 to 6 percent slopes, and Hubbard loamy sand, 1 to 6 percent slopes. **Table 6** provides details on these soil types.

The NRCS Erosion Hazard Ratings indicate the hazard of soil loss from off-road areas after disturbance activities that expose soil surface. Within the study area, 77.7 acres (approximately 89 percent) have a "slight" rating, meaning that erosion is unlikely under normal climatic conditions.

A Stormwater Pollution Prevention Plan (SWPPP) will be developed for this project. All areas disturbed during construction would be revegetated in accordance with the SWPPP and related permitting requirements. In areas with steep slopes, special consideration will be given to prevent erosion during construction, such as erosion control blankets and soil reinforcement. No impacts to soils or topography are anticipated once construction of this project is complete.

American Engineering Testing (AET) completed a report of preliminary geotechnical exploration on November 19, 2025. The soils beneath the road and shoulders are mostly sandy, with some silt and gravel mixed in. A small amount of clayey sand was found in one spot. The top layer of soil in the drainage ditches varies more, including clay, silt, sand, and some organic material. Some ditches have a mix of these soil types. **Table 7** provides details on the soil properties. Recommendations from the geotechnical evaluation will be taken into consideration as design of the project advances.

Table 6: Soil Types Within Study Area

Map Unit Symbol	Map Unit Name	Farmland Classification	Erosion Hazard Rating	Percent of Study Area
7A	Hubbard loamy sand, 0 to 1 percent slopes	Not prime farmland	Slight	2.0%
7B	Hubbard loamy sand, 1 to 6 percent slopes	Not prime farmland	Slight	14.6%

[20] NRCS. *Web Soil Survey*. Available at https://websoilsurvey.nrcs.usda.gov/app/.

Map Unit Symbol	Map Unit Name	Farmland Classification	Erosion Hazard Rating	Percent of Study Area
8A	Sparta loamy fine sand, 0 to 1 percent slopes	Not prime farmland	Slight	3.7%
8B	Sparta loamy fine sand, 1 to 6 percent slopes	Farmland of local importance	Slight	25.1%
39A	Wadena loam, 0 to 2 percent slopes	All areas are prime farmland	Slight	4.2%
100B	Copaston loam, 2 to 6 percent slopes	Farmland of statewide importance	Slight	1.8%
129	Cylinder loam, 0 to 2 percent slopes	All areas are prime farmland	Slight	2.4%
177B	Gotham loamy fine sand, 2 to 6 percent slopes	Not prime farmland	Slight	3.2%
177C	Gotham loamy fine sand, 6 to 12 percent slopes	Not prime farmland	Moderate	0.9%
226	Lawson silt loam	All areas are prime farmland	Slight	1.5%
251D	Marlean loam, 12 to 18 percent slopes	Not prime farmland	Moderate	1.5%
283A	Plainfield loamy sand, 0 to 2 percent slopes	Not prime farmland	Slight	5.0%
283D	Plainfield loamy sand, 6 to 18 percent slopes	Not prime farmland	Moderate	0.3%
285A	Port Byron silt loam, 0 to 2 percent slopes	All areas are prime farmland	Slight	1.2%
285B	Port Byron silt loam, 2 to 6 percent slopes	All areas are prime farmland	Slight	0.0%
299A	Rockton loam, 0 to 2 percent slopes	All areas are prime farmland	Slight	1.3%
299B	Rockton loam, 2 to 6 percent slopes	All areas are prime farmland	Slight	2.8%
299C	Rockton loam, 6 to 12 percent slopes	Farmland of statewide importance	Moderate	0.2%

Map Unit Symbol	Map Unit Name	Farmland Classification	Erosion Hazard Rating	Percent of Study Area
301B	Lindstrom silt loam, till plain, 2 to 6 percent slopes	All areas are prime farmland	Moderate	1.4%
415B	Kanaranzi loam, 2 to 6 percent slopes	Farmland of statewide importance	Slight	6.5%
415C	Kanaranzi loam, 6 to 12 percent slopes	Not prime farmland	Moderate	2.0%
463	Minneiska loam, occasionally flooded	All areas are prime farmland	Slight	0.4%
611F	Hawick loamy sand, 20 to 40 percent slopes	Not prime farmland	Moderate	4.4%
880F	Brodale-Rock outcrop complex, 18 to 45 percent slopes	Not prime farmland	Moderate	0.0%
1030	Pits, sand and gravel	Not prime farmland	Not rated	0.7%
1055	Aquolls and Histosols, ponded	Not prime farmland	Slight	7.0%
1815	Zumbro loamy fine sand	Not prime farmland	Slight	0.5%
1821	Algansee sandy loam, occasionally flooded	Not prime farmland	Slight	0.5%
1827A	Waukegan silt loam, bedrock substratum, 0 to 2 percent slopes	All areas are prime farmland	Slight	0.9%
N644A	Scotah loamy fine sand, 0 to 3 percent slopes, occasionally flooded	Not prime farmland	Slight	4.0%

Table 7: Subgrade Soil Properties[21]

Soil Type	Frost Susceptibility	Drainage Characteristics	Strength and Stability Characteristics
A-8 Organic Clay & Organic Silt	Very High	Very Slow	Very Low

[21] Note: A. The stability of the onsite clayey and silty soils can become rather low when these soils become wet.

Soil Type	Frost Susceptibility	Drainage Characteristics	Strength and Stability Characteristics
A-6 Clayey Sand	At Least Moderate	Slow	Low[A]
A-4 Silty Sand & Silt with Sand	Very High	Slow	Low[A]
A-2-6 Clayey Sand A-2-4 Silty Sand	Moderately High	Moderate	Moderate
A-1-b Silty Sand	Moderate	Moderately Fast	Moderately High
A-3 and A-1-b Sands	Low	Fast	High

12. Water Resources

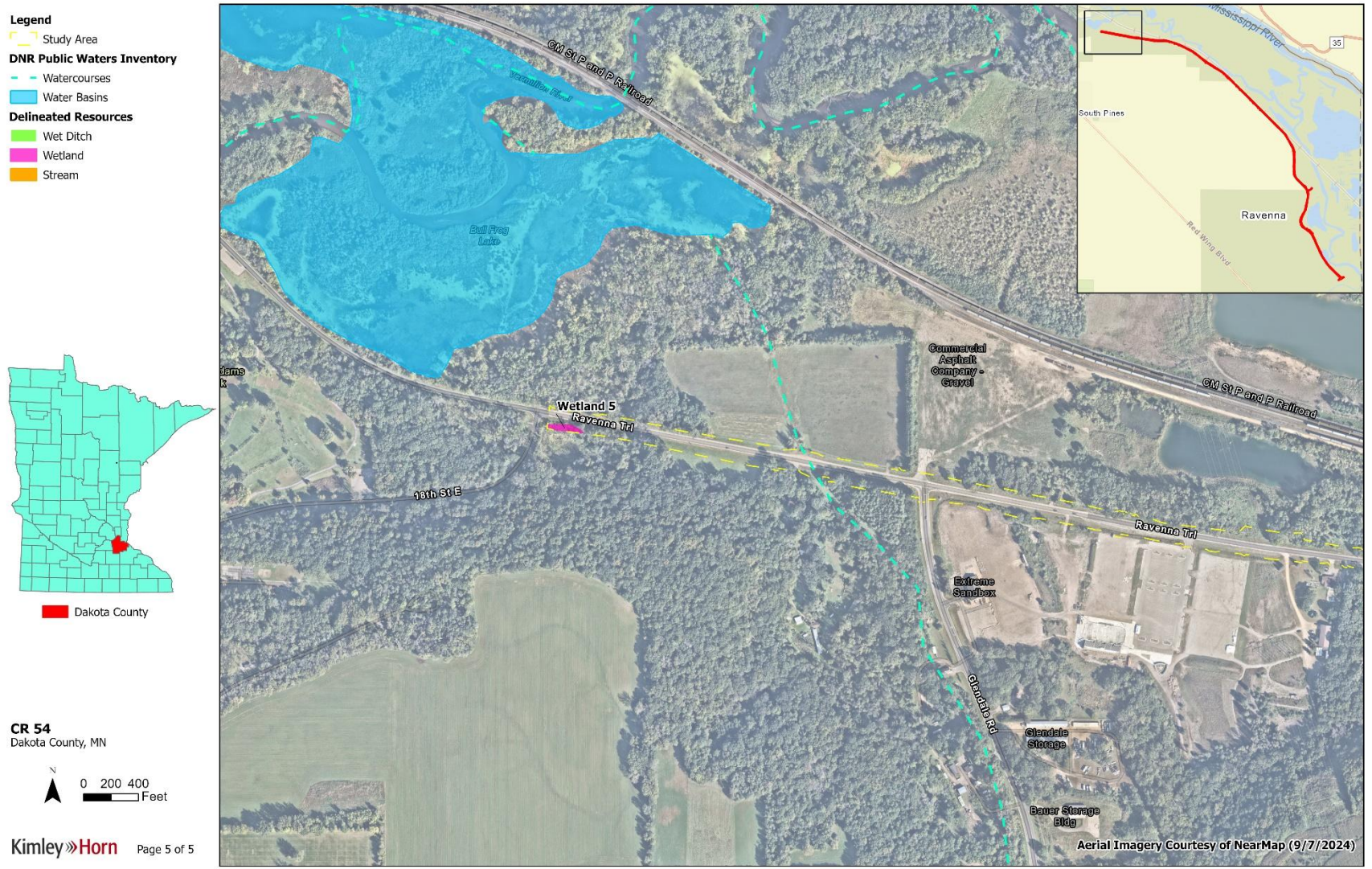
a. Describe surface water and groundwater features on or near the site below.

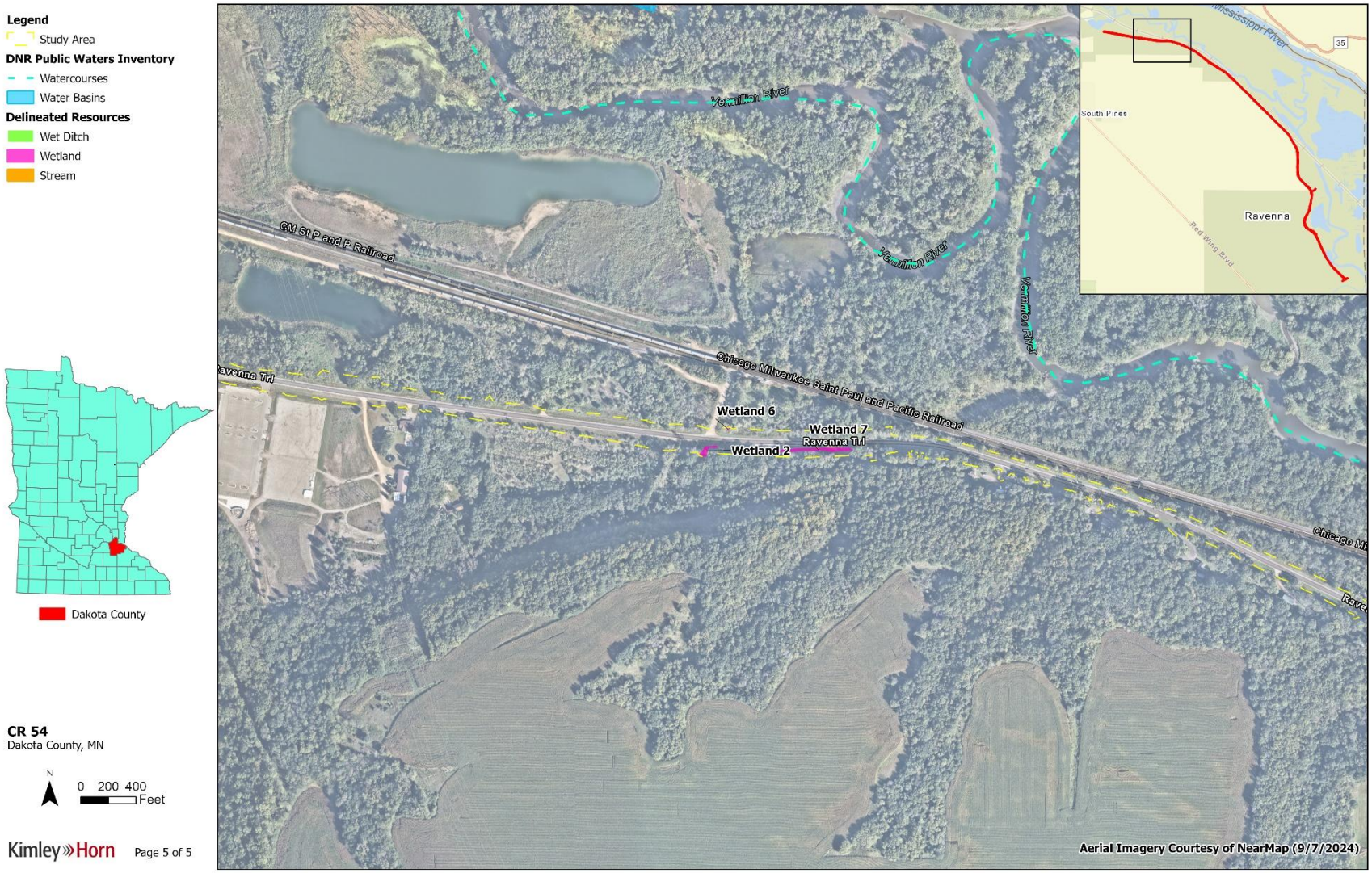
i. Surface Water – lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, shoreland classification and floodplain/floodway, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource 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.

Aquatic resources within the study area were delineated by Kimley-Horn in August 2024 and October 2025 using a routine Level 2 delineation method as outlined in the 1987 Corps of Engineers Wetland Delineation Manual[22] and Midwest Regional Supplement.[23] In total, six wetlands, five wet ditches, and two ephemeral streams were delineated within the study area, as shown on **Figure 5**. Wetland delineation concurrence will be sought from the regulatory agencies as project design progresses.

[22] U.S. Army Corps of Engineers. *Wetlands Delineation Manual*. January 1987. Available at http://www.mvp.usace.army.mil/Portals/57/docs/regulatory/RegulatoryDocs/1987%20Manual.pdf.
[23] U.S. Army Corps of Engineers. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0).* August 2010. Available at https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7630.

Figure 5: Aquatic Resources

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Wetland 7
Ravenna Trl
Wetland 2
Mississippi River
35
South Pines
Ravenna
Red Wing Blvd
Aerial Imagery Courtesy of NearMap (9/7/2024)


Legend
Study Area
DNR Public Waters Inventory
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Page 5 of 5
Vermillion River
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Ephemeral Stream 1
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Vermillion River
Reverse Trl
Aerial Imagery Courtesy of NearMap (9/7/2024)
Mississippi River
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South Pines
Ravenna
Red Wing Blvd


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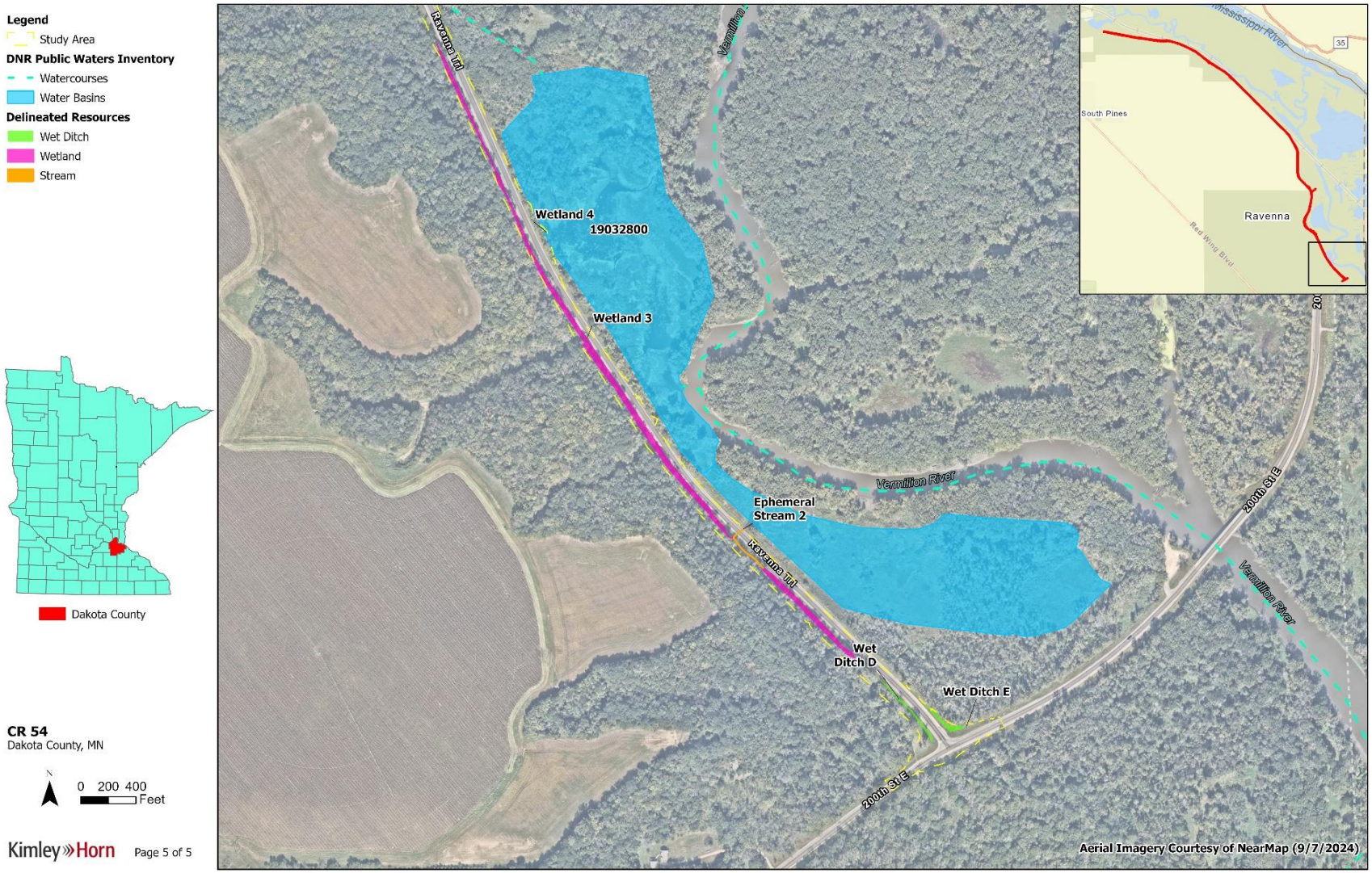
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Aerial Imagery Courtesy of NearMap (9/7/2024)
Mississippi River
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South Pines
Ravenna
Red Wing Blvd

Four unnamed DNR public watercourses intersect the project corridor (PWI IDs 19012a, 19013a, 19014a, and 19015a), see **Figure 5**. These tributaries generally drain north and east to the Vermillion River. Additional PWI waterbodies and watercourses are mapped in the vicinity of the site.

Based on a review of the MPCA's 303d 2024 Final Impaired Waters list, there are two impaired streams located within one mile of the site: the Vermillion River and the Mississippi River. These segments of the Vermillion River and Mississippi River are listed as impaired for aquatic life, which means they do not meet state-defined water quality standards to support aquatic organisms. These segments are also listed as impaired for aquatic consumption, which means that certain pollutants are present in concentrations that may be unsafe for people to eat fish from those waters. There are no trout streams within one mile of the study area. The Vermillion River and its tributaries are designated trout streams upstream of Vermillion Falls in Hastings, approximately 1.1 mile west of the study area.

Segments of the study area are located within the 100-year and 500-year FEMA flood zones.[24] Flood zones are mapped along the Vermillion River. In addition to the 100-year and 500-year FEMA flood zones which intersect the study area in several locations, there is FEMA mapped floodway for the Vermillion River adjacent to the study area.

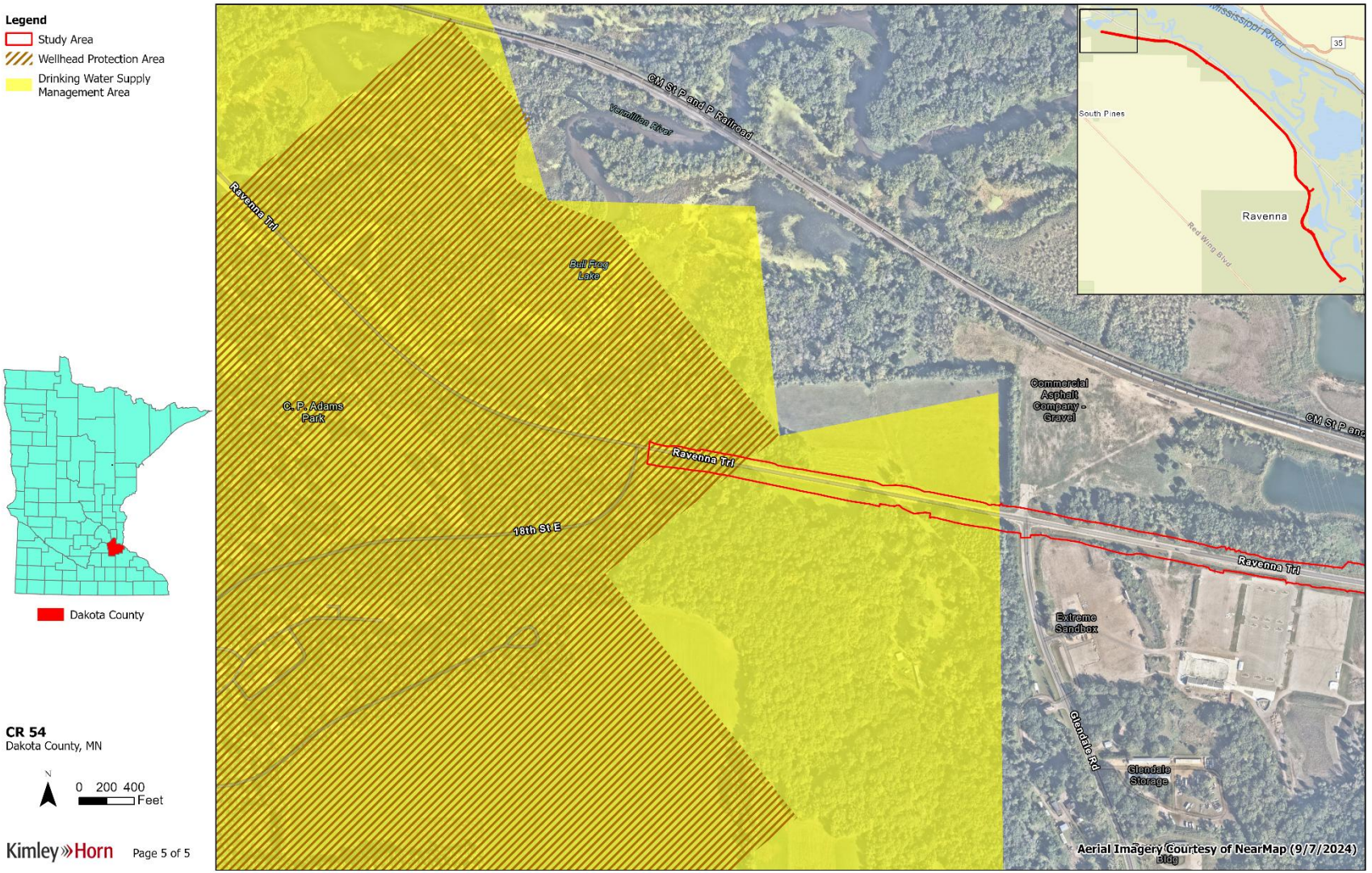
ii. Groundwater – aquifers, springs, and seeps. Include 1) depth to groundwater; 2) if project is within a MDH wellhead protection area; and 3) identification of any onsite and/or nearby wells, including unique numbers and well logs, if available. If there are no wells known on site or nearby, explain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

According to the Minnesota Department of Health's (MDH) Minnesota Well Index, groundwater levels for domestic wells within the vicinity of the study area range from 78 to 340 feet below ground surface.[25] AET conducted a geotechnical investigation that included groundwater borings and recorded depths to groundwater ranging from 5 to 20.5 feet below ground surface. The geotechnical report indicated that the shallow groundwater and coarse soils recorded could be due to perched groundwater conditions; boring depths did not exceed approximately 40 feet below ground surface.

The northwest portion of the project is located within the Hastings Wellhead Protection Area (WHPA) and within the Hastings Drinking Water Supply Management Area (DWSMA), see **Figure 6**. WHPAs are the areas surrounding public water supply wells that contribute groundwater to the wells. The DWSMA is listed at a Mitigation Level 2 due to elevated levels of nitrate-nitrogen. The Minnesota Groundwater Protection Rule generally restricts the application of nitrogen fertilizer in the fall and on frozen soils within the DWSMA.

[24] FEMA. *National Flood Hazard Layer (NFHL) Viewer*. Available at https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd.
[25] Minnesota Department of Health. *Minnesota Well Index*. Accessed November 2025. Available at https://mnwellindex.web.health.state.mn.us/.

Figure 6: Hastings WHPA and DWSMA



Review of the MDH Minnesota Well Index shows 19 wells (See **Table 8**) along the study area. If unidentified wells are found, the MPCA and MDH must be contacted to determine course of action which may include sealing, relocating, or preserving by a licensed well contractor according to Minnesota Rules Chapter 4725.

Table 8: Wells Within 500 Feet of the Construction Limits

Unique Well ID	Type of Well	Status
768815	Domestic Use	Active
171721	Domestic Use	Active
725148	Domestic Use	Active
185292	Domestic Use	Active
480301	Domestic Use	Active
548908	Domestic Use	Active
558799	Domestic Use	Active
463349	Domestic Use	Active
563222	Domestic Use	Active
426909	Domestic Use	Active
761612	Domestic Use	Active
768384	Domestic Use	Active
194248	Domestic Use	Active
698188	Domestic Use	Active
481445	Domestic Use	Active
595082	Domestic Use	Active
429866	Domestic Use	Active
594067	Domestic Use	Active
145890	Domestic Use	Active

b. Describe effects from project activities on water resources and measures to minimize or mitigate the effects below.

i. Wastewater – For each of the following, describe the sources, quantities, and composition of all sanitary, municipal/domestic, and industrial wastewaters projected 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.

Not applicable.

2) **If the wastewater discharge is to a subsurface sewage treatment system (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.**

   Not applicable.

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.**

   Not applicable.

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 project is located within the Vermillion River Watershed Joint Powers Organization (VRWJPO). According to a drainage report prepared for the project, standards from the Vermillion River Watershed and Dakota County were compiled to determine the most restrictive volume requirement for stormwater treatment facility sizing. In addition, stormwater standards for the National Pollutant Discharge Elimination System (NPDES) permit program administered by the MPCA are

applicable to this project. The NPDES permit program regulates stormwater discharges associated with construction activity throughout Minnesota. The NPDES permit is required for all construction activity that disturbs one or more acres of land. Projects that create one acre or more of net new impervious surface area are required to include permanent stormwater treatment practices.

For the watershed as a whole, the VRWJPO adopts standards through a public process. Standards are based on state law, watershed-specific conditions, and best practices for water management. The Standards establish what local governments must do to provide an acceptable level of water management and protection. Each jurisdiction must develop a local water management plan consistent with the Watershed Plan and adopt local controls (e.g. ordinances) consistent with the Standards to ensure that water resource protection and management strategies are implemented.

Existing stormwater runoff in the study area generally sheet flows off the roadway into ditches on either side of the roadway and conveyed to crossing culverts. Additionally, runoff from the neighboring bluff areas collects in the roadside ditches and must be conveyed downstream through the crossing culverts. The proposed project would add approximately 10.8 acres of net new impervious surface through the reconstruction of CSAH 54, along with intersection improvements, shoulder widening, vertical and horizontal curve corrections, and an off-road multi-use trail to extend the Mississippi River Greenway. Since the amount of net new impervious surface is greater than one acre, the VRWJPO requires that there is no increase for the 2-year 24-hour event above 2005 conditions for volume control.

Given a projected 2.8% to 13.4% increase in 100-year storm intensity by 2035 and a projected 5.4% to 26.1% increase in 100-year storm intensity by 2060 for the study area, greater precipitation frequency, intensity, and amount are anticipated. The increased storm and flood events that are projected would put more pressure on existing stormwater infrastructure. Existing infrastructure is undersized and proposed conditions are being designed to pass a 50-year storm event for bridges and culverts and a 10-year storm event for storm sewer trunkline and structures within the roadway.

The proposed system will include additional stormwater infrastructure and increased pipe sizes to mitigate ponding along the corridor to meet the design standards of the County and State Aid and stormwater requirements of the VRWPJO. The existing drainage patterns will be largely maintained. Stormwater will be collected in an updated storm sewer system and conveyed to the existing stormwater management facilities for detention and rate control in areas of urban section (curb and gutter). The existing ditches will be expanded to effectively manage the stormwater runoff and meet water quality requirements. No additional offsite areas are being routed to the roadway corridor as part of the proposed conditions. There are additional low points that are being created as part of the road reconstruction to meet minimum longitudinal road slope requirements and for improved access to residential frontage roads.

A stormwater pollution prevention plan (SWPPP) will be developed for the construction phase of this project. The SWPPP will require erosion control BMPs to be implemented by the contractor during all phases of construction.

Six BMPs will be implemented throughout the study area: five linear infiltration BMPs and one stepped linear infiltration BMP. These will be implemented along existing drainage areas to filter pollutant runoff.

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.

Dewatering BMPs will be identified in the SWPPP, and a project dewatering plan will be attached to the construction documents. Any locations that are determined to require dewatering by the contractor would follow the dewatering plan. If dewatering rates during construction exceed 10,000 gallons per day or a million gallons per year, a DNR water appropriation permit would be obtained by the contractor for these temporary activities. Dewatering is expected to be temporary in nature to address the construction of the project, as no continued water use is anticipated after construction is complete.

iv. Surface Waters

1) Wetlands – Describe any anticipated physical effects or alterations to wetland features, such as draining, filling, permanent inundation, dredging, and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed, 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.

Based on preliminary engineering details for a multi-use trail along CSAH 54, approximately 2.3 acres of impact to delineated resources would result from placement of roadway fill, trail installation, culvert installations, and stormwater BMPs, see **Table 9**.

Table 9: Delineation Summary

Delineated Resource Type	Total Acreage	WCA Regulated (Anticipated)
Wetland	2.1	Yes
Wet Ditch	0.2	No
Total	**2.3**	

The project corridor includes multiple wetland regulatory agencies, including the US Army Corps of Engineers (USACE), the Minnesota DNR, and two Local Government Units (LGUs). The two LGUs for this project, the City of Hastings and Dakota Soil and Water Conservation District, enforce the Wetland Conservation Act (WCA), which apply to nearly all wetlands not regulated by the DNR.

As design progresses and is finalized, the wetland impact calculations will be refined and subject to change. Dakota County will identify measures to avoid or minimize impacts to wetlands and coordinate with the LGUs and USACE to ensure the project is designed to avoid and minimize potential impacts to the extent practicable and all construction activities would be authorized by the appropriate permits and approvals. For impacts that require mitigation, it is anticipated that approved wetland banking credits within the same Bank Service Area (BSA) will be used at a replacement ratio for impacts of 2:1.

2) **Other surface waters – Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal, and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features, 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.**

Four unnamed DNR Public Watercourses are mapped within the study area, see **Table 10** and **Figure 7**.

Table 10: DNR Public Watercourses

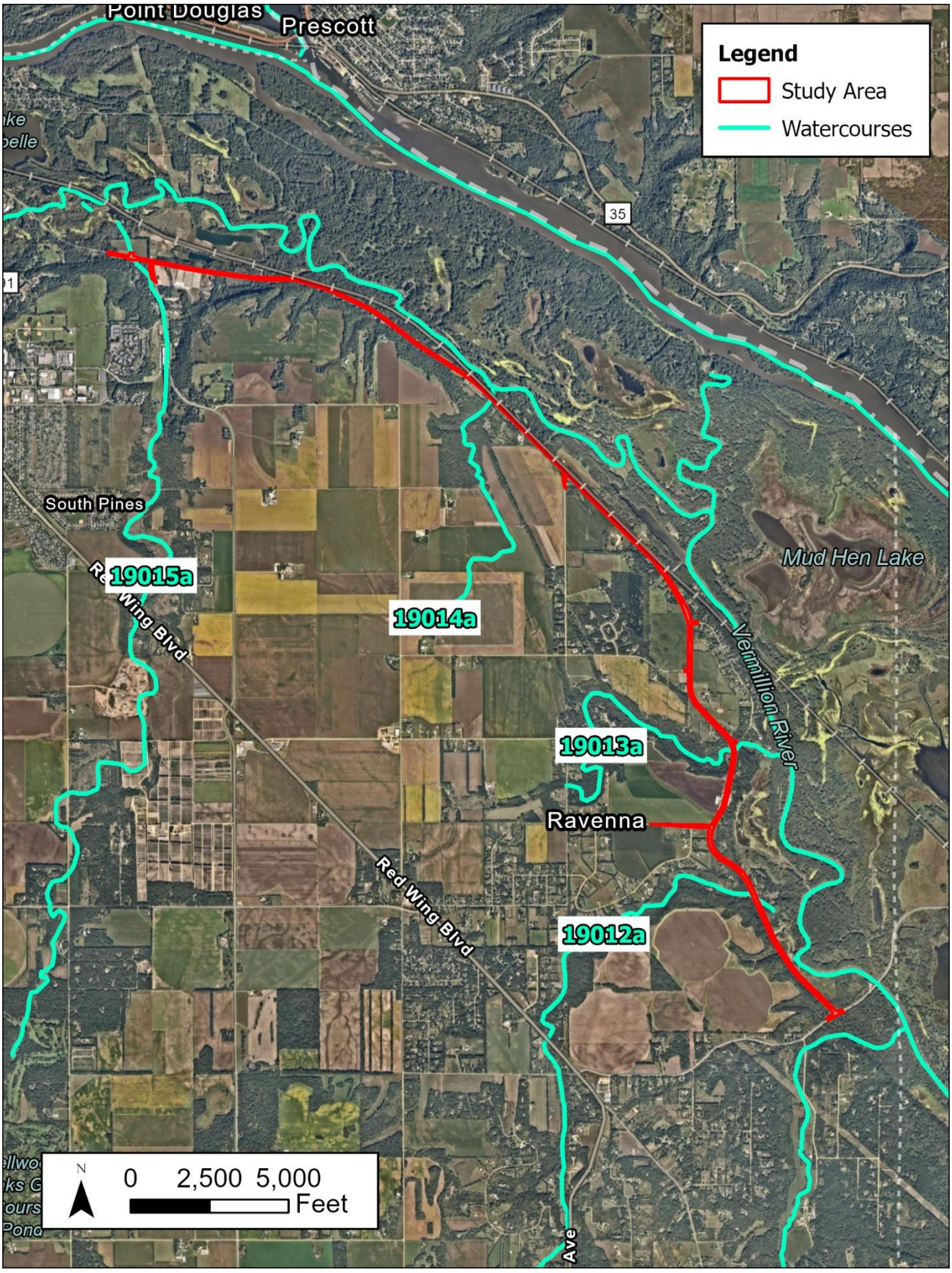
Name	PWI ID
Unnamed Creek	19012a
Unnamed Creek	19013a
Unnamed Creek	19014a
Unnamed Creek	19015a

Work in these locations would need to be coordinated with and permitted through the DNR Public Waters Work permit program. Work is proposed at the existing pipe arch crossing of PWI 19031a which would increase the existing pipe size and span. There is also work proposed at the existing box culvert crossing of PWI 19015 and would increase the span and number of barrels.

There are no other surface water features such as lakes, streams, ponds, or intermittent channels that are anticipated to be impacted by this project.

Four segments of CSAH 54 are currently located below 100-year floodplain. Between CSAH 91 and CSAH 68, the project would raise the profile of the roadway to alleviate flooding concerns, which would impact the 100-year floodplain. Additionally, proposed grading for shoulder widening and trail construction would impact the 100-year floodplain. The project will be designed to meet necessary floodplain requirements for the City of Hastings, Dakota County, and VRWJPO requirements.

Figure 7: DNR Public Watercourses



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 groundwater 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.

The presence of potentially contaminated properties (defined as properties where soil and/or groundwater is impacted with pollutants, contaminants, or hazardous wastes) is a concern due to the potential liabilities associated with ownership of such properties, potential cleanup costs, and safety concerns associated with construction personnel encountering unsuspected wastes or contaminated soil or groundwater. Contaminated materials encountered must be properly handled and treated in accordance with state and federal regulations. Improper handling of contaminated materials can worsen their impact on the environment. Contaminated materials also cause adverse impacts to highway projects by increasing construction costs and causing construction delays, which also can increase project costs.

AET completed a Limited Phase I Environmental Site Assessment (ESA) (August 2024) to determine if any known contaminated properties or environmental hazards are located within 500 feet of the project corridor, the study area.

During the Phase I ESA, potentially contaminated properties were identified in conformance with the United States Environmental Protection Agency (EPA) Standards and Practices for All Appropriate Inquiries, ASTM 1527-21, ASTM 2247-16, and ASTM 1528-22. Sites identified by the Phase I ESA have been classified into high, medium, and low environmental risk levels:

- High Risk – All active and inactive VIC and MERLA/Superfund sites, all active and inactive dump sites, LUST sites with known free-product, all dry cleaners (with on-site or unknown chemical processing), all bulk chemical/petroleum facilities, all active agricultural release sites, railroad facilities (Fueling, yards, or maintenance), clandestine chemical/drug laboratories, all historical/pre-CERCLA rulemaking industrial sites with likely chemical use (printing, photography, blacksmithing, plating, dentistry) on the premises, and polyfluoroalkyl substance (PFAS) potential source areas.
- Medium Risk – All LUST sites, all sites with USTs or ASTs, machine shops, all sites with historical vehicle repair activities, all bulk grain/feed storage sites, all historical lumber yards, all closed agricultural release sites, historical USTs in roadway, graveyards, and all sites with detections of non-petroleum chemicals.
- Low Risk – Hazardous waste generators, railroad lines, current lumber yards, golf courses, and possibly some farmsteads, residences, or commercial properties with poor housekeeping practices.

All parcels within the Phase I ESA study area were reviewed and a total of 14 sites were identified as having potential risk for contamination. All of the sites were ranked (high, medium, or low) solely on their potential for contamination that may affect the proposed project based on current and past use and storage and/or release or hazardous substances or petroleum products. The rankings for the parcels within the project vicinity are listed in **Table 11** and shown on **Appendix C**.

Table 11: Sites Identified in the Phase I ESA

Site ID	Site Name	Ranking	Rationale
1	Legler Property	High	The site was historically occupied by a vehicle salvage and disposal facility.
2	Extreme Sandbox	High	The site is associated with onsite vehicle maintenance, fueling, and demolition/crushing operations.
3	Proposed Hastings Wastewater Treatment Plant	High	The site was historically occupied by a sand and gravel mine, an asphalt plant, and a dump, and is associated with a closed LUST listing (LS0017556).
5	Former Soo Line Derailment Fuel Spill	High	The site was the location of a trail derailment in 1989 which resulted in a 1,200-gallon diesel release and a sill of approximately 2,000 tons of coal. The site has also historically been used for incidental dumping.
6	Metropolitan Council Property	High	The site was historically occupied by a gravel pit with onsite dumping activities.
4	Tradition Veterans Complex / Scheels Rink	Medium	The site was historically occupied by an aggregate mine.
9	Agricultural Land and Minnesota DNR Land	Medium	A hazardous material pipeline runs beneath the site.
10	16780 Ravenna Trail	Medium	The site was historically occupied by a gravel pit.
11	16750 Ravenna Trail	Medium	The site was historically occupied by a gravel pit.
13	Ravenna Cemetery / 18140 Ravenna Trail Residence	Medium	The site is occupied by a cemetery.
7	Chicago, Milwaukee, Saint Paul and Pacific Railroad	Low	The site is occupied by a railroad.
8	McDowell Property	Low	The site is associated with a FINDS listing, with no violations documented.

Site ID	Site Name	Ranking	Rationale
12	Triple K Ranch	Low	The site is registered as an active feedlot.
14	Carl & Dennis Reuter Farm	Low	The site is registered as an active feedlot.

The Phase I ESA identified 14 sites of environmental concern with the potential to impact the project corridor. Of these 14 identified sites, 4 sites have a low potential, 5 sites have a medium potential, and 5 sites have a high potential risk to impact the project corridor. The high-risk sites include vehicle salvage facilities and sites with historical dumping activities documented. Of the identified sites, AET has identified 6 high or medium risk sites (Site 1, 2, 3, 4, 5, and 6) that may benefit from further investigation as it pertains to anticipated property acquisition and/or proposed construction.

AET also conducted a geotechnical investigation which included soil and groundwater borings and environmental sampling. According to the results of the study, only one of the soil samples analyzed exceeded the regulatory criteria for the parameters that were tested. Perfluorooctanoic acid (PFOA) was detected at a concentration that exceeded the MPCA Residential Soil Reference Value; however, the MPCA regulates PFOA to a background value above the detected concentration. Therefore, AET determined that the detected PFOA concentration was within acceptable background levels.

Within the groundwater sample, laboratory analytical results did not identify concentrations of DRO, GRO, or VOCs above laboratory reporting limits. The RCRA Metals were not detected above laboratory reporting limits, except for barium which was detected at a concentration above laboratory reporting limits but below the MDH Health Risk Limit (HRL). Various PFAS compounds including perflourobutanoic acid, perfluorohexanoic acid, perfluoropentanoic acid, and Bis(trifluoromethylsulfonyl)amine were detected at concentrations above laboratory limits; however regulatory thresholds have not been established for these compounds. Perfluorooctanesulfonic acid (PFOS) and PFOA were detected at concentrations above the EPA Maximum Contaminant Level (MCL).

Based on the results of the geotechnical investigation, soils along the project corridor qualify as unregulated fill. If debris, unusual staining, odors, and/or organic vapor concentrations greater than 10 ppm are encountered during construction, the affected soil should be treated as regulated fill and managed in accordance with MCPA requirements. If groundwater is encountered during construction activities and dewatering is necessary, the discharge and/or treatment of groundwater would need to be managed in accordance with state, federal, and local agencies.

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.

All solid wastes generated by construction of the proposed project would be disposed of properly in a permitted, licensed solid waste facility. Project demolition of concrete, asphalt,

and other potentially recyclable construction materials would be directed to the appropriate storage, crushing, or renovation facility for recycling.

The disposal of solid waste generated by clearing the construction area is a common occurrence associated with road construction projects. During project construction, excavation of soil will need to occur within the construction limits. Preliminary design will consider selection of grade-lines and locations to minimize excess materials, and consideration will be given to using excess materials on the proposed project or other nearby projects. Any excess soil material that is not suitable for use on the project site or other nearby projects will be disposed of in accordance with state and federal requirements.

Excess materials and debris from this project such as concrete and asphalt will be disposed of in accordance with MnDOT Standard Specifications for Construction, 2104.3C and Minnesota Rule 7035.2825 and the Dakota County Solid Waste Ordinance.

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 spills or releases 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.

No aboveground or underground storage tanks are planned for permanent use in conjunction with this project. Temporary storage tanks for petroleum products may be located in the construction limits for refueling construction equipment during roadway construction. Appropriate measures would be taken during construction to avoid spills that could contaminate groundwater or surface water in the study area. In the event that a leak or spill occurs during construction, appropriate action to remedy the situation would be taken immediately in accordance with MPCA guidelines and regulations.

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 wastes including source reduction and recycling.

Normal construction wastes are anticipated. Toxic or hazardous materials such as fuel for construction equipment and materials used in the construction of roads (paint, contaminated rags, acids, bases, herbicides, and pesticides) may be used during site preparation and road construction. Although spills of these materials are not common, any spills of reportable quantities that occur will be reported to the MPCA and the contractor will clean up spilled material according to state requirements.

Measures to avoid adverse effects from storage of hazardous waste include the following:

- Products will be kept in their original containers unless they cannot be resealed. Original labels and Material Safety Data Sheets will be retained on site and accessible at all times; they contain important product and safety information. If surplus product must be disposed of, manufacturers' or local and State recommended methods for proper disposal will be followed. An effort will be made to store only enough products required to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure with secondary containment
- Substances will not be mixed with one another unless recommended by the manufacturer
- Whenever possible, all of a product will be used up before disposing of the container
- Manufacturers' recommendations for proper use and disposal will be followed

The contractor's site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

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 near the site.

Habitats within and in the vicinity of the site include manicured and un-manicured grasslands, cropland, deciduous forest, and wetlands. The land in the vicinity of the study area contains sensitive ecological resources. There are eight Minnesota Biological Survey (MBS) Sites of Biodiversity Significance adjacent to the study area. Two of the eight sites intersect the study area.

The Hastings SNA is in the northwestern portion of the study area and consists of two parcels. The northwest parcel, approximately 26 acres, is located entirely within the floodplain of the Mississippi and Vermillion Rivers. Land cover consists primarily of floodplain forest and emergent marsh, in addition to the Vermillion River which meanders through this parcel. Silver maple, green ash, and American elm dominate the forest canopy. The southeast unit, approximately 43 acres, is dominated by mesic oak forest, with old-growth red oak, sugar maple, and basswood on steep north-facing bluffs and bluff tops. Sugar maple-basswood forest covers a small section of the mid-slope, and emergent marsh, pond and floodplain forest cover low-lying areas.

There are several Minnesota DNR Public Watercourses within the study area. There are four unnamed creeks (19012a, 19013a, 19014a, and 19015a) intersecting the site. These water features may allow fish species or fish habitat to be present.

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-2024-006) 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 results.

State-Listed Species

A review of the DNR Natural Heritage Inventory System database was conducted (LA-2024-006) for the project study area and area within a one-mile buffer of the study area. Records of 16 threatened or endangered species, and 15 species of special concern were identified within the search radius (see **Table 12**).

In September 2024, Friends of the Mississippi River conducted a survey for cut-leaf water parsnip (*Berula erecta*) along a portion CSAH 54. Approximately 255,000 plants of this species were observed along CSAH 54 during the survey.

Table 12: NHIS Review State-Listed Species

Common Name	Scientific Name	Status	Habitat
Mussels			
Ebonyshell	*Reginaia ebenus*	Endangered (state)	Primarily inhabits large rivers in sand or gravel.
Higgins eye	*Lampsilis higginsii*	Endangered (state and federal)	Occurs only in the Mississippi River and the lower portion of some of its large tributaries. It occupies stable substrates that vary from sand to boulders, but not firmly packed clay, flocculent silt, organic material, bedrock, concrete or unstable sand.
Winged mapleleaf	*Quadrula fragosa*	Endangered (state and federal)	It has been found in the St. Croix River in riffles dominated by gravel, sand, and rubble substrates in water averaging about 1 m (3 ft.) deep.
Elephant-ear	*Elliptio crassidens*	Endangered (state)	Primarily inhabits large rivers in mud, sand or fine gravel.
Washboard	*Megalonaias nervosa*	Endangered (state)	Typically a large river species, inhabiting the main channel areas of a stream. Suitable habitat consists of slow current areas with substrates composed of sand, gravel, or mud.
Black sandshell	*Ligumia recta*	Species of special concern	Usually found in the riffle and run areas of medium to large rivers in areas dominated by sand or gravel.
Spike	*Eurynia dilatata*	Threatened (state)	Usually found in small to large rivers, but are also known to inhabit reservoirs and lakes. Whether in rivers or lakes, they are most often found in sand and gravel substrates in depths ranging from 0.6-7.3 m (2-24 ft.).
Wartyback	*Pustulosa nodulata*	Threatened (state)	Found in large rivers in Minnesota, and it can be found in fine or coarse substrates in areas of slow or moderate current.

