Downtown Duluth Final Alternative Urban Areawide Review (AUAR)

Responsible Governmental Unit: City of Duluth
Proposer: City of Duluth

Stantec

Prepared for:
City of Duluth

Prepared by:
Stantec Consulting Services Inc.

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Project/File:
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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 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.

Introduction

An Alternative Urban Areawide Review (AUAR) is an alternative to an Environmental Impact Statement (EIS) that responds to the items in the EAW form to the level of analysis similar to an EIS. Minnesota Rules Chapter 4410.3610, subp. 4 states that "the content and format [of an AUAR document] must be similar to that of an EAW but must provide for a level of analysis comparable to that of an EIS for impacts typical of urban residential, commercial warehousing, and light industrial development and associated infrastructure."

An AUAR consists of three steps: Scoping EAW, Draft AUAR and Final AUAR. A Draft AUAR Order and Scoping EAW was published in the EQB Monitor on November 25, 2025, initiating a 30-day comment period that concluded on December 26, 2025. Responses to comments received on the Scoping EAW were included in the Final AUAR Order adopted by the City of Duluth Planning Commission on January 13, 2026. Comments received were considered in the preparation of the Draft AUAR.

The revised EAW form (December 2022 version) was used to prepare the Downtown Duluth AUAR. The twenty-two items in the EAW form provide information about the proposed development scenarios within the AUAR area, existing conditions, existing plans, potential issues to explore through the AUAR process, and specific methodologies for special studies that will be conducted for the AUAR (i.e., the scope of the Traffic Impact Study). The EAW and AUAR Guidelines provide additional details and resources for completing the EAW form for an AUAR and conducting the AUAR review process.

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

Downtown Duluth Alternative Urban Areawide Review (AUAR)

2. Proposer

Proposer:	City of Duluth
Contact person:	Tricia Hobbs
Title:	Executive Director, Duluth Economic Development Authority (DEDA)
Address:	411 W. 1st Street
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3. Responsible Governmental Unit (RGU)

RGU Agency:	City of Duluth
Contact person:	Jenn Moses, AICP
Title:	Planning Manager
Address:	Planning and Development Division 411 W. 1st Street, Room 160
City, State, ZIP:	Duluth, MN 55802
Phone:	(218) 730-5328
Email:	jmoses@DuluthMN.gov

4. Reason for EAW Preparation

Required:	Discretionary:
X EIS Scoping (AUAR)	□ Citizen petition
□ Mandatory EAW	□ RGU discretion
	□ Proposer initiated

If EAW or EIS is mandatory give EQB rule category subpart number(s) and name(s):

Minnesota Rules 4410.3610, Subpart 1 allow for eligible projects to be reviewed through the AUAR procedures instead of the EAW and EIS procedures. Pursuant to Minnesota Rules Chapter 4410.3610, Subpart 5a additional procedures are required when certain large specific projects are reviewed. A Scoping EAW and Draft Order for Review was prepared and noticed on November 25, 2025, in accordance with these procedures to guide this Draft AUAR. A Final Order for Review was adopted by the City of Duluth Planning Commission on January 13, 2026. Minnesota Rules Chapter 4410.4300 Subpart 32 and 4410.4400 Subpart 21 pertain to the Development Scenario B (Maximum Development Scenario).

5. Project Location

County: Saint Louis

City/Township: Duluth

PLS Location (¼, ¼, Section, Township, Range): Township 50 North, Range 14 West, Section 22, 23, 27, 34

Watershed (81 major watershed scale): St. Louis River and Lake Superior - South

GPS Coordinates: Latitude 46.790583, Longitude -92.095905

Tax Parcel Number: Appendix A provides a list of parcels within each of the four AUAR subareas.

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

- County map showing the general location of the Project;

  See Figure 1 and Figure 2, Appendix B

- U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating Project boundaries (photocopy acceptable); and

  See Figure 1, Appendix B

- Site plans showing all significant Project and natural features. Pre-construction site plan and post-construction site plan.

  See Exhibits 1 and 2 (development scenarios) on pages 6 and 7, respectively, and Lot D Concept Plan in Appendix C

- List of data sources, models, and other resources (from the Item-by-Item Guidance: *Climate*

Adaptation and Resilience or other) used for information about current Minnesota climate trends and how climate change is anticipated to affect the general location of the Project during the life of the Project (as detailed below in item 7. Climate Adaptation and Resilience).

See data sources provided in Item 7 of this document.

6. Project Description

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

The City of Duluth is preparing an AUAR for an approximately 354-acre area encompassing the traditional downtown, Essentia Health Medical Campus and surrounding Hillside neighborhood, as well as the proposed "Lot D" development in the Bayfront area. The purpose of this AUAR is to prepare for infill or redevelopment of key sites within this broader area. Two development scenarios will be evaluated as part of the AUAR which include an existing conditions scenario and a maximum mixed use (commercial and residential) redevelopment scenario consistent with the City's adopted Comprehensive Plan.