Common Name	Scientific Name	Status	Habitat
Mucket	*Actinonaias ligamentina*	Threatened (state)	Known to inhabit medium to large rivers. Substrates that are most preferred include coarse sand and gravel.
Monkeyface	*Theliderma metanevra*	Threatened (state)	The densities of the monkeyface mussels in the St. Croix River peaked in habitats dominated by stable substrates in water over 2 m (6.6 ft) deep.
Fawnsfoot	*Truncilla donaciformis*	Threatened (state)	Occurs in flowing areas of large rivers in soft or coarse substrate, and they have been found at depths up to 9 m (30 ft.)
Butterfly	*Ellipsaria lineolata*	Threatened (state)	Usually inhabits areas of large rivers with swift currents in sand or gravel substrates.
Round pigtoe	*Pleurobema sintoxia*	Species of special concern	Found primarily in medium to large rivers but occasionally occurs in smaller rivers. Preferred habitats include fast current areas dominated by coarse sand and gravel substrates. Found in waters 0.9 m (3 ft.) to greater than 6.1 m (20 ft.) deep.
Plants			
James' polanisia	*Polanisia jamesii*	Endangered (state)	Sandy or sandy-gravelly soil in dry open settings with sand prairie species. This includes southern dry prairie and southern dry savanna native plant communities.
Kitten-tails	*Synthyris bullii*	Threatened (state)	Plants show a preference for partial shade to full sunlight and upper slopes. Soils are most often, well-drained sandy to gravelly soil derived from alluvium or limestone bedrock.
Cut-leaf water parsnip	*Berula erecta*	Threatened (state)	Occurs in part shade or sun in swamps, seeps, shallow water, and cool streams.
Discoid beggarticks	*Bidens discoidea*	Species of special concern	Seems to occur in a wide range of wetlands, such as marshes, wet meadow/carr, pond margins, and riverine sloughs. However, due to its scarcity, there are thought to be specific habitat requirements that are yet unknown.

Common Name	Scientific Name	Status	Habitat
Kentucky coffee tree	*Gymnocladus dioicus*	Species of special concern	Found most often in mesic hardwood forests on terraces of the Minnesota River, the Mississippi River below the Twin Cities, and a few major tributaries.
American ginseng	*Panax quinquefolius*	Species of special concern	Grows only in well-developed forest soil, typically mesic loamy soil. Does not tolerate habitats that are seasonally flooded, such as might be found along a stream or river, or the edge of a marsh.
Sessile-flowered yellow cress	*Rorippa sessiliflora*	Species of special concern	There are no first-hand accounts of sessile-flowered yellow cress in Minnesota, only old herbarium specimens with minimal label information. Drawing from this fragmentary data and information from other states, it appears that it occurs on exposed river sediments along the Mississippi River.
Snow trillium	*Trillium nivale*	Species of special concern	Prefers fine, moist, calcareous soils in previously glaciated areas.
Gray's sedge	*Carex grayi*	Species of special concern	Occurs in alluvial forests of the type dominated by cottonwood and silver maple, with lesser amounts of black willow, green ash, American elm, river birch, swamp white oak, and hackberry. Soils include a variety of water-borne sediments, predominately silt but sometimes coarser material such as sand.
Muskingum sedge	*Carex muskingumensis*	Species of special concern	Occurs primarily in floodplain forests along the Mississippi River. The forest canopy is typically composed of cottonwood and silver maple), and the soil is coarse or fine-grained sediments.
Birds			
Loggerhead shrike	*Lanius ludovicianus*	Endangered (state)	Areas of upland grasslands and sometimes in agricultural areas where short grass vegetation and perching sites such as hedgerows, shrubs, and small trees are found. They may occur in both native and non-native grasslands.

Common Name	Scientific Name	Status	Habitat
Red-shouldered hawk	*Buteo lineatus*	Species of special concern	Most commonly found in large tracts of mature deciduous forest with scattered wetland openings. Suitable habitat typically occurs in uplands with diverse topography characterized by numerous small hills, ridges, and depressional wetlands or small lakes.
Cerulean warbler	*Setophaga cerulea*	Species of special concern	Requires large tracts of deciduous forest with mature to old-growth trees and a structurally diverse canopy.
Bell's Vireo	*Vireo bellii*	Species of special concern	Prefers shrub thickets, clumps, and edges within or bordering open habitats such as grasslands or wetlands. Occasionally it may occupy more extensive shrublands, either upland or wetland.
Lark sparrow	*Chondestes grammacus*	Species of special concern	Typically occur in dry grasslands with a specific set of components and characteristics: short and/or sparse grasses (usually native) in areas of sand or gravel soils, with at least some bare ground and widely-scattered or patchy trees.
Fish			
Mississippi silvery minnow	*Hybognathus nuchalis*	Species of special concern	Most often found in lower reaches of tributary streams near confluences with large rivers. Water is usually clear up to 1.5 m (4.9 ft.) deep. Substrates are comprised primarily of sand and sparsely vegetated.
Snakes			
Timber rattlesnake	*Crotalus horridus*	Threatened (state)	Ideal habitat includes forested bluffs, south-facing rock outcrops, and bluff prairies, particularly in the Mississippi River valley. Two necessary habitat components for this species are open areas for thermoregulation and dens for over-wintering.
Amphibians			
Mudpuppy	*Necturus maculosus*	Species of special concern	Inhabits rivers, lakes, reservoirs, and sluggish streams. In southern Minnesota, this species prefers large and medium rivers; while north of the Minnesota River, this salamander inhabits large lakes.

Federally-Listed Species

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool was used to identify federally-listed species within or near the study area (**Appendix C**). This review identified seven federally-listed species to be considered in association with the study area (see **Table 13**).

Table 13: IPaC Review Federally-Listed Species

Common Name	Scientific Name	Status	Habitat
Northern Long-eared Bat	*Myotis septentrionali*	Endangered	During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or crevices of both live and dead trees. The bat uses tree species based on suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns or sheds.
Tricolored Bat	*Perimyotis subflavus*	Proposed endangered	During the winter, tricolored bats are often found in caves and abandoned mines. During the spring, summer, and fall, tricolored bats are found in forested habitats where they roost in trees.
Whooping Crane	*Grus americana*	Experimental population, non-essential	Whooping crane is designated as a non-essential experimental population 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.
Higgins Eye (pearlymussel)	*Lampsilis higginsii*	Endangered	Preferred habitat is stable substrates of the Mississippi River and the lower portion of some large tributaries.
Monarch Butterfly	*Danaus plexippus*	Proposed threatened	The preferred habitat for this species is prairie where milkweed and flowers are present.
Rusty Patched Bumble Bee	*Bombus affinis*	Endangered	Preferred habitat includes semi-natural upland grassland, shrubland, woodlands, and forests.
Western Regal Fritillary	*Argynnis idalia occidentalis*	Proposed Threatened	Suitable habitat consists of native grasslands containing violets, nectar sources, and tall vegetation.

Sensitive Ecological Resources

There are eight MBS Sites of Biodiversity Significance adjacent to the study area, see **Table 14**. Two of the eight sites intersect the study area.

Table 14: MBS Sites of Biodiversity Significance

Name	Biodiversity Significance Rating	Proximity to Study Area
Mud Hen Lakes Area	Outstanding[26]	Within
Ravenna 17	High[27]	Within
Vermillion River Outlet	Outstanding	Adjacent
East Part Nininger 35 West	High	Adjacent
Lake Isabelle East	Moderate[28]	Adjacent
Ravenna 6	Moderate	Adjacent
Ravenna 36 West	Moderate	Adjacent
Ravenna 36 East	Moderate	Adjacent

The Hastings SNA is present within the study area (described above in Item **14.a**).

There are 11 native plant communities adjacent to the study area, including 2 that intersect the study area, see **Table 15**.

Sensitive ecological resources are mapped on **Figure 8**.

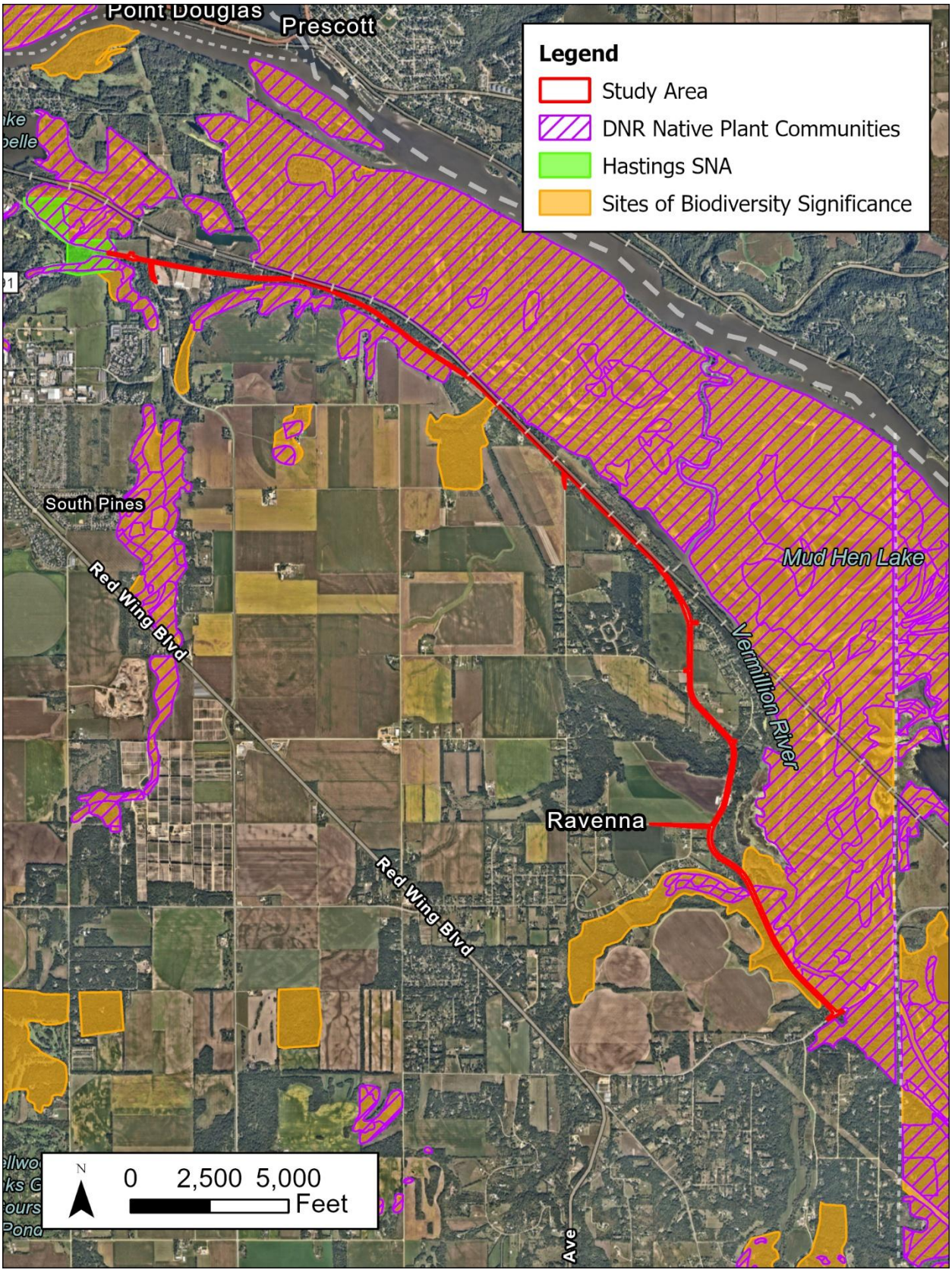
Table 15: Native Plant Communities

Name	Biodiversity Significance Rating	Proximity to Study Area
Sedge Meadow	Outstanding	Within
Bulrush Marsh (Northern)	Outstanding	Within
Silver Maple - (Virginia Creeper) Floodplain Forest	Outstanding	Adjacent
Silver Maple - (Virginia Creeper) Floodplain Forest	Outstanding	Adjacent

[26] Sites of **Outstanding Biodiversity Significance** are sites containing 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.
[27] Sites of **High Biodiversity Significance** are sites containing very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.
[28] Sites of **Moderate Biodiversity Significance** are sites containing occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.

Name	Biodiversity Significance Rating	Proximity to Study Area
Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	High	Adjacent
Sugar Maple - Basswood - (Bitternut Hickory) Forest	High	Adjacent
Dry Sand - Gravel Prairie (Southern)	High	Adjacent
Dry Sand - Gravel Oak Savanna (Southern)	High	Adjacent
Silver Maple - (Virginia Creeper) Floodplain Forest	Moderate	Adjacent
Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	Moderate	Adjacent
Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	Moderate	Adjacent

Figure 8: Sensitive Ecological Resources



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.

The project would involve significant grading and ground disturbance within the construction limits. The following discusses how the project may affect species or habitats identified above.

State-Listed Species

Mussels

State-listed mussel species are not anticipated to be impacted due to the absence of potential suitable habitat within the project study area. No medium to large rivers were identified during delineation of aquatic resources.

Plants

If identified onsite, impacts to state-listed plant species would necessitate a take permit or for the specimens to be relocated. Dakota County would coordinate with the DNR regarding potential impacts to specific state-listed plant species, including cut-leaf water parsnip, of which many specimens were identified onsite.

Birds

The County will consider measures to minimize potential habitat impacts to the loggerhead shrike such as removal of trees outside of critical breeding season, typically April through July. Removing habitat outside of the breeding season would eliminate incidental take.

Fish

Mississippi silvery minnow is not anticipated to be impacted due to the absence of potential suitable habitat within the project study area, as there are no large rivers. The project SWPPP will outline erosion and sediment control techniques.

Snakes

Timber rattlesnake is not anticipated to be impacted due to no planned impacts to bluffs within the project study area.

Amphibians

Mudpuppy is not anticipated to be impacted due to the absence of potential suitable habitat within the project study area.

Federally-Listed Species

The project would require tree clearing. According to the USFWS, tree removal can negatively impact bat species (northern long-eared bat, tricolored bat) by destroying roosting habitat, especially during the pup rearing season when females are forming maternity roosting colonies and pups cannot yet fly. Removal of trees outside of the active bat season (April-October) may be considered.

Noxious Weeds/Invasive Species

State requirements necessitate the control and spread of state listed noxious weeds and/or invasive weeds if encountered prior to construction. Methods to avoid spreading noxious weeds and/or invasive species will be incorporated into project specifications and/or SWPPP when developed. Disturbed areas would be reestablished using appropriate native and stabilization seed mixes.

Invasive species are plants and animals that are not native to an area and are capable of causing harm. Certain measures can be taken to limit the likelihood of introducing invasive species, such as securing local materials to avoid the long-range movement of goods or washing vehicles prior to accessing the project site. Additionally, as landscape designs are finalized, they will consider including native, non-invasive plants.

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

State requirements necessitate the control and spread of state listed noxious weeds and/or invasive weeds if encountered prior to construction. Methods to avoid spreading noxious weeds and/or invasive species will be incorporated into project specifications and/or SWPPP when developed. Disturbed areas would be reestablished using appropriate native and stabilization seed mixes.

The project may result in a taking and/or potential relocation of the Minnesota-threatened cut-leaf water parsnip. Staging locations and access roads would be located to minimize or avoid takings of this species as is practicable. For adverse effects to the cut-leaf water parsnip, an Endangered/Threatened Species Incidental Take Authorization is anticipated from the MnDNR prior to construction. In completing the permit, appropriate compensatory mitigation measures would be developed.

To minimize adverse effects to water quality for fish, wildlife, and plant communities, a SWPPP would be implemented during construction in accordance with the project's NPDES permit. Best management practices to avoid potential effects from spills or contamination from project activities would be implemented on site during construction. These controls include implementing stabilization methods on exposed soils adjacent to wetland and aquatic resources immediately after construction activity has ceased. Revegetation of disturbed soil would include native seed mixes.

To minimize impacts to wildlife, particularly migratory birds and bats (including threatened and endangered species), tree clearing would occur during the winter months (November 1 to March 31) to avoid the active or nesting/breeding season of these species.

The northwestern approximately 0.1 mile of the project corridor crosses the Hastings SNA, which is near the intersection of Ravenna Trail and Leduc Drive. According to the MnDNR, a wide diversity of plant species has been documented on this site, and at least seventeen state-listed threatened and endangered species are found within a mile of this SNA, including at least one federally-endangered species. The project is considering redesigning to minimize impacts to this property. Coordination is currently occurring with the MnDNR.

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.

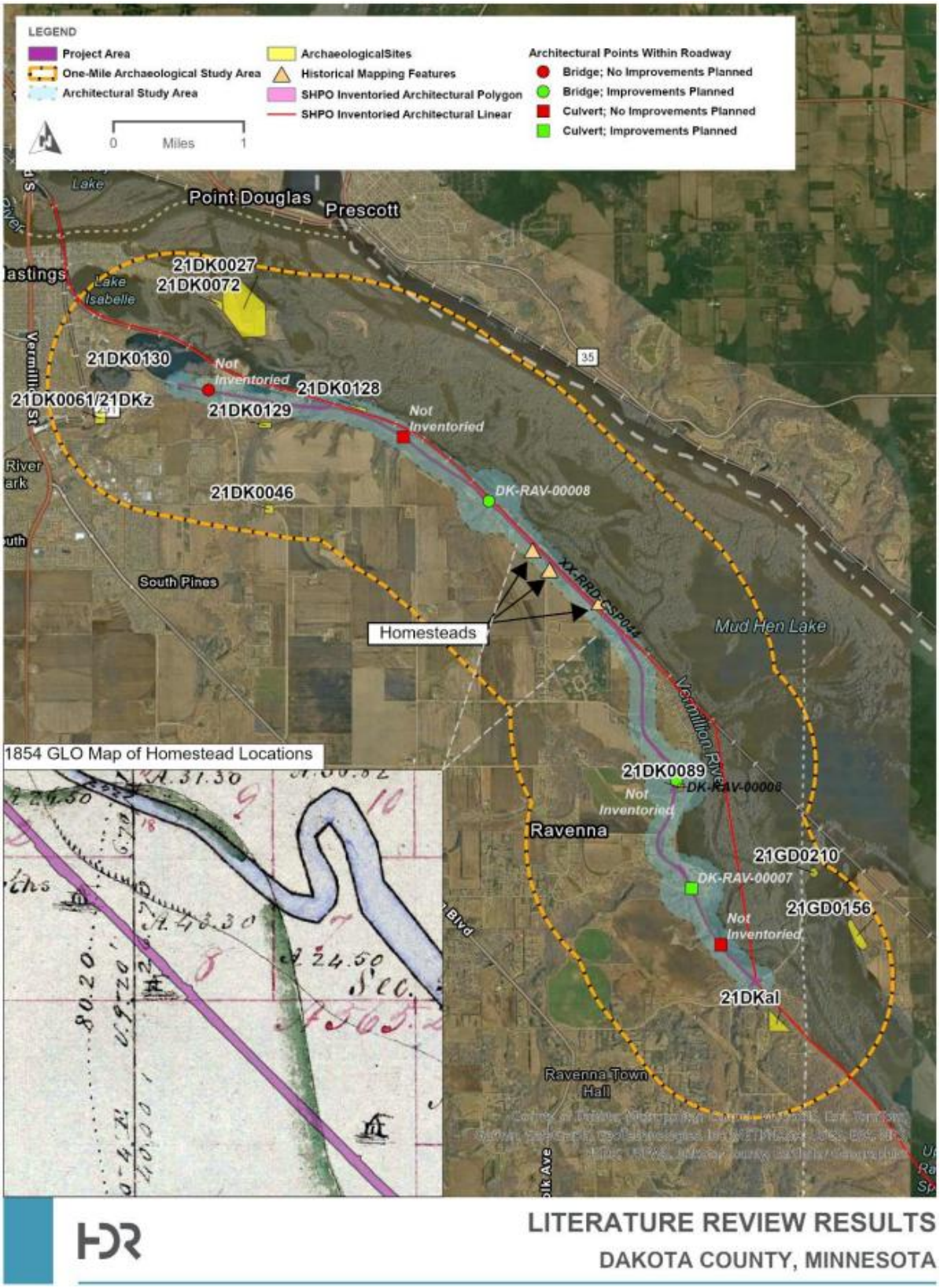
HDR completed a cultural resources literature search for the proposed project in September through October of 2024, including an archaeological survey and an architectural survey.

The report used a larger review area, as the archaeological study area was comprised of one-mile around the Project Area. This one-mile radius was utilized to both identify resources that may be adversely impacted by the Project, as well as develop a broader archaeological context to inform on archaeological potential within the Project Area. This broader contextual understanding will help determine where survey, if any, would be recommended for the Project.

The architectural study area was developed to consider the Project's potential to incur both direct and indirect effects to architectural properties. For a roadway improvement project, indirect effects can include atmospheric, noise, vibration, and visual impacts to the qualities that make an architectural property eligible for listing in the National Register of Historic Places (NRHP). For this Project, this Study Area was defined as 500 feet surrounding the majority of the Project Area where roadway improvements are proposed in order to encompass any adjacent properties that may have indirect effects from the Project, and a 0.25-mile buffer surrounding proposed bridge improvements as these have the potential for greater vibration and visual effects. Three bridge improvements were identified within the provided plans.

Eleven archaeological sites, one of which is a historical cemetery, were identified within the Archaeological Study Area. Four SHPO-inventoried architectural properties, no National Historic Landmarks, and no Locally Designated historic properties were identified within the Architectural Study Area. Based on the literature review and analysis of geospatial data and historical mapping, portions of the Project Area have reasonable potential to retain yet unrecorded archaeological sites. Additionally, the Project Area is less than 50 feet from an existing cemetery and Precontact burial site (21DK0089/DK-RAV-00006). Archaeological construction monitoring is recommended for the portion of the Project Area nearest to the cemetery, and a Phase I Reconnaissance Survey is recommended for the areas of highest archaeological potential within Project Area as identified by this assessment. Completion of this archaeological survey and monitoring is recommended to facilitate compliance with the Minnesota Field Archaeology Act (MS 138.31-138.42) and The Minnesota Private Cemeteries Act (MS 307.08). See **Figure 9** for more information.

Figure 9: Literature Review Results



The location of the Project Area within the floodplain and on river terraces overlooking the Mississippi and Vermillion rivers indicates higher potential for archaeological sites in the area. This is bolstered by the presence of Precontact sites within the general vicinity of the Project Area, both within the floodplain and on the terraces. Furthermore, a review of the Project Area against LiDAR hillshade imagery, 2024 satellite imagery, and the prior alignment of CSAH 54 highlights which portions of the Project Area may be disturbed and which are likely still intact. HDR utilized this information, along with 2024 surveyed wetland data provided by Kimley-Horn, to select recommended Phase I Reconnaissance Survey areas (**Appendix C**). Approximately 18 acres of the nearly 85-acre survey area are recommended for survey, equaling approximately 20 percent of the total Project Area acreage. Additionally, construction monitoring is recommended for the portion of the Project Area nearest to the cemetery (21DK0089/DK-RAV-00006). Completion of this archaeological survey and monitoring is recommended to facilitate compliance with the Minnesota Field Archaeology Act and The Minnesota Private Cemeteries Act. To facilitate compliance with the Minnesota Tribal Nations Consultation Policy, HDR recommends inviting the 11 federally recognized Tribes in Minnesota to review this literature review, provide feedback on the archaeological assessment, and participate in the archaeological survey.

As currently planned, the Project involves MnDOT funding and oversight. Due to state agency involvement, the Project will need to comply with state laws governing cultural resources, which for archaeology include the Minnesota Historic Sites Act (Minnesota Statutes, section 138.661-138.669), Minnesota Field Archaeology Act (Minnesota Statutes, section 138.31-138.42), Minnesota Private Cemeteries Act (Minnesota Statutes, section 307.08), and the Minnesota Tribal Nations Consultation Policy (Minnesota Statutes, section 10.65). In the case of architectural history, the Project will need to comply with the Minnesota Historic Sites Act (MS 138.61-669). The Minnesota Historic Sites Act requires effects to properties listed in the NRHP or Minnesota State Register of Historic Places, or properties that are part of the Minnesota Historic Sites Network to be considered.

There is no federal involvement for this Project at this time, however, a federal nexus may be identified in the future. If a federal nexus does become involved, the lead federal agency will determine if their involvement requires compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations (36 CFR 800). If this is so determined, the lead federal agency will formally define the archaeological and/or architectural Area of Potential Effects (APE), initiate consultation with the SHPO and interested parties under Section 106 regulations and determine if additional archaeological studies may be needed to comply with Section 106.

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.

The study area is an existing roadway corridor that does not include any uniquely scenic views or vistas. The proposed project would modify the existing roadway by expanding the number of

lanes and adding trails on either side but would be similar to the current views of and from CSAH 54.

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 and criteria pollutants. Discuss effects to air quality including any sensitive receptors, human health, or applicable regulatory criteria. Include a discussion of any methods used to 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.

Not applicable.

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.

Motor vehicles emit a variety of air pollutants including carbon monoxide (CO), hydrocarbons, nitrogen oxides and particulates. The primary pollutant of concern is CO, which is a byproduct of the combustion process of motor vehicles. CO concentrations are highest where vehicles idle for extended periods of time. For this reason, CO concentrations are generally highest in the vicinity of signalized intersections where vehicles are delayed and emitting CO. Generally, concentrations approaching state air quality standards are found within about 100 feet of a roadway source. Further from the road, the CO in the air is dispersed by the wind such that concentrations rapidly decrease.

The U.S. Environmental Protection Agency has approved a screening method to determine which intersections need analysis for potential hot spot air quality impacts. The screening analysis consists of two criteria. If either criterion is met, then an intersection analysis would be required.

The first criterion is to determine whether the total daily approach volume of the study area exceeds 82,300 Average Annual Daily Traffic (AADT). All intersection AADTs for the project corridor are well below this threshold, as identified in **Appendix D**.

The second criterion compares the study area to the locations of 10 intersections that the MPCA has identified as having the highest volumes in the metro area. If any of these 10 intersections were affected by the project then analysis would be required. The nearest of these intersections is over 19 miles away, at the intersection of Cedar Avenue and 140th Street West in Apple Valley; therefore, the second criterion is not met and no hot spot analysis is needed.

No air quality mitigation is required.

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.

During grading and roadway construction, fugitive dust will be created. Due to impacts from wind and other construction conditions, nearby properties may be temporarily affected. It will be minimized through general dust control measures such as applying water to exposed soils and limiting the extent and duration of the exposed soil conditions. All exposed soil surfaces will be permanently covered after completion of construction with pavement or vegetation, eliminating the potential to generate dust.

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 cometo that conclusion and any GHG emission sources not included in the total calculation.

About Greenhouse Gases (GHGs)

Certain gases in the earth's atmosphere, classified as greenhouse gases, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space. A portion of the radiation is absorbed by the earth's surface and a smaller portion of this radiation is reflected back toward space. This absorbed radiation is then emitted from the earth as low-frequency infrared radiation. The frequencies at which bodies emit radiation are proportional to temperature. Because the earth has a much lower temperature than the sun, it emits lower-frequency radiation. Most solar radiation passes through GHGs; however, infrared radiation is absorbed by these gases. As a result, radiation that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the greenhouse effect, is responsible for maintaining a habitable climate on earth.

The primary GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Fluorinated gases also make up a small fraction of the GHGs that contribute to climate change. Examples of fluorinated gases include chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3); however, it is noted that these gases are not associated with typical land use development. Human-caused emissions of GHGs exceeding natural ambient concentrations are believed to be responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the earth's climate, known as global climate change or global warming.[29]

Project Related GHG Emissions

This section describes the GHG emissions associated with the proposed project.

- Carbon dioxide (CO_2)

[29] U.S. EPA. *Overview of Greenhouse Gases.* Available at https://www.epa.gov/ghgemissions/overview-greenhouse-gases.

- Nitrous oxide (N_2O)
- Methane (CH_4)

The projected GHG emissions are provided on an average annual basis using the CO_2 equivalent (CO_2e) and include the construction phase of the project. Emissions were estimated using the Minnesota Infrastructure Carbon Estimator (MICE) (Version 2.1).[30]

Construction emissions for the proposed project are based on length of construction and are from mobile equipment including passenger cars, light-duty trucks, and medium and heavy-duty trucks, and construction equipment (both gasoline and diesel) (see **Table 16**).

Table 16: Construction Emissions

Construction CO2e Emissions (Total over Construction Period)	CO_{2e}, Metric Tons (total)	Calculation Method
Build Alternative	4,639	Minnesota Infrastructure Carbon Estimator

b. GHG Assessment

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

Not applicable.

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

Not applicable.

iii. Quantify the proposed project's predicted net lifetime GHG emissions (total tons per number 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.

Not applicable.

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.

Construction Noise

The construction activities associated with implementation of the proposed project will result in increased noise levels relative to existing conditions. These impacts will primarily be associated with construction equipment and pile driving.

[30] MnDOT. *Greenhouse Gas Emissions Analysis*. Available at https://www.dot.state.mn.us/sustainability/ghg-analysis.html.

The following **Table 16** shows peak noise levels monitored at 50 feet from various types of construction equipment. This equipment is primarily associated with site grading/site preparation, which is generally the roadway construction phase associated with the greatest noise levels.

Table 17: Typical Construction Equipment Noise Levels at 50 feet[31]

Equipment Type	Manufacturers Sampled	Total Number of Models in Sample	Peak Noise Level (dBA): Range	Peak Noise Level (dBA): Average
Backhoes	5	6	74-92	83
Front Ladders	5	30	75-96	85
Dozers	8	41	65-95	85
Graders	3	15	72-92	84
Scrapers	2	27	76-98	87
Pile Drivers	N/A	N/A	95-105	101

Elevated noise levels are, to a degree, unavoidable for this type of project. Dakota County will require that construction equipment be properly muffled and in proper working order. While Dakota County and its contractor(s) are exempt from local noise ordinances, it is the practice to require contractor(s) to comply with applicable local noise restrictions and ordinances to the extent that is reasonable. Advanced notice will be provided to affected communities of any planned abnormally loud construction activities. Night construction is not anticipated. This project is expected to be under construction for one to two construction seasons.

Any associated high-impact equipment noise, such as pavement sawing or jack hammering, will be unavoidable with construction of the proposed project. No pile driving is anticipated to be needed for this project.

Operational Traffic Noise

The Minnesota State Noise Standards do not apply to certain roadways outside the cities of Minneapolis and St. Paul. The exemption criteria are found in 2017 Minnesota Statutes, Section 116.07 Subdivision 2a.3:

> Subd. 2a. Exemptions from standards: No standards adopted by any state agency for limiting levels of noise in terms of sound pressure which may occur in the outdoor atmosphere shall apply to
>
> (3) except for the cities of Minneapolis and St. Paul, an existing or newly constructed segment of a road, street, or highway under the jurisdiction of a road authority of a

[31] United States Environmental Protection Agency and Federal Highway Administration

town, statutory or home rule charter city, or county, except for roadways for which full control of access has been acquired,

This exemption applies to many local roadway projects since full control of access is not acquired for many of these facilities. In applying this exemption, full control of access means that the authority to control access is exercised to give preference to through traffic by providing access connections with selected public roads only and by prohibiting crossings at grade or direct private driveway connections. CSAH 54 is exempt due to the lack of full access control.

This project is not anticipated to meet the Level 1 Definition Criteria per FHWA. This project is currently not federally funded. If it were later determined that the project does meet the Level 1 Definition Criteria, the project team will revisit the noise requirements.

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) source of trip generation rates used in the estimates; and 5) availability of transit and/or other alternative transportation modes.

According to a roundabout justification report prepared for the project, CSAH 54 is a county roadway that runs predominantly in a north-south direction. There are no existing parking spaces, and there are no proposed additional parking spaces that will be added. The average annual daily traffic (AADT) along CSAH 54 was 3,900 vehicles per day (vpd) in 2018 according to the MnDOT Traffic Mapping Application.

Existing turning movement counts were collected at the study intersection of CSAH 54 (Ravenna Trail) and CSAH 68 (200th Street E) on May 7, 2024. The AM peak hour was calculated to be from 7:15 AM to 8:15 AM, and the PM peak hour was calculated to be from 4:45 PM to 5:45 PM. Historical AADT trends were used to determine the Future (2048) Conditions volumes. The base year (2017) AADT was 5,500 and forecasted 2040 AADT for CSAH 54 was 6,400 vpd just east of Hastings. A forecasted AADT on CSAH 54 closer to the study intersection or for CSAH 68 was not available, but the growth is assumed to be similar. A review of historic AADT data shows that neither corridor has experienced significant growth in the past 10 years. For this study, a 0.7% annual growth rate was used to estimate future traffic volumes.

Per a review of the City of Hastings and Dakota County websites, there does not appear to be any available transit and/or other alternative transportation modes on CSAH 54.

During project construction, temporary detours will be required due to the scale of the project activities. TH 316 will be the primary detour route; however, specific details regarding detours will be determined as project design continues.

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.

An intersection capacity analysis was performed for the Future Year (2048) to quantify anticipated operating conditions taking into account growth in traffic volumes. Based on the capacity analysis, all intersections are anticipated to operate at level of service (LOS) A or better during the AM peak hour and LOS B or better during the PM peak hour with side-street stop control. All approaches are expected to operate at LOS A or better during the AM and PM peak hours with roundabout control through the Future Year (2048). A memorandum summarizing the traffic analysis can be found in **Appendix E**.

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

The purpose of the proposed project is to improve safety and mobility along the CSAH 54 corridor. As a result, mitigation is not necessary or required.

21. Cumulative Potential Effects

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.

Cumulative potential effects are defined as "the effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects."[32] The geographic areas considered for cumulative potential effects are those near the project site (within approximately one-half mile), and the timeframe considered includes projects that would be constructed in the reasonably foreseeable future (by 2030).

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.

Based on a review of land use and zoning maps from comprehensive plans, there are no reasonably foreseeable future projects that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.

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.

[32] Minnesota Rules, part 4410.0200, subpart 11a

The impacts from the project listed previously will be addressed via regulatory permitting and approval processes; therefore, they would be individually mitigated to ensure minimal cumulative impacts occur.

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.

All known potentially adverse environmental impacts are addressed in the preceding EAW items.

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

Proposed Project Layout

LEGEND

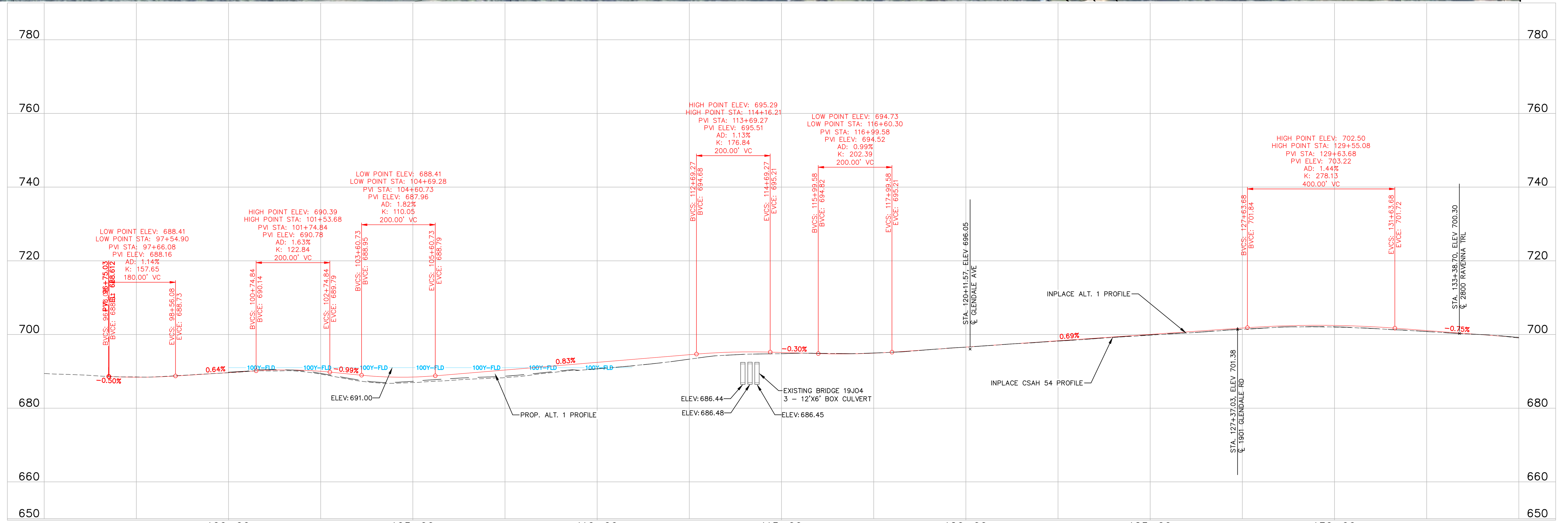
- PROPOSED ALIGNMENT
- 100-YEAR FLOODPLAIN (100Y-FLD)
- FLOODWAY
- CONSTRUCTION LIMITS
- PROPOSED FENCE
- PROPOSED GUARD RAIL
- PROPOSED RETAINING WALL
- PROPOSED RIGHT-OF-WAY
- TEMPORARY EASEMENT
- SEPTIC TANK/SEPTIC LINES
- WETLAND DELINEATION (WL)
- PROPOSED BITUMINOUS ROADWAY
- PROPOSED BITUMINOUS SHOULDER
- POTENTIAL FUTURE TRAIL
- PROPOSED CURB & GUTTER
- RAISED CONCRETE MEDIAN
- ROUNDABOUT CENTER
- TRUCK APRON
- GRAVEL
- URBAN TRAIL
- FUTURE TRAIL ALTERNATIVE
- FUTURE URBAN TRAIL ALTERNATIVE

EXISTING TYPICAL SECTION
CSAH 54/RAVENNA TRAIL

PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL RURAL TRAIL

PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL URBAN TRAIL

PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL URBAN TRAIL ON BACK OF CURB



Kimley»Horn

CSAH 54 – ROADWAY PLAN & PROFILE

CSAH 54 – ROADWAY PLAN & PROFILE

Kimley»Horn

LEGEND
PROPOSED ALIGNMENT
100-YEAR FLOODPLAIN
FLOODWAY
CONSTRUCTION LIMITS
PROPOSED FENCE
PROPOSED GUARD RAIL
PROPOSED RETAINING WALL
PROPOSED RIGHT-OF-WAY
TEMPORARY EASEMENT
SEPTIC TANK/SEPTIC LINES
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URBAN TRAIL
FUTURE TRAIL ALTERNATIVE
FUTURE URBAN TRAIL ALTERNATIVE
EXISTING TYPICAL SECTION
CSAH 54/RAVENNA TRAIL
PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL RURAL TRAIL
PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL URBAN TRAIL
PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL URBAN TRAIL ON BACK OF CURB
MATCH LINE 220+00
MATCH LINE 305+00
CPKC RAILWAY
POLK AVE
EXISTING BRIDGE 2951
PROP. ALT. 1 PROFILE
INPLACE ALT. 1 PROFILE
INPLACE CSAH 54 PROFILE
780
760
740
720
700
680
660
650
225+00
230+00
235+00
240+00
245+00
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255+00
260+00
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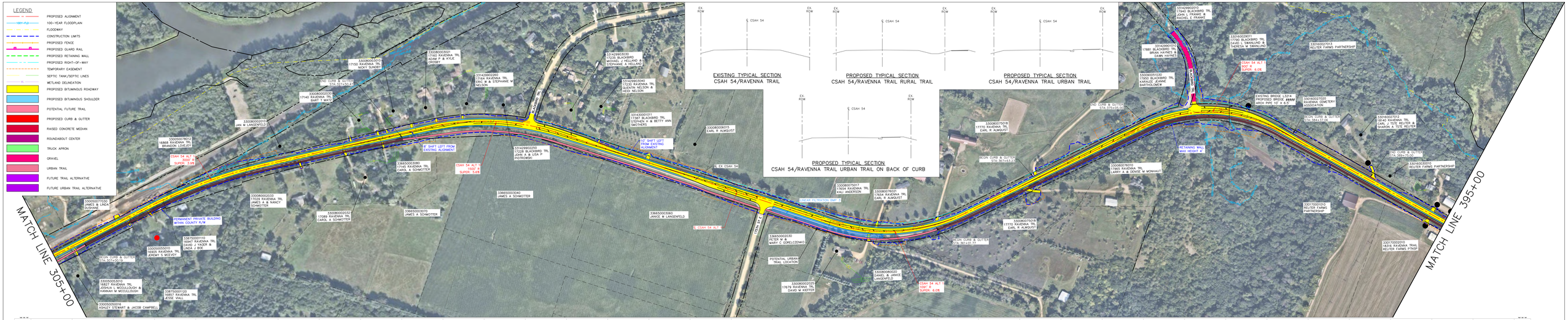
290+00
295+00
300+00


LEGEND
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TRUCK APRON
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URBAN TRAIL
FUTURE TRAIL ALTERNATIVE
FUTURE URBAN TRAIL ALTERNATIVE
EXISTING TYPICAL SECTION
CSAH 54/RAVENNA TRAIL
PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL RURAL TRAIL
PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL URBAN TRAIL
PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL URBAN TRAIL ON BACK OF CURB
MATCH LINE 305+00
MATCH LINE 395+00
RAVENNA TRL
CSAH 54
PROPOSED BRIDGE L3214
EXISTING BRIDGE L3214
PERMANENT PRIVATE BUILDING WITHIN COUNTY R/W
POTENTIAL URBAN TRAIL LOCATION
RETAINING WALL MAX HEIGHT 4'
CLOSE ELEVATION 1509'
INPLACE ALT. 1 PROFILE
PROP. ALT. 1 PROFILE
INPLACE CSAH 54 PROFILE
EXISTING BRIDGE L3214
57.06.5" ARCH PIPE
ELEV: 688.12
ELEV: 679.06
100Y-FLD
100Y-FLD


MATCH LINE 395+00
EXISTING TYPICAL SECTION
CSAH 54/RAVENNA TRAIL
PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL RURAL TRAIL
PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL URBAN TRAIL
PROPOSED TYPICAL SECTION
CSAH 54/RAVENNA TRAIL URBAN TRAIL ON BACK OF CURB
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PROPOSED BITUMINOUS SHOULDER
POTENTIAL FUTURE TRAIL
PROPOSED CURB & GUTTER
RAISED CONCRETE MEDIAN
ROUNDABOUT CENTER
TRUCK APRON
GRAVEL
URBAN TRAIL
FUTURE TRAIL ALTERNATIVE
FUTURE URBAN TRAIL ALTERNATIVE
INPLACE ALT. 1 PROFILE
INPLACE CSAH 54 PROFILE
PROP. ALT. 1 PROFILE
EXISTING BRIDGE 92731
TRIPLE 9.5'X6' ARCH PIPE
800
780
760
740
720
700
680
670
400+00
405+00
410+00
415+00
420+00
425+00
430+00
435+00
440+00
445+00
450+00
455+00
460+00
465+00
470+00
475+00

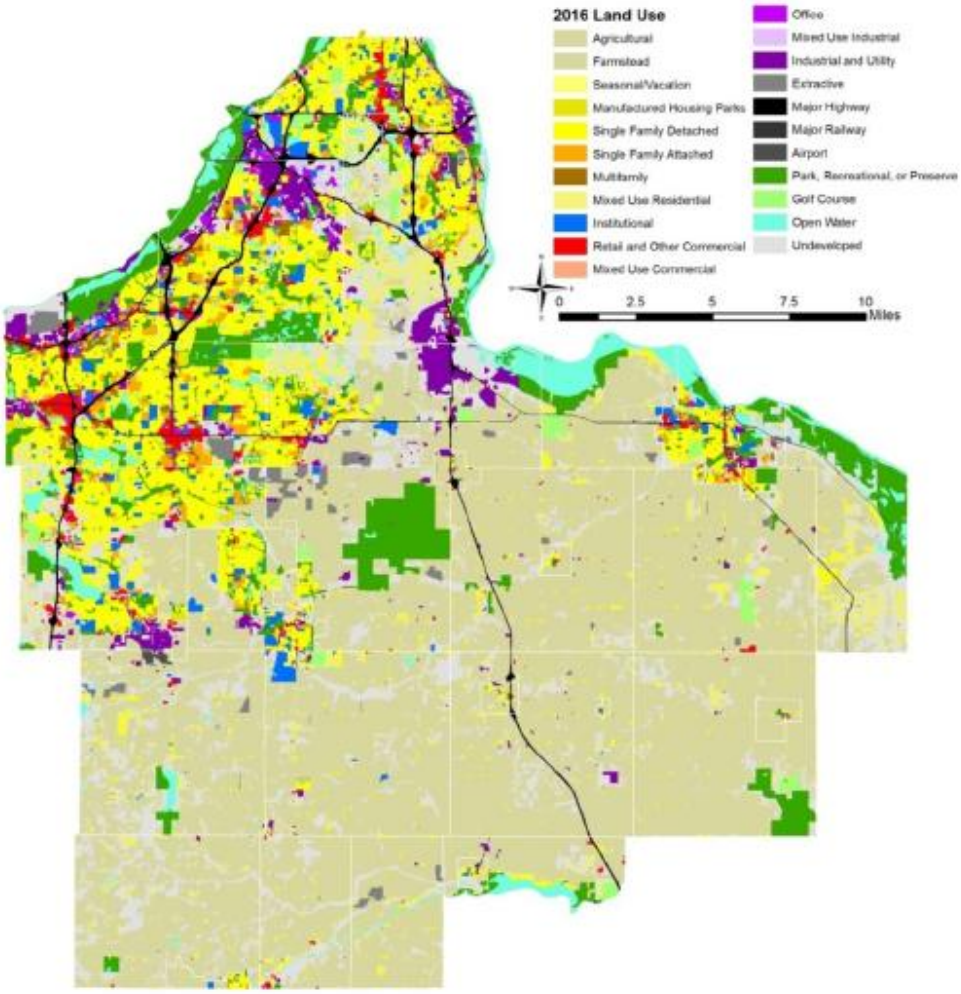
CSAH 54 – ROADWAY PLAN & PROFILE

Kimley»Horn

Appendix B

Land Use and Zoning Maps from Comprehensive Plans

Figure 5.2: 2016 Land Use



Source: Metropolitan Council

Close to 400,000 people are concentrated in the urbanized third of the County. The other two-thirds remain primarily agricultural and are home to roughly 4.4 percent of Dakota County's population.

Thrive MSP 2040 Regional Community Designations

Urban Areas

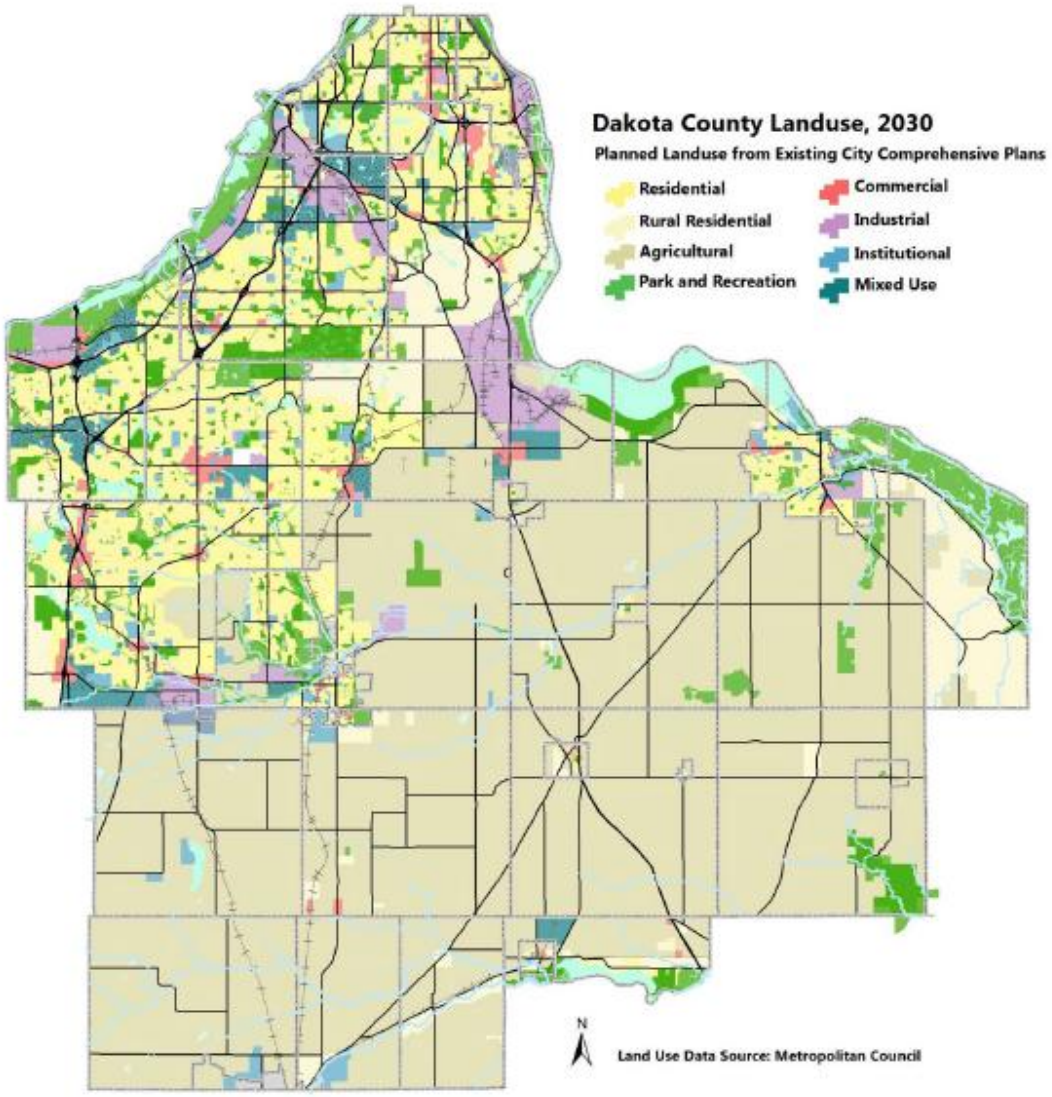
West St. Paul and South St. Paul are extensions of St. Paul's earliest streetcar suburbs. Development is compact because it predates freeways and widespread auto use. Many homes were built before World War II. Metropolitan Council's Urban community designations within Dakota County's developed cities include:

Urban Center: neighborhoods are conducive to transit and walking. Streets are generally gridded, narrow, and interconnected; sidewalks are common; and buildings are oriented toward pedestrians,

County land use forecasts

Dakota County's land use forecast attempts to predict where development will occur over the next 20 years given existing trends and future expectations. This forecast was created based on information gathered by the Metropolitan Council from local plans. Dakota County's land use forecasts will need to be revised following completion of the cities' and townships' comprehensive plans.