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

Existing Conditions

The AUAR area is an urban environment within the City of Duluth, St. Louis County, Minnesota, consisting of a traditional downtown commercial and business district (East and West Superior Street), a medical campus (Essentia), and some high-density residential areas with local streets and sidewalks, as well as an interstate highway corridor and railroad. The AUAR area includes businesses focused on hospitality such as restaurants, bars, hotels shopping and a casino. Additionally, the area includes businesses focused on supporting the local residential population including small scale grocery/convenience, bakeries, drug stores, hardware stores, and other small scale shopping areas. The AUAR area is the heart of government services for the city and region, including a large government campus. Finally, the AUAR area includes support services including food and shelter or other social support, job counseling, health delivery systems, etc. scattered throughout the AUAR area.

Some sections of the AUAR area remain undeveloped due to the discontinuation and removal of previous commercial and light industrial activities. The natural environment primarily features landscaped vegetation with limited lawn space or mature trees, except for the approximately two miles of the Lake Superior shoreline, which functions as a seaport within the Great Lakes Region.

Proposed Project

Proposed AUAR Development Scenarios

Two development scenarios will be considered as part of the AUAR which include one scenario that encompasses the existing conditions as a comparison to the maximum development scenario which is consistent with the growth planned for in the Future Land Use map and assumptions included in the City's adopted Comprehensive Plan (Imagine Duluth 2035 – Forward Together[1]). The alignment with the City's adopted Comprehensive Plan complies with Minnesota Rules 4410.3610, Subpart 3.The maximum development scenario plans generally for mixed use redevelopment of key sites within the broader downtown area.

The purpose of the AUAR is to help the City adequately plan for this redevelopment and provide a mitigation plan for how the City and future developers will manage the environmental impacts. The City

[1] City of Duluth. Imagine Duluth 2035 – Forward Together. Adopted June 25, 2018. https://duluthmn.gov/media/rtgk5tin/imagine-duluth-2035-combined_website_temp.pdf

initiated this AUAR in anticipation that the downtown area could see significant infill and redevelopment within the coming years, including areas that are within the City's shoreland area and would require environmental review and sensitivity. The AUAR is meant to plan for this development in a holistic manner, understanding that there are environmental benefits of development within an already dense urban area, and that environmental impacts are not contained to one site but rather are best studied and mitigated with a broader lens.

The City has elected to designate subareas within the broader AUAR area to facilitate the process of studying and planning mitigation for 354 acres of the City's urban core, which is comprised of many different uses and forms of development. The four subareas include:

- Lot D Subarea (500-1000 Railroad Street in the Bayfront District)
- Essentia Subarea (generally bounded by 5th Street to the north, 7th Avenue East to the east, Interstate 35 (I-35) to the south and 3rd Avenue E to the west)
- 1st Street Subarea (generally bounded by 2nd Street to the north, 3rd Avenue East to the east, I-35 to the south, Mesaba Avenue to the west)
- Secondary Subarea (generally bounded by 5th Street to the north, 14th Avenue East to the east, London Road to the south and 7th Avenue East to the west)

These subarea boundaries are shown in Exhibit 1 and Exhibit 2 below.

Development Scenario A: Existing Conditions

Exhibit 1 depicts Development Scenario A. The following paragraphs describe the existing conditions for the four subareas. Table 1 identifies existing building area assumptions for Development Scenario A based on available parcel data.

Lot D Subarea

The Lot D subarea was historically a light industrial site, with its most notable past use as a manufacturing and cold storage facility. Today, the site is the last piece of undeveloped commercial waterfront in the City of Duluth, which has remained vacant for more than three decades. Complicating factors in the redevelopment of the site include a collapsing seawall, a massive cement slab, and contaminated soil. The Lot D subarea is roughly 19 acres and includes surrounding site context and roads.

While the site was historically developed, for the purposes of this analysis, the site is considered vacant. The site is currently owned by the Duluth Economic Development Authority (DEDA). DEDA has a predevelopment agreement with Inland Development Partners (Inland) for the development rights to Lot D. Lot D is located on Railroad Street between the Pier B hotel and Compass Minerals, a salt packaging plant.

Essentia Subarea

The Essentia subarea is mostly occupied by the Essentia Health Medical Campus and Benedictine Sisters of the St. Scholastica Monastery properties. Construction of the new Essentia Health – St. Mary's Medical Center at 402 East 2nd Street was recently completed to bring to fruition Vision Northland, a $900 million investment seeking to transform the Essential Health Medical Campus. The demolition of the former St. Mary's Medical Center at 407 East 3rd Street was also recently completed. The Essentia subarea includes about 141 acres and 4.3 million square feet of mostly institutional (medical campus) and other commercial and residential uses. Several existing surface parking lots within the subarea will become surplus with the consolidation of the Essentia campus.