Figure 5.6: Land Use Forecast 2030



Source: Metropolitan Council

Note: Because Dakota County does not administer land use controls, this map will be updated based on the 2040 round of comprehensive plans from Dakota County communities.

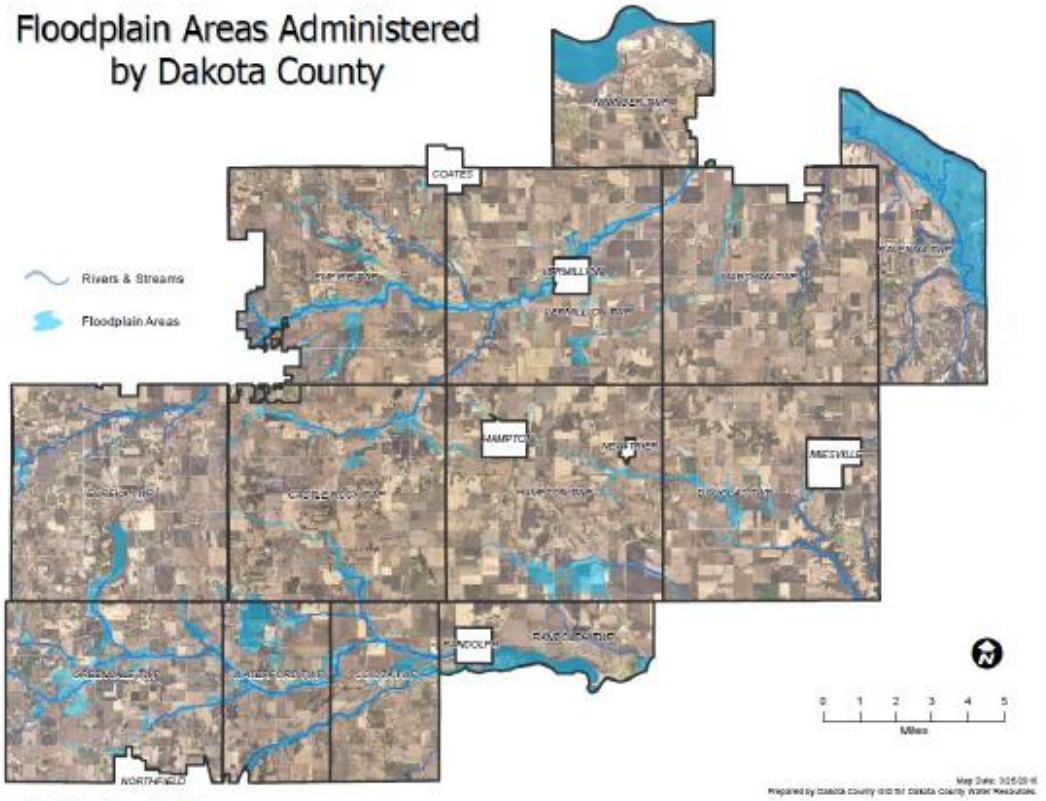
DAKOTA COUNTY OFFICIAL CONTROLS AND LAND USE

Dakota County has played a limited role in administering land use controls. Providing transportation and protecting the natural environment will continue as the County's primary concern with land use patterns. Dakota County administers the following ordinances for the purposes of protecting the health, safety, and welfare of the citizens of Dakota County and to protect the natural resources of the County.

Shoreland and Floodplain Zoning: Ordinance Number 50

The County retains zoning authority in unincorporated areas of the County but does not exercise this authority except in rural floodplain and shoreland areas. Ordinance 50 regulates land subdivision, use, and development of shoreland and floodplain areas to preserve and enhance the quality of surface waters, to protect and preserve the outstanding values of rivers and streams, to conserve the economic and natural environmental values of shorelands, and to provide for the wise use of waters and related land resources. The County has also elected jurisdiction to enforce the State's buffer law county-wide. The law is enforced through Ordinance 50, requiring 50-foot wide permanent buffers on all Public Waters and 16.5-foot wide permanent buffers on all public ditches.

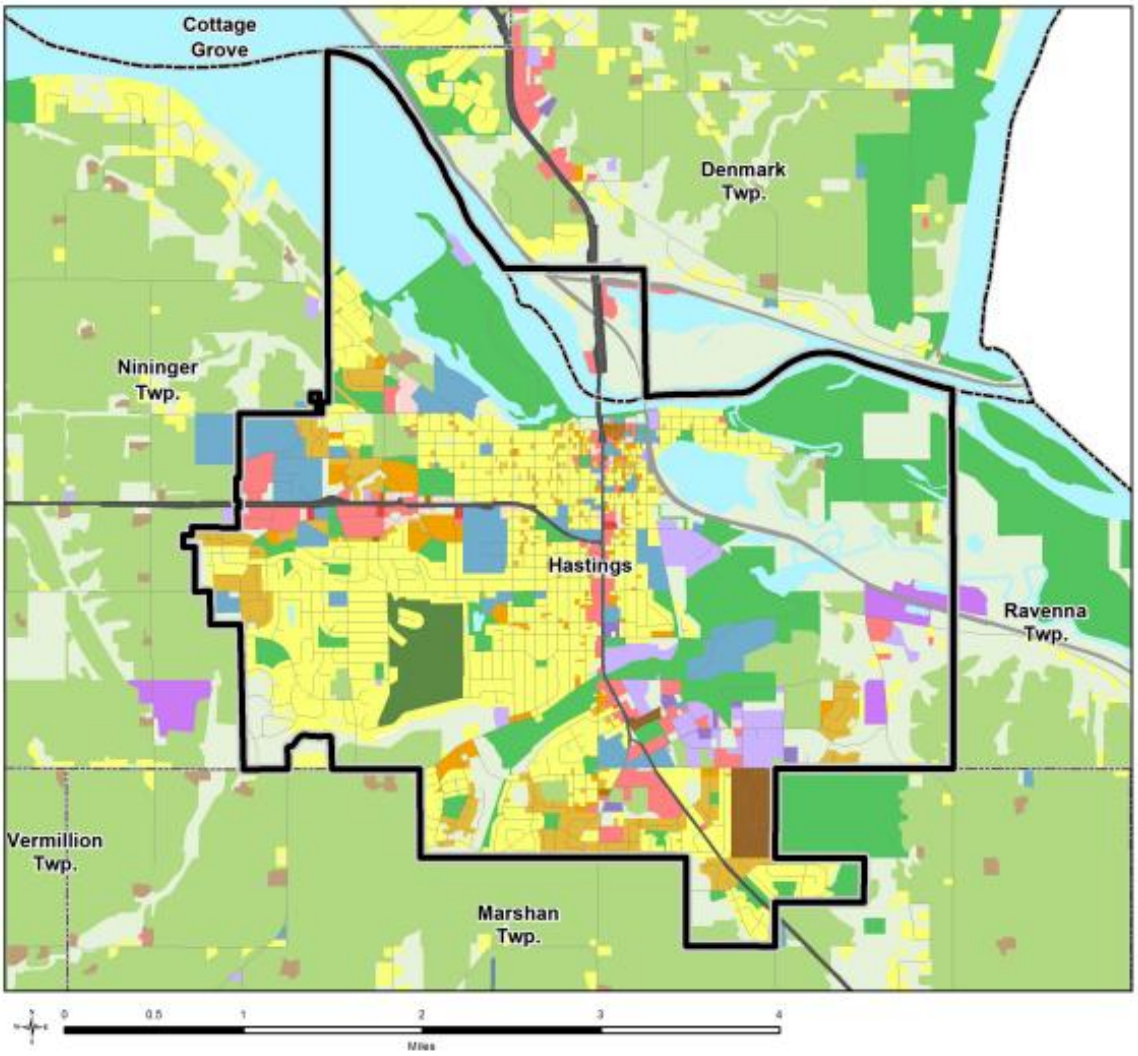
Figure 5.7: Floodplain Zoning Areas Administered by Dakota County



Source: Dakota County GIS

2016 Generalized Land Use

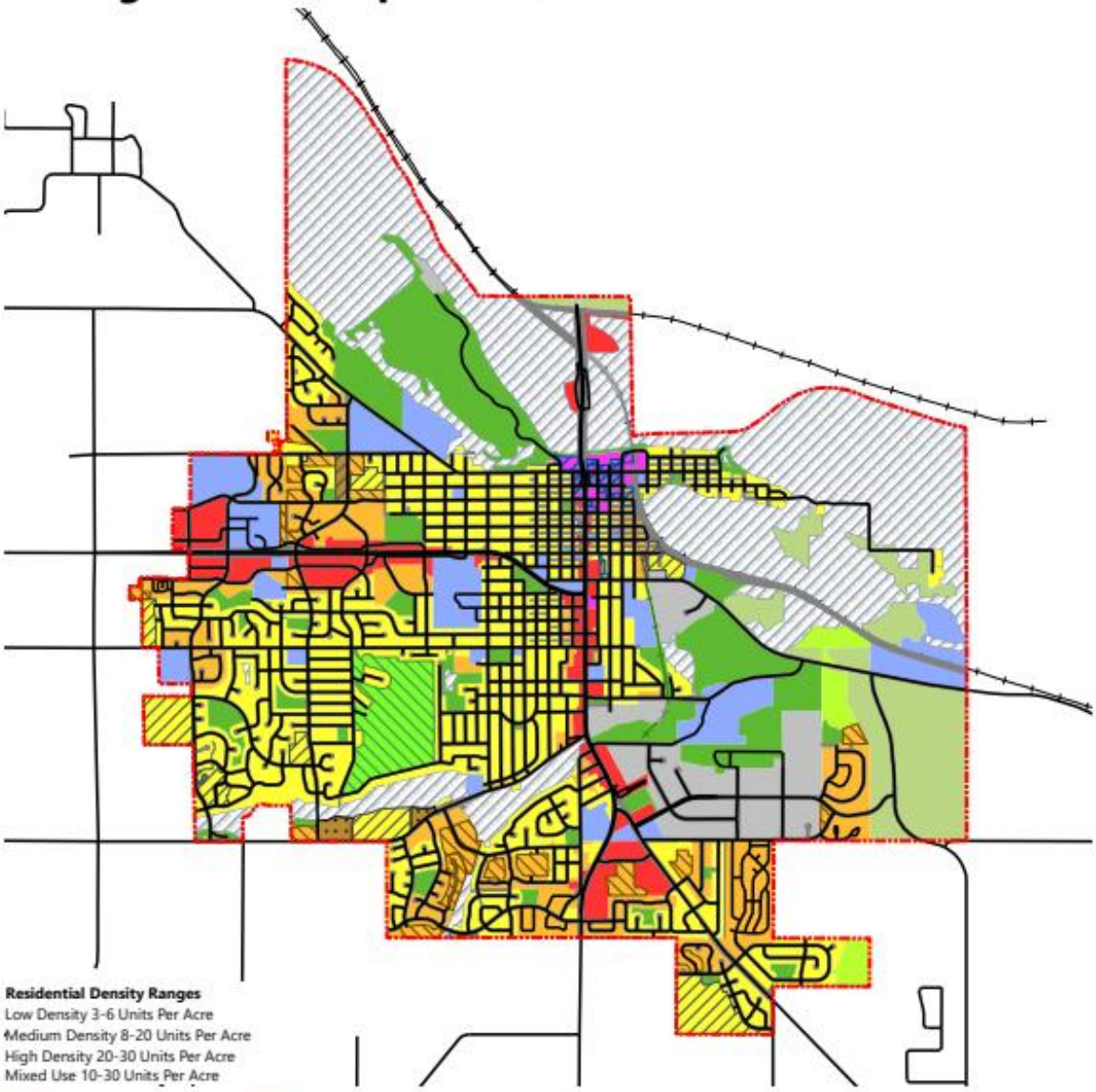
City of Hastings, Dakota & Washington Counties



2016 Generalized Land Use

- Farmstead
- Seasonal/Vacation
- Single Family Detached
- Manufactured Housing Park
- Single Family Attached
- Multifamily
- Retail and Other Commercial
- Office
- Mixed Use Residential
- Mixed Use Industrial
- Mixed Use Commercial and Other
- Industrial and Utility
- Extractive
- Institutional
- Park, Recreational or Preserve
- Golf Course
- Major Highway
- Railway
- Airport
- Agricultural
- Undeveloped
- Water
- County Boundaries
- City and Township Boundaries
- NCompass Street Centerlines

FUTURE LAND USE MAP
Hastings 2040 Comprehensive Plan



Residential Density Ranges
Low Density 3-6 Units Per Acre
Medium Density 8-20 Units Per Acre
High Density 20-30 Units Per Acre
Mixed Use 10-30 Units Per Acre

- Current City Limits
- Floodplain & Wetland Protection
- Agriculture
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Mixed Use
- Commercial
- Industrial & Utility
- Institutional
- Parks
- Upland Conservation Area
- Golf Course

Forecasted Residential Growth Areas

- New Low Density Residential Growth
- New Medium Density Residential Growth
- New High Density Residential Growth
- Mixed Use Redevelopment
- Upper Story Redvelopment (Commercial on Ground Floor)

Since 1857 Hastings MINNESOTA

0 7501,500 3,000 Feet

N

Floodplains and Riparian Open Space

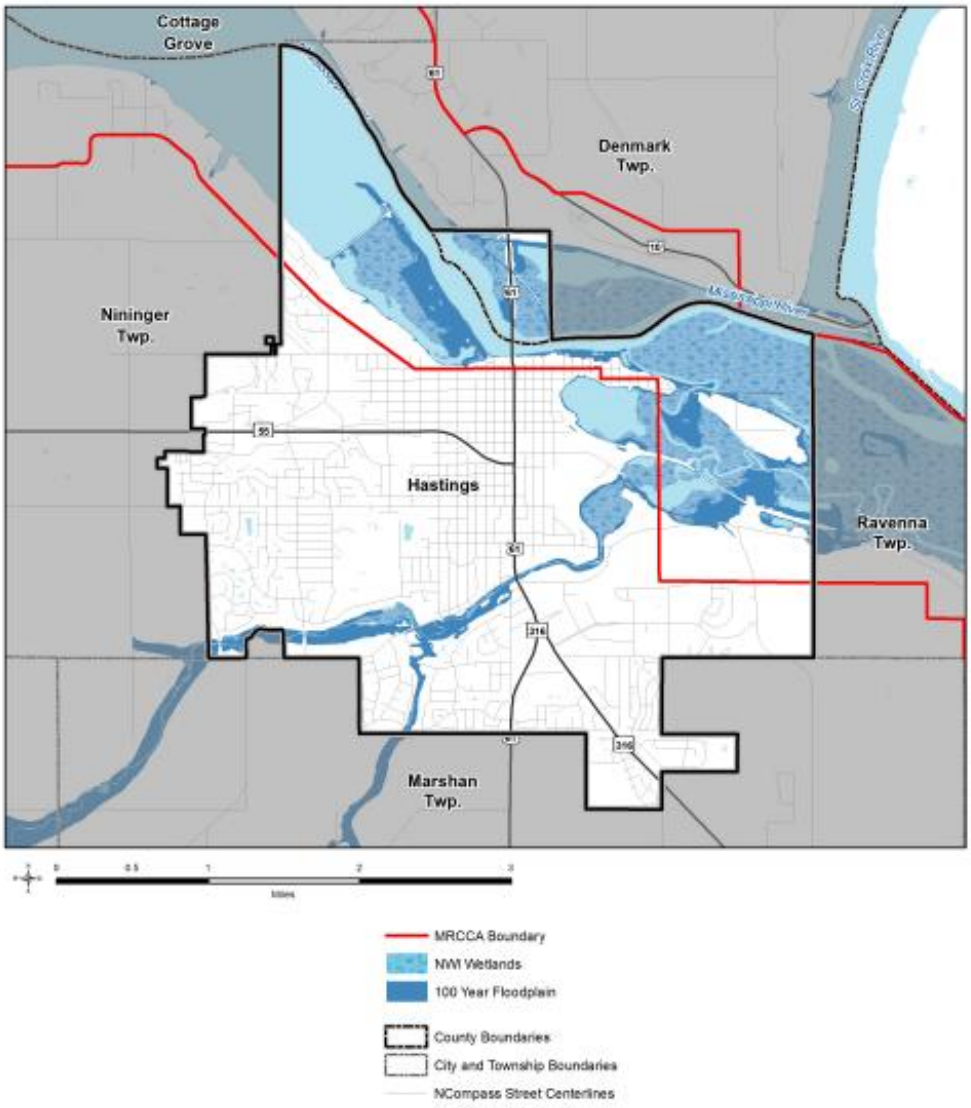
The Mississippi and Vermillion Rivers each contain extensive floodplain areas that are important to the land use planning heritage of the City.

Discussion of these resources which are located in the Hastings portion of the Mississippi National River and Recreation Area (MNRRA) corridor is found in the Mississippi River Corridor Area Plan chapter of the 2030 Comprehensive Plan, which incorporates the Critical Area and MNRRA requirements.

The western part of the City contains the portion of the Vermillion River that falls outside of the Mississippi River corridor in Hastings. The Vermillion River floodplain occupies a relatively narrow band with 100-year flood elevations that range from 783 feet at the Peavey Mill Dam to the east of Vermillion Street to 802 feet at the City's western border.

Mississippi River Corridor Critical Area - Wetlands & Floodplains

City of Hastings, Dakota & Washington Counties



Planned Bicycle Network Maps

Figure C22 Map D Planned Bicycle Network: Hastings, Nininger, Ravenna, Marshan, Vermillion

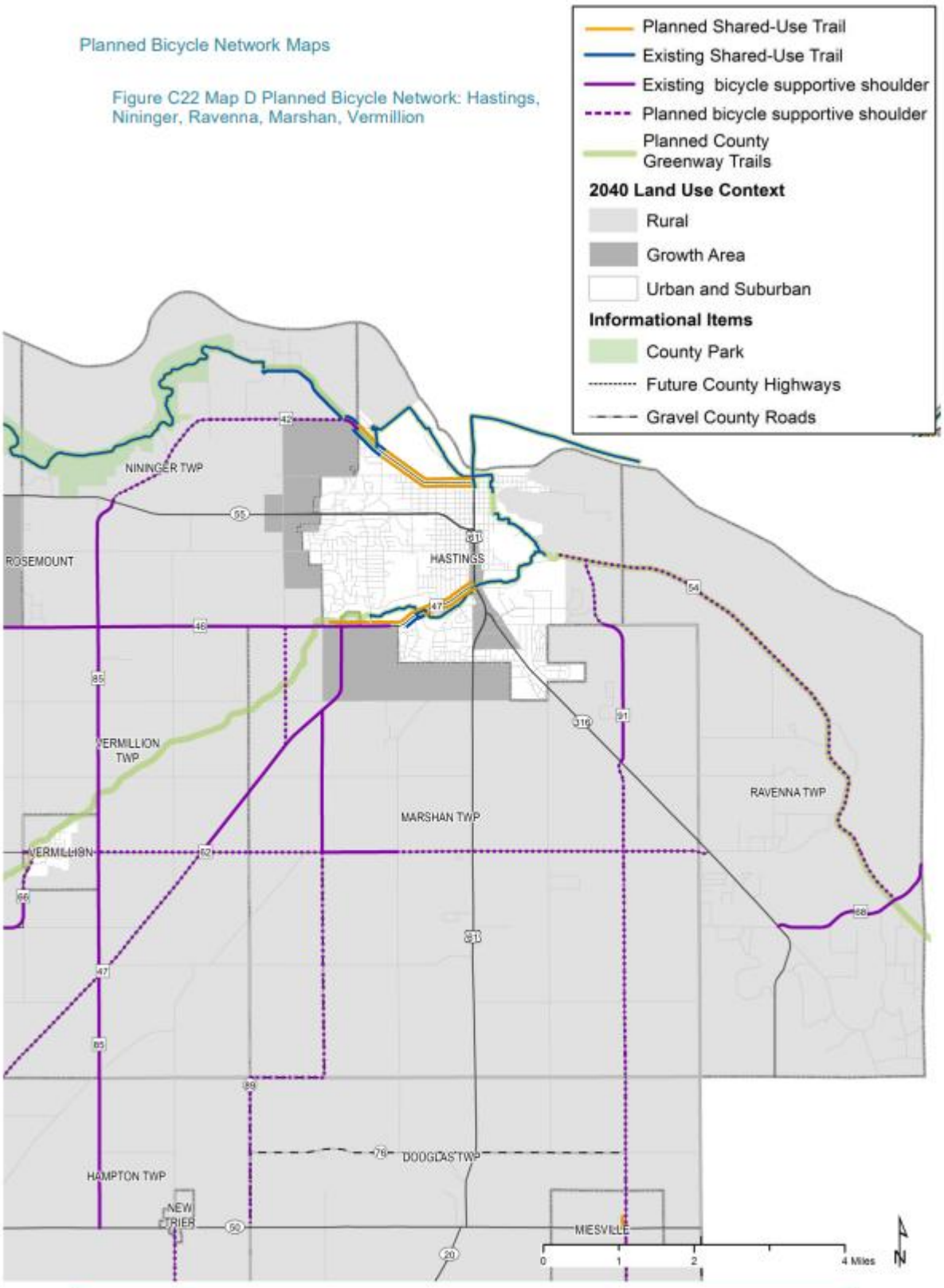
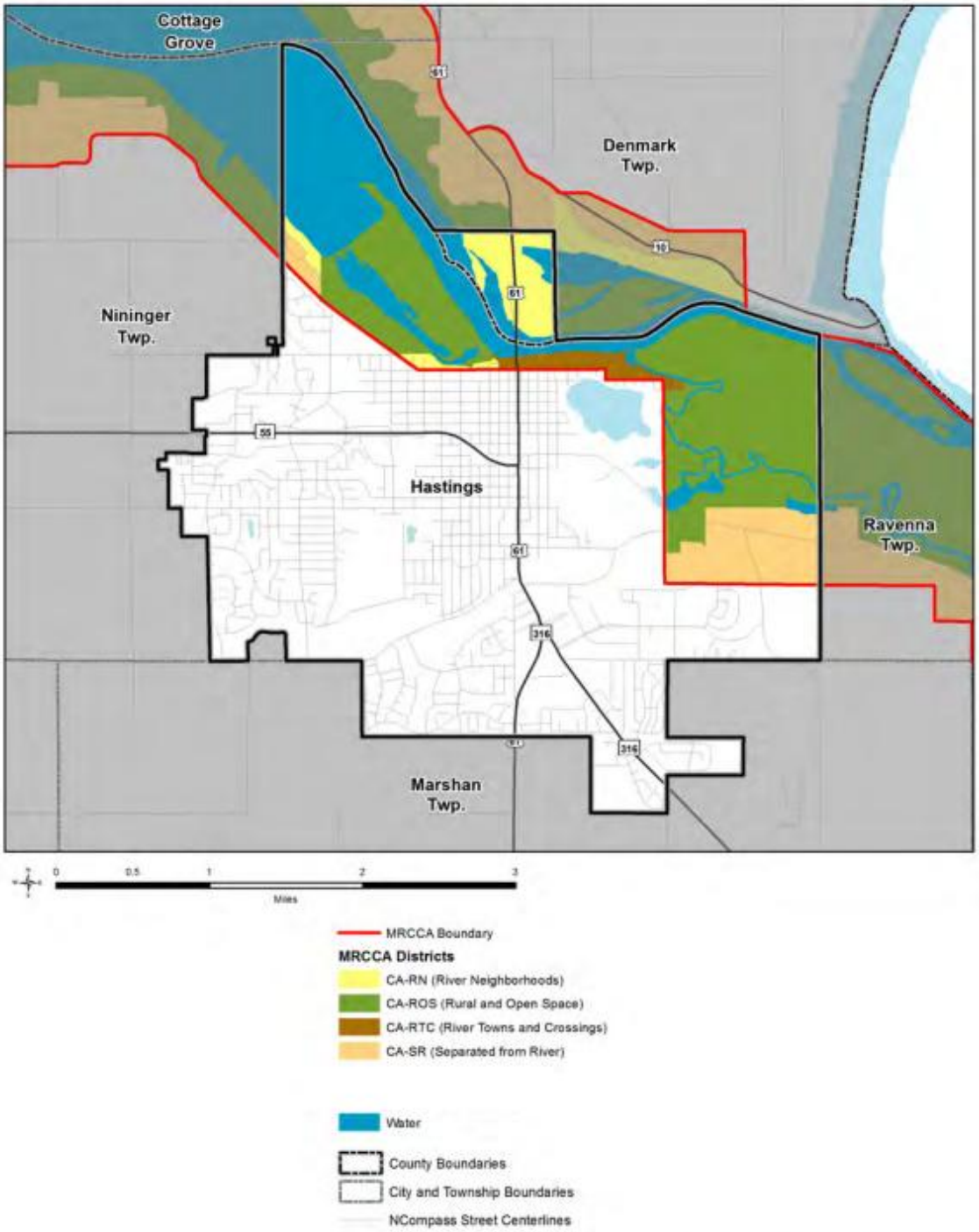
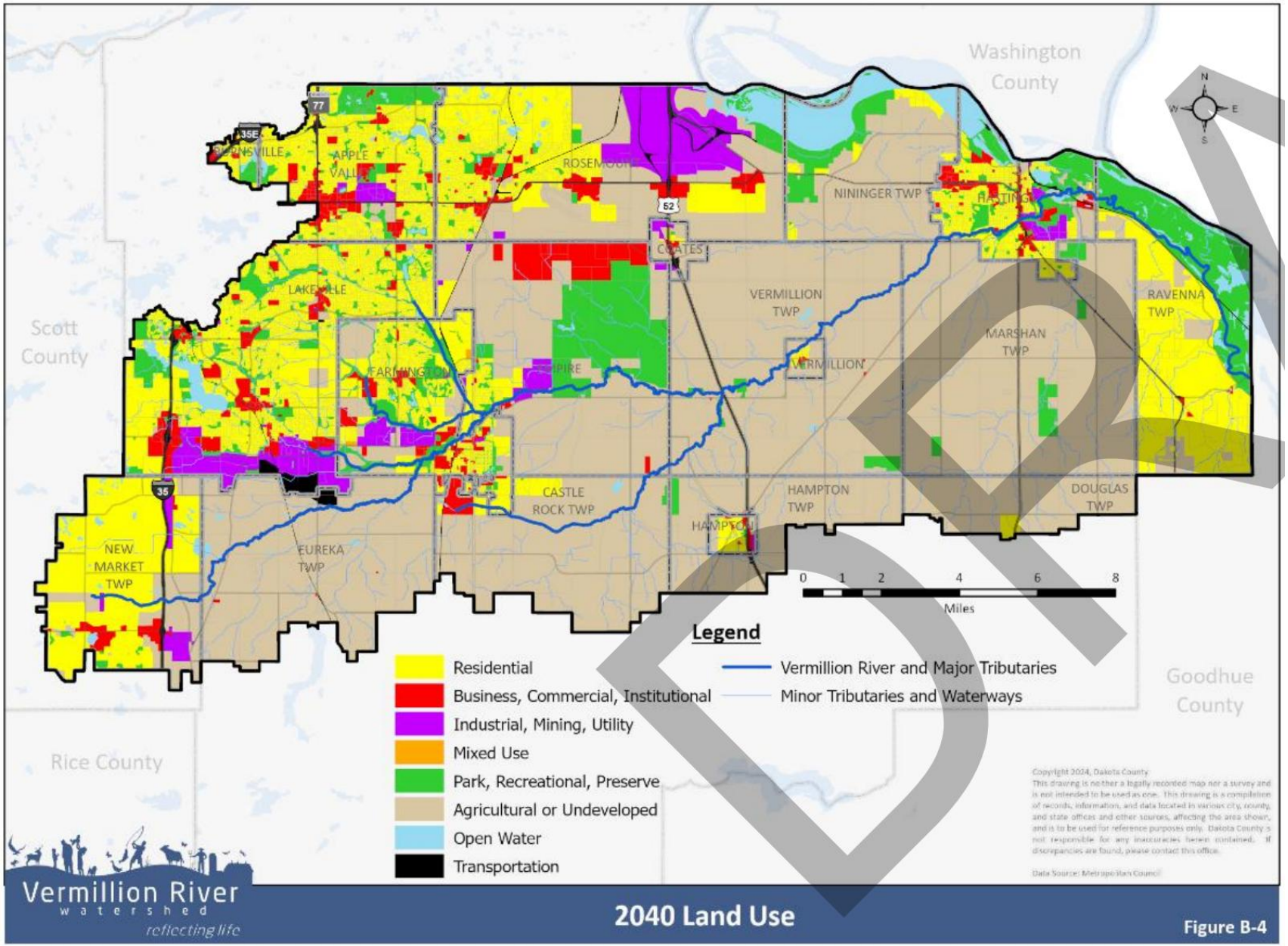


Figure 11.1

Mississippi River Corridor Critical Area Districts
City of Hastings, Dakota & Washington Counties



Source: Metropolitan Council


Washington County
Scott County
Rice County
Goodhue County
APPLE VALLEY
ROSEMOUNT
NININGER TWP
HASTINGS
COATES
LAKEVILLE
FARMINGTON
EMPIRE
VERMILLION TWP
VERMILLION
MARSHAN TWP
RAVENNA TWP
CASTLE ROCK TWP
HAMPTON TWP
HAMPTON
DOUGLAS TWP
NEW MARKET TWP
EUREKA TWP
0 1 2 4 6 8
Miles
Legend
Residential
Business, Commercial, Institutional
Industrial, Mining, Utility
Mixed Use
Park, Recreational, Preserve
Agricultural or Undeveloped
Open Water
Transportation
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Vermillion River watershed
reflecting life
2040 Land Use
Figure B-4

Appendix C

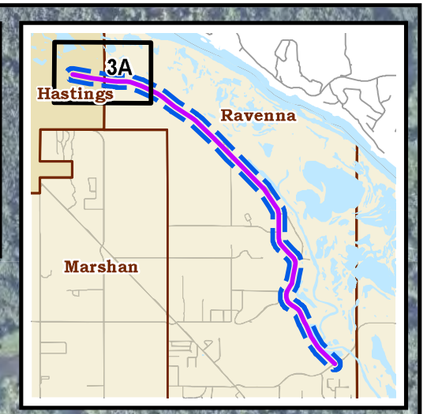
Environmental Documentation and Agency Correspondence

Site Number	Site Name (Former Site Names)	Address (Historic Address)	Property Type	Ranking Rationale	Ranking Designation
1	Legler Property (Legler Salvage and Disposal)	2100 Glendale Road	Residential	The site was historically occupied by a vehicle salvage and disposal facility.	High
2	Extreme Sandbox (Brunotte Demo)	1901 Glendale Road Hastings, MN 55033	Exempt	The site is associated with onsite vehicle maintenance, fueling, and demolition/crushing operations.	High
3	Proposed Hastings Wastewater Treatment Plan (Commercial Asphalt Company, Davies Excavating Dump)	2445 Ravenna Trail Hastings, MN 55033	Exempt	The site was historically occupied by a sand and gravel mine, an asphalt plant, and a dump, and is associated with a closed LUST listing (LS0017556).	High
4	Tradition Veterans Complex / Scheels Rink	2800 Ravenna Trail Hastings, MN 55033	Exempt	The site was historically occupied by an aggregate mine.	Medium
5	Former Soo Line Derailment Fuel Spill	Unaddressed Parcels Hastings, MN 55033	Agricultural / Residential / Exempt	The site was the location of a train derailment in 1989 which resulted in a 1,200-gallon diesel release and a spill of approximately 2,000 tons of coal. The site has also historically been used for incidental dumping.	High
6	Metropolitan Council Property (Gravel Pit, Soo Line Railroad)	15300 Ravenna Trail Hastings, MN 55033	Exempt	The site was historically occupied by a gravel pit with onsite dumping activities.	High
7	Chicago, Milwaukee, Saint Paul & Pacific Railroad	Address Unassigned	Railroad	The site is occupied by a railroad.	Low

Legend

- Alignment
- 500' Radius
- Parcel Boundary
- Former UST Location
- Former Building Location

Ranked Site
- High
- Medium
- Low



AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

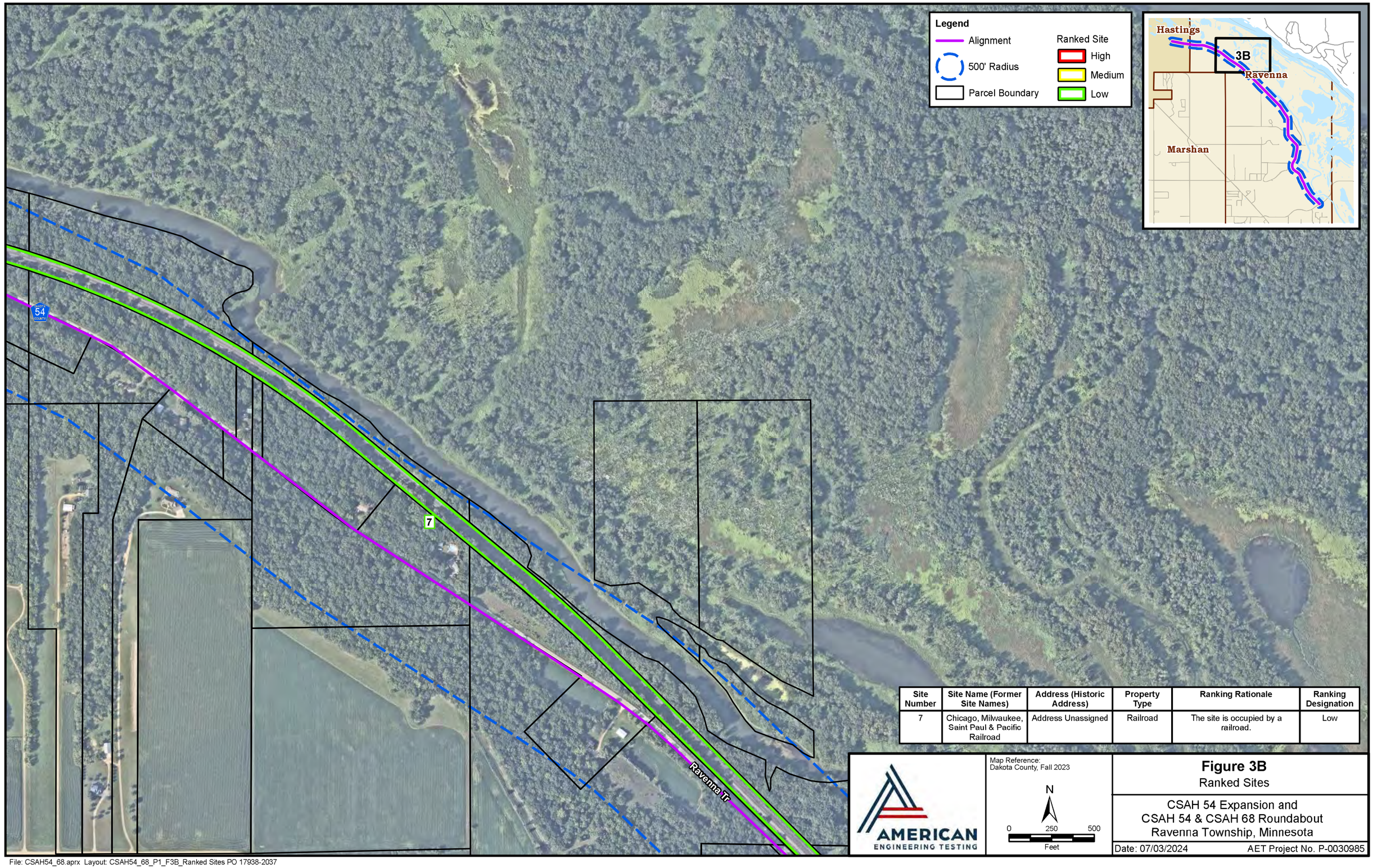
0 250 500
Feet

Figure 3A
Ranked Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F3A_Ranked Sites PO 17938-2037



Site Number	Site Name (Former Site Names)	Address (Historic Address)	Property Type	Ranking Rationale	Ranking Designation
7	Chicago, Milwaukee, Saint Paul & Pacific Railroad	Address Unassigned	Railroad	The site is occupied by a railroad.	Low

AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

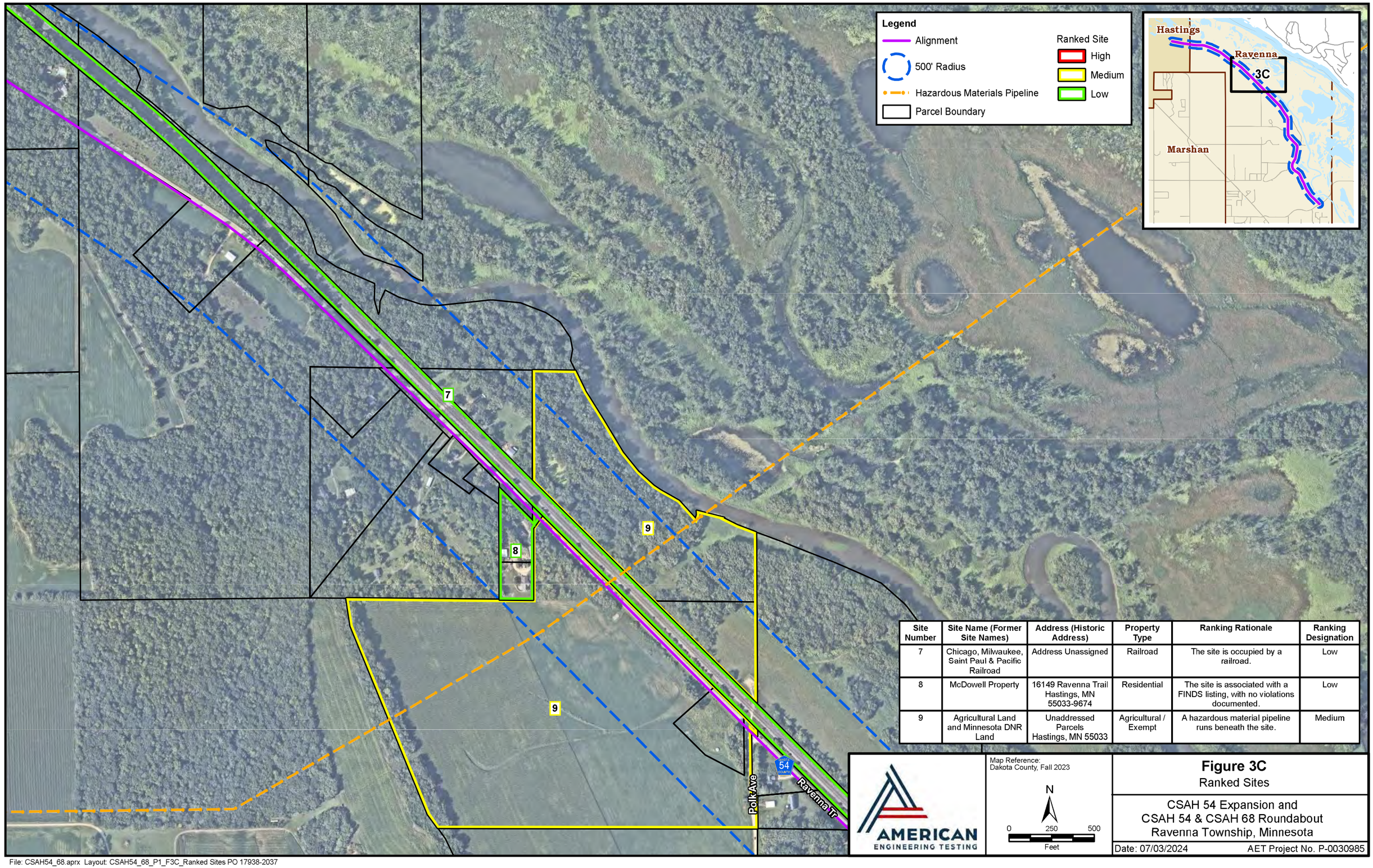
0 250 500
Feet

Figure 3B
Ranked Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F3B_Ranked Sites PO 17938-2037



Site Number	Site Name (Former Site Names)	Address (Historic Address)	Property Type	Ranking Rationale	Ranking Designation
7	Chicago, Milwaukee, Saint Paul & Pacific Railroad	Address Unassigned	Railroad	The site is occupied by a railroad.	Low
8	McDowell Property	16149 Ravenna Trail Hastings, MN 55033-9674	Residential	The site is associated with a FINDS listing, with no violations documented.	Low
9	Agricultural Land and Minnesota DNR Land	Unaddressed Parcels Hastings, MN 55033	Agricultural / Exempt	A hazardous material pipeline runs beneath the site.	Medium

AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

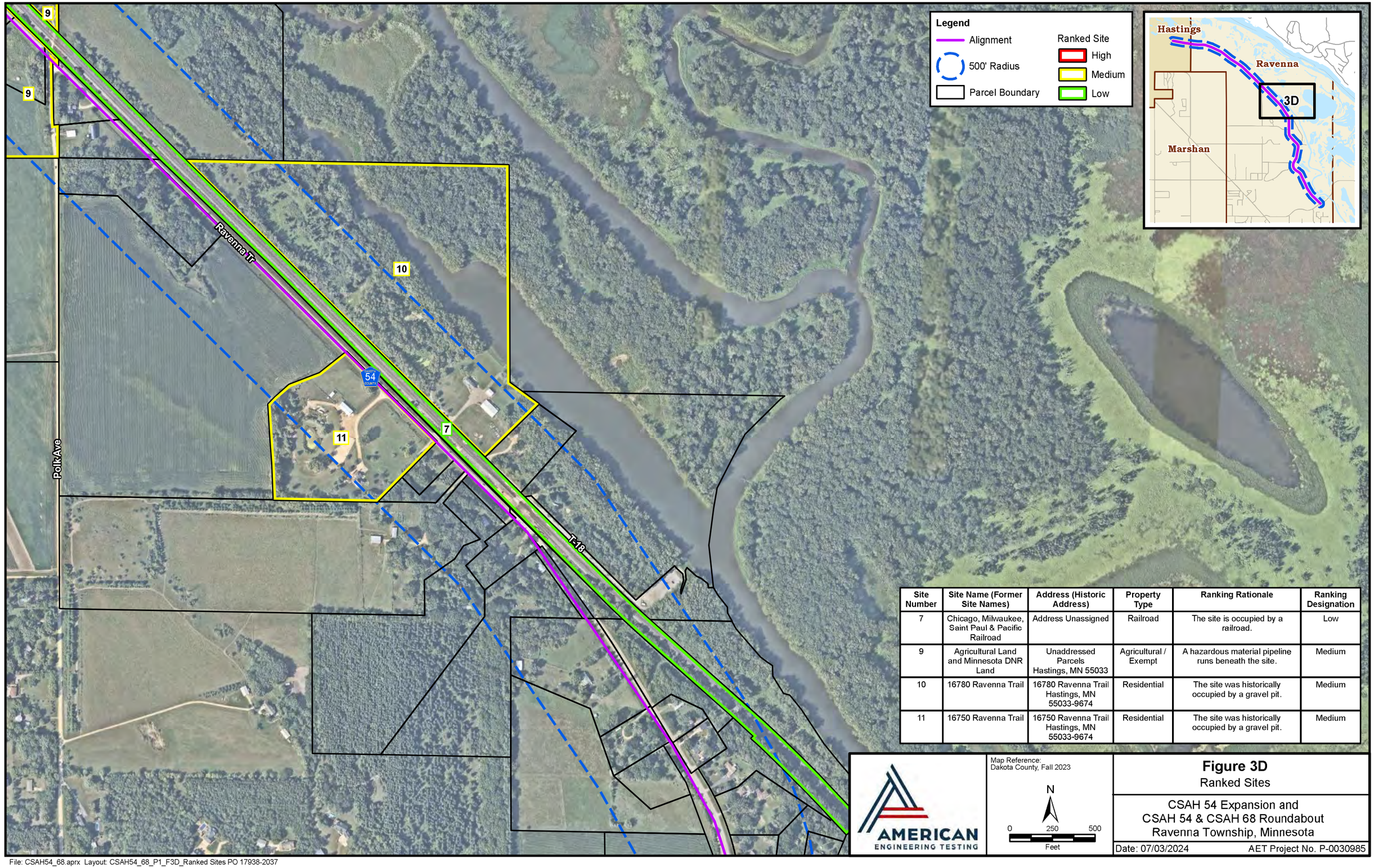
0 250 500
Feet

Figure 3C
Ranked Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F3C_Ranked Sites PO 17938-2037



Site Number	Site Name (Former Site Names)	Address (Historic Address)	Property Type	Ranking Rationale	Ranking Designation
7	Chicago, Milwaukee, Saint Paul & Pacific Railroad	Address Unassigned	Railroad	The site is occupied by a railroad.	Low
9	Agricultural Land and Minnesota DNR Land	Unaddressed Parcels Hastings, MN 55033	Agricultural / Exempt	A hazardous material pipeline runs beneath the site.	Medium
10	16780 Ravenna Trail	16780 Ravenna Trail Hastings, MN 55033-9674	Residential	The site was historically occupied by a gravel pit.	Medium
11	16750 Ravenna Trail	16750 Ravenna Trail Hastings, MN 55033-9674	Residential	The site was historically occupied by a gravel pit.	Medium

AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

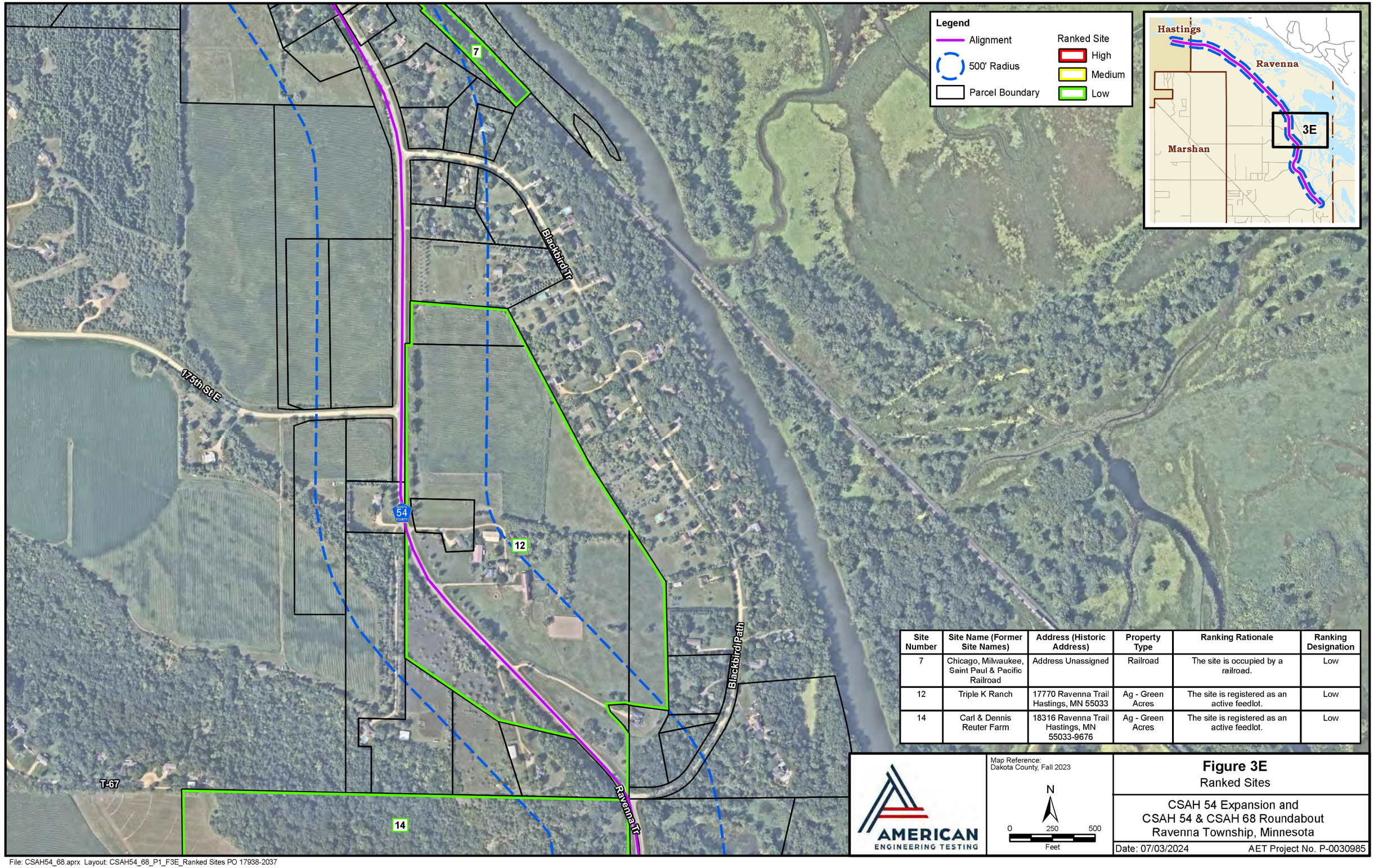
0 250 500
Feet

Figure 3D
Ranked Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F3D_Ranked Sites PO 17938-2037



Site Number	Site Name (Former Site Names)	Address (Historic Address)	Property Type	Ranking Rationale	Ranking Designation
7	Chicago, Milwaukee, Saint Paul & Pacific Railroad	Address Unassigned	Railroad	The site is occupied by a railroad.	Low
12	Triple K Ranch	17770 Ravenna Trail Hastings, MN 55033	Ag - Green Acres	The site is registered as an active feedlot.	Low
14	Carl & Dennis Reuter Farm	18316 Ravenna Trail Hastings, MN 55033-9676	Ag - Green Acres	The site is registered as an active feedlot.	Low

AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

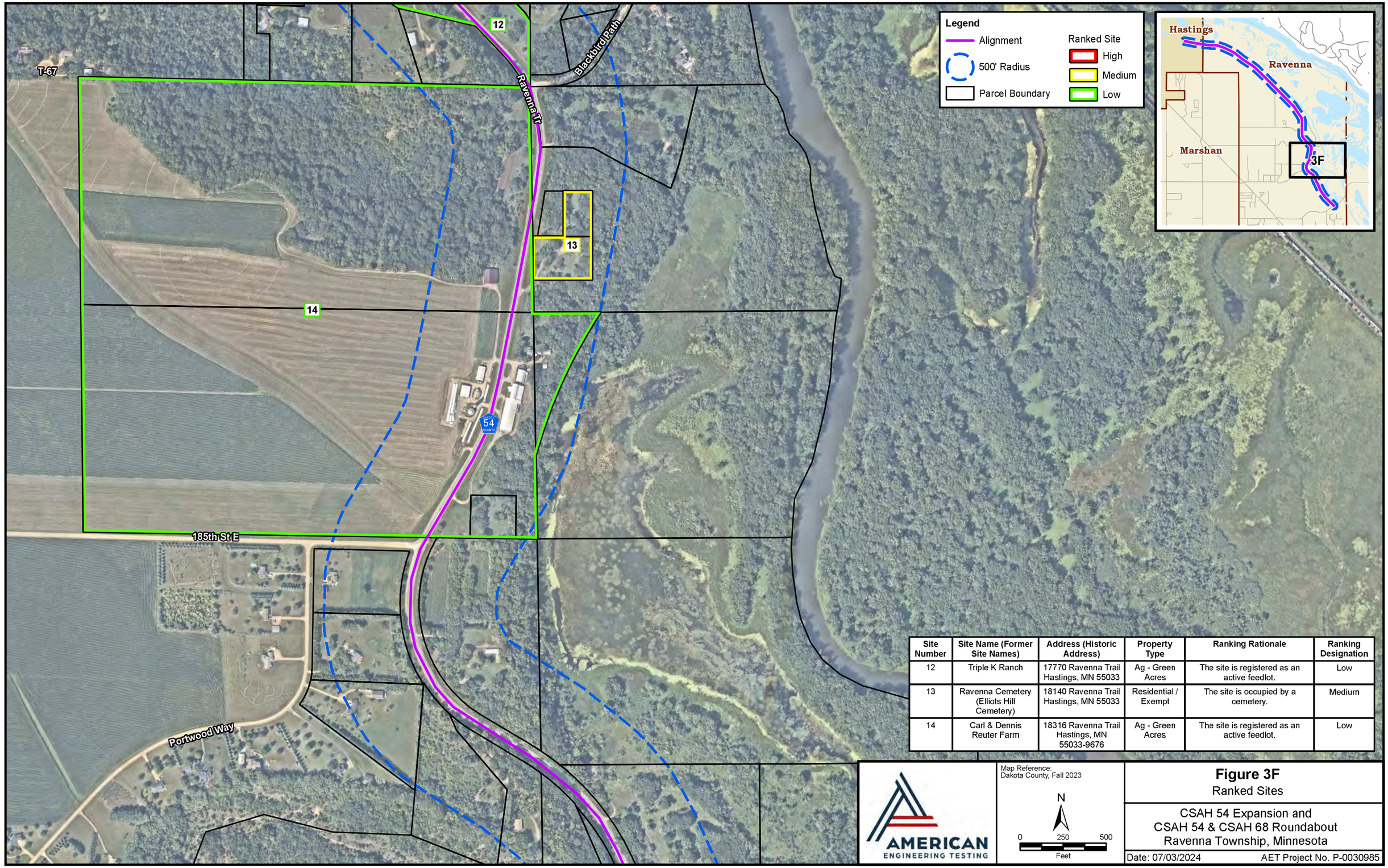
0 250 500
Feet

Figure 3E
Ranked Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F3E_Ranked Sites PO 17938-2037



Site Number	Site Name (Former Site Names)	Address (Historic Address)	Property Type	Ranking Rationale	Ranking Designation
12	Triple K Ranch	17770 Ravenna Trail Hastings, MN 55033	Ag - Green Acres	The site is registered as an active feedlot.	Low
13	Ravenna Cemetery (Elliots Hill Cemetery)	18140 Ravenna Trail Hastings, MN 55033	Residential / Exempt	The site is occupied by a cemetery.	Medium
14	Carl & Dennis Reuter Farm	18316 Ravenna Trail Hastings, MN 55033-9676	Ag - Green Acres	The site is registered as an active feedlot.	Low

AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

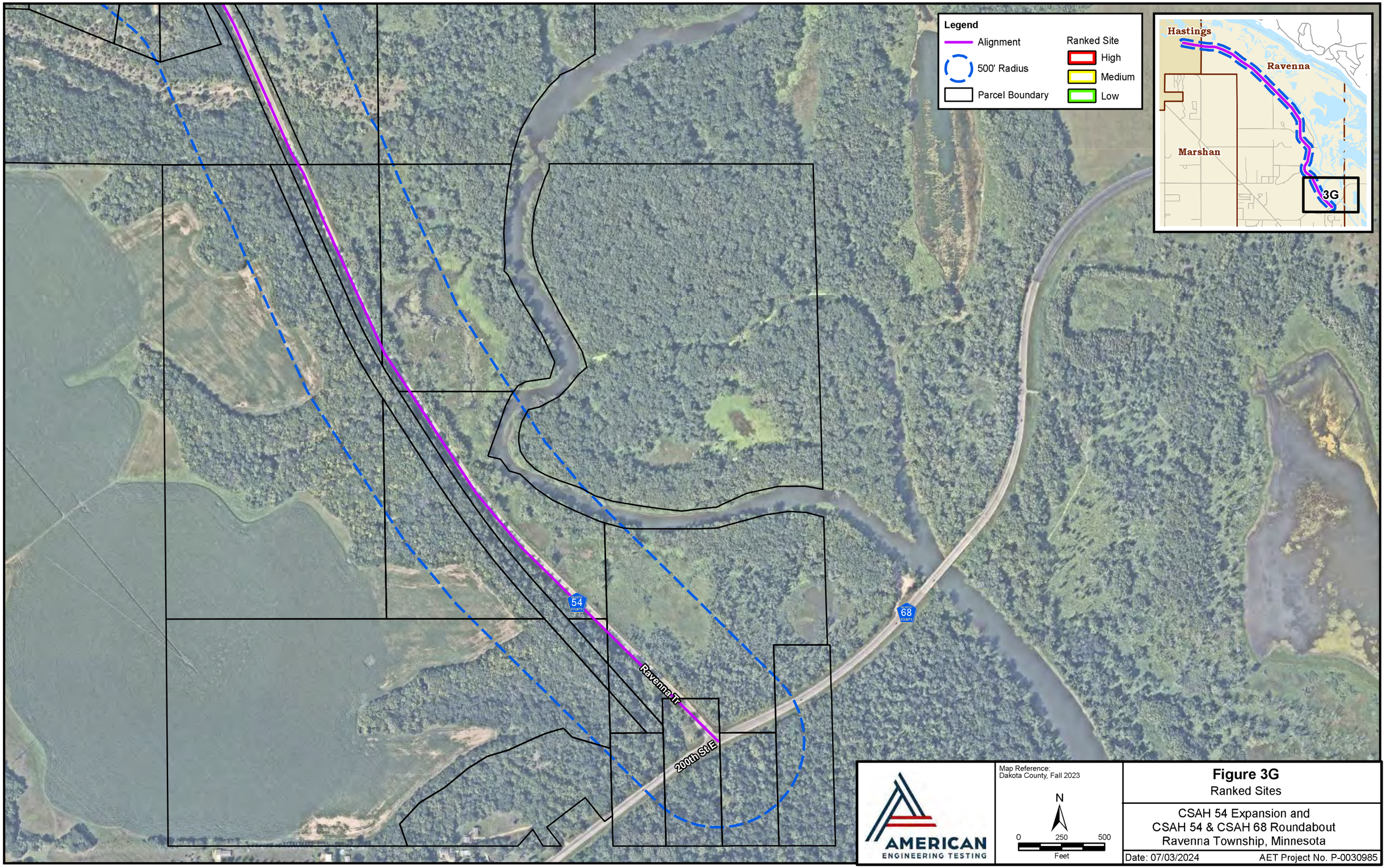
0 250 500
Feet

Figure 3F
Ranked Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F3F_Ranked Sites PO 17938-2037



Map Reference:
Dakota County, Fall 2023

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0 250 500

Feet

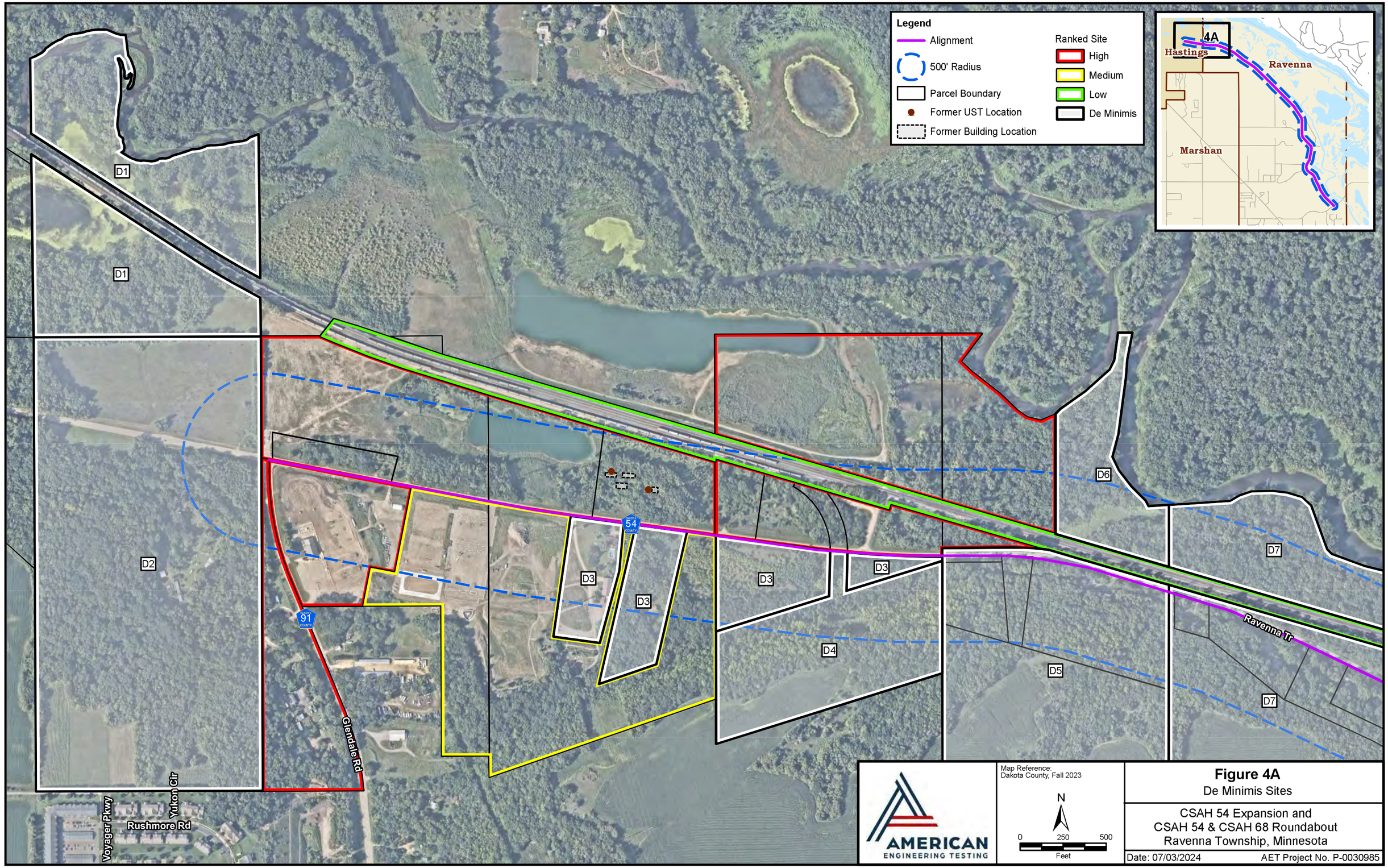
AMERICAN ENGINEERING TESTING

Figure 3G
Ranked Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F3G_Ranked Sites PO 17938-2037



AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

0 250 500
Feet

Figure 4A
De Minimis Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

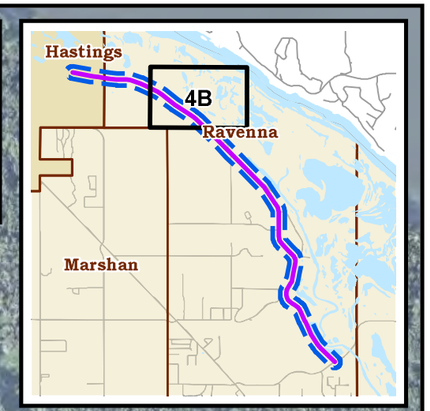
Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F4_DeMinimis PO 17938-2037

Legend

- Alignment
- 500' Radius
- Hazardous Materials Pipeline
- Parcel Boundary

Ranked Site
- High
- Medium
- Low
- De Minimis



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D13
Ravenna Tr
D15

AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

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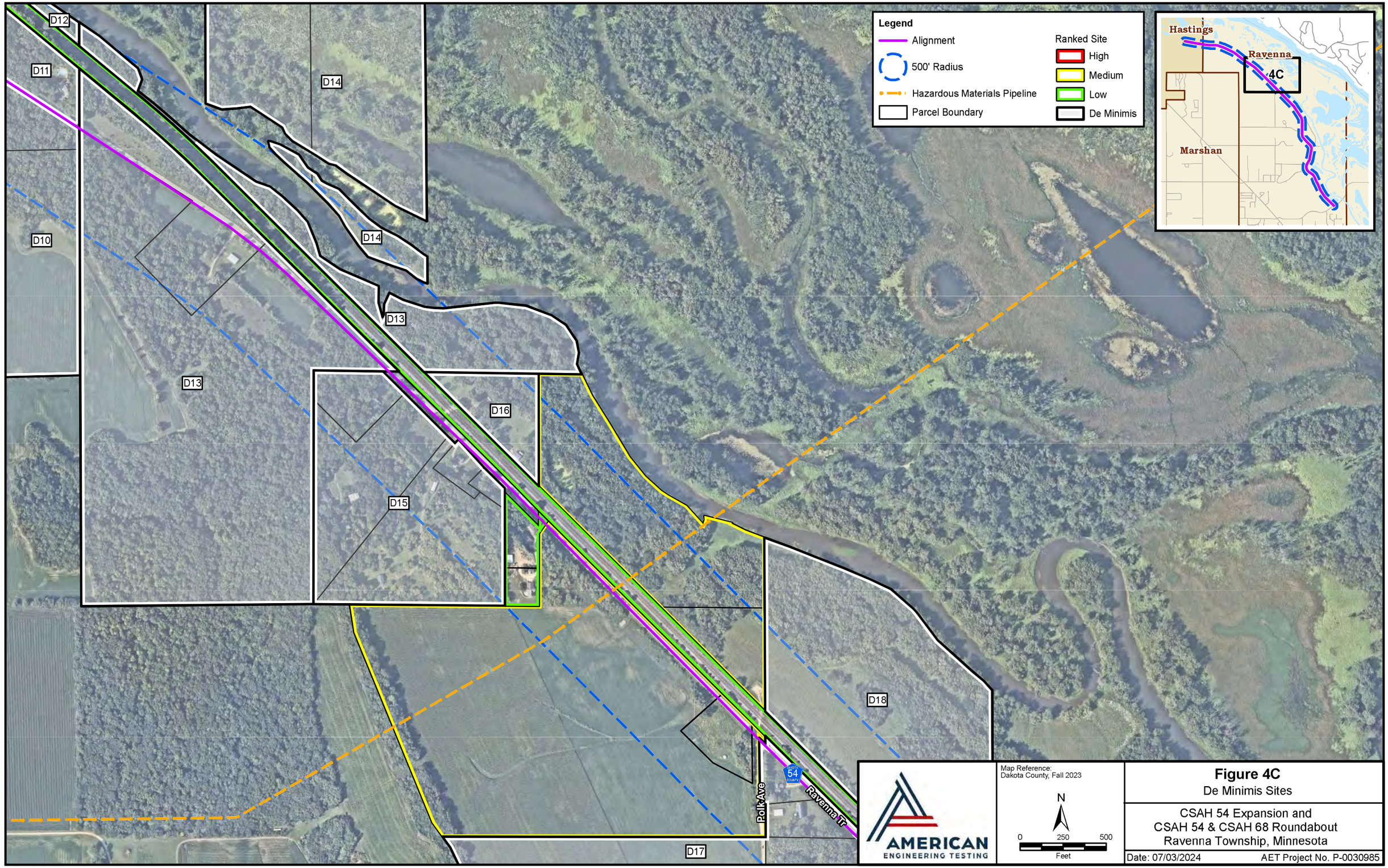
0 250 500
Feet

Figure 4B
De Minimis Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F4_DeMinimis PO 17938-2037



AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

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Figure 4C
De Minimis Sites

CSAH 54 Expansion and
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Ravenna Township, Minnesota

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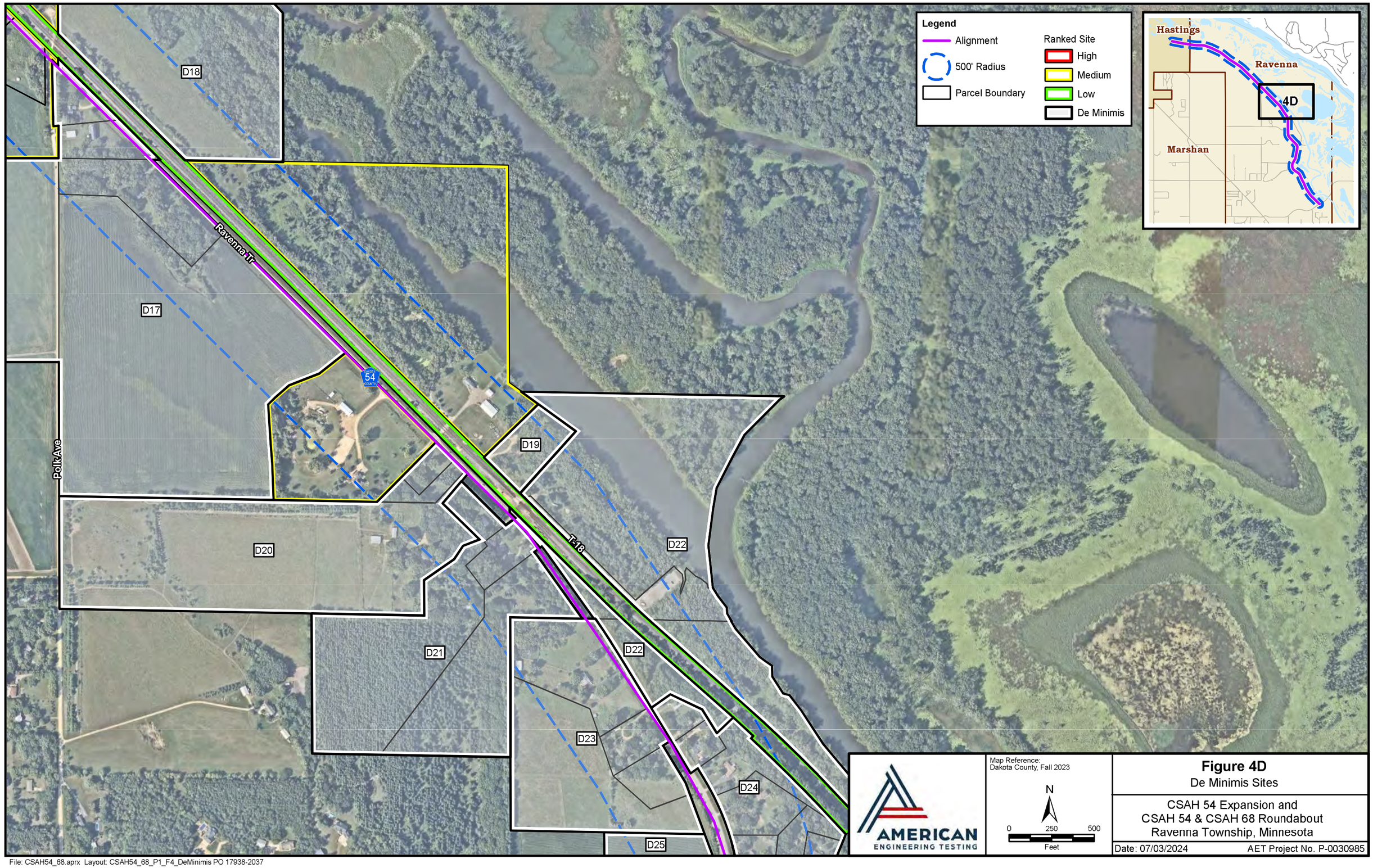
File: CSAH54_68.aprx Layout: CSAH54_68_P1_F4_DeMinimis PO 17938-2037



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Feet

Figure 4D
De Minimis Sites

CSAH 54 Expansion and
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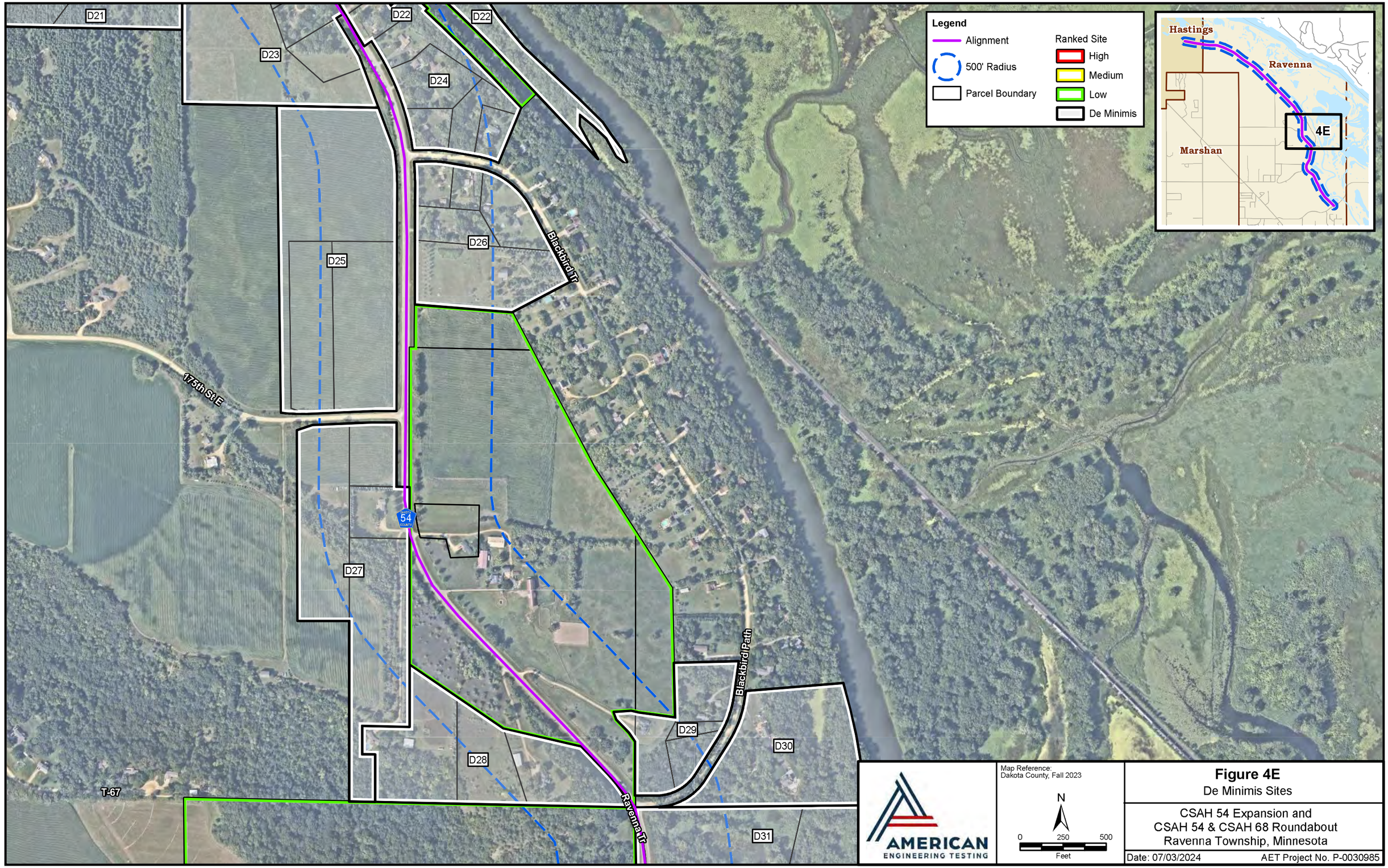
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F4_DeMinimis PO 17938-2037



AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

0 250 500
Feet

Figure 4E
De Minimis Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

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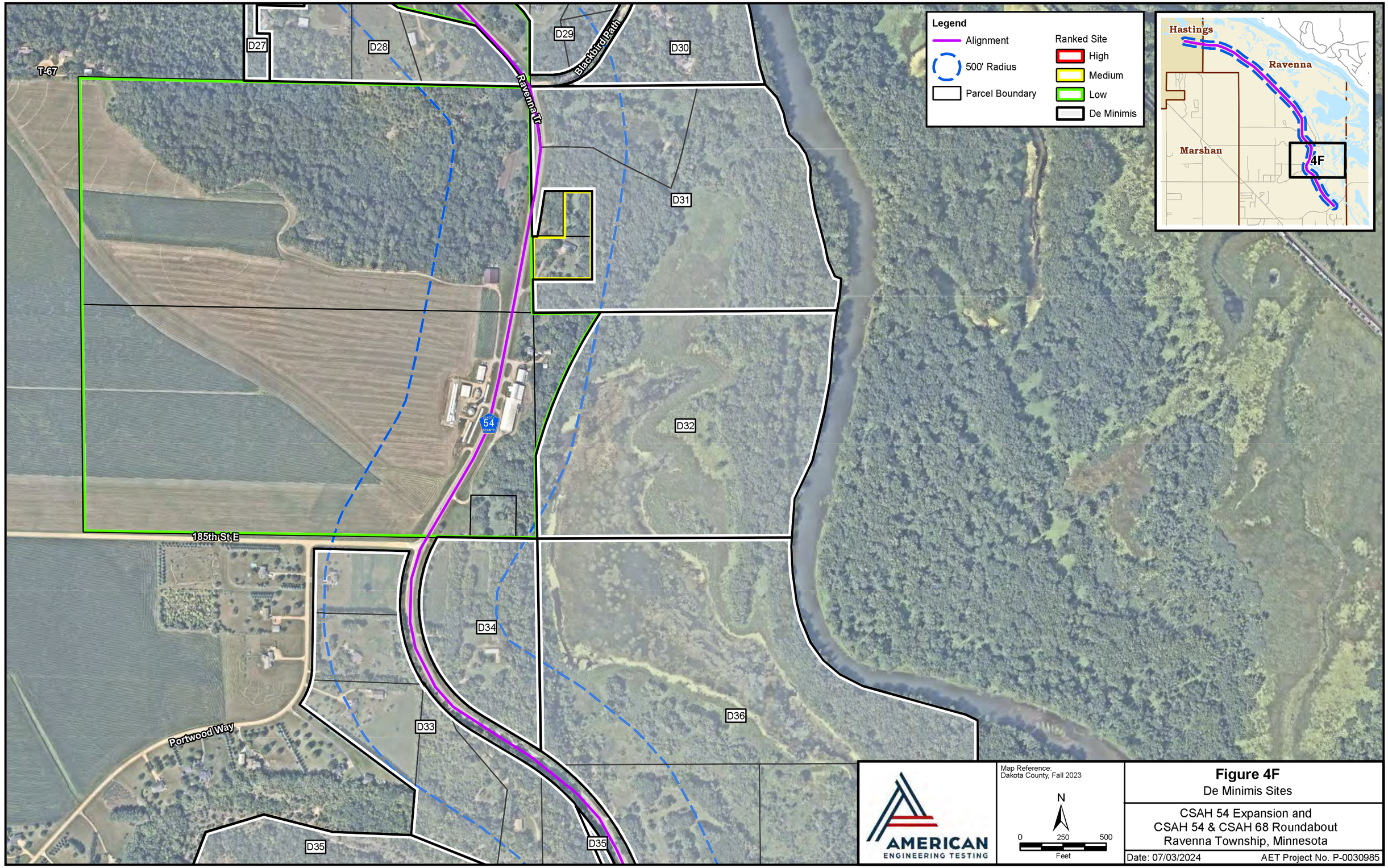


AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

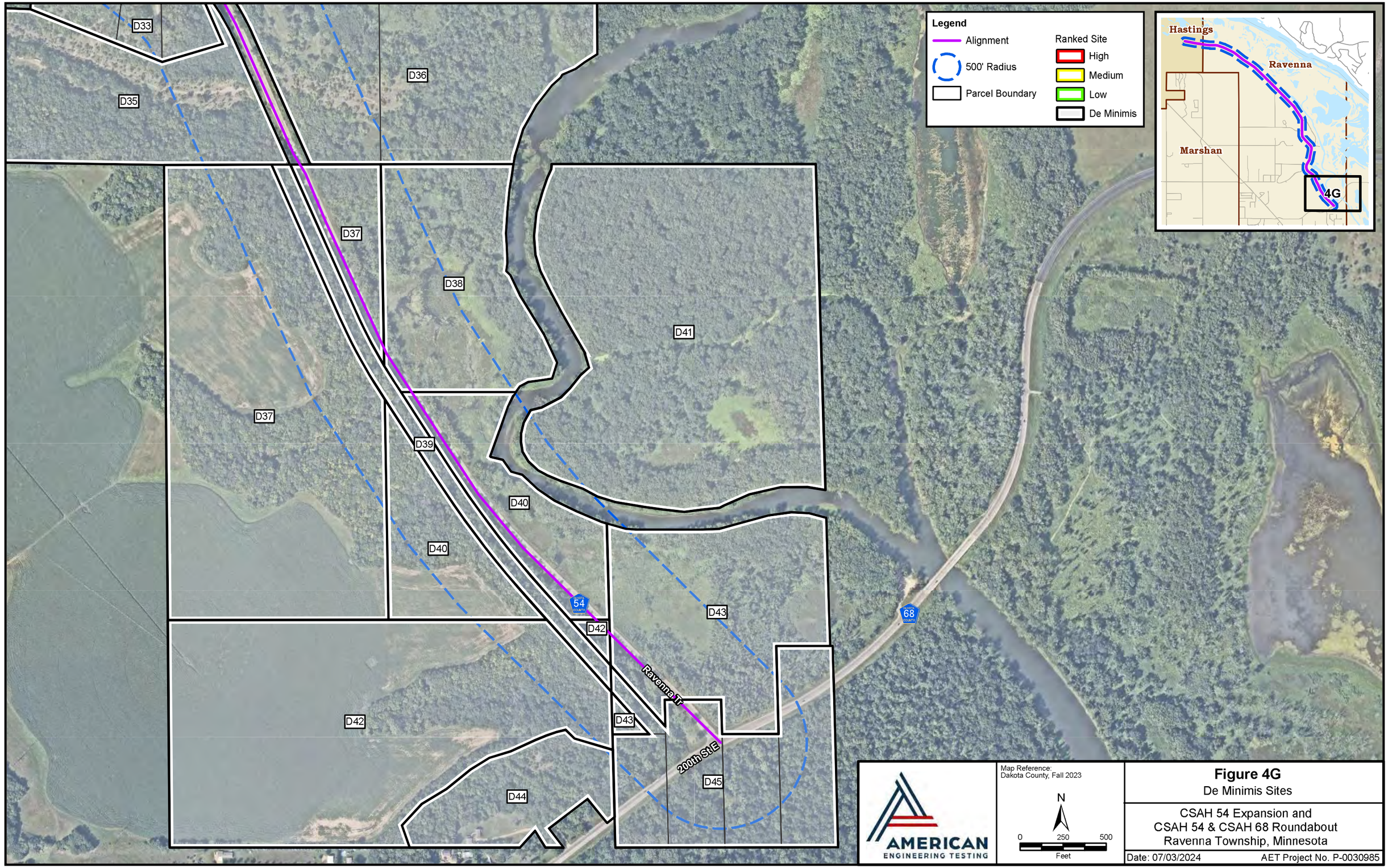
0 250 500
Feet

Figure 4F
De Minimis Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F4_DeMinimis PO 17938-2037



AMERICAN ENGINEERING TESTING

Map Reference:
Dakota County, Fall 2023

N

0 250 500
Feet

Figure 4G
De Minimis Sites

CSAH 54 Expansion and
CSAH 54 & CSAH 68 Roundabout
Ravenna Township, Minnesota

Date: 07/03/2024 AET Project No. P-0030985

File: CSAH54_68.aprx Layout: CSAH54_68_P1_F4_DeMinimis PO 17938-2037

Phase I Archaeological Survey Report

CSAH 54 Expansion and Improvements

Prepared for Kimley-Horn

City of Hastings, Prairie Island Indian Community, and Ravenna Township, Dakota County, Minnesota

MnDOT Contract No.
County Project No. 54-011
OSA License No. 25-231
SHPO No. 2025-0113

October 3, 2025

Prepared by:
Laura Koski, Co-Principal Investigator
(OSA License #25-231);
and John Seidl, Co-Principal Investigator
HDR Engineering, Inc.
1601 Utica Avenue S., Suite 600
St. Louis Park, MN 55416

Management Summary

Dakota County, in partnership with the City of Hastings, Prairie Island Community and Ravenna Township, propose improvements to County State Aid Highway (CSAH) 54 (Ravenna Trail) from Hastings city limits to CSAH 68 (200th Street E) and the construction of a roundabout at the intersection of CSAH 54 and CSAH 68 in Ravenna Township (Project). The Project is taking place in Sections 5, 6, 8, 9, 16, and 17 of Township 114N, Range 16W and Section 31 of Township 115N, Range 16W and Sections 35 and 36 of Township 115N, Range 17W. Kimley-Horn retained HDR to conduct a Phase I Archaeological Survey.

The Project is considered a state undertaking as it anticipates Minnesota Department of Transportation (MnDOT) funding and oversight. The Project will need to comply with state laws governing cultural resources, primarily including the Minnesota Historic Sites Act (Minnesota Statutes, section 138.661-138.669), Minnesota Field Archaeology Act (Minnesota Statutes, section 138.31-138.42), Minnesota Private Cemeteries Act (Minnesota Statutes, section 307.08), and the Minnesota Tribal Nations Consultation Policy (Minnesota Statutes, section 10.65). A federal nexus is not currently anticipated for this project. However, if a federal nexus is identified in the future, compliance with Section 306108 (previously Section 106 and hereinafter referred to as Section 106) of the National Historic Preservation Act of 1966, as amended (54 United States Code § 306108) and its implementing regulations, 36 Code of Federal Regulations (CFR) Part 800 et. seq. may be necessary. Section 106 addresses the effects of federal undertakings on historic properties (properties listed in or eligible for listing in the NRHP). Cultural resources studies may be needed to identify if unknown historic properties may be impacted, as well as to assess effects to those properties and resolve adverse effects, if identified. This report and its recommendations have been prepared under the assumption a federal nexus will be identified, and Section 106 review will be required.

Laura Koski and John Seidl acted as HDR's Co-Principal Investigators for this survey under Koski's OSA license #25-231. HDR conducted the Phase I Archaeological Survey between the dates July 21 to July 25, July 28 to August 1, and August 6, 2025. The Project Area coincides within the Southwest Riverine SHPO Subregions 3E and 3W. The Project Area measures approximately 85-acres. HDR utilized a combination of systematic shovel testing at 15-meters and pedestrian survey for areas where ground surface visibility was greater than 25%. No archaeological sites were identified. Considering no cultural resources were identified within the Project extents, HDR recommends no further survey for this project. HDR does recommend monitoring within 500 feet of burial site 21DK0089/DK-RAV-00006.

Table of Contents

Table of Figures

Table of Tables

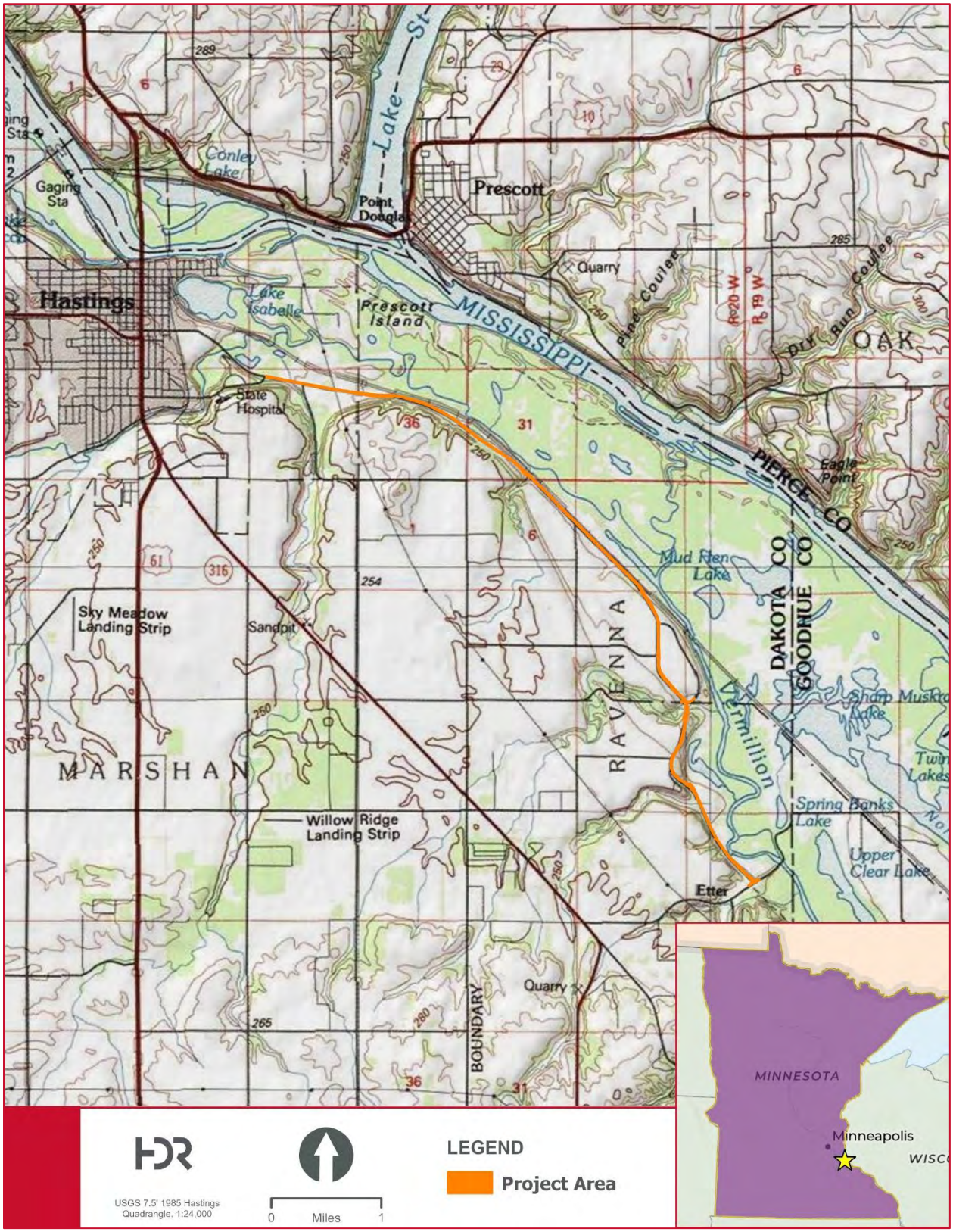
Introduction

Dakota County and the Minnesota Department of Transportation (MnDOT) are proposing capital improvements to County-State Aid Highway (CSAH) 54 in Dakota County, Minnesota (Project). The Project Area comprises the maximum extent of anticipated construction limits, equaling approximately 85-acres, and is located in Sections 5, 6, 8, 9, 16, and 17 of Township 114N, Range 16W and Section 31 of Township 115N, Range 16W and Sections 35 and 36 of Township 115N, Range 17W (Centroid UTM 15T 517551N 4951335E) (**Figure 1**). CSAH 54 is a high-speed, two-lane rural highway connecting the City of Hastings and the Prairie Island Indian Community. The road has a documented crash history, lacking turn lanes and standard shoulders, with limited multimodal opportunities. Reconstruction of CSAH 54 will enhance traffic safety, improve access to the Prairie Island Indian Community, and allow for the extension of the Mississippi River Trail as part of the County's Greenway Trail system.

Kimley-Horn is completing design services for the Project. The final design will include turn lanes, shoulder widening, culvert and bridge replacement, and construction of a roundabout at the CSAH 68 intersection. This replacement will improve CSAH 54 roadway operations, safety, replace aging infrastructure, and implement the necessary drainage. Kimley-Horn is also exploring the viability and constructability of a multi-use trail along the CSAH 54 corridor from Hastings to CSAH 68. The construction of the roundabout at the intersection of CSAH 54 (Ravenna Trail) and CSAH 68 (200th Street E) in Ravenna Township will improve the intersection operations and provide safer travel for increasing traffic levels.

The Project is considered a state undertaking as it anticipates MnDOT funding and oversight. The Project will need to comply with state laws governing cultural resources, primarily including the Minnesota Historic Sites Act (Minnesota Statutes, section 138.661-138.669), Minnesota Field Archaeology Act (Minnesota Statutes, section 138.31-138.42), Minnesota Private Cemeteries Act (Minnesota Statutes, section 307.08), and the Minnesota Tribal Nations Consultation Policy (Minnesota Statutes, section 10.65). A federal nexus is not currently anticipated for this project. However, if a federal nexus is identified in the future, compliance with Section 306108 (previously Section 106 and hereinafter referred to as Section 106) of the National Historic Preservation Act of 1966, as amended (54 United States Code § 306108) and its implementing regulations, 36 Code of Federal Regulations (CFR) Part 800 et. seq. may be necessary. Section 106 addresses the effects of federal undertakings on historic properties (properties listed in or eligible for listing in the NRHP). Cultural resources studies may be needed to identify if unknown historic properties may be impacted, as well as to assess effects to those properties and resolve adverse effects, if identified. This investigation and its recommendations have been prepared under the assumption a federal nexus will be identified, and Section 106 review will be required.

Figure 1. Project Location on USGS Topographic Map



Methodology

Objectives

A Phase IA Literature Review and Archaeological Assessment for the Project (Koski and Seidl 2024) assessed the Project Area as containing high potential for Precontact archaeological sites based on a high frequency of nearby identified archaeological sites and the proximity to the nearby Vermillion River. HDR conducted a subsequent Phase I Archaeological Survey with two objectives.

1) Testing the survey areas recommended in the Phase IA Literature Review and Archaeological Assessment prepared by HDR (Koski and Seidl 2024).
2) Identifying whether cultural resources are located within the Project Area.

Methods

The Phase I Archaeological Survey was conducted in accordance with the Minnesota SHPO Manual for Archaeological Projects in Minnesota (Anfinson 2005), the State Archaeologist's Manual for Archaeological Projects in Minnesota (OSA 2011), the MnDOT Cultural Resources Unit (CRU) Project and Report Requirements (MnDOT 2017), and the Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation [48 Federal Register 44716-44740] (National Park Service [NPS] 1983).

Research

In September 2024, HDR archaeologists completed a Phase IA Literature Review and Archaeological Assessment (Koski and Seidl 2024). The background research utilized the Minnesota Statewide Historic Inventory Portal (MnSHIP) records maintained by the State Historic Preservation Office (SHPO) and the Minnesota Office of the State Archaeologist (OSA) online portal to identify known Precontact and Post-Contact archaeological sites within one mile of the Project Area, and architectural properties within one-quarter mile of the Project Area. The National Park Service's online National Register of Historic Places (NRHP) information was reviewed to confirm if NRHP Listed Historic Properties or National Historic Landmarks are present within the Project Area. The results of the Phase IA Literature Review and Archaeological Assessment are summarized in the Error! Reference source not found. section. HDR also completed an updated literature review in June of 2025 to identify whether additional archaeological sites or architectural properties had since been reported to OSA or SHPO in the time between the publication of the Phase IA Literature Review and Archaeological Assessment (Koski and Seidl 2024) and the results of the fieldwork as described in this report.

Field Survey

Utilizing the research results, the Phase I Archaeological Survey focused on Survey Areas assessed with moderate to high potential for Precontact archaeological sites as identified in Koski and Seidl (2024). Kimley-Horn and Dakota County provided geospatial data relating to buried natural gas lines, electrical lines, and fiber optic lines which further helped to refine the Survey Areas. A ten-foot (3-meter) buffer was applied to mapped utility lines to account for potential

projection conflicts as well as the width of potential trenching disturbance. In total, 26 of the Survey Areas recommended in Koski and Seidl (2024) were identified as safely surveyable.

The Phase I Archaeological Survey utilized systematic shovel testing at 15-meter (50-feet) intervals. Given the linear nature of the Survey Areas, positive tests were delineated at intervals of 7.5-meters (25 feet) between positive tests, and 5-meters (16 feet) between a positive and a negative test. Shovel tests were typically excavated to a depth of 1-meter (3 feet) unless obstructions such as bedrock, impassable roots, dense gravels, or compact soils were encountered.

Site Recording and Evaluation

HDR recorded field results with paper shovel test forms and Field Maps (ESRI Suite). If sites were identified during the Phase I Archaeological Survey, archaeological site forms would be prepared and reported to the Office of the State Archaeologist (OSA). However, no sites were identified.

Artifact Curation

If diagnostic artifacts or dense artifact scatters related to an archaeological site were collected during the field survey, curation would take place at the Minnesota Historical Society under HDR's 2025 repository agreement number 1108. .

Tribal Engagement

The Project anticipates oversight and funding by MNDOT, a state agency. Pursuant to the Minnesota Tribal Nations Consultation Policy (MS 10.65), executive-branch state agencies must consult with Minnesota Tribal governments regarding projects in a timely and meaningful manner. HDR completed Tribal outreach for the Project. Outreach began in October of 2024 with submission of the Phase IA Cultural Resources Literature Review and Assessment via email, and included follow-up communications via phone and email regarding feedback to the assessment and planning for and Tribal involvement in the 2025 Phase I Archaeological Survey.

Results

Literature Search Results

Environmental-Cultural History

The Project is located on the northern boundary of Archaeological Region 3e: Southeast Riverine (Anfinson 1990). This region spans southeast Minnesota including Dodge, Fillmore, Goodhue, Houston, Mower, Olmsted, Wabasha, and Winona counties and extends into the adjacent corners of Wisconsin and Iowa. The region is characterized by stream-dissected terrain. No natural lakes are located within the region's interior, though large lakes have developed within the Mississippi River floodplain. This region contains extensive bedrock outcrops containing occasional deposits of high-quality flaking materials. Chert concentrations are found along the Mississippi River Valley and just below the surface along river terraces.

Southeastern Minnesota was mostly glacier free during the last several glacial periods, however its landscape is defined by the massive flows of glacial meltwater from Lake Agassiz and Lake Duluth enlarging the valley and defining the extensive riverine terraces.

During the last full glacial period, the landscape was blanketed with spruce parkland. Approximately 7,000 years ago, prairie vegetation had taken over the region and it was defined by open grassland for the next 2,000 years. Deciduous forests returned approximately 5,000 years ago, and by the early Post-Contact period, floodplains contained forests of elm, ash, and cottonwood along the river lowlands. Uplands were covered in maple, elm, and basswood.

Late Precontact subsistence resources in this region likely included deer, elk, and scattered bison along the uplands. The river lowlands would have provided mussels, fish, and waterfowl along with edible plants such as waterlilies and other aquatic flora. Prairie turnip and acorns could have been foraged from the upland prairies and oak forests.

Site Conditions

The Project Area, approximately 7.5 miles (12 kilometers) in length, crosses floodplain and upper riverine terraces. The Project Area is bordered by agricultural land, private residences, and forested and riverine land. **Figure 2** illustrates current land use conditions within and surrounding the Project Area. Additionally, the area is prone to flooding due to its location primarily at the bottom of riverine terraces within the Mississippi and Vermillion River floodplain.

Precontact Vegetation

A review of Precontact vegetation information collected by Marschner (1895) found that the Project Area extended through oak openings and barrens and prairie (**Figure 3**). The Project Area was also in proximity to river bottom forest. Marschner defines oak openings as “fire dependent savannas dominated by oaks” and prairies as “diverse, fire-dependent native grassland communities” (Cohen et al. 2020). River bottom forests can also be described as floodplain forests and are forest communities of trees with extensive shallow root systems that hold soil tightly (MNDNR 2024a). These three ecotypes would likely be abundant in resources and be attractive spots for Precontact settlement.

Figure 2. Land Use and Vegetation

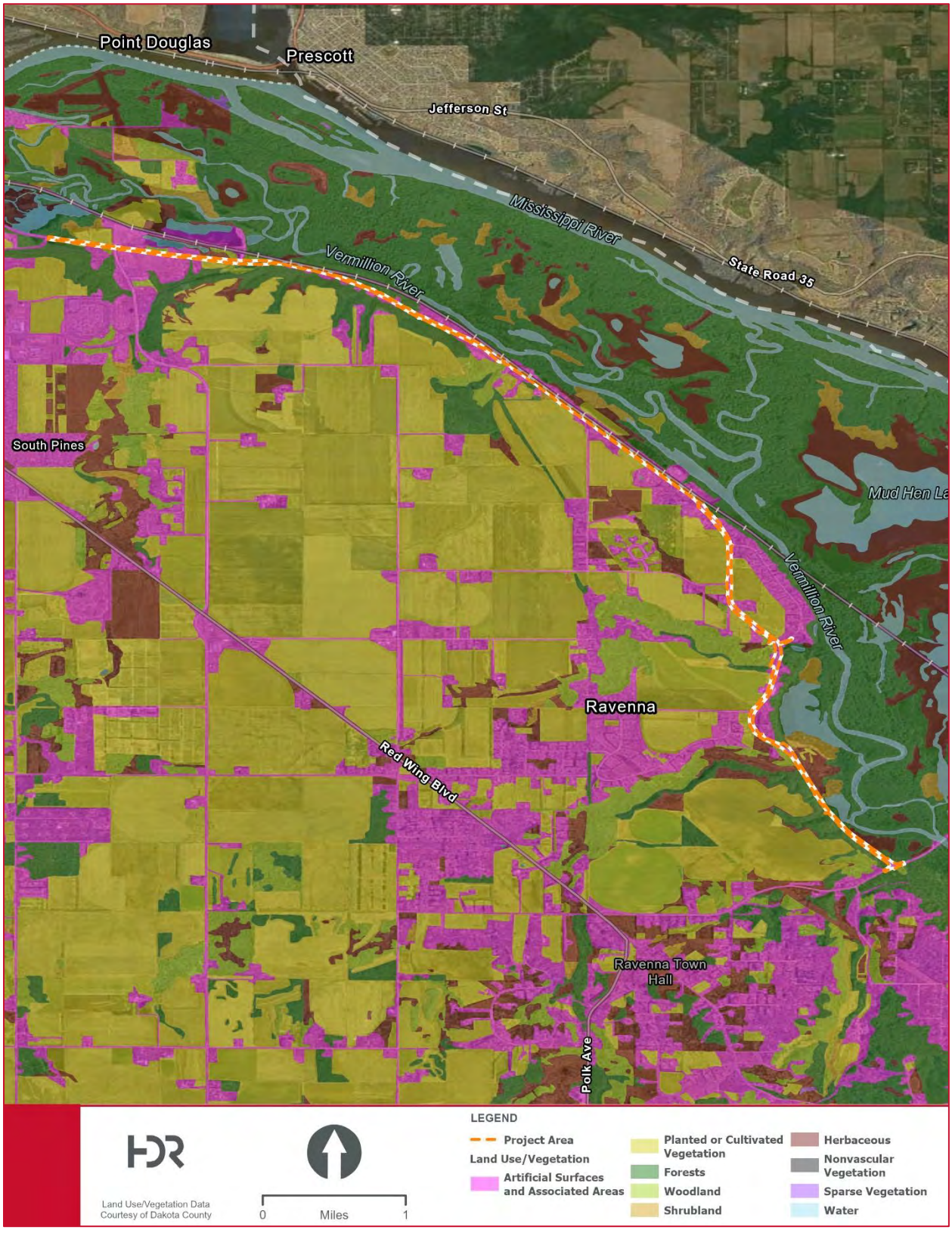
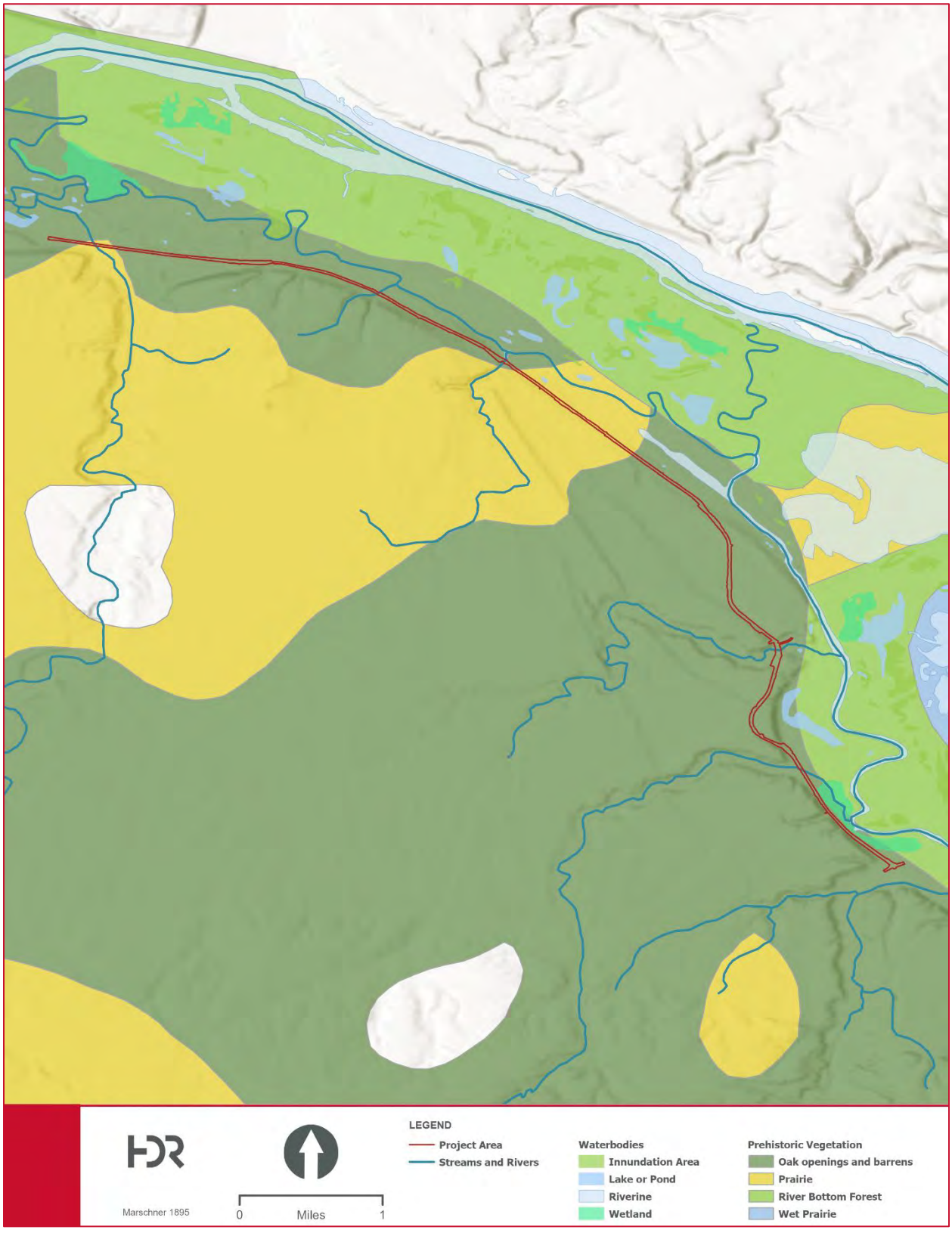


Figure 3. Precontact Vegetation and Contemporary Hydrography



Soils

HDR reviewed recorded soil series within the Project Area using the United States Department of Agriculture (USDA) Soils Web application to determine the presence of deep soils within the Project Area (NRCS 2024). The seven-mile corridor includes 40 soil series (**Table 1**). Soils are generally loamy and sandy, typical for a floodplain. The likelihood of encountering wet or inundated soils within the floodplain portion of the Project Area is high, and shallow bedrock is likely to be encountered along the Project Area's terraces.

Table 1. Soil Series within the Project Area

Soil Series	Approximate Acreage of Project Area	Percent of Project Area
Sparta loamy fine sand, 1 to 6 percent slopes	84.5	10.30%
Hawick loamy sand, 20 to 40 percent slopes	70.4	8.60%
Wadena loam, 0 to 2 percent slopes	60.9	7.40%
Minneiska loam, occasionally flooded	58.7	7.20%
Hubbard loamy sand, 1 to 6 percent slopes	49.5	6.00%
Rockton loam, 2 to 6 percent slopes	47.2	5.80%
Aquolls and Histosols, ponded	45.1	5.50%
Kanaranzi loam, 2 to 6 percent slopes	38.7	4.70%
Marlean loam, 12 to 18 percent slopes	33.4	4.10%
Copaston loam, 2 to 6 percent slopes	29.5	3.60%
Pits, sand and gravel	28.4	3.50%
Plainfield loamy sand, 0 to 2 percent slopes	25.4	3.10%
Scotah loamy fine sand, 0 to 3 percent slopes, occasionally flooded	24.4	3.00%
Gotham loamy fine sand, 6 to 12 percent slopes	24	2.90%
Water	20.7	2.50%
Gotham loamy fine sand, 2 to 6 percent slopes	17.2	2.10%
Sparta loamy fine sand, 0 to 1 percent slopes	15.4	1.90%
Rockton loam, 0 to 2 percent slopes	13.9	1.70%
Lawson silt loam	11.4	1.40%
Mayer loam, swales	11.1	1.30%
Colo silt loam, occasionally flooded	10	1.20%
Waukegan silt loam, bedrock substratum, 2 to 6 percent slopes	9.9	1.20%
Port Byron silt loam, 0 to 2 percent slopes	9.8	1.20%
Sparta loamy sand, bedrock substratum, 2 to 8 percent slopes	9	1.10%
Kanaranzi loam, 6 to 12 percent slopes	8.1	1.00%
Anthroportic Udorthents-Pits-Dumps complex, abandoned, 2 to 45 percent slopes	7.9	1.00%
Port Byron silt loam, 2 to 6 percent slopes	7.8	1.00%

Soil Series	Approximate Acreage of Project Area	Percent of Project Area
Lindstrom silt loam, till plain, 2 to 6 percent slopes	7.7	0.90%
Plainfield loamy sand, 6 to 18 percent slopes	6.6	0.80%
Hubbard loamy sand, 12 to 18 percent slopes	6	0.70%
Waukegan silt loam, bedrock substratum, 0 to 2 percent slopes	5.6	0.70%
Kanaranzi loam, 0 to 2 percent slopes	4.7	0.60%
Rockton loam, 6 to 12 percent slopes	4.3	0.50%
Zumbro loamy fine sand	3.3	0.40%
Marlean loam, 18 to 25 percent slopes	2.2	0.30%
Udorthents, wet	1.8	0.20%
Kennebec silt loam	1.6	0.20%
Anthroportic Udorthents, 2 to 9 percent slopes	1.4	0.20%
Brodale-Rock outcrop complex, 18 to 45 percent slopes	1.2	0.10%
Frontenac silt loam, 25 to 40 percent slopes	0.3	0.00%
Waukegan silt loam, bedrock substratum, 6 to 12 percent slopes	0.3	0.00%

Reported Cultural Resources

In September and October of 2024, a Phase IA Literature Review was completed for the proposed Project, and a literature review update was completed in June of 2025 in advance of the Phase I Archaeological Survey. No additional resources had been reported between the fall of 2024 and summer of 2025. Eleven archaeological sites, including one OSA-recorded Historical Cemetery, were identified within the Archaeological Study Area. Four SHPO-inventoried architectural properties were identified within the Architectural Study Area. No National Historic Landmarks, and no locally designated historic properties were identified within the Architectural Study Area.

Archaeological Sites

Eleven previously recorded archaeological sites are located within the one-mile Archaeological Study Area (**Table 2**, **Figure 4**). Identified sites are comprised of nine Precontact sites, one multi-component site containing both Precontact and Post-Contact deposits, and one Post-Contact site. Of the Precontact sites there are three burial mounds, three lithic scatters, two artifact scatters, and two isolated findspots. Post-Contact site 21DK0061, the Ramsey Mill, is Listed in the NRHP under Criterion A. All other sites are Unevaluated for the NRHP. No archaeological sites overlap the Project Area. However, 21DK0089 is less than 50 feet and 21DK0128, the multi-component Precontact burial and Post-Contact cemetery, is approximately 145 feet from the Project Area. These two sites are discussed in greater detail below. 21DK0089 is also recorded with the OSA within the Historical Cemetery files as cemetery identification number 20242. This is the only OSA-recorded Historical Cemetery within immediate proximity of the Project Area.

Table 2. Archaeological Sites within the Archaeological Study Area

Site Number	Site Name	Site Description	Distance to Project Area	NRHP Status
21DK0089	Ravenna Mounds	Precontact Burial Mounds/Post-Contact Euro-American Cemetery	<50 Feet	Unevaluated
21DK0128	None	Precontact Artifact Scatter	145 Feet	Unevaluated
21DK0129	None	Precontact Lithic Scatter	0.16 Miles	Unevaluated
21DKal	Etter Ridge Mound	Precontact Alpha Site/Burial Mounds	0.22 Miles	Unevaluated
21DK0130	None	Precontact Isolated Findspot - Lithic	0.29 Miles	Unevaluated
21DK0027	Freitag Mound Site	Precontact Burial Mounds	0.43 Miles	Unevaluated
21DK0061/ 21DKz	Ramsey Mill/Old Mill (DK-HTC-101)	Post-Contact Mill Ruin	0.60 Miles	Listed
21DK0072	Freitag Ridge	Precontact Artifact Scatter	0.64 Miles	Unevaluated
21GD0156	Upper Clear Lake	Precontact Lithic Scatter	0.76 Miles	Unevaluated
21DK0046	None	Precontact Isolated Findspot - Lithic	0.76 Miles	Unevaluated
21GD0210	Spring Banks Lakes	Precontact Lithic Scatter	0.86 Miles	Unevaluated

21DK0089 – RAVENNA MOUNDS

In 1957, Lloyd Wilford, an archaeologist from the University of Minnesota, assisted in the recovery and identification of human remains disturbed by looters. The skeleton was determined to be a young adult Euro-American male. In the same visit, mound features were noted at the site. In 2011-2012, Scott Anfinson visited the location and mapped three burial mounds: two conical and one linear leading south out of one of the conical mounds. According to the 21DK0089 site form, Euro-American burials occurred at this site as early as 1855. The Ravenna Mounds represent a multi-component burial site. This site will be discussed further in the geospatial and historical mapping analysis.

21DK0128 – NO NAME

21DK0128 is a Precontact artifact scatter consisting of an end scraper, lithic debitage, faunal remains, and cord-marked grit tempered pottery. The site is south of the Vermillion River and the confluence of the St. Croix River and the Mississippi River. Artifacts are curated at the Science Museum of Minnesota. This site appears to be relatively intact, save for disturbances from a nearby canoe launch and a railroad corridor to the north. 21DK0128 is Unevaluated for NRHP eligibility

Previous Archaeological Surveys

HDR reviewed files curated at the Minnesota State Historic Preservation Office (SHPO) and at the Minnesota Office of the State Archaeologist (OSA) to determine if previous archaeological surveys had been conducted overlapping or immediately adjacent to the Project Area. One survey

within immediate vicinity of the Project Area was identified: *An Archaeological Survey of Dakota County, Minnesota* conducted by the Science Museum in 2017 (Fleming et al. 2018). This survey is detailed below.

FLEMING ET AL. (2018)

An Archaeological Survey of Dakota County, Minnesota.

Methods: Pedestrian survey and shovel testing was completed at 15-meter intervals. Survey was conducted within the entirety of Dakota County in 2018 sponsored by the legacy fund. The publicly available version of this report, the only version currently available to HDR, does not map survey areas. HDR is unable to determine whether this survey may have crossed into the Project Area.

Results: Shovel testing identified lithic scatters within one mile of the Project Area (21DK0128 and 21DK0129).

Architectural Properties

Four SHPO-inventoried architectural properties are located within the Architectural Study Area (**Table 3, Figure 4**). These include one historical cemetery, one culvert, one bridge, and one railroad. The historical cemetery, Ravenna Cemetery (DK-RAV-00006) is the same cemetery as the OSA-recorded 21DK0089. Both the culvert (DK-RAV-00007) and the bridge (DK-RAV-0008) are noted in the Project plans as being proposed for improvements or possible replacement. In the plans, DK-RAV-00007 is noted as 'Existing Bridge 92731' and DK-RAV-00008 is noted as 'Existing Bridge 2951'. These properties are discussed below. Railroad XX-RRD-CSP0044 has been evaluated and determined to be Eligible for listing in the NRHP, however, it is not located within the Project Area and its eligibility for listing in the NRHP is unlikely to be adversely impacted by the Project.

Table 3. Architectural Properties within Architectural Study Area

SHPO Inventory No	Property Name	Property Type	National Register Status
DK-RAV-00006	Ravenna Cemetery	Historical Cemetery	Unevaluated
DK-RAV-00007	Culvert 97231	Culvert	Not Eligible
DK-RAV-00008	Bridge 2951	Bridge	Unevaluated
XX-RRD-CSP0044	St. Paul and Chicago Railway Company/Chicago, Milwaukee and St. Paul Railway Company/Chicago, Milwaukee, St. Paul and Pacific Railroad Company, River Division Railroad Corridor Historic District	Railroad	Eligible

CULVERT 92731

Culvert 92731 was constructed in 1971 in the Prestress or Precast Pipe method. Mead & Hunt evaluated this property in March of 2023. They noted that this structure type is included in the Program Comment for Common Post-1945 Concrete and Steel Bridges, which exempts Section 106 review of particular concrete and steel types not located on tribal lands or within a listed or eligible historic district. The structure would need to exemplify exceptional significance in order to be considered NRHP eligible. Mead & Hunt could not identify such significance and

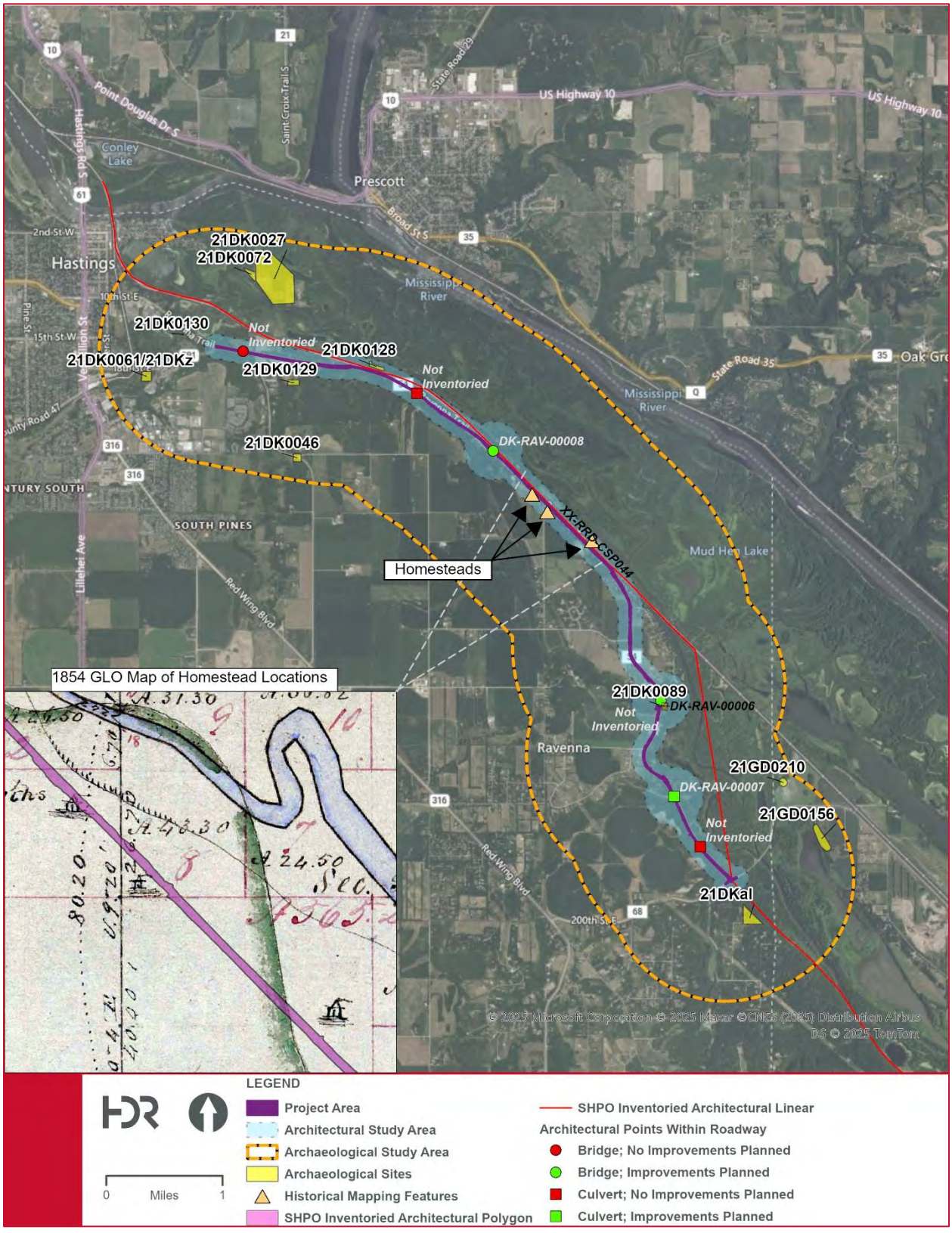
recommended it as Not Eligible for the National Register of Historic Places. SHPO concurred with this recommendation.

BRIDGE 2951

Bridge 2951 is a Concrete Slab Span style bridge constructed in 1918. This bridge was originally evaluated for NRHP eligibility as part of the 1995 Historic Highway Bridge Inventory by Hess, Roise, & Company, and was recommended Not Eligible. Mead & Hunt reevaluated this property in June of 2023 and recommended it Not Eligible under all NRHP Criteria.

Additionally, HDR reviewed the Project Area for architectural properties not already inventoried in MnSHIP that may be directly affected by the roadway improvements. Two non-inventoried bridges and two non-inventoried culverts were identified (**Figure 4**). One of these bridges is noted in the Project plans to potentially be replaced as part of the Project. In the plans, this is identified as 'Existing Bridge L3214'. If a federal nexus is identified, these architectural properties and others within the Architectural Study Area may need to be reviewed to determine whether they are of historic age (over 50 years old). Those architectural properties identified as of historic age may require survey, completion of SHPO inventory forms, evaluation for NRHP eligibility, and assessment for direct and/or indirect effects (if found to be NRHP eligible) for compliance with Section 106. No additional documentation is required for these not-inventoried properties to comply with state laws governing cultural resources.

Figure 4. Literature Review Results



Tribal Engagement

HDR staff initiated the cultural resources outreach for the Project in October of 2024 by submitting the Phase IA Cultural Resources Literature Review and Assessment to the 11 federally recognized Tribes of Minnesota for review and comment. Responses were received from the Bois Forte Band of Chippewa, Mille Lacs Band of Ojibwe, the Shakopee Mdewakanton Sioux Community, Upper Sioux Community, and White Earth Nation. The Bois Forte Band of Chippewa, Mille Lacs Band of Ojibwe, and White Earth Nation THPOs stated they would defer to the four Dakota Nations since the project is in historical Dakota territory.

Of the responding Dakota Nations, the Shakopee Mdewakanton Sioux Community and Upper Sioux Community both expressed interest in the Project. Neither had comments on the Phase IA Cultural Resources Literature Review and Assessment. Both the Shakopee Mdewakanton Sioux Community and Upper Sioux Community wished to defer to the Prairie Island Indian Community due to their proximity to the Project, though the Shakopee Mdewakanton Sioux did recommend construction monitoring within 500 feet of burial site 21DK0089/DK-RAV-00006. Neither HDR, Dakota County, nor Kimley-Horn received a response from the Prairie Island Indian Community regarding the cultural resources outreach for the Project despite multiple contact attempts between October of 2024 and June of 2025. The Shakopee Mdewakanton Sioux Community stated they would send one Tribal Cultural Specialist (TCS) to accompany the Phase I Archaeological Survey, however, the TCS did not arrive to the Project site, nor did they respond to phone calls. The Shakopee Mdewakanton Sioux Community THPO, Leonard Wabasha, was contacted when the TCS did not arrive. Wabasha did not have another TCS to send, and he informed the HDR crew they could initiate survey without a TCS present and to give him a call if Precontact cultural materials were encountered during survey.

This survey report will be submitted to the Prairie Island Indian Community, Shakopee Mdewakanton Community, and Upper Sioux Community for their records and review upon finalization.

Fieldwork Summary

HDR archaeologists Laura Koski and John Seidl acted as Co-Principal Investigators (Co-PIs) for this Phase I Archaeological Survey. The crew included the Co-PIs and HDR staff Garrett Smith, Kirsten Granstrom-Arndt, Elizabeth Arnold, and Natalie Haberman. At least one Co-PI was present for each day of fieldwork. Fieldwork was conducted on weekdays between July 21 and August 1, 2025, with additional work on August 6, 2025.

Field Conditions

The Phase I Archaeological I Survey occurred on both shoulders of CSAH 54 within the proposed Project construction extents. Kimley-Horn was responsible for obtaining landowner permission though the majority of the Survey Areas were located in public right-of-way. The weather ranged from sunny to rainy with occasional wildfire haze and consistent high humidity. The Project Area resides within an ecological transition zone between the wet lowland deciduous forests of the Minnesota bluff lands and the drier oak savannas of the Vermillion Valley. Historic vegetation was comprised of cottonwoods, black willows, and silver maples within floodplains and river terraces, and mosaic prairie grasses and bur oaks along the dry slopes of ridges and coulees. Much of the

landscape within the Project Corridor has since been converted to agricultural farmland and pasture, with fragmented woodlands and prairies limited to valley bottoms and bluff ridges. Terrain in the Project Area exhibited relatively level characteristics consistent with riverine landscapes shaped by fluvial deposition across floodplains. Gently sloping areas were present near both artificial and natural drainages. Portions of the Project Area have been modified by roadway construction, including grading and landscaping.

Field Survey Results

In total, 26 Survey Areas were completed utilizing a combination of shovel testing and pedestrian survey. In total, 218 shovel tests were excavated; while 58 planned shovel tests were not excavated due to lack of landowner permission, or for sloping terrain (greater than 20 degrees). Soil profiles within the Project Area reflected the NRCS (2024) analysis which predicted silty and sandy soils with a high chance of encountering bedrock or the water table. No archaeological sites were identified. Post-Contact cultural materials were identified within Survey Areas A, J, and X. However, the identified materials were isolated finds, such as glass bottles, and were determined to be roadside debris likely tossed from passing vehicles or deposited in relation to road construction or use of the roadside as a horse trail. **Table 4** summarizes the results of the Phase I Archaeological Survey. Survey Areas and results are illustrated in **Appendix A: Phase I Survey Results**.

Table 4. Field Survey Results by Survey Area

Survey Area	Setting	Typical Soil Profiles	Artifacts	Number of STPs
A	Forested Edge and Artificial Drainage	10YR3/1-10YR3/3 Silt Loam or Sandy Loam to 60-65cmbs over a 10YR4/6 Silt to 100cmbs.	Asphalt (STP A8 and STP A9), amber and clear bottle glass (STP A9, modern), 2 penny nails. Materials were reburied.	2 excavated. 7 not excavated due to sloping terrain.
B	Forested Edge and Artificial Drainage	10YR3/2-10YR3/3 Sandy Loam transitioning at 20-30cmbs to a 10YR5/4 Fine Sand with Glacial Till to 50cmbs over a 10YR4/3-10YR5/6 Fine Sand to 100 cmbs.	None	9 excavated. 1 not excavated due to sloping terrain.
C	Agricultural Field and Artificial Drainage	10YR3/3 Silt Loam mottled with 10YR2/1 Silt Loam to 100 cmbs.	None	4 excavated. 3 not excavated due to existing gravel two-track.
D	Agricultural Facility	N/A	None	Area D was not excavated due to the existing agricultural storage facility.

Survey Area	Setting	Typical Soil Profiles	Artifacts	Number of STPs
E	Artificial Drainage	N/A	None	Area E was not excavated due to sloping terrain.
F	Forest Edge and Artificial Drainage	10YR2/2-10YR3/2 Sandy Clay Loam from 0-20cmbs over a 10YR3/2 Silty Loam to 40cmbs with a gradual transition to a 10YR4/4 Fine Sand terminating at 83cmbs.	None	3 excavated. 13 not excavated due to sloping conditions. Area F on eastern portion of CSAH 54 not excavated due to mapped Utility lines.
G	Forest	10YR2/2 Silt Loam from 0 to 10 cmbs over a 10YR5/4 Sand to 40-50cmbs.	None	2 excavated.
H	Artificial Drainage	N/A	None	Area H was not excavated due to the sloping nature of the terrain.
I	Pasture	10YR3/2 Sandy Loam mottled with 10YR3/4 Silt to 30cmbs over a 10YR3/4-10YR5/6 Silt to 70cmbs.	None	3 excavated. 4 were not excavated due to sloping terrain.
J	Forested Lowland	10YR3/2 Sandy Loam with gravels to 65cmbs. Bedrock encountered at 65cmbs.	1 forged 2 ¼" nail (STP J9), materials were reburied.	8 excavated. 6 were not excavated due to sloping terrain.
K	Forested Road Edge and Artificial Drainage	10YR3/2 Silt Loam with glacial till from 0 to 30-40cmbs over a 10YR4/3 Silt with glacial till.	None	9 excavated. 8 not excavated due to sloping terrain.
L	Forested Road Edge, Corn Field, and Artificial Drainage	10YR2/1 Silt Loam mottled with 10YR3/3 Silt Loam from 0-80cmbs over a 10YR3/3 Sandy Loam to 100 cmbs. OR 10YR3/3 Silt Loam from 0-35cmbs over a 10YR4/6 Sand terminating at 60cmbs. Bedrock encountered in some tests at 60cmbs.	None	14 excavated. 20 were not excavated due to high Ground Surface Visibility. 1 was not excavated due to sloping conditions. 1 was not excavated due to landowner request.

Survey Area	Setting	Typical Soil Profiles	Artifacts	Number of STPs
M	Managed Lawn	N/A	None	Area M was not excavated due to apparent utility lines.
N	Managed Lawn	N/A	None	Area N was not excavated due to mapped utility lines.
O	Forest	10YR3/2 Sandy Loam from 0-10cmbs over a 10YR3/2 Sandy Loam mottled with a 10YR4/3 Sand from 10-60cmbs over a 10YR4/6 Sand with Glacial Till terminating at 70cmbs. Bedrock was commonly encountered.	None	24 excavated. 4 were not excavated due to sloping conditions.
P	Forest	10YR3/2 Sandy Loam from 0-45cmbs over 10YR4/6 Sand with Glacial Till terminating at 70cmbs.	None	1 excavated. 1 was not excavated due to sloping conditions.
Q	Managed Lawn	10YR3/3 Silt Loam with large cobbles from terminating at 60cmbs with compact soils.	None	1 excavated.
R	Forest	N/A	None	Area R not excavated due to mapped utility lines.
S	Forest	N/A	None	Area S not excavated due to mapped utility lines.
T	Forest and Soybean Field	10YR3/2 Silt Loam from 0-20cmbs over a 10YR3/3 Silt Loam terminated at 75cmbs.	None	5 excavated. 8 not excavated due to high Ground Surface Visibility.
U	Managed Lawn	10YR3/3 Silt Loam from 0-20cmbs over a 10YR4/6 sand terminating at 55cmbs.	None	4 excavated.
V	Fallow Agricultural Field and Forested Edge	10YR3/2 Silty Clay Loam from 0-50cmbs gradually transitioning to a 10YR3/3 Silt Loam to 80cmbs over	None	37 excavated.

Survey Area	Setting	Typical Soil Profiles	Artifacts	Number of STPs
		a 10YR4/3 Sand to 90cmbs.		
W	Forested Edge	10YR3/3 Silt Loam from 0-50cmbs over a 10YR4/6 Sand terminating around 70cmbs	None	25 excavated.
X	Forested Edge and Managed Lawn	10YR3/3 Silt Loam from 0-40cmbs over 10YR4/4 Sand with Glacial Till terminating at 90cmbs. The water table was encountered around 90cmbs. Bedrock was encountered in some tests around 55cmbs.	1 Amber Glass Bottle (no seam, STP X26) 1Horseshoe (STP X27), materials were reburied.	35 excavated. 2 were not excavated due to sloping terrain. 1 was not excavated due to an asphalt driveway.
Y	Roadside Meadow	10YR2/2 Silt Loam from 0-20cmbs over a 10YR4/6 Sand with gravels terminating around 70cmbs.	None	21 excavated.
Z	Scientific Natural Area (SNA) and Roadside Meadow	10YR2/2 Sandy Loam from 0-30cmbs over 10YR3/2 Sandy Clay Loam from 30-40cmbs terminating in 10YR3/3 Loamy Sand at 90cmbs. The water table was encountered at around 90cmbs.	None	10 excavated. No Shovel Tests were excavated within the SNA at the request of the Minnesota DNR.

Summary and Recommendations

Dakota County, in partnership with the City of Hastings, Prairie Island Community and Ravenna Township, propose improvements to County State Aid Highway (CSAH) 54 (Ravenna Trail) from Hastings City limits to CSAH 68 (200th Street E) and the construction of a roundabout at the intersection of CSAH 54 and CSAH 68 in Ravenna Township (Project). The Project is taking place in Sections 5, 6, 8, 9, 16, and 17 of Township 114N, Range 16W and Section 31 of Township 115N, Range 16W and Sections 35 and 36 of Township 115N, Range 17W. Kimley-Horn, the prime contractor for this Project, retained HDR to conduct a Phase I Archaeological Survey.

The Project is considered a state undertaking as it anticipates Minnesota Department of Transportation (MnDOT) funding and oversight. The Project will need to comply with state laws governing cultural resources, primarily including the Minnesota Historic Sites Act (Minnesota Statutes, section 138.661-138.669), Minnesota Field Archaeology Act (Minnesota Statutes, section 138.31-138.42), Minnesota Private Cemeteries Act (Minnesota Statutes, section 307.08), and the Minnesota Tribal Nations Consultation Policy (Minnesota Statutes, section 10.65). A federal nexus is not currently anticipated for this project. However, if a federal nexus is identified

in the future, compliance with Section 306108 (previously Section 106 and hereinafter referred to as Section 106) of the National Historic Preservation Act of 1966, as amended (54 United States Code § 306108) and its implementing regulations, 36 Code of Federal Regulations (CFR) Part 800 et. seq. may be necessary. Section 106 addresses the effects of federal undertakings on historic properties (properties listed in or eligible for listing in the NRHP). Cultural resources studies may be needed to identify if unknown historic properties may be impacted, as well as to assess effects on those properties and resolve adverse effects, if identified. This assessment and its recommendations have been prepared under the assumption a federal nexus will be identified, and Section 106 review will be required.

In July and August of 2025, HDR conducted a Phase I Archaeological Survey for the Project. Approximately 85 acres were surveyed utilizing subsurface shovel testing at 15-meter intervals and pedestrian survey where GSV was greater than 25%. While some archaeological materials were identified, they were determined to be the result of ephemeral refuse sites related to the Project Area's history as a transit corridor, and the finds did not consist of enough substance or research quality materials to constitute archaeological sites. Considering no cultural resources were identified within the Project extents, HDR recommends no further survey for this project. HDR does recommend monitoring within 500 feet of burial site 21DK0089/DK-RAV-00006.

References Cited

Anfinson, Scott

1990 Archaeological Regions in Minnesota and the Woodland Period. In the *Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson*, edited by Guy Gibbon, pp. 135-166. University of Minnesota Publications in Anthropology No. 4, Minneapolis.

Cohen, J.G., M.A. Kost, B.S. Slaughter, D.A. Albert, J.M. Lincoln, A.P. Kortenhoven, C.M. Wilton, H.D. Enander, and K.M. Korroch.

2020 Michigan Natural Community Classification [web application]. Michigan Natural Features Inventory, Michigan State University Extension, Lansing, Michigan. Available https://mnfi.anr.msu.edu/communities/classification. (Accessed: October 1, 2024).

Fleming, Ed, James Almendinger, Joshua Anderson, Taylor Brehm, Jasmine Koncur, and Jason Ulrich

2018 *An Archaeological Survey of Dakota County, Minnesota.* Prepared by the Science Museum of Minnesota.

Koski, Laura J., and John Seidl

2024 *Phase Ia Cultural Resources Literature Review and Assessment, CSAH 54 Expansion and Improvements.* Prepared for Kimley-Horn, Saint Paul, MN

Marschner, Francis

1895 "Native Vegetation at the Time of the Public Land Survey 1847-1907." Accessed 10 May 2024. https://gisdata.mn.gov/dataset/biota-marschner-presettle-veg.

Minnesota Department of Natural Resources (MnDNR)

2024a DNR Hydrography Dataset. Electronic database, Minnesota Geospatial Commons Accessed 10 July 2024. https://gisdata.mn.gov/dataset/water-dnr-hydrography.

2024b Floodplain Forest. Electronic document, Minnesota Department of Natural Resources. Accessed October 1, 2024. https://www.dnr.state.mn.us/rys/pg/floodplainforest.html#:~:text=Floodplain%20forest%20Floodplains%20are%20the%20broad%2C%20flat%2C%20low-lying,melts%2C%20or%20during%20periods%20of%20unseasonably%20high%20rainfall.

Minnesota Department of Transportation (MnDOT)

2017 *MnDOT Cultural Resources Unit (CRU) Project and Report Requirements.* Minnesota Department of Transportation, Saint Paul, MN

National Park Service (NPS)

1983 *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation.* Federal Register 48(190):44716-44740.

Office of the State Archaeologist (OSA)

2011 *State Archaeologist's Manual for Archaeological Projects in Minnesota.* Office of the State Archaeologist, St. Paul, MN.

State Historic Preservation Office (SHPO)

2005 SHPO Manual for Archaeological Projects in Minnesota. Minnesota State Historic Preservation Office. St. Paul, Minnesota.

United States Department of Agriculture, Natural Resources Conservation Service (NRCS)

2024 *Web Soil Survey*. Online service, Accessed 20 August, 2024, available at https://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Appendix A: Phase I Survey Results

Appendix A, Figure 1

Appendix A, Figure 2

Appendix A, Figure 3

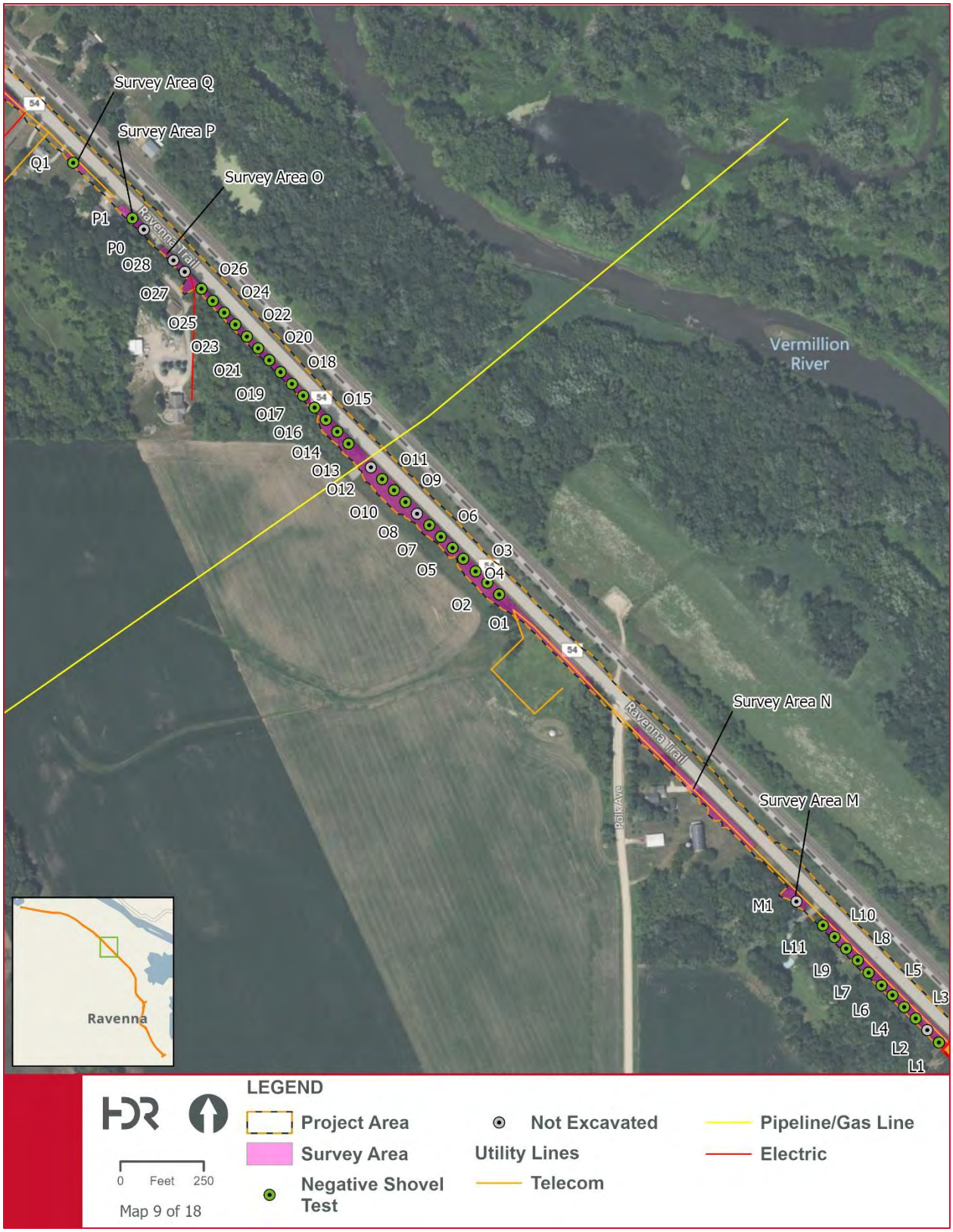
Appendix A, Figure 4

Appendix A, Figure 5

Appendix A, Figure 6

Appendix A, Figure 7

Appendix A, Figure 8



Appendix A, Figure 9

Appendix A, Figure 10

Appendix A, Figure 11

Appendix A, Figure 12

Appendix A, Figure 13

Appendix A, Figure 14

Appendix A, Figure 15

Appendix A, Figure 16

Appendix A, Figure 17

Appendix A, Figure 18

Appendix B: Field Photos

Photo 1. From northwest end of Survey Area V facing southeast.

Photo 2. From northwest end of Survey Area T facing southeast.

Photo 3. Overview of Typical Shovel Test (STP X34).

Photo 4. Profile view of Typical Shovel Test (STP X34).

Photo 5. Horseshoe recovered from Shovel Test X27 (not collected).

Photo 6. Amber glass bottle recovered from Shovel Test X26 (not collected).

Photo 7. Overview of Survey Area F facing west.

Photo 8. From southeast of Survey Area J facing northwest.

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Dakota County, Minnesota

Local office

Minnesota-Wisconsin Ecological Services Field Office

(952) 858-0793

3815 American Blvd East
Bloomington, MN 55425-1659

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. 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.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat Perimyotis subflavus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Birds

NAME	STATUS
Whooping Crane Grus americana No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/758	EXPN

Clams

NAME	STATUS
Higgins Eye (pearlymussel) Lampsilis higginsii Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5428	Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Rusty Patched Bumble Bee Bombus affinis Wherever found There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/9383	Endangered
Western Regal Fritillary Argynnis idalia occidentalis Wherever found No critical habitat has been designated for this species.	Proposed Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their nests, should follow appropriate regulations and implement required avoidance and minimization measures, as described in the various links on this page.

The data in this location indicates that no eagles have been observed in this area. This does not mean eagles are not present in your project area, especially if the area is difficult to survey. Please review the 'Steps to Take When No Results Are Returned' section of the Supplemental Information on Migratory Birds and Eagles document to determine if your project is in a poorly surveyed area. If it is, you may need to rely on other resources to determine if eagles may be present (e.g. your local FWS field office, state surveys, your own surveys).

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 avoidance and minimization 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

Bald and Golden Eagle information is not available at this time

Bald & Golden Eagles FAQs

What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are an eagle (Bald and Golden Eagle Protection Act requirements may apply).

Proper interpretation and use of your eagle report
On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort line or no data line (red horizontal) means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide you in knowing when to implement avoidance and minimization measures to eliminate or reduce potential impacts from your project activities or get the appropriate permits should presence be confirmed.

How do I know if eagles are breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If an eagle on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your “IPaC PROBABILITY OF PRESENCE SUMMARY” at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

Interpreting the Probability of Presence Graphs

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()
Vertical black lines superimposed on probability of presence bars indicate 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.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Migratory birds

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (FWS).

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

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 avoidance and minimization measures for birds
- 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 bird information is not available at this time

Migratory Bird FAQs

Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Avoidance & Minimization Measures for Birds describes measures that can help avoid and minimize impacts to all birds at any location year-round. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is one of the most effective ways to minimize impacts. To see when birds are most likely to occur and breed in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location, such as those listed under the Endangered Species Act or the Bald and Golden Eagle Protection Act and those species marked as "Vulnerable". See the FAQ "What are the levels of concern for migratory birds?" for more information on the levels of concern covered in the IPaC migratory bird species list.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) with which your project intersects. These species have been identified as warranting special attention because they are BCC species in that area, an eagle (Bald and Golden Eagle Protection Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, and to verify survey effort when no results present, please visit the Rapid Avian Information Locator (RAIL) Tool.

Why are subspecies showing up on my list?

Subspecies profiles are included on the list of species present in your project area because observations in the AKN for **the species** are being detected. If the species are present, that means that the subspecies may also be present. If a subspecies shows up on your list, you may need to rely on other resources to determine if that subspecies may be present (e.g. your local FWS field office, state surveys, your own surveys).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go to the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your "IPaC PROBABILITY OF PRESENCE SUMMARY" at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Bald and Golden Eagle Protection Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially BCC species. For more information on avoidance and minimization measures you can implement to help avoid and minimize migratory bird impacts, please see the FAQ "Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Proper interpretation and use of your migratory bird report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s)

that overlap your project; not your exact project footprint. On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list does not represent all birds present in your project area. It is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide implementation of avoidance and minimization measures to eliminate or reduce potential impacts from your project activities, should presence be confirmed. To learn more about avoidance and minimization measures, visit the FAQ "Tell me about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Interpreting the Probability of Presence Graphs
Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()
Vertical black lines superimposed on probability of presence bars indicate 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.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Facilities

National Wildlife Refuge lands

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 at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

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.

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix D

GHG Analysis

Office of Environmental Stewardship
395 John Ireland Blvd.
St. Paul, MN 55155

01/20/2026

Greenhouse Gas Analysis Standard Attachment for Categorical Exclusion Projects

No Changes in Traffic flow

MnDOT evaluates greenhouse gas (GHG) emissions from projects due to concerns about current and future impacts of climate change in Minnesota. GHGs from transportation (carbon dioxide, methane and nitrous oxide) contribute to warming of the atmosphere, which leads to effects in Minnesota that include increases in heavy precipitation, increased flooding, and more episodes of extreme heat.

Because the project will not change traffic, operational greenhouse gas emissions are not expected to change. Construction greenhouse gas emissions will result from production and transportation of construction materials, and from fuel used in construction equipment.

Table 1. Analysis Results

Construction CO2e Emissions (Total over Construction Period*)*	***$CO2_e$, Metric Tons (total)***
Build Alternative	4,639

Appendix E

Traffic Study

ROUNDABOUT JUSTIFICATION REPORT

For

State Aid Project Number: S.A.P. XXX-XXX-XXX
CSAH 54 (Ravenna Trail) & CSAH 68 (200th Street E)
in Ravenna Township, MN

Proposed Letting Date:

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

Tim Klockziem, P.E.	58860 Lic. No.	Date

REVIEWED:

Dakota County Assistant Traffic Engineer	Date

APPROVED:

Metro District State Aid Engineer	Date

PROJECT DESCRIPTION

The intersection for which this roundabout justification report (RJR) has been prepared is located in Ravenna Township in Dakota County. It is at the intersection of CSAH 54 (Ravenna Trail) & CSAH 68 (200th Street E), which is currently side street stop controlled. **Exhibit 1** provides the location of the study intersection.

Dakota County is planning for improvements on CSAH 54 from Hastings City Limits to CSAH 68 in Ravenna Township. The improvements will enhance traffic safety and improve access to the Prairie Island Indian Community. As part of these improvements, roundabout intersection control is being considered at the intersection of CSAH 54 & CSAH 68 intersection.

STUDY INTERSECTION CONDITIONS

EXISTING CONDITIONS

CSAH 54 is a county roadway that runs predominantly in a north-south direction. At the study intersection, CSAH 54 features a two-lane undivided configuration with a posted speed limit of 55 mph. Based on MnDOT classification, it is designated as a major-collector roadway. According to the Minnesota Department of Transportation's (MnDOT) Traffic Mapping Application, the 2018 Annual Average Daily Traffic (AADT) on CSAH 54 was recorded at 3,900 vehicles per day (vpd) in the vicinity of the study intersection.

CSAH 68 is a county roadway that runs predominantly in an east-west direction. At the study intersection, CSAH 68 is a two-lane undivided roadway with a posted speed limit of 55 mph to the east of the study intersection and 45 mph to the west. According to the Minnesota Department of Transportation's (MnDOT) Traffic Mapping Application, the 2018 Annual Average Daily Traffic (AADT) on CSAH 68 was 6,400 vehicles per day (vpd) to the east and 2,700 vpd to the west of the study intersection.

The intersection of CSAH 54 & CSAH 68 is currently side street stop control. There is a dedicated westbound right turn lane at the study intersection. There are no pedestrian or bicycle facilities in the vicinity of the intersection.

The existing geometry and intersection control of the CSAH 54 & CSAH 68 intersection is shown in **Exhibit 2**.

AREA LAND USES

The area directly adjacent to the CSAH 54 & CSAH 68 is comprised of primarily rural and agricultural land uses and has not changed significantly within the past 10 years. There are planned developments in the area that would significantly change nearby land uses or traffic patterns on CSAH 54 or CSAH 68.

PROPOSED CONDITIONS

Improvements and geometric changes are proposed at the CSAH 54 & CSAH 68 intersection as a part of this project. A signal Lane roundabout with a single approach lane for all legs of the intersection is proposed. The proposed roadway geometry is included in **Appendix A**.

TRAFFIC ANALYSIS

A traffic analysis was completed for the AM and PM peak hours for three scenarios: Existing (2024) Conditions, Opening Year (2028) Conditions, and Future Conditions (2048). The traffic analysis focused on the following types of intersection control: side street stop-control, all-way stop control, traffic signal and roundabout control.

TRAFFIC VOLUMES

The analysis was based on existing turning movement volumes and forecasted future traffic volumes for 2048. The existing traffic counts were collected on Tuesday, May 7th, 2024, while school was in session. An AM peak hour of 7:15 AM to 8:15 AM was selected to represent traffic levels during morning hours. Traffic volumes increase significantly starting in the midday until the evening peak period. The PM peak hour was determined to be from 4:45 PM to 5:45 PM.

The traffic volumes for Future (2048) Conditions were developed by applying an annual growth rate to study intersection volumes. Annual growth rates were calculated by comparing base year AADT data with 2040 forecasted volumes from the Travel Demand Model Report that accompanies the Dakota County 2040 Transportation Plan. A 0.7% annual growth was applied to the turning movement traffic volumes to obtain the Future (2048) Conditions traffic volumes. The base year (2017) AADT was 5,500 and forecasted 2040 AADT for CSAH 54 was 6,400 vpd just east of Hastings. A forecasted AADT on CSAH 54 closer to the study intersection or for CSAH 68 was not available, but the growth is assumed to be similar. A review of historic AADT data shows that neither corridor has experienced significant growth in the past 10 years. **Exhibit 3** provides the Existing (2023) Conditions traffic volumes during the AM and PM peak hours. The unadjusted turning movement counts are provided in **Appendix B**.

Exhibit 4 provides the Future (2048) Conditions traffic volumes during the AM and PM peak hours.

WARRANT ANALYSIS

In order to determine which intersection traffic control types may be justified, a warrant analysis was performed for the study intersection using twenty-four hours of traffic data. All-way stop and traffic signal warrants are documented in the Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD). Generally, if the volumes meet the thresholds for all-way stop control, then a roundabout is considered a viable method of intersection control according to the MnDOT Intersection Control Evaluation (ICE) Manual (2017).

All-Way Stop Warrant – Section 2B.7 of the MnMUTCD provides guidance on when an all-way stop is warranted. This warrant is satisfied when the vehicle volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour (vph) for any eight hours of an average day and the combined vehicle, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 vph for the same eight-hour period of the major street.

Traffic Signal Warrant – Section 4 of the MnMUTCD provides guidance on when a traffic signal is a warranted. State Aid requires that at least one signal warrant is met to justify a traffic signal. The following warrants were included in the analysis: Warrant 1 (Eight-Hour Vehicular Volume), Warrant 2 (Four-Hour Vehicular Volume), and Warrant 3 (Peak Hour).

Right-turn traffic on the minor street approach (northbound and southbound right-turn movements) was included in the minor approach volumes in the traffic signal warrant analysis based on standard Dakota County practice and guidance from the MnDOT Metro Traffic Signal Justification Methodology.

The 70% reduction factor for high-speed roadway was applied to the warrant volume thresholds as the intersection is located on a roadway with a speed limit of 45 mph or greater.

The warrants were evaluated based on the Existing (2024) Conditions, Opening Year (2028) Conditions, and Future Year (2048) Conditions. A summary of the warrant analysis for each scenario is shown in **Table 1**.

Table 1: Warrant Analysis Summary

Warrant	Requirement	Existing (2024) Conditions		Opening Year (2028) Conditions		Future Year (2048) Conditions	
		Results	Warrant Met	Results	Warrant Met	Results	Warrant Met
All-Way Stop Control Warrant	8 hours	1 hours	No	1 hour	No	3 hours	No
Signal Warrant 1A Eight-Hour Vehicular Volume	8 hours	0 hours	No	0 hours	No	0 hours	No
Signal Warrant 1B Eight-Hour Vehicular Volume	8 hours	0 hours	No	0 hours	No	0 hours	No
Signal Warrant 2 Four-Hour Vehicular Volume	4 hours	0 hours	No	0 hours	No	0 hours	No
Signal Warrant 3 Peak Hour	1 hour	0 hours	No	0 hours	No	0 hours	No

Based on the Existing Conditions (2024), Opening Year Conditions (2028), and Future Year Conditions (2048) traffic volumes, no warrants were met. Because no traffic signal warrants were met and the all-way stop control warrant was not met, neither traffic signal control or all-way stop control were considered for further evaluation at this intersection. While the all-way stop control warrant is used as an indicator of where a roundabout may be a viable method of intersection control, there are other considerations when considering roundabouts that will be discussed in later sections. The warrant analysis worksheets are provided in **Appendix C**.

INTERSECTION CAPACITY ANALYSIS

An intersection capacity analysis was performed for Existing (2024) Conditions, Opening Year (2028) Conditions, and Future (2048) Conditions. Synchro/SimTraffic was utilized to analyze the intersection as all-way stop control and RODEL was utilized to analyze the roundabout control scenario. For SimTraffic, an average of five runs was used to calculate the level of service (LOS) and delay. The 50th percentile confidence interval results from RODEL are reported. The 50% confidence level provides expectations of typical roundabout performance on an average day and equally compares to intersection control types analyzed in other software programs.

EXISTING (2024) CONDITIONS

An intersection capacity analysis was performed for Existing (2024) Conditions in order to evaluate the existing operations of the intersection with all-way stop control. **Table 2** provides a summary of the capacity analysis for Existing (2024) Conditions during the AM and PM peak hours.

Table 2 – Existing (2024) Conditions Intersection Operations Analysis Results

Intersection Control	Peak Hour	Approach	Left		Through		Right		Overall	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Side Street Stop	AM	EB	0.7	A	2.0	A			4.6	A
		WB			1.6	A	0.1	A		
		SB	7.5	A			5.6	A		
	PM	EB	1.2	A	2.5	A			5.2	A
		WB			2.5	A	0.6	A		
		SB	11.3	B			10.9	B		

Based on the Existing (2024) Conditions capacity analysis, all movements currently operate at LOS B or better during the AM and PM peak hours. All 95th percentile queues are anticipated to remain within their respective storage bays. The SimTraffic reports for Existing (2024) Conditions are included in **Appendix D**.

OPENING YEAR (2028) CONDITIONS

An intersection capacity analysis was performed for Opening Year (2028) Conditions for signal control and roundabout intersection control. Synchro/SimTraffic was used to analyze the signal control, and RODEL was utilized to analyze the roundabout control. For the roundabout analysis, the geometry provided in **Appendix A** was used.

The capacity analysis for all-way stop control in the Opening Year (2028) Conditions during the AM and PM peak hours is summarized in **Table .** The capacity analysis for roundabout control in the Opening Year (2028) Conditions during the AM and PM peak hours are summarized in

Table .

Table 3: Opening Year (2028) No Build Conditions Intersection Operations Analysis Results

Intersection Control	Peak Hour	Approach	Left		Through		Right		Overall	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Side Street Stop	AM	EB	0.5	A	2.0	A			4.6	A
		WB			1.9	A	0.1	A		
		SB	7.9	A			5.6	A		
	PM	EB	1.2	A	2.5	A			5.2	A
		WB			2.4	A	1.9	A		
		SB	11.2	B			9.6	A		

Table 4 – Opening Year (2028) Build Conditions Intersection Operations Analysis Results

Intersection Control	Peak Hour	Approach	Intersection Operations		Overall	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Roundabout 50% Confidence Level	AM	EB	3.3	A	3.35	A
		WB	3.2	A		
		SB	3.4	A		
	PM	EB	3.6	A	3.73	A
		WB	3.8	A		
		SB	3.7	A		

Based on the Opening Year (2028) Conditions capacity analysis, all movements are expected to operate at LOS A or better during the AM peak hour and LOS B or better during the PM peak hour with side-street stop control, and all approaches are expected to operate at LOS A or better during the AM and PM peak hours with roundabout control.

The SimTraffic and RODEL reports for the Opening Year (2028) Conditions analysis are included in **Appendix E** and **Appendix F**, respectively.

FUTURE YEAR (2048) CONDITIONS

An intersection capacity analysis was also performed for Future (2048) Conditions for signal control and roundabout intersection control. Synchro/SimTraffic was used to analyze the signal control, and RODEL was utilized to analyze the roundabout control. For the roundabout analysis, the geometry provided in **Appendix A** was used.

The capacity analysis for all-way stop control in the Future (2048) Conditions during the AM and PM peak hours is summarized in **Table 5.** The capacity analysis for roundabout control in the Future (2048) Conditions during the AM and PM peak hours are summarized in

Table .

Table 5: Future (2048) No Build Conditions Intersection Operations Analysis Results

Intersection Control	Peak Hour	Approach	Left		Through		Right		Overall	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Side Street Stop	AM	EB	0.7	A	2.0	A			5.2	A
		WB			1.9	A	0.1	A		
		SB	8.9	A			7.1	A		
	PM	EB	1.6	A	2.5	A			5.6	A
		WB			2.7	A	0.9	A		
		SB	12.6	B			11.4	B		

Table 6 – Future (2048) Build Conditions Intersection Operations Analysis Results

Roundabout 50% Confidence Level	AM	EB	3.4	A	3.4	A
		WB	3.2	A		
		SB	3.4	A		
	PM	EB	4.5	A	4.8	A
		WB	5.0	A		
		SB	4.8	A		

Based on the Future (2048) Conditions capacity analysis, all movements are expected to operate at LOS A or better during the AM peak hour and LOS B or better during the PM peak hour with side-street stop control, and all approaches are expected to operate at LOS A or better during the AM and PM peak hours with roundabout control.

The SimTraffic and RODEL reports for the Future (2048) Conditions analysis are included in **Appendix G** and **Appendix H**, respectively.

SAFETY

A review of the intersection's crash history shows that there have been eight reported crashes at the study intersection between 2020 and 2024. Using MnDOT's 2023 "Green Sheets" intersection crash rates were calculated and compared against statewide average values to develop a critical index. The crash index is a comparison of the intersection crashes, volume, and characteristics to similar locations statewide. A critical index greater than 1.0 indicates that there is a high probability that the conditions at the site are contributing to the higher crash rate. **Table 7** provides a summary of the crash data for the CSAH 54 & CSAH 68 intersection and includes the total number of crashes, crash severities, observed crash rates, statewide average and critical crash rates, and the critical indices.

Table 7 – Intersection Crash Summary (2020-2024)

Total Number of Crashes	Crash Severity					Crash Rate Type	Statewide Average Crash Rate[1] (crashes/ MEV)	Critical Crash Rate	Critical Index
	PDO	C	B	A	K				
8	3	1	3	1	0	Total Crash Rate	0.15	0.47	**1.43**
						Fatal & Serious Injury Crash Rate	0.41	7.0	**1.20**

1. *Source: MnDOT 2015 Intersection Green Sheet, 5 Years of Crash Data, Signals: low volume, low speed.*
2. *Critical crash index above 1.0 indicates a crash rate that is above the statewide average for similar intersections at a statistically significant level.*

Based on the statewide critical crash rate for similar intersections, this intersection is above the normal, expected range. The critical index was 1.43 for (an average MnDOT critical rate of 0.47) and a critical index of 1.20 for fatal & serious injury crash rate (an average MnDOT critical rate of 7.0). Therefore, there is a statistically significant safety issue at the intersection. Most crashes can be attributed to drivers being unaware that they are approaching

an intersection, specifically in the southbound direction on CSAH 54 and not being prepared to stop and yield the right of way to vehicles on CSAH 68. The Green Sheet calculations and crash diagram for the intersection are included in **Appendix I**.

Roundabouts have been shown to improve safety compared to traditional intersection control methods in many cases. The MnDOT Office of Traffic Engineering produced A Study of the Traffic Safety at Roundabouts in Minnesota[1] in 2017 that was updated in 2021. This study found that roundabouts reduced rate of fatal crashes and injury crashes by 86 percent and 83 percent, respectively. This study also found that right angle and left turn crash rates were reduced by 69 percent and 83 percent, respectively. The improvement in safety is in part due to the elimination of crossing conflict points, where more severe crash types like angle and left-turn crashes usually occur. A conventional intersection on a two-lane roadway has 32 conflict points: 16 crossing conflicts, eight merging conflicts, and eight diverging conflicts The proposed roundabout would reduce this number to eight conflict points: zero crossing conflicts, four merging conflicts, and four diverging conflicts. Data published by Crash Modification Factors (CMF) Clearinghouse supports these findings. Based on studies summarized in the CMF Clearinghouse, a 58 percent reduction in total crashes and a 82 percent reduction in injury crashes could be expected with the conversion of a stop-controlled intersection to a single-lane roundabout on rural roadways (CMF 207[2] and CMF 211[3]).

Another reason roundabouts have proven to improve safety is their ability to reduce speeds through the intersection. The geometry of the approaches to the roundabout and the circulating roadway limit driver speeds, thus reducing speed differential between vehicles, shallowing out conflict angles, and reducing severity of crashes. This could specifically improve crash outcomes in this location as the larger footprint of a roundabout and curvature of approaches will increase driver awareness that they are approaching and intersection and will need to correctly yield the right of way to other drivers.

DESIGN DATA

The roundabout is proposed to be an urban single lane roundabout. Landscaping will be provided on the center island of the roundabout. The proposed geometric layout and typical section of the roundabout can be referenced in **Appendix A** and **Appendix J**, respectively. The roundabout has been designed consistent with criteria outlined in the Federal Highway Administration's (FHWA) *Roundabouts: An Informational Guide*.

The lane width is proposed to be 22 feet including gutter widths for the circulating lanes with the entrance/exit lane widths ranging from 19.5 feet to 23 feet, including gutter widths. A B612 concrete curb and gutter is proposed along the inside of the truck apron with R424 curb and gutter between the truck apron and circulating lane. The design vehicle utilized in the design of the roundabout an interstate semi-trailer (WB-62). B418 curb and gutter will be constructed on the outside of the roundabout for accommodation of larger vehicles. The design vehicle paths are shown in **Appendix K**.

The roundabout design meets MnDOT and FHWA guidelines for speed control and speed differential. The vehicle fastest path radii and speeds for each leg, as described in FHWA's *Roundabouts: An Informational Guide*, are included in **Appendix L**.

[1] https://www.dot.state.mn.us/trafficeng/safety/docs/roundaboutstudy.pdf

[2] https://cmfclearinghouse.fhwa.dot.gov/detail.php?facid=207

[3] https://cmfclearinghouse.fhwa.dot.gov/detail.php?facid=211

HORIZONTAL SIGHT DISTANCE

A horizontal sight distance analysis was completed to make sure that a vehicle entering the roundabout would have enough unobstructed sight distance to see another potentially conflicting vehicle (in the upstream entry or circulating lane) from far enough away to decide whether to yield. Detailed information pertaining to the sight distance diagrams are shown in **Appendix M**. Sight distance diagrams also inform where tall growth vegetation shall be prohibited in boulevards and the central island.

PEDESTRIAN AND BICYCLIST IMPACTS

Pedestrian safety is anticipated to be improved with the installation of a roundabout compared to a side-street stop-controlled intersection. Pedestrian facilities, sidewalks/multi-use trail and curb ramps with painted cross walks are being proposed for legs of the intersection. The existing intersection geometry has no pedestrian or bike facilities. With the proposed roundabout design, splitter islands would be provided on all three intersection approaches. These splitter islands allow for a two-stage crossing, where pedestrians only need to cross one direction of a traffic at a time. With traditional intersections, pedestrians are required to cross all lanes of traffic in one stage.

ALTERNATIVE CONSIDERED

Four alternatives were considered at this intersection. The intersection is currently side street stop control. Leaving the intersection control unchanged was considered as an alternative. The analysis also considered converting the intersection to all-way stop control, a traffic signal, or a roundabout. The evaluation of the alternatives considered traffic operations and safety as well as other factors and found the following:

- Side street stop control: Maintaining side street stop control would require the least right-of-way and lowest cost to install and maintain compared to the other alternatives. However, the crash rate with the existing intersection control is well above statewide averages for similar intersections.
- All-way stop control: all-way stop control would cost less to construct than a roundabout and require no additional right-of-way. However, all-way stop control was determined to not be warranted based on traffic volumes. Unwarranted all-way stop control can produce negative safety outcomes.
- Traffic Signal: A Traffic signal would likely have cost less to construct and require less right-of-way than a roundabout. A traffic signal was determined to not be warranted based on traffic volumes. Traffic signal also has higher operation and maintenance costs than a roundabout.
- Roundabout: Roundabout control is expected to operate with the lower delays to side street stop control. It was also determined to be the safest alternative, for vehicles, pedestrians, and bicyclists. This due to the reduction in conflict points and reduction of vehicle speeds through the intersection. A roundabout would require more right-of-way and likely cost more to construct than all-way stop control or a traffic signal.

JUSTIFICATION

A roundabout is justified at the intersection of CSAH 54 & CSAH 68 for the following reasons:

- The analysis shows that a roundabout will operate with lower delay than under side street stop control, and all approaches would be expected to operate at LOS A or better under Future (2048) Conditions.

- The proposed roundabout is expected to have fewer total and fewer injury crashes when compared to an all-way stop intersection based on the reduction in conflict points at the intersection. Studies conducted by MnDOT confirm that roundabouts reduce the rate of fatal and injury crashes by 86 and 83 percent, respectively.

- The implementation of a roundabout is expected to significantly enhance pedestrian safety. The design incorporates splitter islands, facilitating a two-stage crossing for pedestrians as opposed to traditional intersections, where pedestrians must traverse all lanes of traffic in a single stage.

EXHIBITS

EXHIBIT 1

PROJECT SITE LOCATION AND STUDY AREA

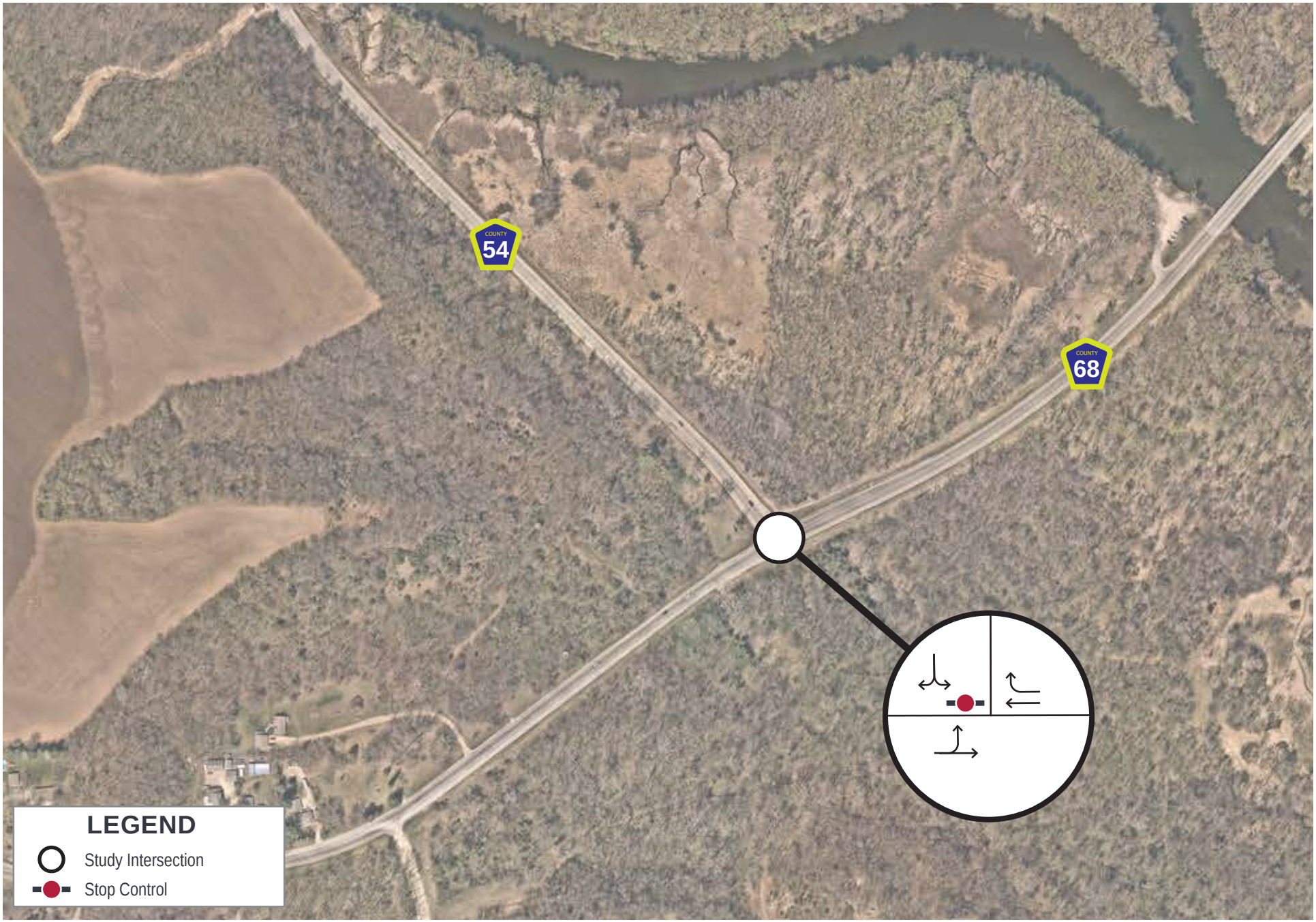


EXHIBIT 2

EXISTING GEOMETRY AND INTERSECTION CONTROL

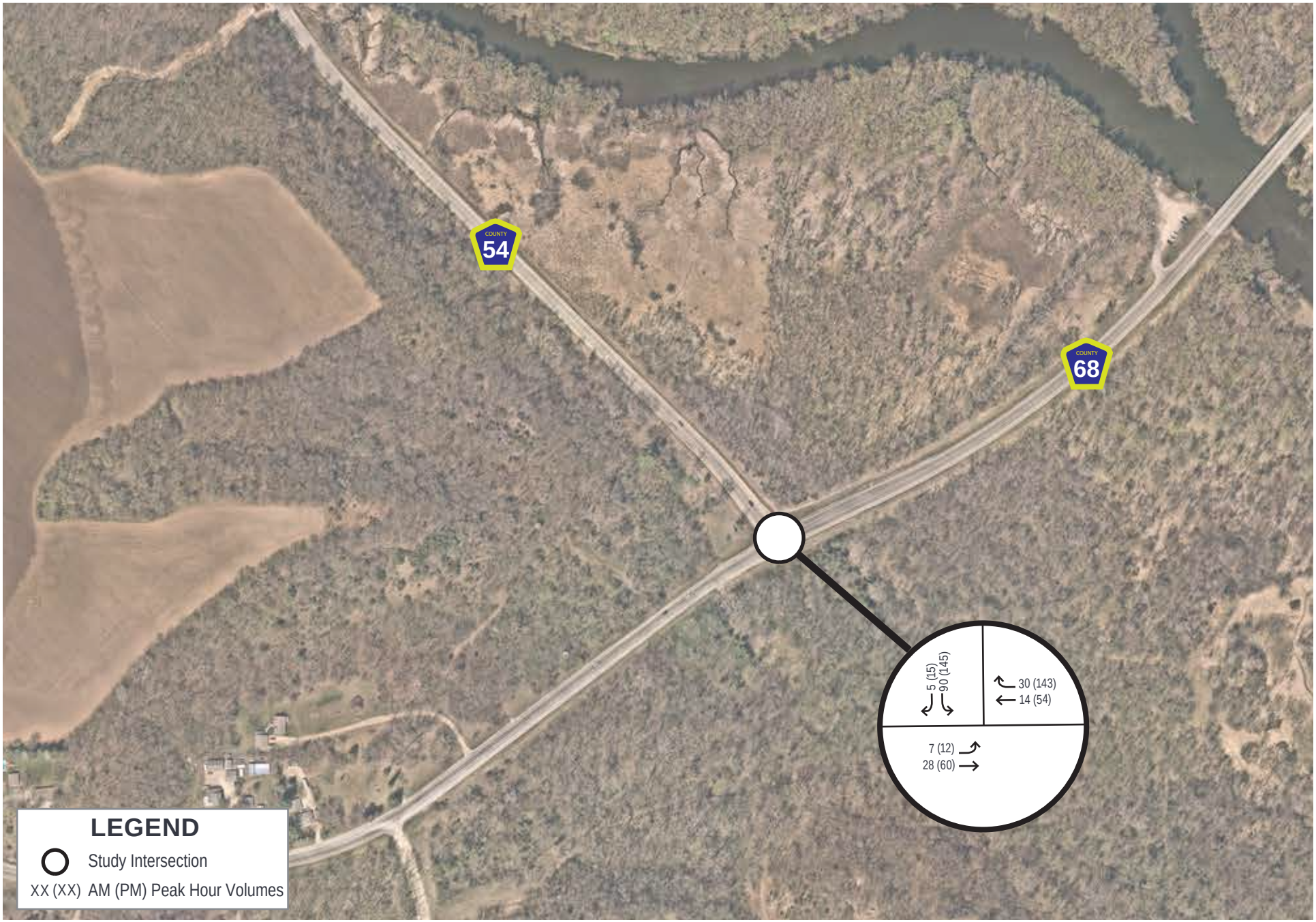


EXHIBIT 3

EXISTING YEAR 2024
PEAK HOUR TRAFFIC VOLUMES

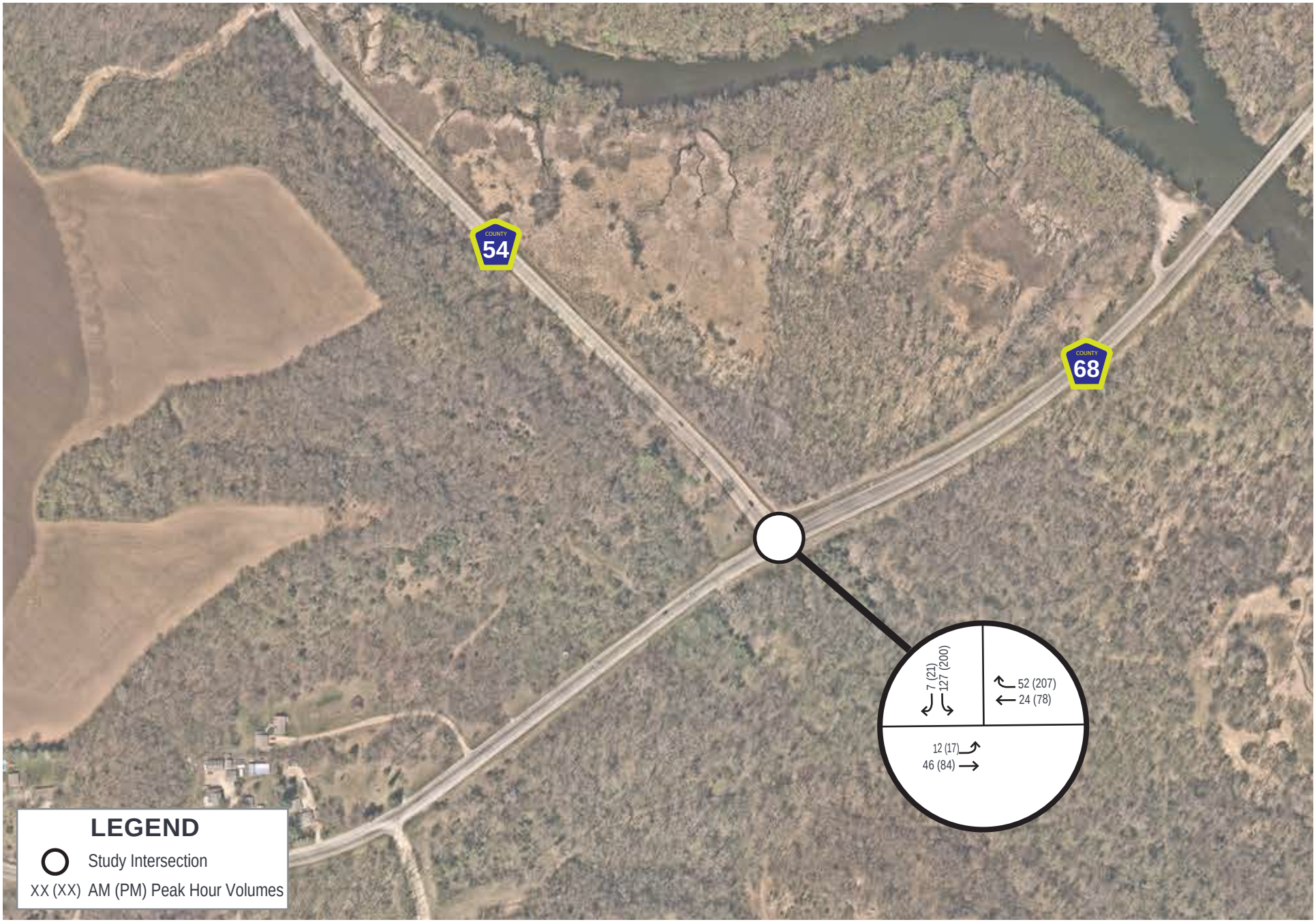


EXHIBIT 4

FUTURE YEAR 2040
PEAK HOUR TRAFFIC VOLUMES

APPENDIX

Appendix A: Proposed Geometric Layout

Appendix B: Unadjusted Turning Movement Counts

Appendix C: Warrant Analyses

Appendix D: Existing (2024) Conditions SimTraffic Reports

Appendix E: Opening Year (2028) Conditions SimTraffic Reports

Appendix F: Opening Year (2028) Conditions RODEL Reports

Appendix G: Future (2048) Conditions SimTraffic Reports

Appendix H: Future (2048) Conditions RODEL Reports

Appendix I: Historical Crash Data

Appendix J: Proposed Typical Section

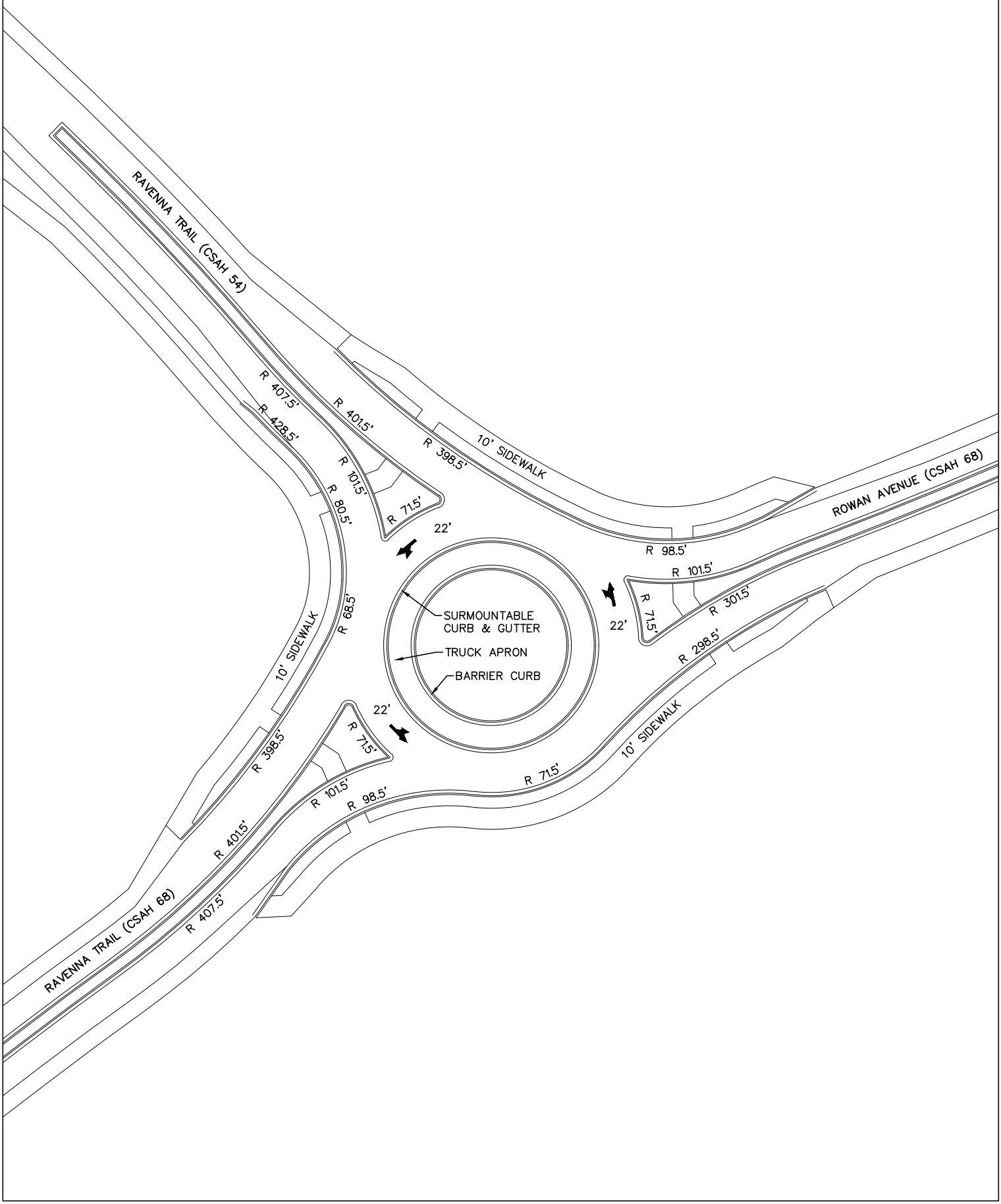
Appendix K: Design Vehicle Paths

Appendix L: Fastest Path Radii and Speeds

Appendix M: Sight Distance Diagrams

Appendix A: Proposed Geometric Layout

NOTE: RADII MEASURED AT FACE OF CURB



K:\TCS_Civil\County\DAKOTA\CSAH 54 - Ravenna Trail\CAD\Plan Sheets\Exhibits\RJR\CSAH 54_RJR_Appx D.dwg November 07, 2024 - 4:20pm

Kimley»Horn

PROPOSED GEOMETRIC LAYOUT
CSAH 54 & CSAH 68

Dakota COUNTY

NORTH

0 30 60
HORIZONTAL
SCALE IN FEET

Appendix B: Unadjusted Turning Movement Counts

CR 54 & 200th St E - TMC

Tue May 7, 2024
Full Length (12 AM-12 AM (+1))
All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 1183709, Location: 44.663534, -92.739718

Provided by: Kimley-Horn and Associates, Inc.
767 Eustis Street, Suite 100,
Saint Paul, MN, 55114, US

Leg Direction	CR 54 Southbound					200th St Eastbound					200th St Westbound					
Time	L	R	U	**App**	Ped*	L	T	U	**App**	Ped*	T	R	U	**App**	Ped*	**Int**
2024-05-07 12:00AM	3	0	0	**3**	0	1	2	0	**3**	0	7	13	0	**20**	0	**26**
12:15AM	8	0	0	**8**	0	0	2	0	**2**	0	7	10	0	**17**	0	**27**
12:30AM	2	0	0	**2**	0	0	2	0	**2**	0	4	9	0	**13**	0	**17**
12:45AM	5	0	0	**5**	0	0	1	0	**1**	0	4	4	0	**8**	0	**14**
Hourly Total	18	0	0	**18**	0	1	7	0	**8**	0	22	36	0	**58**	0	**84**
1:00AM	2	0	0	**2**	0	0	1	0	**1**	0	5	9	0	**14**	0	**17**
1:15AM	4	0	0	**4**	0	0	3	0	**3**	0	1	4	0	**5**	0	**12**
1:30AM	3	0	0	**3**	0	0	2	0	**2**	0	3	11	0	**14**	0	**19**
1:45AM	1	0	0	**1**	0	0	1	0	**1**	0	6	8	0	**14**	0	**16**
Hourly Total	10	0	0	**10**	0	0	7	0	**7**	0	15	32	0	**47**	0	**64**
2:00AM	4	0	0	**4**	0	0	0	0	**0**	0	6	9	0	**15**	0	**19**
2:15AM	2	0	0	**2**	0	0	3	0	**3**	0	2	10	0	**12**	0	**17**
2:30AM	4	0	0	**4**	0	0	0	0	**0**	0	3	3	0	**6**	0	**10**
2:45AM	2	0	0	**2**	0	0	2	0	**2**	0	3	1	0	**4**	0	**8**
Hourly Total	12	0	0	**12**	0	0	5	0	**5**	0	14	23	0	**37**	0	**54**
3:00AM	0	0	0	**0**	0	0	0	0	**0**	0	3	1	0	**4**	0	**4**
3:15AM	3	0	0	**3**	0	0	2	0	**2**	0	0	7	0	**7**	0	**12**
3:30AM	1	0	0	**1**	0	0	1	0	**1**	0	2	6	0	**8**	0	**10**
3:45AM	0	1	0	**1**	0	0	2	0	**2**	0	2	6	0	**8**	0	**11**
Hourly Total	4	1	0	**5**	0	0	5	0	**5**	0	7	20	0	**27**	0	**37**
4:00AM	2	0	0	**2**	0	0	0	0	**0**	0	3	5	0	**8**	0	**10**
4:15AM	2	0	0	**2**	0	0	2	0	**2**	0	1	6	0	**7**	0	**11**
4:30AM	6	1	0	**7**	0	0	10	0	**10**	0	3	2	0	**5**	0	**22**
4:45AM	7	0	0	**7**	0	1	9	0	**10**	0	3	1	0	**4**	0	**21**
Hourly Total	17	1	0	**18**	0	1	21	0	**22**	0	10	14	0	**24**	0	**64**
5:00AM	8	0	0	**8**	0	0	4	0	**4**	0	0	4	0	**4**	0	**16**
5:15AM	10	0	0	**10**	0	0	10	0	**10**	0	0	9	0	**9**	0	**29**
5:30AM	5	0	0	**5**	0	0	22	0	**22**	0	5	11	0	**16**	0	**43**
5:45AM	18	0	0	**18**	0	0	12	0	**12**	0	3	7	0	**10**	0	**40**
Hourly Total	41	0	0	**41**	0	0	48	0	**48**	0	8	31	0	**39**	0	**128**
6:00AM	9	0	0	**9**	0	2	7	0	**9**	0	0	15	0	**15**	0	**33**
6:15AM	24	0	0	**24**	0	3	10	0	**13**	0	0	11	0	**11**	0	**48**
6:30AM	17	0	0	**17**	0	5	13	0	**18**	0	3	8	0	**11**	0	**46**
6:45AM	16	1	0	**17**	0	3	15	0	**18**	0	2	11	0	**13**	0	**48**
Hourly Total	66	1	0	**67**	0	13	45	0	**58**	0	5	45	0	**50**	0	**175**
7:00AM	15	0	0	**15**	0	3	13	0	**16**	0	0	6	0	**6**	0	**37**
7:15AM	22	1	0	**23**	0	4	8	0	**12**	0	3	13	0	**16**	0	**51**
7:30AM	27	1	0	**28**	0	1	11	0	**12**	0	3	4	0	**7**	0	**47**
7:45AM	18	1	0	**19**	0	1	5	0	**6**	0	2	5	0	**7**	0	**32**
Hourly Total	82	3	0	**85**	0	9	37	0	**46**	0	8	28	0	**36**	0	**167**
8:00AM	23	2	0	**25**	0	1	4	0	**5**	0	6	8	0	**14**	0	**44**
8:15AM	25	1	0	**26**	0	3	8	0	**11**	0	8	6	0	**14**	0	**51**
8:30AM	23	2	0	**25**	0	0	8	0	**8**	0	6	11	0	**17**	0	**50**
8:45AM	24	1	0	**25**	0	2	8	0	**10**	0	4	5	0	**9**	0	**44**
Hourly Total	95	6	0	**101**	0	6	28	0	**34**	0	24	30	0	**54**	0	**189**
9:00AM	23	1	0	**24**	0	0	8	0	**8**	0	3	9	0	**12**	0	**44**
9:15AM	15	3	0	**18**	0	4	9	0	**13**	0	6	10	1	**17**	0	**48**
9:30AM	21	2	0	**23**	0	1	12	0	**13**	0	2	14	0	**16**	0	**52**
9:45AM	23	1	1	**25**	0	3	6	0	**9**	0	5	16	0	**21**	0	**55**
Hourly Total	82	7	1	**90**	0	8	35	0	**43**	0	16	49	1	**66**	0	**199**
10:00AM	24	1	0	**25**	0	2	7	0	**9**	0	8	10	0	**18**	0	**52**
10:15AM	32	2	0	**34**	0	2	8	0	**10**	0	4	9	0	**13**	0	**57**
10:30AM	31	0	0	**31**	0	1	14	0	**15**	0	7	15	0	**22**	0	**68**

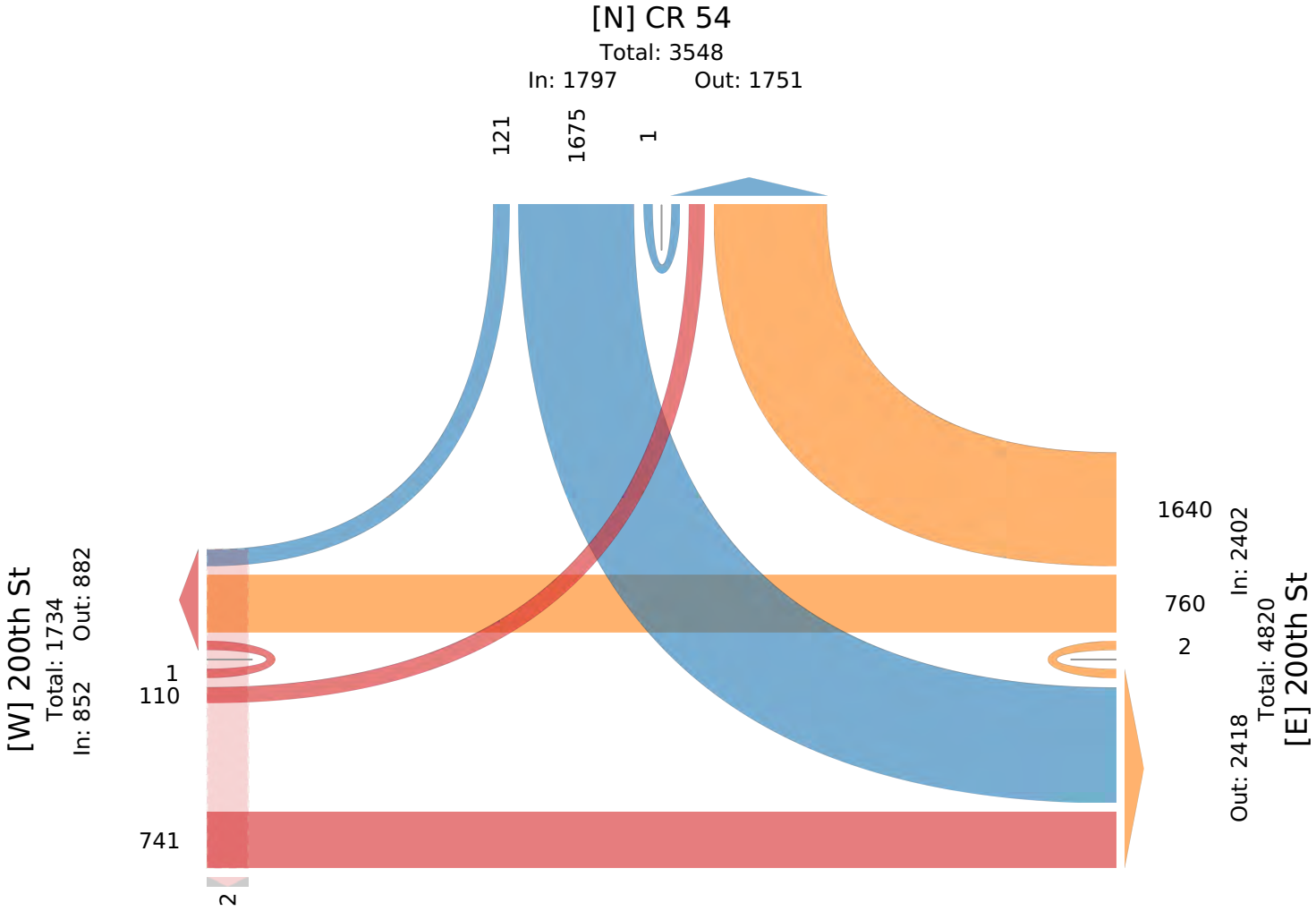
Leg	CR 54					200th St					200th St					
Direction	Southbound					Eastbound					Westbound					
Time	L	R	U	**App**	Ped*	L	T	U	**App**	Ped*	T	R	U	**App**	Ped*	**Int**
10:45AM	23	0	0	**23**	0	2	7	0	**9**	0	7	13	0	**20**	0	**52**
Hourly Total	110	3	0	**113**	0	7	36	0	**43**	0	26	47	0	**73**	0	**229**
11:00AM	24	3	0	**27**	0	3	16	0	**19**	0	2	8	0	**10**	0	**56**
11:15AM	27	4	0	**31**	0	2	14	0	**16**	0	5	8	0	**13**	0	**60**
11:30AM	27	2	0	**29**	0	2	11	0	**13**	0	10	18	0	**28**	0	**70**
11:45AM	32	1	0	**33**	0	0	14	0	**14**	0	7	12	0	**19**	0	**66**
Hourly Total	110	10	0	**120**	0	7	55	0	**62**	0	24	46	0	**70**	0	**252**
12:00PM	37	1	0	**38**	0	1	6	0	**7**	0	6	19	0	**25**	0	**70**
12:15PM	18	0	0	**18**	0	0	14	0	**14**	0	8	29	0	**37**	0	**69**
12:30PM	30	1	0	**31**	0	1	10	0	**11**	0	7	30	0	**37**	0	**79**
12:45PM	27	1	0	**28**	0	2	14	0	**16**	0	12	28	0	**40**	0	**84**
Hourly Total	112	3	0	**115**	0	4	44	0	**48**	0	33	106	0	**139**	0	**302**
1:00PM	26	3	0	**29**	0	2	5	0	**7**	0	9	30	0	**39**	0	**75**
1:15PM	29	2	0	**31**	0	1	8	0	**9**	0	9	31	1	**41**	0	**81**
1:30PM	27	1	0	**28**	0	0	9	0	**9**	0	9	27	0	**36**	0	**73**
1:45PM	25	1	0	**26**	0	3	9	0	**12**	0	9	25	0	**34**	0	**72**
Hourly Total	107	7	0	**114**	0	6	31	0	**37**	0	36	113	1	**150**	0	**301**
2:00PM	16	1	0	**17**	0	2	13	1	**16**	2	14	36	0	**50**	0	**83**
2:15PM	19	0	0	**19**	0	3	8	0	**11**	0	13	32	0	**45**	0	**75**
2:30PM	21	5	0	**26**	0	1	6	0	**7**	0	11	23	0	**34**	0	**67**
2:45PM	19	3	0	**22**	0	1	8	0	**9**	0	15	30	0	**45**	0	**76**
Hourly Total	75	9	0	**84**	0	7	35	1	**43**	2	53	121	0	**174**	0	**301**
3:00PM	29	6	0	**35**	0	3	19	0	**22**	0	20	37	0	**57**	0	**114**
3:15PM	28	2	0	**30**	0	0	11	0	**11**	0	23	41	0	**64**	0	**105**
3:30PM	25	3	0	**28**	0	1	9	0	**10**	0	25	34	0	**59**	0	**97**
3:45PM	29	4	0	**33**	0	4	5	0	**9**	0	22	32	0	**54**	0	**96**
Hourly Total	111	15	0	**126**	0	8	44	0	**52**	0	90	144	0	**234**	0	**412**
4:00PM	22	5	0	**27**	0	2	12	0	**14**	0	32	43	0	**75**	0	**116**
4:15PM	22	0	0	**22**	0	0	10	0	**10**	0	22	49	0	**71**	0	**103**
4:30PM	29	4	0	**33**	0	0	11	0	**11**	0	25	37	0	**62**	0	**106**
4:45PM	32	2	0	**34**	0	6	14	0	**20**	0	10	21	0	**31**	0	**85**
Hourly Total	105	11	0	**116**	0	8	47	0	**55**	0	89	150	0	**239**	0	**410**
5:00PM	38	3	0	**41**	0	2	18	0	**20**	0	13	45	0	**58**	0	**119**
5:15PM	42	4	0	**46**	0	2	19	0	**21**	0	16	43	0	**59**	0	**126**
5:30PM	33	6	0	**39**	0	2	9	0	**11**	0	15	34	0	**49**	0	**99**
5:45PM	30	2	0	**32**	0	1	7	0	**8**	0	19	37	0	**56**	0	**96**
Hourly Total	143	15	0	**158**	0	7	53	0	**60**	0	63	159	0	**222**	0	**440**
6:00PM	31	2	0	**33**	0	3	7	0	**10**	0	12	19	0	**31**	0	**74**
6:15PM	25	5	0	**30**	0	0	16	0	**16**	0	14	30	0	**44**	0	**90**
6:30PM	23	3	0	**26**	0	2	10	0	**12**	0	11	23	0	**34**	0	**72**
6:45PM	31	2	0	**33**	0	0	6	0	**6**	0	5	23	0	**28**	0	**67**
Hourly Total	110	12	0	**122**	0	5	39	0	**44**	0	42	95	0	**137**	0	**303**
7:00PM	18	1	0	**19**	0	1	5	0	**6**	0	8	22	0	**30**	0	**55**
7:15PM	27	0	0	**27**	0	3	6	0	**9**	0	9	25	0	**34**	0	**70**
7:30PM	20	3	0	**23**	0	0	11	0	**11**	0	8	9	0	**17**	0	**51**
7:45PM	17	0	0	**17**	0	1	7	0	**8**	0	16	19	0	**35**	0	**60**
Hourly Total	82	4	0	**86**	0	5	29	0	**34**	0	41	75	0	**116**	0	**236**
8:00PM	25	2	0	**27**	0	1	9	0	**10**	0	11	21	0	**32**	0	**69**
8:15PM	14	3	0	**17**	0	0	6	0	**6**	0	12	22	0	**34**	0	**57**
8:30PM	12	1	0	**13**	0	1	6	0	**7**	0	8	20	0	**28**	0	**48**
8:45PM	17	0	0	**17**	0	0	11	0	**11**	0	6	23	0	**29**	0	**57**
Hourly Total	68	6	0	**74**	0	2	32	0	**34**	0	37	86	0	**123**	0	**231**
9:00PM	15	1	0	**16**	0	1	8	0	**9**	0	7	12	0	**19**	0	**44**
9:15PM	15	2	0	**17**	0	0	8	0	**8**	0	6	17	0	**23**	0	**48**
9:30PM	18	1	0	**19**	0	0	5	0	**5**	0	10	29	0	**39**	0	**63**
9:45PM	11	1	0	**12**	0	0	2	0	**2**	0	3	22	0	**25**	0	**39**
Hourly Total	59	5	0	**64**	0	1	23	0	**24**	0	26	80	0	**106**	0	**194**
10:00PM	8	0	0	**8**	0	0	3	0	**3**	0	9	17	0	**26**	0	**37**
10:15PM	8	0	0	**8**	0	1	4	0	**5**	0	13	21	0	**34**	0	**47**
10:30PM	6	0	0	**6**	0	2	7	0	**9**	0	11	12	0	**23**	0	**38**

Leg	CR 54					200th St					200th St					
Direction	Southbound					Eastbound					Westbound					
Time	L	R	U	**App**	Ped*	L	T	U	**App**	Ped*	T	R	U	**App**	Ped*	**Int**
10:45PM	3	0	0	**3**	0	0	4	0	**4**	0	8	10	0	**18**	0	**25**
Hourly Total	25	0	0	**25**	0	3	18	0	**21**	0	41	60	0	**101**	0	**147**
11:00PM	10	0	0	**10**	0	0	4	0	**4**	0	8	13	0	**21**	0	**35**
11:15PM	8	0	0	**8**	0	1	8	0	**9**	0	9	16	0	**25**	0	**42**
11:30PM	9	0	0	**9**	0	1	5	0	**6**	0	5	10	0	**15**	0	**30**
11:45PM	4	2	0	**6**	0	0	0	0	**0**	0	8	11	0	**19**	0	**25**
Hourly Total	31	2	0	**33**	0	2	17	0	**19**	0	30	50	0	**80**	0	**132**
Total	1675	121	1	**1797**	0	110	741	1	**852**	2	760	1640	2	**2402**	0	**5051**
% Approach	93.2%	6.7%	0.1%	**-**	-	12.9%	87.0%	0.1%	**-**	-	31.6%	68.3%	0.1%	**-**	-	-
% Total	33.2%	2.4%	0%	**35.6%**	-	2.2%	14.7%	0%	**16.9%**	-	15.0%	32.5%	0%	**47.6%**	-	-
Lights	1667	120	1	**1788**	-	108	729	1	**838**	-	748	1635	2	**2385**	-	5011
% Lights	99.5%	99.2%	100%	**99.5%**	-	98.2%	98.4%	100%	**98.4%**	-	98.4%	99.7%	100%	**99.3%**	-	99.2%
Articulated Trucks and Single-Unit Trucks	7	1	0	**8**	-	2	12	0	**14**	-	12	4	0	**16**	-	38
% Articulated Trucks and Single-Unit Trucks	0.4%	0.8%	0%	**0.4%**	-	1.8%	1.6%	0%	**1.6%**	-	1.6%	0.2%	0%	**0.7%**	-	0.8%
Buses	1	0	0	**1**	-	0	0	0	**0**	-	0	1	0	**1**	-	2
% Buses	0.1%	0%	0%	**0.1%**	-	0%	0%	0%	**0%**	-	0%	0.1%	0%	**0%**	-	0%
Bicycles on Road	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	0	-	-	-	-	2	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

CR 54 & 200th St E - TMC
Tue May 7, 2024
Full Length (12 AM-12 AM (+1))
All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 1183709, Location: 44.663534, -92.739718

Provided by: Kimley-Horn and Associates, Inc.
767 Eustis Street, Suite 100,
Saint Paul, MN, 55114, US



CR 54 & 200th St E - TMC

Tue May 7, 2024
AM Peak (9:45 AM - 10:45 AM)
All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 1183709, Location: 44.663534, -92.739718

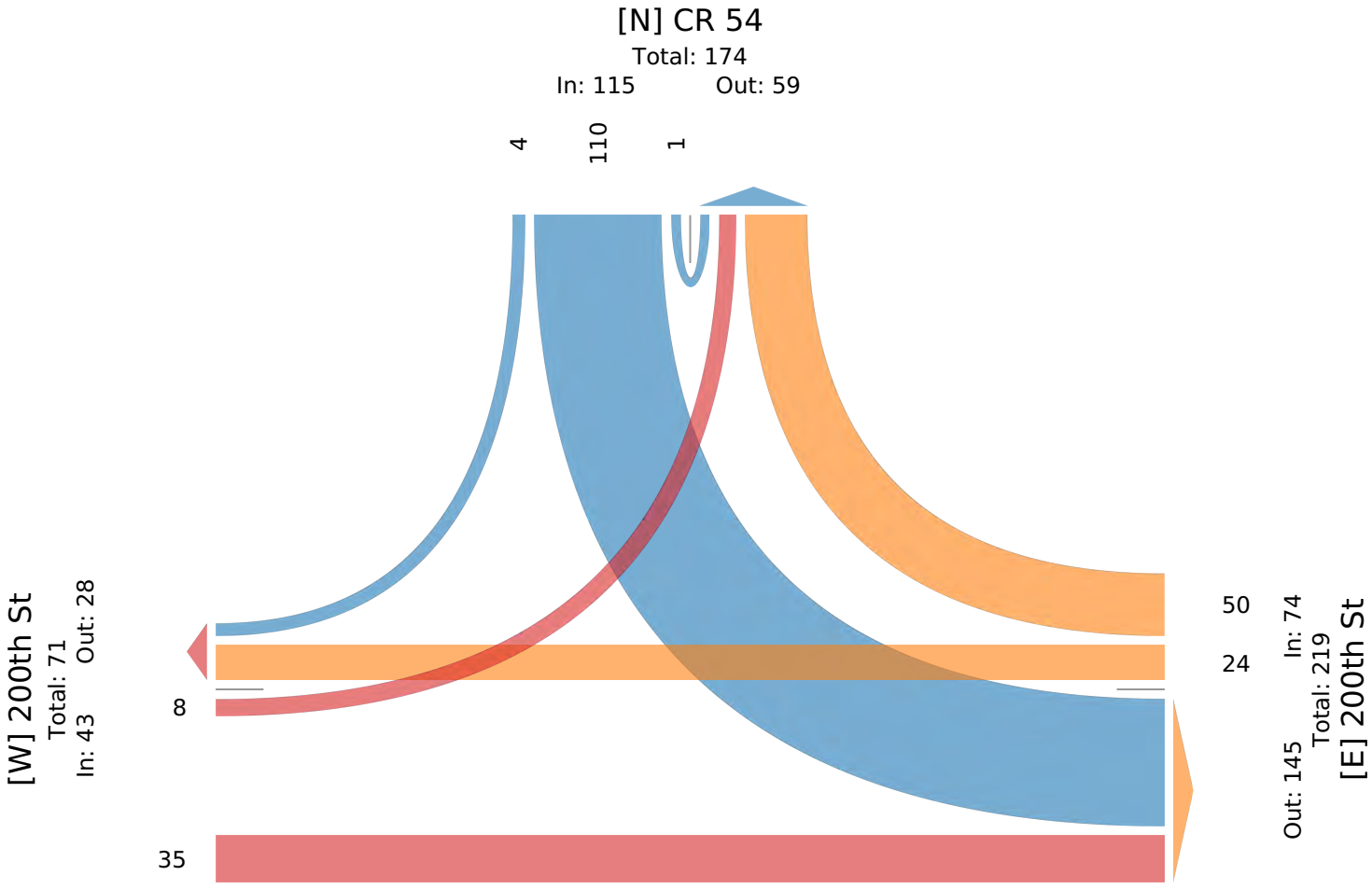
Provided by: Kimley-Horn and Associates, Inc.
767 Eustis Street, Suite 100,
Saint Paul, MN, 55114, US

Leg Direction	CR 54 Southbound					200th St Eastbound					200th St Westbound					
Time	L	R	U	**App**	Ped*	L	T	U	**App**	Ped*	T	R	U	**App**	Ped*	**Int**
2024-05-07 9:45AM	23	1	1	**25**	0	3	6	0	**9**	0	5	16	0	**21**	0	**55**
10:00AM	24	1	0	**25**	0	2	7	0	**9**	0	8	10	0	**18**	0	**52**
10:15AM	32	2	0	**34**	0	2	8	0	**10**	0	4	9	0	**13**	0	**57**
10:30AM	31	0	0	**31**	0	1	14	0	**15**	0	7	15	0	**22**	0	**68**
Total	110	4	1	**115**	0	8	35	0	**43**	0	24	50	0	**74**	0	**232**
% Approach	95.7%	3.5%	0.9%	**-**	-	18.6%	81.4%	0%	**-**	-	32.4%	67.6%	0%	**-**	-	**-**
% Total	47.4%	1.7%	0.4%	**49.6%**	-	3.4%	15.1%	0%	**18.5%**	-	10.3%	21.6%	0%	**31.9%**	-	**-**
PHF	0.859	0.500	0.250	**0.846**	-	0.667	0.625	-	**0.717**	-	0.750	0.781	-	**0.841**	-	0.853
Lights	109	4	1	**114**	-	8	34	0	**42**	-	19	50	0	**69**	-	225
% Lights	99.1%	100%	100%	**99.1%**	-	100%	97.1%	0%	**97.7%**	-	79.2%	100%	0%	**93.2%**	-	97.0%
Articulated Trucks and Single-Unit Trucks	0	0	0	**0**	-	0	1	0	**1**	-	5	0	0	**5**	-	6
% Articulated Trucks and Single-Unit Trucks	0%	0%	0%	**0%**	-	0%	2.9%	0%	**2.3%**	-	20.8%	0%	0%	**6.8%**	-	2.6%
Buses	1	0	0	**1**	-	0	0	0	**0**	-	0	0	0	**0**	-	1
% Buses	0.9%	0%	0%	**0.9%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0.4%
Bicycles on Road	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

CR 54 & 200th St E - TMC
Tue May 7, 2024
AM Peak (9:45 AM - 10:45 AM)
All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 1183709, Location: 44.663534, -92.739718

Provided by: Kimley-Horn and Associates, Inc.
767 Eustis Street, Suite 100,
Saint Paul, MN, 55114, US



CR 54 & 200th St E - TMC

Tue May 7, 2024
Midday Peak (12:30 PM - 1:30 PM)
All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 1183709, Location: 44.663534, -92.739718

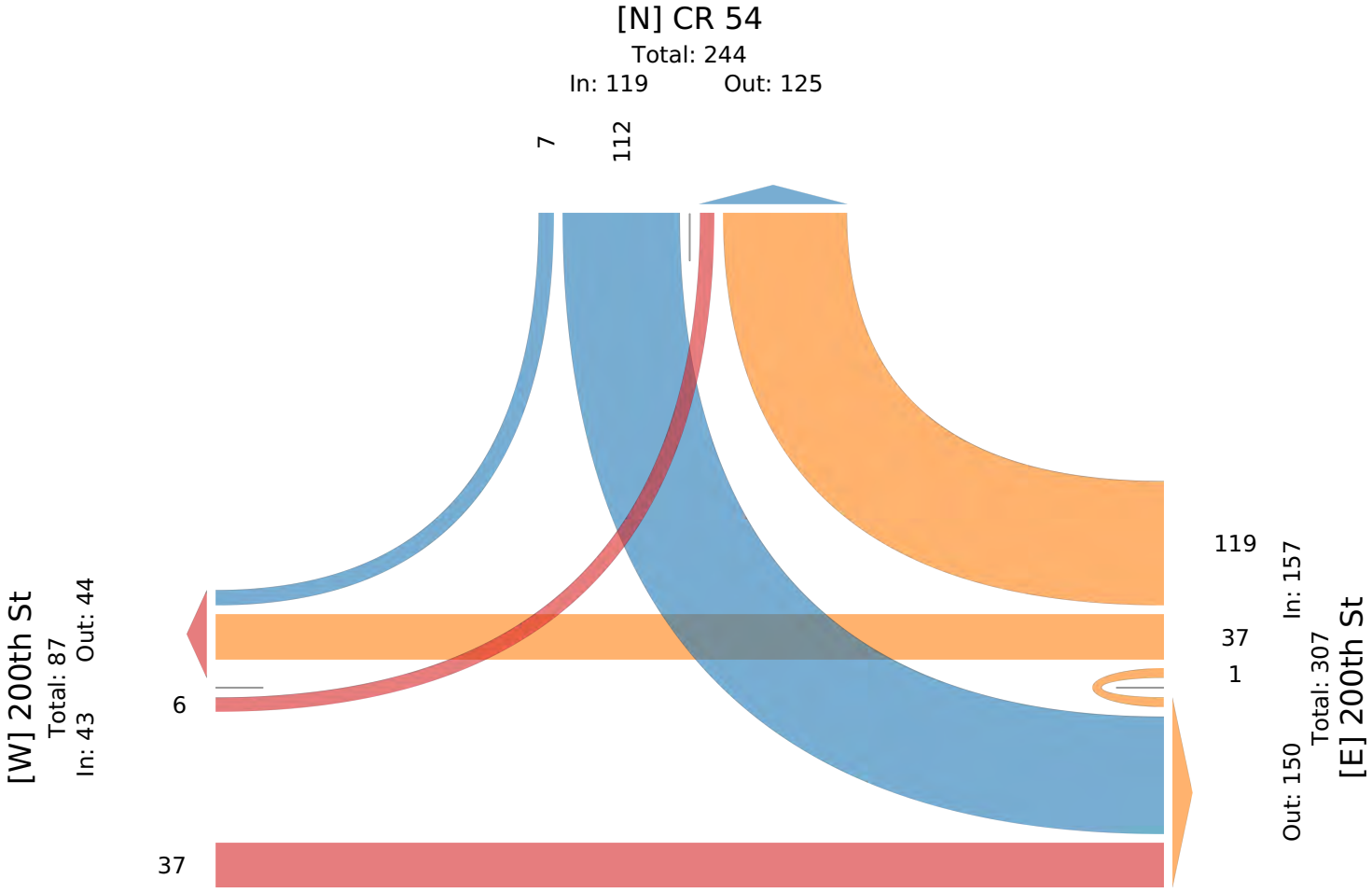
Provided by: Kimley-Horn and Associates, Inc.
767 Eustis Street, Suite 100,
Saint Paul, MN, 55114, US

Leg Direction	CR 54 Southbound					200th St Eastbound					200th St Westbound					
Time	L	R	U	**App**	Ped*	L	T	U	**App**	Ped*	T	R	U	**App**	Ped*	**Int**
2024-05-07 12:30PM	30	1	0	**31**	0	1	10	0	**11**	0	7	30	0	**37**	0	**79**
12:45PM	27	1	0	**28**	0	2	14	0	**16**	0	12	28	0	**40**	0	**84**
1:00PM	26	3	0	**29**	0	2	5	0	**7**	0	9	30	0	**39**	0	**75**
1:15PM	29	2	0	**31**	0	1	8	0	**9**	0	9	31	1	**41**	0	**81**
Total	112	7	0	**119**	0	6	37	0	**43**	0	37	119	1	**157**	0	**319**
% Approach	94.1%	5.9%	0%	**-**	-	14.0%	86.0%	0%	**-**	-	23.6%	75.8%	0.6%	**-**	-	**-**
% Total	35.1%	2.2%	0%	**37.3%**	-	1.9%	11.6%	0%	**13.5%**	-	11.6%	37.3%	0.3%	**49.2%**	-	**-**
PHF	0.933	0.583	-	**0.960**	-	0.750	0.661	-	**0.672**	-	0.771	0.960	0.250	**0.957**	-	0.949
Lights	112	7	0	**119**	-	6	37	0	**43**	-	34	118	1	**153**	-	315
% Lights	100%	100%	0%	**100%**	-	100%	100%	0%	**100%**	-	91.9%	99.2%	100%	**97.5%**	-	98.7%
Articulated Trucks and Single-Unit Trucks	0	0	0	**0**	-	0	0	0	**0**	-	3	1	0	**4**	-	4
% Articulated Trucks and Single-Unit Trucks	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	8.1%	0.8%	0%	**2.5%**	-	1.3%
Buses	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Buses	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Bicycles on Road	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

CR 54 & 200th St E - TMC
Tue May 7, 2024
Midday Peak (12:30 PM - 1:30 PM)
All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 1183709, Location: 44.663534, -92.739718

Provided by: Kimley-Horn and Associates, Inc.
767 Eustis Street, Suite 100,
Saint Paul, MN, 55114, US



CR 54 & 200th St E - TMC

Tue May 7, 2024
PM Peak (5 PM - 6 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 1183709, Location: 44.663534, -92.739718

Provided by: Kimley-Horn and Associates, Inc.
767 Eustis Street, Suite 100,
Saint Paul, MN, 55114, US

Leg Direction	CR 54 Southbound					200th St Eastbound					200th St Westbound					
Time	L	R	U	**App**	Ped*	L	T	U	**App**	Ped*	T	R	U	**App**	Ped*	**Int**
2024-05-07 5:00PM	38	3	0	**41**	0	2	18	0	**20**	0	13	45	0	**58**	0	**119**
5:15PM	42	4	0	**46**	0	2	19	0	**21**	0	16	43	0	**59**	0	**126**
5:30PM	33	6	0	**39**	0	2	9	0	**11**	0	15	34	0	**49**	0	**99**
5:45PM	30	2	0	**32**	0	1	7	0	**8**	0	19	37	0	**56**	0	**96**
Total	143	15	0	**158**	0	7	53	0	**60**	0	63	159	0	**222**	0	**440**
% Approach	90.5%	9.5%	0%	**-**	-	11.7%	88.3%	0%	**-**	-	28.4%	71.6%	0%	**-**	-	**-**
% Total	32.5%	3.4%	0%	**35.9%**	-	1.6%	12.0%	0%	**13.6%**	-	14.3%	36.1%	0%	**50.5%**	-	**-**
PHF	0.851	0.625	-	**0.859**	-	0.875	0.697	-	**0.714**	-	0.829	0.883	-	**0.941**	-	0.873
Lights	143	15	0	**158**	-	7	53	0	**60**	-	63	159	0	**222**	-	440
% Lights	100%	100%	0%	**100%**	-	100%	100%	0%	**100%**	-	100%	100%	0%	**100%**	-	100%
Articulated Trucks and Single-Unit Trucks	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Articulated Trucks and Single-Unit Trucks	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Buses	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Buses	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Bicycles on Road	0	0	0	**0**	-	0	0	0	**0**	-	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

CR 54 & 200th St E - TMC
Tue May 7, 2024
PM Peak (5 PM - 6 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks and Single-Unit Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)
All Movements
ID: 1183709, Location: 44.663534, -92.739718

Provided by: Kimley-Horn and Associates, Inc.
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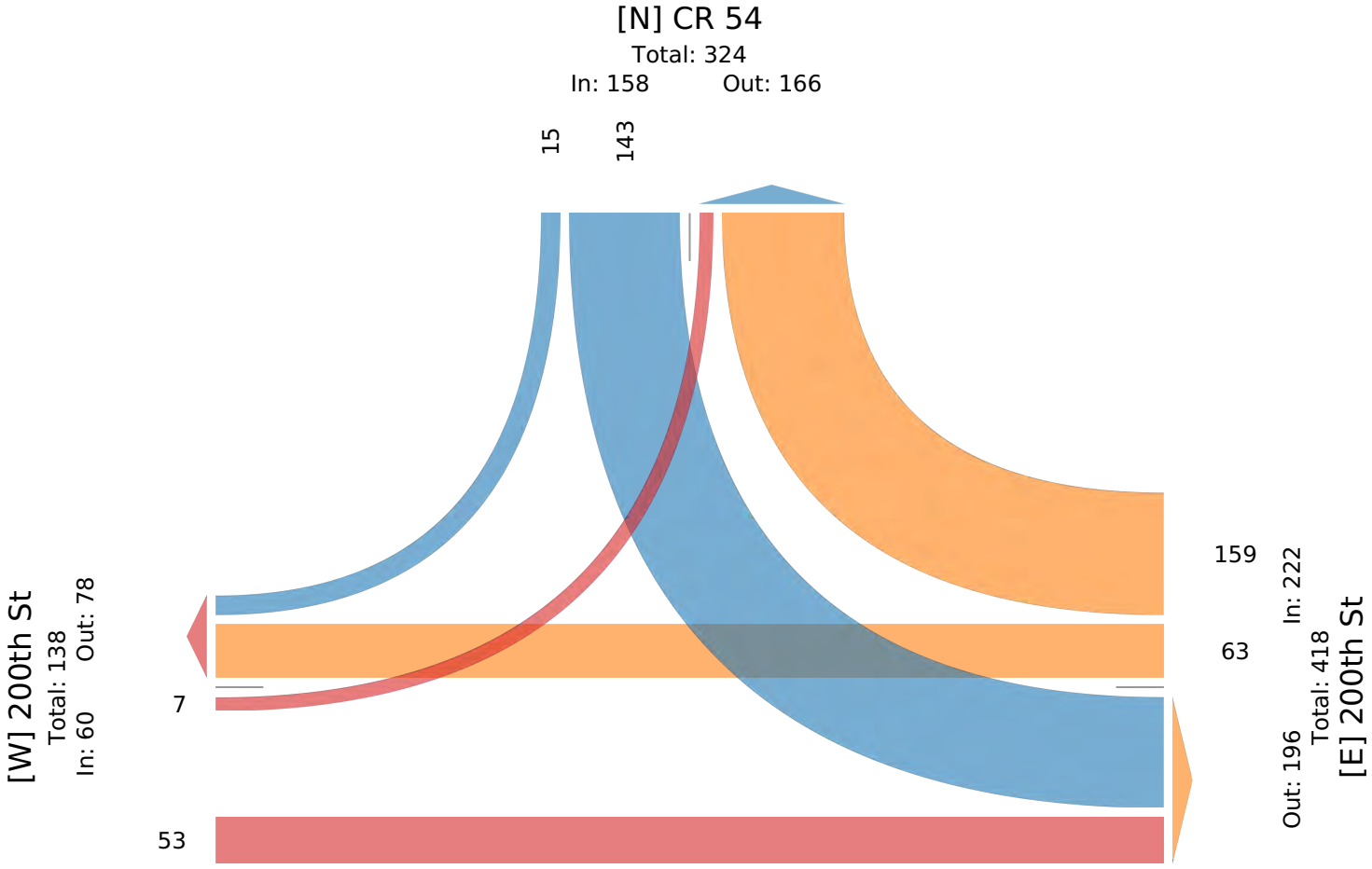


Appendix C: Warrant Analyses

SIGNAL WARRANTS ANALYSIS

Intersection:	CSAH 68 & CSAH 54	Scenario:	Existing Conditions
		Traffic Volumes:	5/7/2024

Kimley»Horn

City:		Population < 10,000?		Intersection Jurisdictions:		Date:	
County:		0.70 Factor Used?	yes			Analyst:	
State:		Existing Signal Justification?					

Approach Description	Direction	Street Name	Lanes	Speed	Right Turn Inclusion?*
Major Approach 1:					
Major Approach 3:					
Minor Approach 2:					
Minor Approach 4:					

** Applied for all warrants.*

HOUR	Traffic Volumes						Peds	Traffic Signal Warrants								All-Way Stop Warrant		HOUR
	Major Appr 1	Major Appr 3	Total 1+3	Minor Appr 2	Minor Appr 4	Higher Volume Minor		70% 1A	70% 1B	56% 1C	60% 1A	60% 1B	70% 4A	70% 4B	56% 7C	70%	80%	
0:00 - 1:00			66			18												0:00 - 1:00
1:00 - 2:00			54			10												1:00 - 2:00
2:00 - 3:00			42			12												2:00 - 3:00
3:00 - 4:00			32			5												3:00 - 4:00
4:00 - 5:00			46			18												4:00 - 5:00
5:00 - 6:00			87			41												5:00 - 6:00
6:00 - 7:00			108			67												6:00 - 7:00
7:00 - 8:00			82			85												7:00 - 8:00
8:00 - 9:00			88			101												8:00 - 9:00
9:00 - 10:00			109			90												9:00 - 10:00
10:00 - 11:00			116			113												10:00 - 11:00
11:00 - 12:00			132			120												11:00 - 12:00
12:00 - 13:00			187			115												12:00 - 13:00
13:00 - 14:00			187			114												13:00 - 14:00
14:00 - 15:00			217			84												14:00 - 15:00
15:00 - 16:00			286			126									X			15:00 - 16:00
16:00 - 17:00			294			116									X			16:00 - 17:00
17:00 - 18:00			282			158									X	X		17:00 - 18:00
18:00 - 19:00			181			122												18:00 - 19:00
19:00 - 20:00			150			86												19:00 - 20:00
20:00 - 21:00			157			74												20:00 - 21:00
21:00 - 22:00			130			64												21:00 - 22:00
22:00 - 23:00			122			25												22:00 - 23:00
23:00 - 24:00			99			33												23:00 - 24:00

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 1a	Eight-Hour (Min. Vehicular Volume)	0	8	Not satisfied
Warrant 1b	Eight-Hour (Interruption of Continuous Traffic)	0	8	Not satisfied
Warract 1c	Eight-Hour (Combination of 1a and 1b)	0	8	Not satisfied
Warrant 1a - 60%	Existing Signal Justification (Warrant 1a)	0	8	Not satisfied
Warrant 1b - 60%	Existing Signal Justification (Warrant 1b)	0	8	Not satisfied
Warrant 2	Four-Hour	0	4	Not satisfied

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 3	Peak Hour	0	1	Not satisfied
Warrant 4a†	Pedestrian Volume (Four-Hour)	0	4	Not satisfied
Warrant 4b†	Pedestrian Volume (Peak Hour)	0	1	Not satisfied
Warrant 7c	Crash Experience (Volume Component)	3	8	Not satisfied
All-Way Stop	All-Way Stop Control/Roundabout	1	8	Not satisfied
All-Way Stop - 80%	All-Way Stop Control/Roundabout (Combination)	0	8	Not satisfied

† Results of Warrant 4 assume that the nearest traffic control signal or stop sign controlling the street that pedestrians desire to cross is more than 300 feet away and that the 15th percentile pedestrian walking speed is not less than 3.5 ft/sec .

SIGNAL WARRANTS ANALYSIS

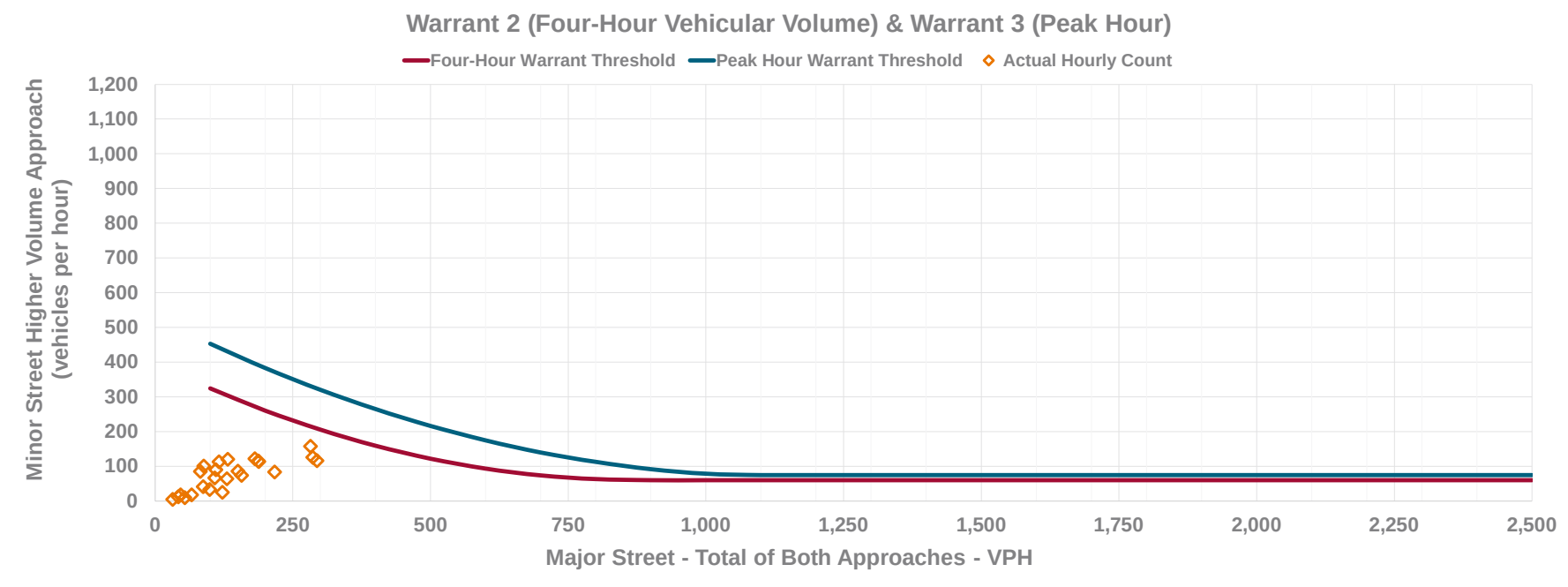
Intersection:	**CSAH 68 & CSAH 54**	**Scenario:**	**Existing Conditions**
		Traffic Volumes:	**5/7/2024**

Kimley»Horn

City:		**Population < 10,000?**	No	**Intersection Jurisdictions:**	**Date:**
County:		**0.70 Factor Used?**	yes		**Analyst:**
State:		**Existing Signal Justification?**			

Approach Description	Direction	Street Name	Lanes	Speed	Right Turn Inclusion?*
Major Approach 1:					
Major Approach 3:					
Minor Approach 2:					
Minor Approach 4:					

** Applied for all warrants.*



Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 1a	Eight-Hour (Min. Vehicular Volume)	0	8	Not satisfied
Warrant 1b	Eight-Hour (Interruption of Continuous Traffic)	0	8	Not satisfied
Warract 1c	Eight-Hour (Combination of 1a and 1b)	0	8	Not satisfied
Warrant 1a - 60%	Existing Signal Justification (Warrant 1a)	0	8	Not satisfied
Warrant 1b - 60%	Existing Signal Justification (Warrant 1b)	0	8	Not satisfied
Warrant 2	Four-Hour	0	4	Not satisfied

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 3	Peak Hour	0	1	Not satisfied
Warrant 4a†	Pedestrian Volume (Four-Hour)	0	4	Not satisfied
Warrant 4b†	Pedestrian Volume (Peak Hour)	0	1	Not satisfied
Warrant 7c	Crash Experience (Traffic Volume)	3	8	Not satisfied
All-Way Stop	All-Way Stop Control/Roundabout	1	8	Not satisfied
All-Way Stop - 80%	All-Way Stop Control/Roundabout (Combination)	0	8	Not satisfied

† Results of Warrant 4 assume that the nearest traffic control signal or stop sign controlling the street that pedestrians desire to cross is more than 300 feet away and that the 15th percentile pedestrian walking speed is not less than 3.5 ft/sec .

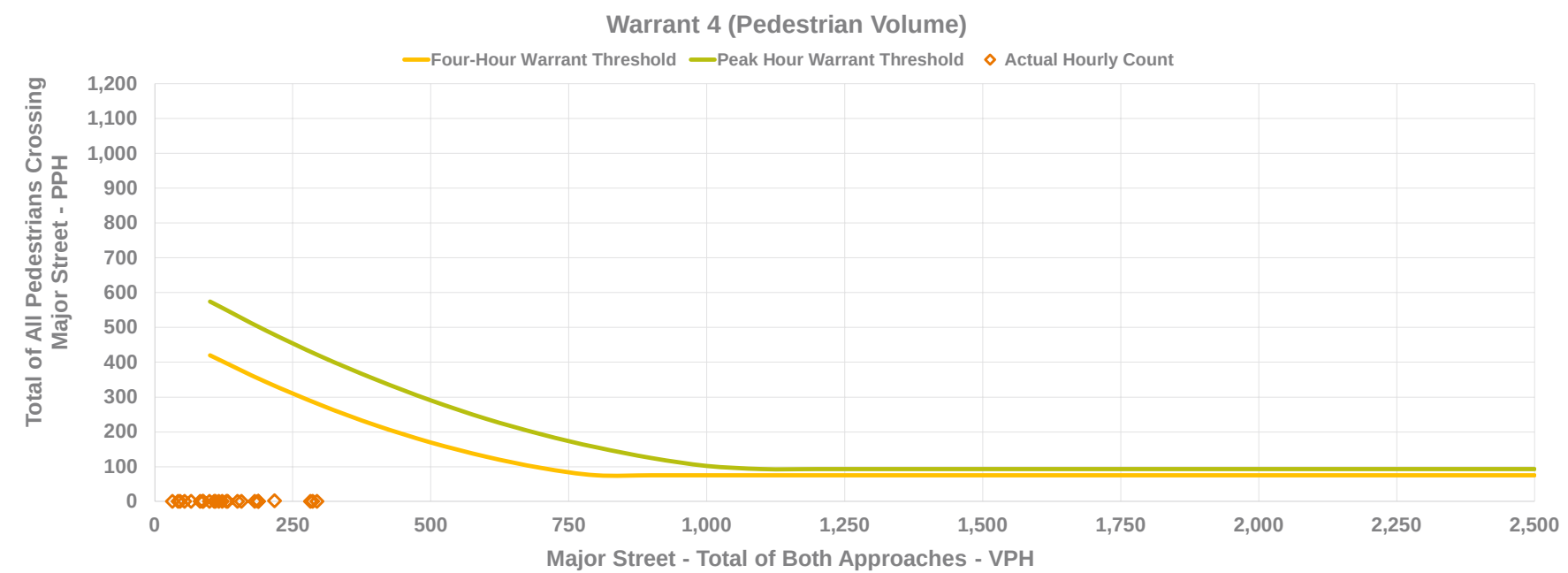
SIGNAL WARRANTS ANALYSIS

Intersection:	CSAH 68 & CSAH 54	Scenario:	Existing Conditions
		Traffic Volumes:	5/7/2024

City:		Population < 10,000?	No	Intersection Jurisdictions:		Date:	
County:		0.70 Factor Used?	yes			Analyst:	
State:		Existing Signal Justification?					

Approach Description	Direction	Street Name	Lanes	Speed	Right Turn Inclusion?*
Major Approach 1:					
Major Approach 3:					
Minor Approach 2:					
Minor Approach 4:					

** Applied for all warrants.*



Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 1a	Eight-Hour (Min. Vehicular Volume)	0	8	Not satisfied
Warrant 1b	Eight-Hour (Interruption of Continuous Traffic)	0	8	Not satisfied
Warract 1c	Eight-Hour (Combination of 1a and 1b)	0	8	Not satisfied
Warrant 1a - 60%	Existing Signal Justification (Warrant 1a)	0	8	Not satisfied
Warrant 1b - 60%	Existing Signal Justification (Warrant 1b)	0	8	Not satisfied
Warrant 2	Four-Hour	0	4	Not satisfied

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 3	Peak Hour	0	1	Not satisfied
Warrant 4a†	Pedestrian Volume (Four-Hour)	0	4	Not satisfied
Warrant 4b†	Pedestrian Volume (Peak Hour)	0	1	Not satisfied
Warrant 7c	Crash Experience (Traffic Volume)	3	8	Not satisfied
All-Way Stop	All-Way Stop Control/Roundabout	1	8	Not satisfied
All-Way Stop - 80%	All-Way Stop Control/Roundabout (Combination)	0	8	Not satisfied

† Results of Warrant 4 assume that the nearest traffic control signal or stop sign controlling the street that pedestrians desire to cross is more than 300 feet away and that the 15th percentile pedestrian walking speed is not less than 3.5 ft/sec .

SIGNAL WARRANTS ANALYSIS

Intersection:	CSAH 68 & CSAH 54	Scenario:	Opening Year (2028) Conditions
		Traffic Volumes:	5/7/2024

Kimley»Horn

City:		Population < 10,000?		Intersection Jurisdictions:	Date:	
County:		0.70 Factor Used?	yes		Analyst:	
State:		Existing Signal Justification?				

Approach Description	Direction	Street Name	Lanes	Speed	Right Turn Inclusion?*
Major Approach 1:					
Major Approach 3:					
Minor Approach 2:					
Minor Approach 4:					

** Applied for all warrants.*

HOUR	Traffic Volumes						Peds	Traffic Signal Warrants								All-Way Stop Warrant		HOUR
	Major Appr 1	Major Appr 3	Total 1+3	Minor Appr 2	Minor Appr 4	Higher Volume Minor		70% 1A	70% 1B	56% 1C	60% 1A	60% 1B	70% 4A	70% 4B	56% 7C	70%	80%	
0:00 - 1:00			66			18												0:00 - 1:00
1:00 - 2:00			54			10												1:00 - 2:00
2:00 - 3:00			42			12												2:00 - 3:00
3:00 - 4:00			32			5												3:00 - 4:00
4:00 - 5:00			46			18												4:00 - 5:00
5:00 - 6:00			88			42												5:00 - 6:00
6:00 - 7:00			108			68												6:00 - 7:00
7:00 - 8:00			82			88												7:00 - 8:00
8:00 - 9:00			88			105												8:00 - 9:00
9:00 - 10:00			109			92												9:00 - 10:00
10:00 - 11:00			116			117												10:00 - 11:00
11:00 - 12:00			133			124												11:00 - 12:00
12:00 - 13:00			191			119												12:00 - 13:00
13:00 - 14:00			191			118												13:00 - 14:00
14:00 - 15:00			220			87												14:00 - 15:00
15:00 - 16:00			295			130									X			15:00 - 16:00
16:00 - 17:00			301			120									X			16:00 - 17:00
17:00 - 18:00			289			162									X	X	X	17:00 - 18:00
18:00 - 19:00			185			126												18:00 - 19:00
19:00 - 20:00			153			89												19:00 - 20:00
20:00 - 21:00			161			75												20:00 - 21:00
21:00 - 22:00			132			65												21:00 - 22:00
22:00 - 23:00			123			25												22:00 - 23:00
23:00 - 24:00			99			33												23:00 - 24:00

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 1a	Eight-Hour (Min. Vehicular Volume)	0	8	Not satisfied
Warrant 1b	Eight-Hour (Interruption of Continuous Traffic)	0	8	Not satisfied
Warract 1c	Eight-Hour (Combination of 1a and 1b)	0	8	Not satisfied
Warrant 1a - 60%	Existing Signal Justification (Warrant 1a)	0	8	Not satisfied
Warrant 1b - 60%	Existing Signal Justification (Warrant 1b)	0	8	Not satisfied
Warrant 2	Four-Hour	0	4	Not satisfied

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 3	Peak Hour	0	1	Not satisfied
Warrant 4a†	Pedestrian Volume (Four-Hour)	0	4	Not satisfied
Warrant 4b†	Pedestrian Volume (Peak Hour)	0	1	Not satisfied
Warrant 7c	Crash Experience (Volume Component)	3	8	Not satisfied
All-Way Stop	All-Way Stop Control/Roundabout	1	8	Not satisfied
All-Way Stop - 80%	All-Way Stop Control/Roundabout (Combination)	1	8	Not satisfied

† Results of Warrant 4 assume that the nearest traffic control signal or stop sign controlling the street that pedestrians desire to cross is more than 300 feet away and that the 15th percentile pedestrian walking speed is not less than 3.5 ft/sec .

SIGNAL WARRANTS ANALYSIS

Intersection:	**CSAH 68 & CSAH 54**	**Scenario:**	**Opening Year (2028) Conditions**
		Traffic Volumes:	**5/7/2024**

Kimley»Horn

City:	
County:	
State:	

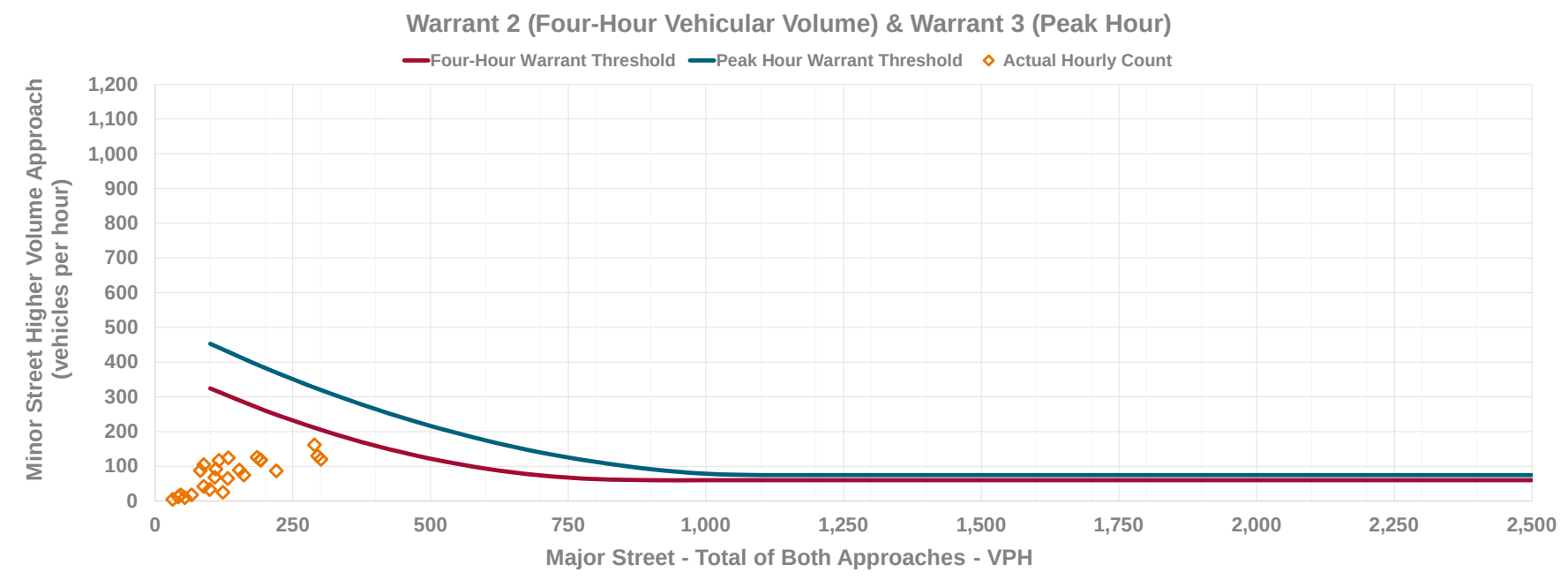
Population < 10,000?	No
0.70 Factor Used?	yes
Existing Signal Justification?	

Intersection Jurisdictions:

Date:	
Analyst:	

Approach Description	Direction	Street Name	Lanes	Speed	Right Turn Inclusion?*
Major Approach 1:					
Major Approach 3:					
Minor Approach 2:					
Minor Approach 4:					

** Applied for all warrants.*



Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 1a	Eight-Hour (Min. Vehicular Volume)	0	8	Not satisfied
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Warrant 1a - 60%	Existing Signal Justification (Warrant 1a)	0	8	Not satisfied
Warrant 1b - 60%	Existing Signal Justification (Warrant 1b)	0	8	Not satisfied
Warrant 2	Four-Hour	0	4	Not satisfied

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 3	Peak Hour	0	1	Not satisfied
Warrant 4a†	Pedestrian Volume (Four-Hour)	0	4	Not satisfied
Warrant 4b†	Pedestrian Volume (Peak Hour)	0	1	Not satisfied
Warrant 7c	Crash Experience (Traffic Volume)	3	8	Not satisfied
All-Way Stop	All-Way Stop Control/Roundabout	1	8	Not satisfied
All-Way Stop - 80%	All-Way Stop Control/Roundabout (Combination)	1	8	Not satisfied

† Results of Warrant 4 assume that the nearest traffic control signal or stop sign controlling the street that pedestrians desire to cross is more than 300 feet away and that the 15th percentile pedestrian walking speed is not less than 3.5 ft/sec .

SIGNAL WARRANTS ANALYSIS

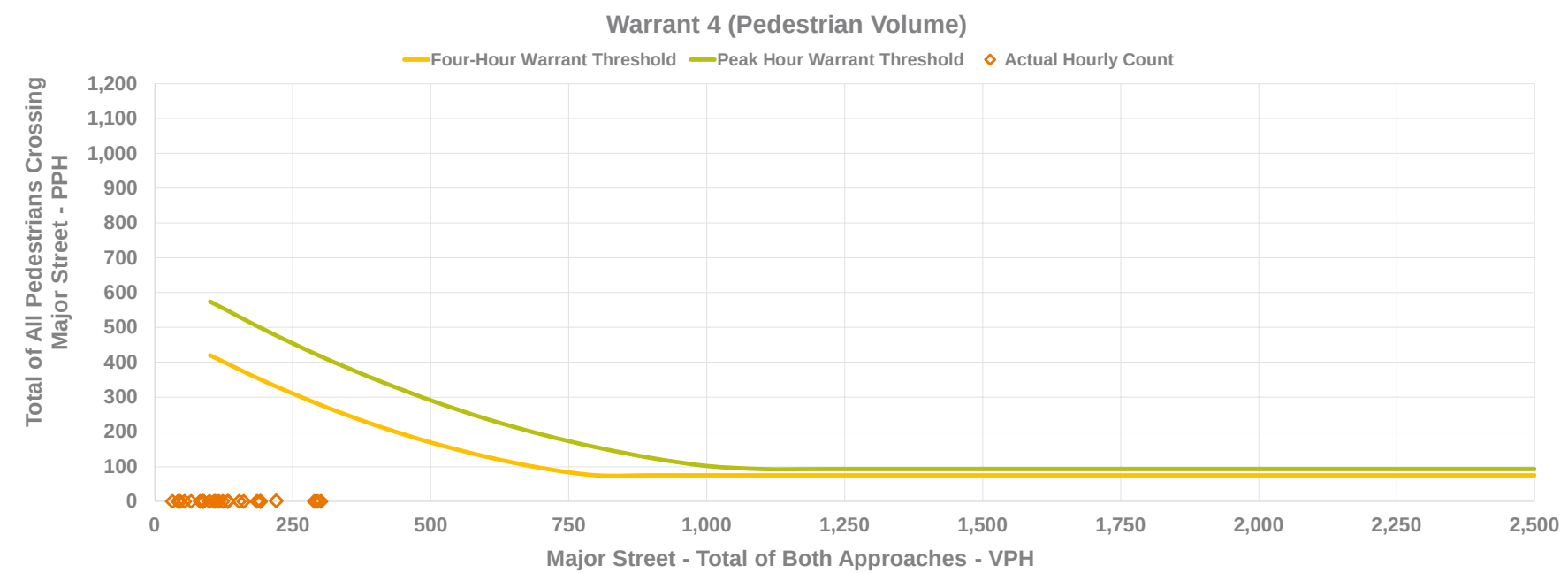
Intersection:	**CSAH 68 & CSAH 54**	**Scenario:**	**Opening Year (2028) Conditions**
		Traffic Volumes:	**5/7/2024**

Kimley»Horn

City:		**Population < 10,000?**	No	**Intersection Jurisdictions:**	**Date:**
County:		**0.70 Factor Used?**	yes		**Analyst:**
State:		**Existing Signal Justification?**			

Approach Description	Direction	Street Name	Lanes	Speed	Right Turn Inclusion?*
Major Approach 1:					
Major Approach 3:					
Minor Approach 2:					
Minor Approach 4:					

** Applied for all warrants.*



Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 1a	Eight-Hour (Min. Vehicular Volume)	0	8	Not satisfied
Warrant 1b	Eight-Hour (Interruption of Continuous Traffic)	0	8	Not satisfied
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Warrant 1b - 60%	Existing Signal Justification (Warrant 1b)	0	8	Not satisfied
Warrant 2	Four-Hour	0	4	Not satisfied

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 3	Peak Hour	0	1	Not satisfied
Warrant 4a†	Pedestrian Volume (Four-Hour)	0	4	Not satisfied
Warrant 4b†	Pedestrian Volume (Peak Hour)	0	1	Not satisfied
Warrant 7c	Crash Experience (Traffic Volume)	3	8	Not satisfied
All-Way Stop	All-Way Stop Control/Roundabout	1	8	Not satisfied
All-Way Stop - 80%	All-Way Stop Control/Roundabout (Combination)	1	8	Not satisfied

† Results of Warrant 4 assume that the nearest traffic control signal or stop sign controlling the street that pedestrians desire to cross is more than 300 feet away and that the 15th percentile pedestrian walking speed is not less than 3.5 ft/sec .

SIGNAL WARRANTS ANALYSIS

Intersection:	CSAH 68 & CSAH 54	Scenario:	Future Year (2048) Conditions
		Traffic Volumes:	5/7/2024

Kimley»Horn

City:		Population < 10,000?		Intersection Jurisdictions:		Date:	
County:		0.70 Factor Used?	yes			Analyst:	
State:		Existing Signal Justification?					

Approach Description	Direction	Street Name	Lanes	Speed	Right Turn Inclusion?*
Major Approach 1:					
Major Approach 3:					
Minor Approach 2:					
Minor Approach 4:					

** Applied for all warrants.*

HOUR	Traffic Volumes						Peds	Traffic Signal Warrants								All-Way Stop Warrant		HOUR
	Major Appr 1	Major Appr 3	Total 1+3	Minor Appr 2	Minor Appr 4	Higher Volume Minor		70%		56%	60%		70%		56%			
								1A	1B	1C	1A	1B	4A	4B	7C	70%	80%	
0:00 - 1:00			77			21												0:00 - 1:00
1:00 - 2:00			64			12												1:00 - 2:00
2:00 - 3:00			51			14												2:00 - 3:00
3:00 - 4:00			36			6												3:00 - 4:00
4:00 - 5:00			55			20												4:00 - 5:00
5:00 - 6:00			104			48												5:00 - 6:00
6:00 - 7:00			128			79												6:00 - 7:00
7:00 - 8:00			97			100												7:00 - 8:00
8:00 - 9:00			102			118												8:00 - 9:00
9:00 - 10:00			130			105												9:00 - 10:00
10:00 - 11:00			135			133												10:00 - 11:00
11:00 - 12:00			155			142												11:00 - 12:00
12:00 - 13:00			219			135												12:00 - 13:00
13:00 - 14:00			223			135												13:00 - 14:00
14:00 - 15:00			254			99												14:00 - 15:00
15:00 - 16:00			339			149									X	X		15:00 - 16:00
16:00 - 17:00			349			137									X			16:00 - 17:00
17:00 - 18:00			331			187									X	X	X	17:00 - 18:00
18:00 - 19:00			213			145										X		18:00 - 19:00
19:00 - 20:00			177			102												19:00 - 20:00
20:00 - 21:00			185			88												20:00 - 21:00
21:00 - 22:00			152			75												21:00 - 22:00
22:00 - 23:00			144			29												22:00 - 23:00
23:00 - 24:00			116			39												23:00 - 24:00

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 1a	Eight-Hour (Min. Vehicular Volume)	0	8	Not satisfied
Warrant 1b	Eight-Hour (Interruption of Continuous Traffic)	0	8	Not satisfied
Warract 1c	Eight-Hour (Combination of 1a and 1b)	0	8	Not satisfied
Warrant 1a - 60%	Existing Signal Justification (Warrant 1a)	0	8	Not satisfied
Warrant 1b - 60%	Existing Signal Justification (Warrant 1b)	0	8	Not satisfied
Warrant 2	Four-Hour	0	4	Not satisfied

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 3	Peak Hour	0	1	Not satisfied
Warrant 4a†	Pedestrian Volume (Four-Hour)	0	4	Not satisfied
Warrant 4b†	Pedestrian Volume (Peak Hour)	0	1	Not satisfied
Warrant 7c	Crash Experience (Volume Component)	3	8	Not satisfied
All-Way Stop	All-Way Stop Control/Roundabout	3	8	Not satisfied
All-Way Stop - 80%	All-Way Stop Control/Roundabout (Combination)	1	8	Not satisfied

† Results of Warrant 4 assume that the nearest traffic control signal or stop sign controlling the street that pedestrians desire to cross is more than 300 feet away and that the 15th percentile pedestrian walking speed is not less than 3.5 ft/sec .

SIGNAL WARRANTS ANALYSIS

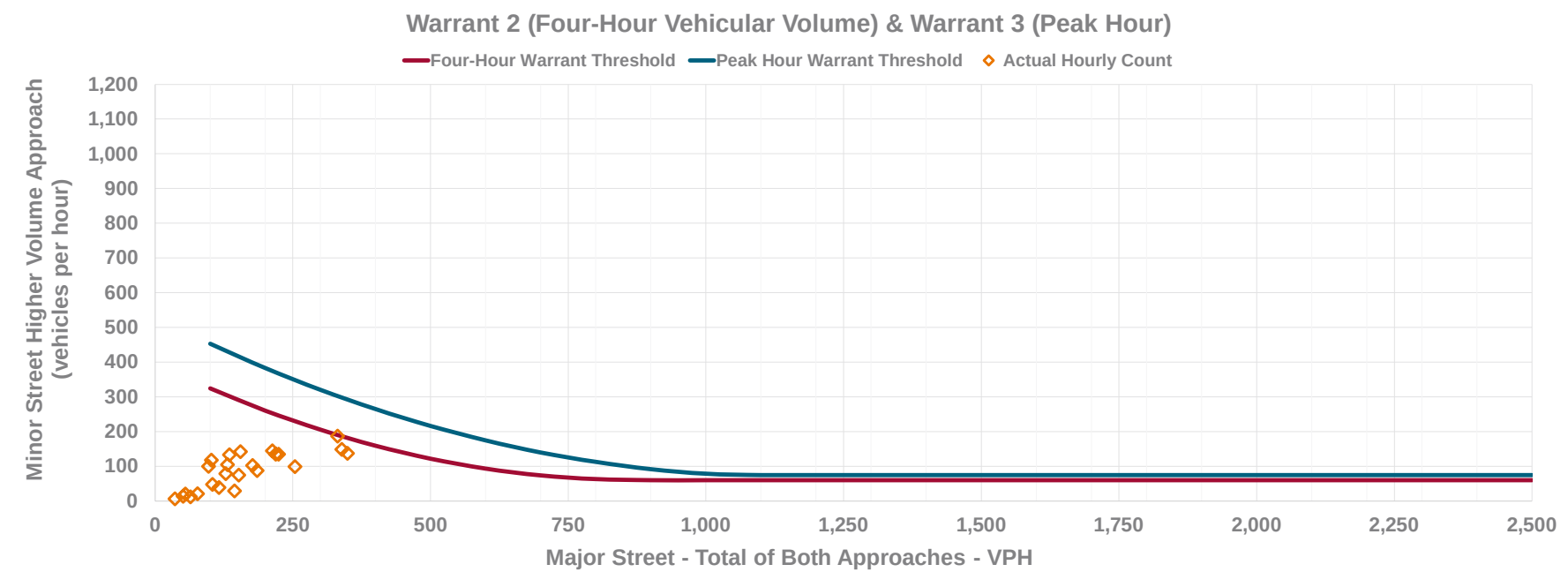
Intersection:	CSAH 68 & CSAH 54	Scenario:	Future Year (2048) Conditions
		Traffic Volumes:	5/7/2024

Kimley»Horn

City:		Population < 10,000?	No	Intersection Jurisdictions:	Date:
County:		0.70 Factor Used?	yes		Analyst:
State:		Existing Signal Justification?			

Approach Description	Direction	Street Name	Lanes	Speed	Right Turn Inclusion?*
Major Approach 1:					
Major Approach 3:					
Minor Approach 2:					
Minor Approach 4:					

** Applied for all warrants.*



Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 1a	Eight-Hour (Min. Vehicular Volume)	0	8	Not satisfied
Warrant 1b	Eight-Hour (Interruption of Continuous Traffic)	0	8	Not satisfied
Warract 1c	Eight-Hour (Combination of 1a and 1b)	0	8	Not satisfied
Warrant 1a - 60%	Existing Signal Justification (Warrant 1a)	0	8	Not satisfied
Warrant 1b - 60%	Existing Signal Justification (Warrant 1b)	0	8	Not satisfied
Warrant 2	Four-Hour	0	4	Not satisfied

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 3	Peak Hour	0	1	Not satisfied
Warrant 4a†	Pedestrian Volume (Four-Hour)	0	4	Not satisfied
Warrant 4b†	Pedestrian Volume (Peak Hour)	0	1	Not satisfied
Warrant 7c	Crash Experience (Traffic Volume)	3	8	Not satisfied
All-Way Stop	All-Way Stop Control/Roundabout	3	8	Not satisfied
All-Way Stop - 80%	All-Way Stop Control/Roundabout (Combination)	1	8	Not satisfied

† Results of Warrant 4 assume that the nearest traffic control signal or stop sign controlling the street that pedestrians desire to cross is more than 300 feet away and that the 15th percentile pedestrian walking speed is not less than 3.5 ft/sec .

SIGNAL WARRANTS ANALYSIS

Intersection:	**CSAH 68 & CSAH 54**	**Scenario:**	**Future Year (2048) Conditions**
		Traffic Volumes:	**5/7/2024**

Kimley»Horn

City:	
County:	
State:	

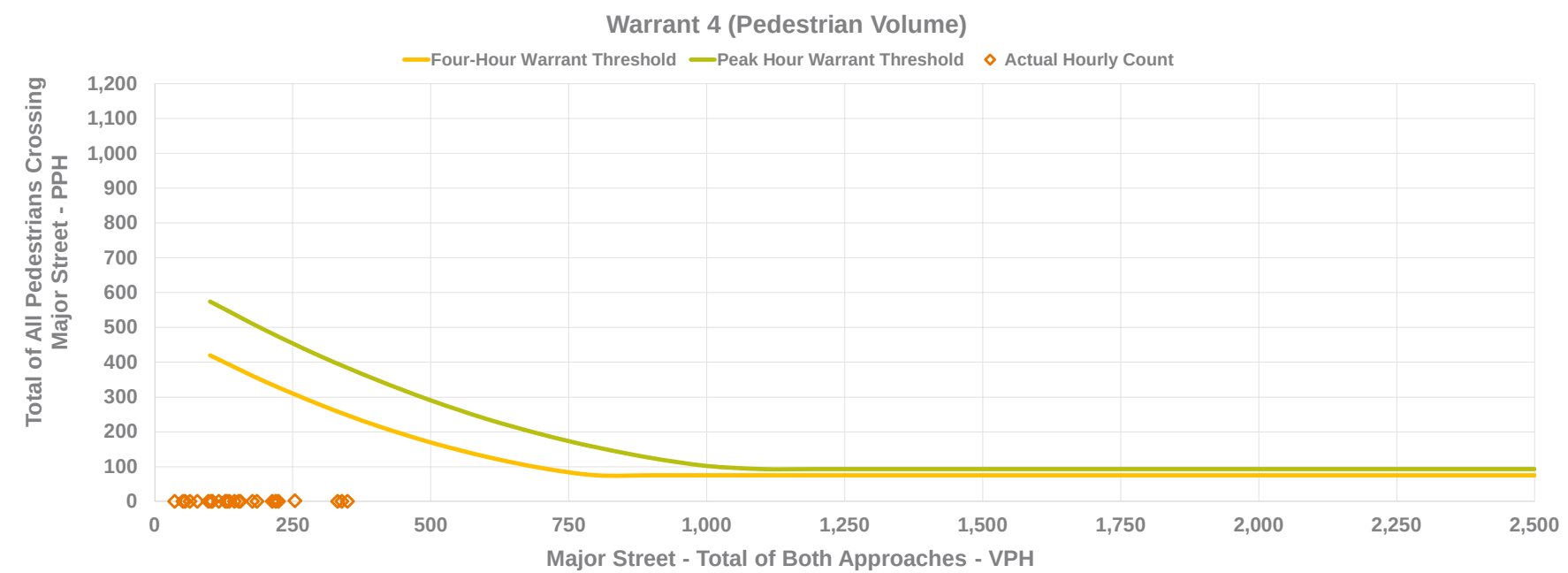
Population < 10,000?	No
0.70 Factor Used?	yes
Existing Signal Justification?	

Intersection Jurisdictions:

Date:	
Analyst:	

Approach Description	Direction	Street Name	Lanes	Speed	Right Turn Inclusion?*
Major Approach 1:					
Major Approach 3:					
Minor Approach 2:					
Minor Approach 4:					

** Applied for all warrants.*



Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 1a	Eight-Hour (Min. Vehicular Volume)	0	8	Not satisfied
Warrant 1b	Eight-Hour (Interruption of Continuous Traffic)	0	8	Not satisfied
Warract 1c	Eight-Hour (Combination of 1a and 1b)	0	8	Not satisfied
Warrant 1a - 60%	Existing Signal Justification (Warrant 1a)	0	8	Not satisfied
Warrant 1b - 60%	Existing Signal Justification (Warrant 1b)	0	8	Not satisfied
Warrant 2	Four-Hour	0	4	Not satisfied

Warrant	Description	Hours Met	Hours Required	Satisfied/ Not Satisfied
Warrant 3	Peak Hour	0	1	Not satisfied
Warrant 4a†	Pedestrian Volume (Four-Hour)	0	4	Not satisfied
Warrant 4b†	Pedestrian Volume (Peak Hour)	0	1	Not satisfied
Warrant 7c	Crash Experience (Traffic Volume)	3	8	Not satisfied
All-Way Stop	All-Way Stop Control/Roundabout	3	8	Not satisfied
All-Way Stop - 80%	All-Way Stop Control/Roundabout (Combination)	1	8	Not satisfied

† Results of Warrant 4 assume that the nearest traffic control signal or stop sign controlling the street that pedestrians desire to cross is more than 300 feet away and that the 15th percentile pedestrian walking speed is not less than 3.5 ft/sec .

Appendix D: Existing (2024) Conditions SimTraffic Reports

8: CSAH 68 & CSAH 54 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	2.7	0.0	0.0	0.0	0.5
Total Del/Veh (s)	0.7	2.0	1.6	0.1	7.5	3.0	5.6	4.6

Total Zone Performance

Denied Del/Veh (s)	1.2
Total Del/Veh (s)	90.7

Intersection: 8: CSAH 68 & CSAH 54

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	18	80
Average Queue (ft)	1	35
95th Queue (ft)	8	64
Link Distance (ft)	2890	4070
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 0

8: CSAH 68 & CSAH 54 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.4	2.4	0.0	0.0	0.9
Total Del/Veh (s)	1.2	2.5	2.5	0.6	11.3	10.9	5.2

Total Zone Performance

Denied Del/Veh (s)	1.4
Total Del/Veh (s)	375.9

Intersection: 8: CSAH 68 & CSAH 54

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	27	114
Average Queue (ft)	1	52
95th Queue (ft)	11	93
Link Distance (ft)	2890	4070
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 0

Appendix E: Opening Year (2028) Conditions SimTraffic Reports

8: CSAH 68 & CSAH 54 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.2	2.6	0.0	0.0	0.0	0.5
Total Del/Veh (s)	0.5	2.0	1.9	0.1	7.9	1.9	5.6	4.6

Total Zone Performance

Denied Del/Veh (s)	1.0
Total Del/Veh (s)	132.5

Intersection: 8: CSAH 68 & CSAH 54

Movement	SB
Directions Served	LR
Maximum Queue (ft)	73
Average Queue (ft)	34
95th Queue (ft)	63
Link Distance (ft)	4070
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 0

8: CSAH 68 & CSAH 54 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.4	2.4	0.0	0.0	0.9
Total Del/Veh (s)	1.2	2.5	2.4	0.9	11.2	9.6	5.2

Total Zone Performance

Denied Del/Veh (s)	1.4
Total Del/Veh (s)	341.5

Intersection: 8: CSAH 68 & CSAH 54

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	26	124
Average Queue (ft)	2	52
95th Queue (ft)	14	98
Link Distance (ft)	2890	4070
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 0

Appendix F: Opening Year (2028) Conditions RODEL Reports

Scheme Summary

Control Data

Control Data and Model Parameters

CSAH 54	2028 Synthetic Flow Profile (veh)
CSAH 54 & CSAH 68 RAB	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	CSAH 54 SB	0	0	12.00	1	14.00	1	33.00	66.00	30.00
2	CSAH 68 EB	120	0	12.00	1	14.00	1	33.00	66.00	30.00
3	CSAH 68 WB	240	0	12.00	1	14.00	1	33.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	CSAH 54 SB	130.00	16.00	1	14.00	1	12.00	1
2	CSAH 68 EB	130.00	16.00	1	14.00	1	12.00	1
3	CSAH 68 WB	130.00	16.00	1	14.00	1	12.00	1

Operational Results

2028 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	CSAH 54 SB	None	98		14		38	1094		0.0896	
2	CSAH 68 EB	None	36		93		19	1053		0.0342	
3	CSAH 68 WB	None	45		7		122	1098		0.0410	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	CSAH 54 SB	None	3.41		3.41	0.28		A		A
2	CSAH 68 EB	None	3.34		3.34	0.10		A		A
3	CSAH 68 WB	None	3.23		3.23	0.12		A		A

Global Results

Performance and Accidents

2028 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	179		179
Capacity	veh/hr	3245		3245
Average Delay	sec/veh	3.35		3.35
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	0.17		0.17

Scheme Summary

Control Data

Control Data and Model Parameters

CSAH 54	2028 Synthetic Flow Profile (veh)
CSAH 54 & CSAH 68 RAB	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	CSAH 54 SB	0	0	12.00	1	14.00	1	33.00	66.00	30.00
2	CSAH 68 EB	120	0	12.00	1	14.00	1	33.00	66.00	30.00
3	CSAH 68 WB	240	0	12.00	1	14.00	1	33.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	CSAH 54 SB	130.00	16.00	1	14.00	1	12.00	1
2	CSAH 68 EB	130.00	16.00	1	14.00	1	12.00	1
3	CSAH 68 WB	130.00	16.00	1	14.00	1	12.00	1

Operational Results

2028 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	CSAH 54 SB	None	164		56		159	1072		0.1529	
2	CSAH 68 EB	None	74		149		71	1024		0.0723	
3	CSAH 68 WB	None	203		12		211	1095		0.1853	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	CSAH 54 SB	None	3.72		3.72	0.52		A		A
2	CSAH 68 EB	None	3.58		3.58	0.22		A		A
3	CSAH 68 WB	None	3.78		3.78	0.65		A		A

Global Results

Performance and Accidents

2028 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	441		441
Capacity	veh/hr	3192		3192
Average Delay	sec/veh	3.73		3.73
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	0.46		0.46

Appendix G: Future (2048) Conditions SimTraffic Reports

8: CSAH 68 & CSAH 54 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.2	2.7	0.0	0.0	0.0	0.5
Total Del/Veh (s)	0.7	2.0	1.9	0.1	8.9	2.2	7.1	5.2

Total Zone Performance

Denied Del/Veh (s)	1.2
Total Del/Veh (s)	126.5

Intersection: 8: CSAH 68 & CSAH 54

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	10	94
Average Queue (ft)	0	40
95th Queue (ft)	5	74
Link Distance (ft)	2890	4070
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 0

8: CSAH 68 & CSAH 54 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	0.2	0.1	0.4	2.4	0.0	0.0	0.9
Total Del/Veh (s)	1.6	2.5	2.7	0.9	12.6	11.4	5.6

Total Zone Performance

Denied Del/Veh (s)	1.4
Total Del/Veh (s)	490.5

Intersection: 8: CSAH 68 & CSAH 54

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	31	153
Average Queue (ft)	2	58
95th Queue (ft)	15	111
Link Distance (ft)	2890	4070
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 0

Appendix H: Future (2048) Conditions RODEL Reports

Operational Results

2048 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	CSAH 54 SB	None	112		17		43	1093		0.1025	
2	CSAH 68 EB	None	41		106		23	1046		0.0392	
3	CSAH 68 WB	None	52		8		139	1097		0.0474	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	CSAH 54 SB	None	3.44		3.44	0.32		A		A
2	CSAH 68 EB	None	3.37		3.37	0.11		A		A
3	CSAH 68 WB	None	3.24		3.24	0.14		A		A

Global Results

Performance and Accidents

2048 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	205		205
Capacity	veh/hr	3237		3237
Average Delay	sec/veh	3.38		3.38
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	0.19		0.19

Operational Results

2048 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	CSAH 54 SB	None	189		64		183	881		0.2146	
2	CSAH 68 EB	None	85		171		82	825		0.1030	
3	CSAH 68 WB	None	233		14		242	907		0.2570	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	CSAH 54 SB	None	4.84		4.84	0.77		A		A
2	CSAH 68 EB	None	4.56		4.56	0.33		A		A
3	CSAH 68 WB	None	4.95		4.95	0.97		A		A

Global Results

Performance and Accidents

2048 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	507		507
Capacity	veh/hr	2612		2612
Average Delay	sec/veh	4.84		4.84
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	0.68		0.68

Appendix I: Historical Crash Data

Intersection Safety Screening

Intersection: CSAH 54 & CSAH 68

Statewide Averages based on 2019-2023 crashes

Crashes by Crash Severity	
Fatal (K)	0
Incapacitating Injury (A)	1
Minor Injury (B)	3
Possible Injury (C)	1
Property Damage (PDO)	3
Total Crashes	8

Intersection Characteristics	
Entering Volume	6,500
Environment	Urban
Lighting	Lit
Traffic Control	Thru-Stop

Annual crash cost = *$614,800*

Statewide comparison = *Thru/STOP, Urban*

Total Crash Rate	
Observed	0.674
Statewide Average	0.145
Critical Rate	0.470
Critical Index	1.43

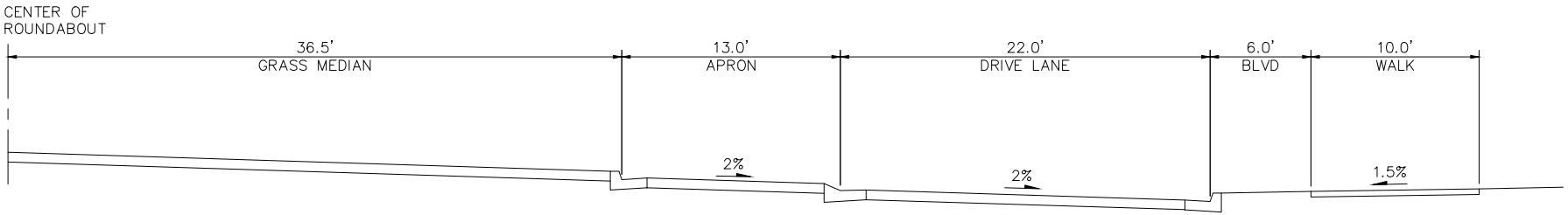
Fatal & Serious Injury Crash Rate	
Observed	8.425
Statewide Average	0.414
Critical Rate	7.020
Critical Index	1.20

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference (i.e. observed crash rate ÷ critical crash rate).

The observed total crash rate for this period is 0.67 per MEV; this is 1.4 times the critical rate. If crashes were reduced by 3 over five years, this intersection would perform within normal range.

The observed fatal and serious injury crash rate for this period is 8.43 per 100 MEV; this is 1.2 times the critical rate. This site may be a sustained severe crash location.

Appendix J: Proposed Typical Section



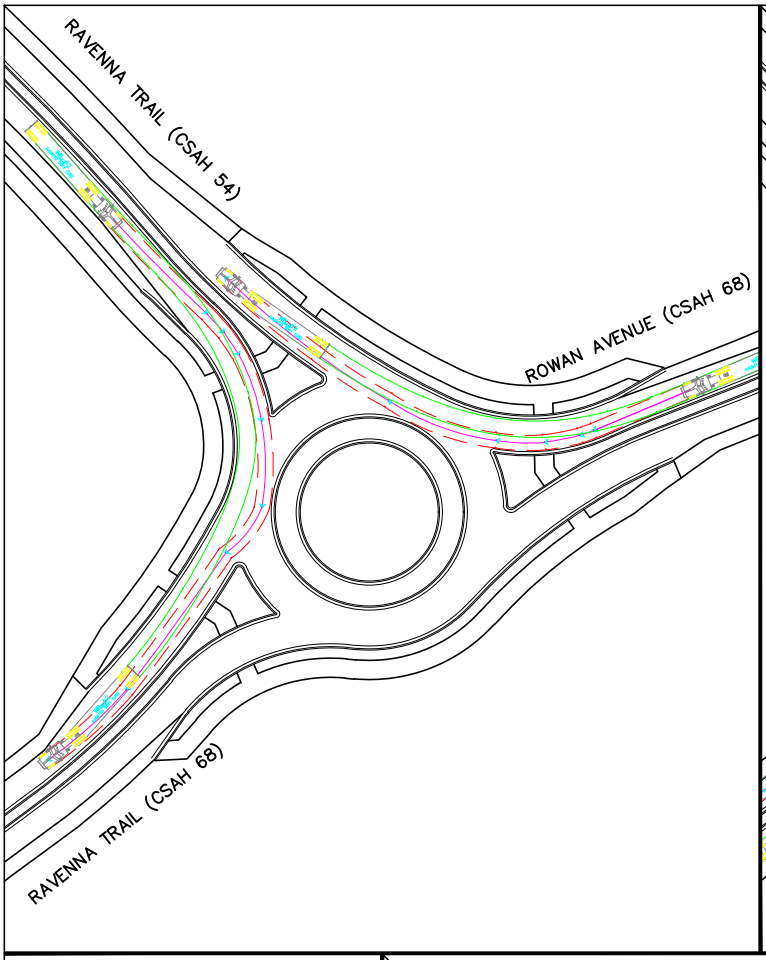
Kimley»Horn

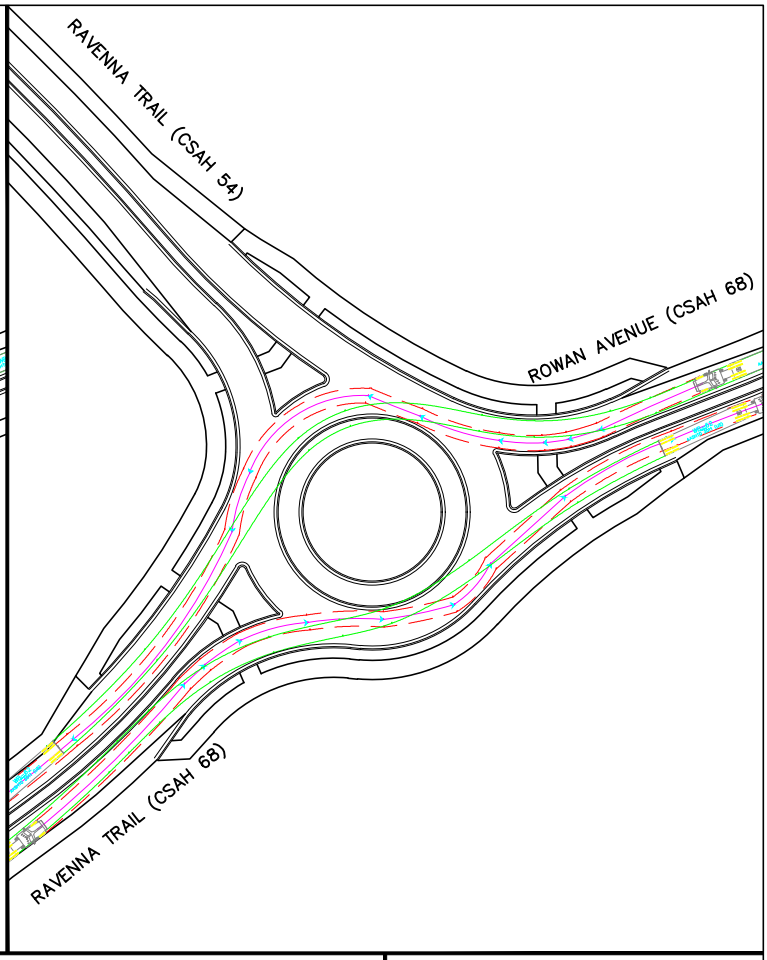
ROUNDABOUT TYPICAL SECTION
CSAH 54 & CSAH 68

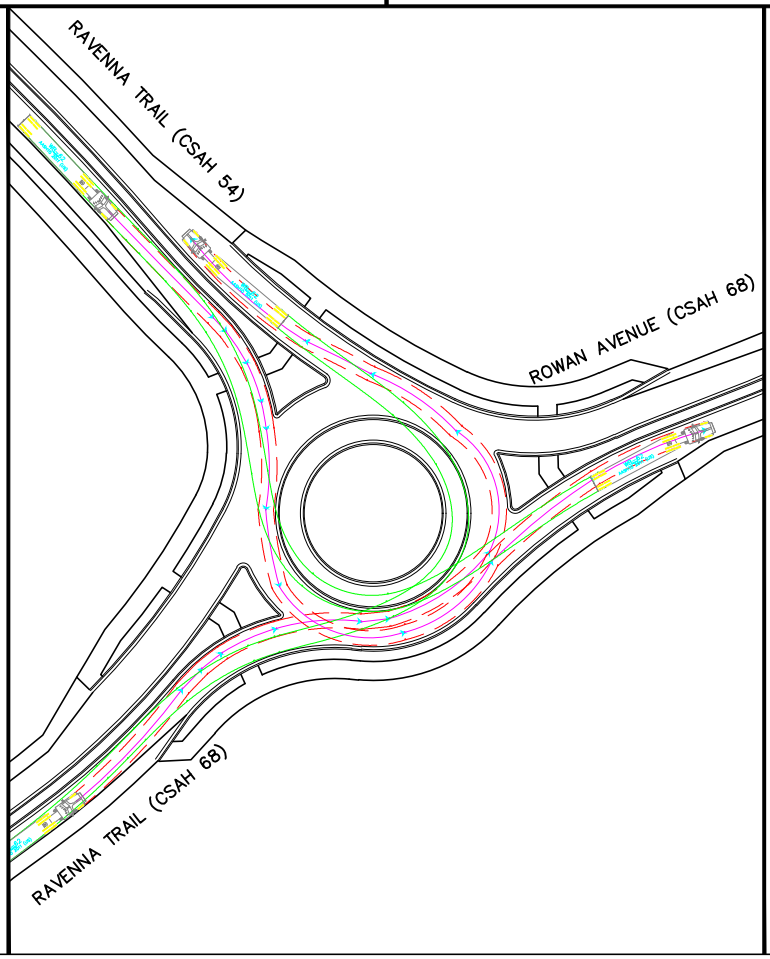
Dakota COUNTY

0 5 10
HORIZONTAL
SCALE IN FEET

Appendix K: Design Vehicle Paths







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Kimley»Horn

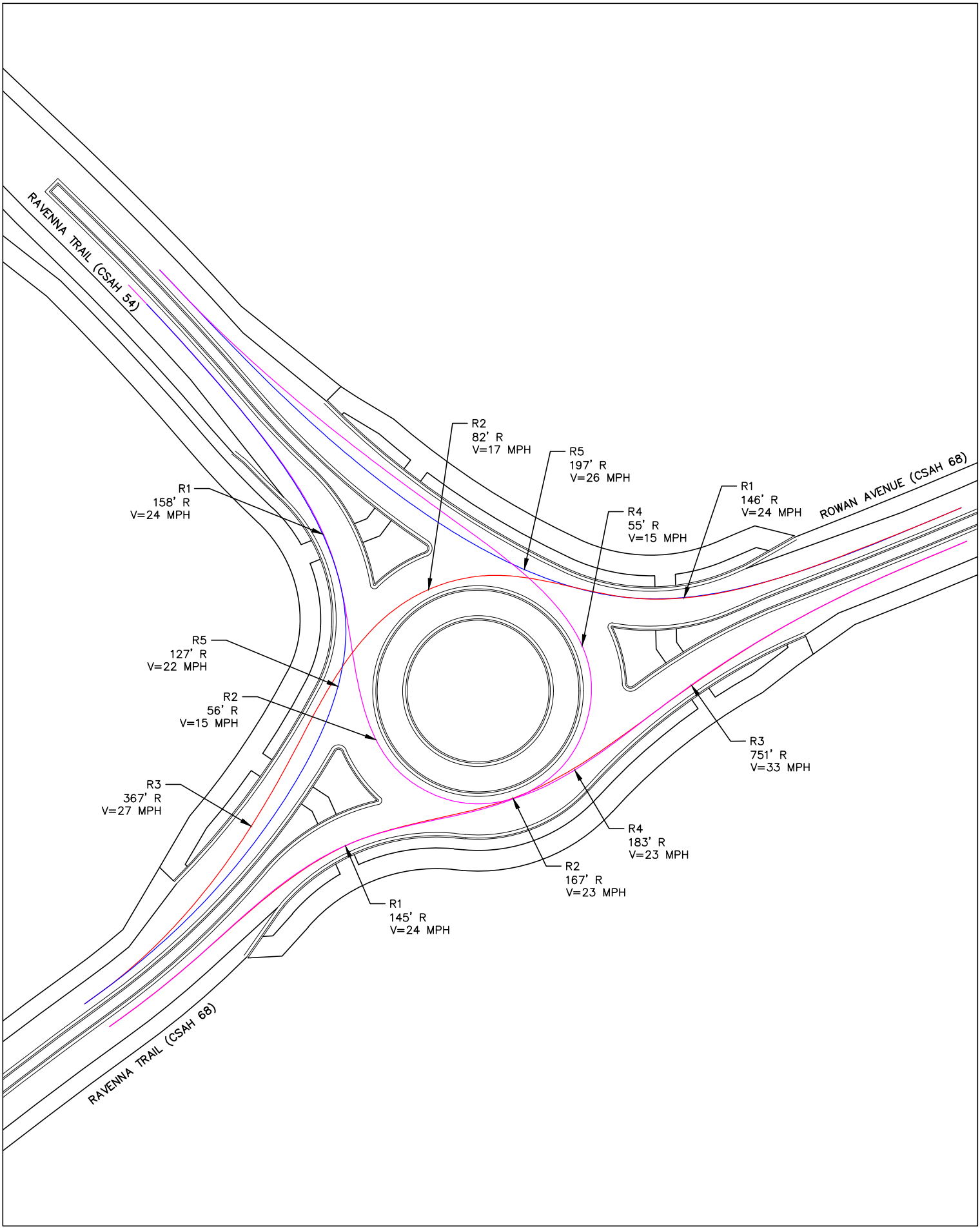
DESIGN VEHICLE PATHS WB-62
CSAH 54 & CSAH 68

Dakota COUNTY

NORTH

0 30 60
HORIZONTAL
SCALE IN FEET

Appendix L: Fastest Path Radii and Speeds



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Kimley»Horn

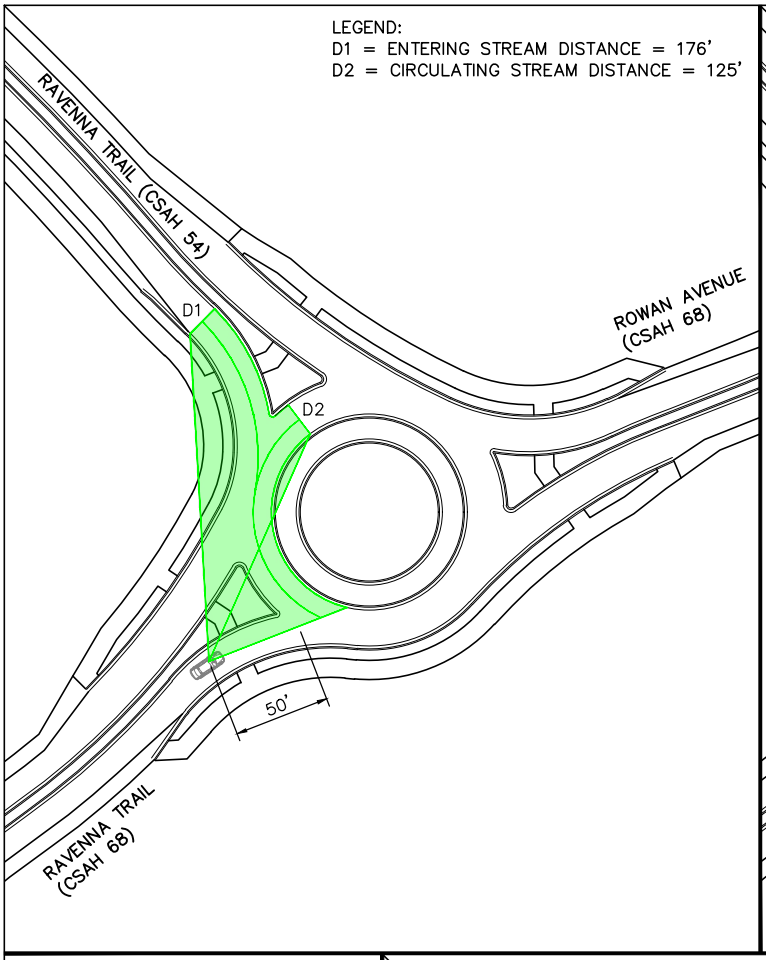
VEHICLE FASTEST PATH RADII
& SPEED
CSAH 54 & CSAH 68

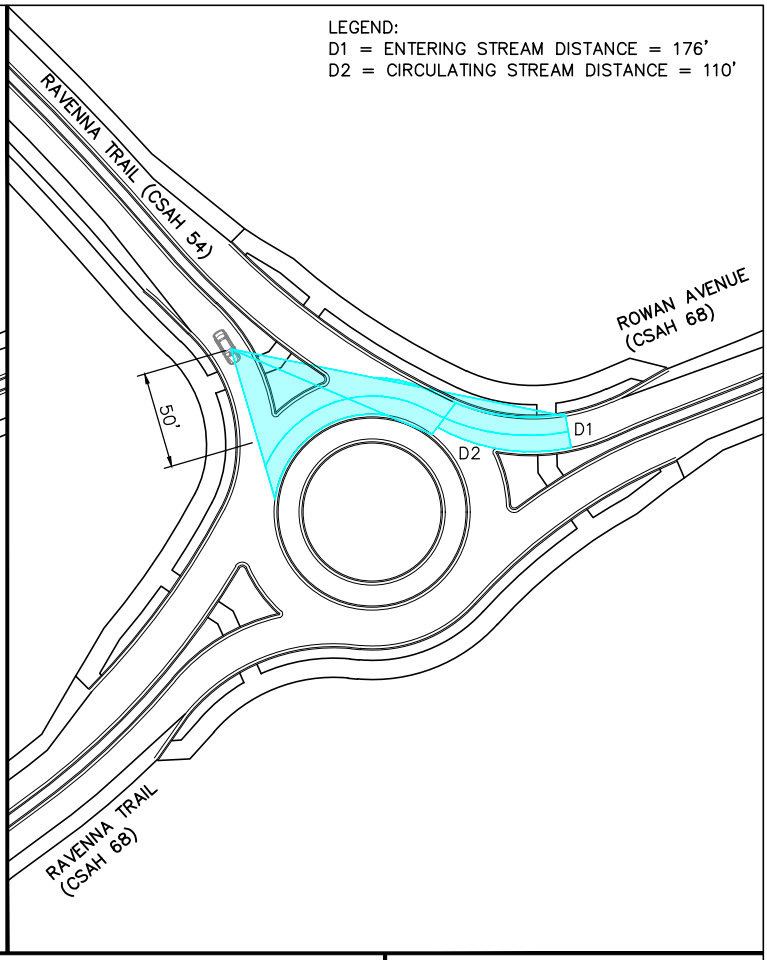
Dakota COUNTY

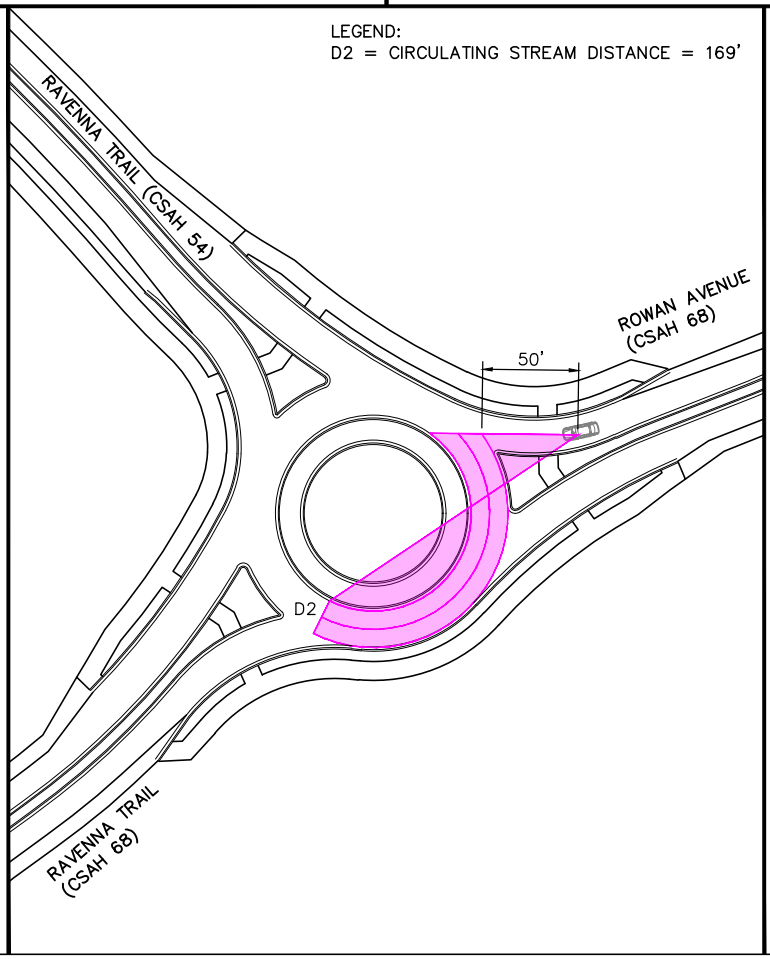
NORTH

0 30 60
HORIZONTAL
SCALE IN FEET

Appendix M: Sight Distance Diagrams







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Kimley»Horn

SIGHT DISTANCE DIAGRAMS
CSAH 54 & CSAH 68

Dakota COUNTY

NORTH

0 50 100
HORIZONTAL
SCALE IN FEET