1st Street Subarea

The 1st Street subarea encompasses the City of Duluth's historic downtown core. The area is about 83 acres and includes nearly 5.2 million square feet of commercial, office, urban residential, hospitality and

tourism, institutional (churches and government offices), and a limited amount of industrial development. The built form is urban in nature, with buildings ranging from one to sixteen stories in height. In addition to the built square footage in the 1st Street subarea, there are many surface and structured parking lots and some vacant land or unoccupied buildings.

Secondary Subarea

The Secondary subarea includes an eclectic mix of uses including high, medium, and low-density housing, the Aspirus St. Luke's Hospital campus, and a mix of commercial uses mostly located along Superior Street. Like the Essentia Health campus, Aspirus St. Luke's is also underway with a hospital modernization and expansion project. The Secondary subarea includes roughly 92 acres and 3.3 million square feet of mostly residential, institutional (medical campus) and other commercial uses.

Development Scenario B: Maximum Development (Mixed Use) Scenario

Proposed development considered in Development Scenario B for this AUAR consists of a mix of commercial/office, retail, and residential uses in the AUAR area. Development Scenario B does not include heavy industrial and data center uses. Additionally, it is noted that future projects proposed within the AUAR area would be subject to the AUAR eligibility criteria pursuant to Minn. R. 4410.3610, Subp. 1.

Lot D Subarea

As mentioned above, the landowner of the Lot D area is DEDA, which has a predevelopment agreement with Inland for the development rights to Lot D. Inland has created a concept plan for a multi-phased mixed use multifamily and hospitality redevelopment. This concept plan is the basis for the maximum development scenario for this subarea. The planned redevelopment includes two buildings of market rate multifamily apartments, constructed over two phases and totaling 802,000 square feet. The maximum redevelopment scenario also includes a hotel totaling about 93,000 square feet. Table 1 and Exhibit 2 detail the Lot D subarea maximum development scenario. Appendix C provides Inland's preliminary Lot D Concept Plan.

In addition to the planned development, there are several site preparation activities which will occur within the subarea including repair and reconstruction of the deteriorated seawall, removal of the cement slab, and remediation and encapsulation of soil contamination. It is anticipated that repair and reconstruction of the deteriorated seawall would likely include installation of a new steel sheet pile (SSP) dock wall installed around the perimeter of Lot D. After installation, the top of the existing seawall would be partially demolished, and excavation would occur behind the new dock wall for installation of a tieback system. Once the tieback system is installed, the space between the new and existing walls would be filled with crushed stone. Construction activities would be confirmed as the project design develops.

Essentia Subarea

The Essentia subarea maximum development scenario is based generally on the plans that Essentia Health and the Benedictine Sisters of the St. Scholastica Monastery have for redevelopment of excess properties made available by the consolidation of the campus and parking lots. This includes 18 properties across a roughly 16-block campus, which are identified in Figure 4, Appendix A. The Duluth Market Study[2] completed by Cushman Wakefield in March 2023 plans for the following maximum development potential for these 18 properties: more than 600 new housing units, 50,000 square feet of retail space, up to 480 hotel rooms and 275,000 square feet of medical office and classroom space. This information is the basis for the maximum development scenario in this subarea, as shown in Table 1 and Exhibit 2.

1st Street Subarea

Within the 1st Street subarea, there are two DEDA owned sites that will be available for redevelopment in the near-term. Figure 3, Appendix A identifies the locations of these sites. These include the former Pastoret Terrace building and the former Shoppers Parking Ramp and adjacent New Garrick Building

[2] Cushman & Wakefield. Duluth, Minnesota Market Study. March 2023.

(Pineapple Building). The maximum development scenario for these sites includes mixed-use development with residential and retail space. In addition to these properties, there is potential for underutilized properties in the downtown area to be redeveloped into a mix of uses, including housing. Scenario B plans for the maximum amount of development that 1st Street subarea may see for the next ten years. Given that the AUAR will be updated every five years, as required by state statute, there is an opportunity to update these assumptions regularly as development expectations shift.

For the next ten-year period, the maximum development scenario for the 1st Street subarea assumes an approximately 60 percent increase in residential development and a small increase in commercial development from existing conditions. This assumes that much of the major redevelopment in the downtown area is mixed use, including primarily housing and some new commercial development. Table 1 and Exhibit 2 detail the 1st Street subarea maximum development scenario.

Secondary Subarea

While there are no major plans currently proposed by landowners, developers, or the City for redevelopment within the Secondary subarea, it is anticipated that some redevelopment may occur within the next ten years. Given the investments in the Aspirus St. Luke's Hospital, and the heavily residential nature of the area, it is anticipated that this may be an attractive area for housing redevelopment. The maximum development scenario for this subarea assumes that the area could see a 20 percent increase in residential development over the next ten years. As with the 1st Street subarea, which also lacks clear development expectations, there is an opportunity with each AUAR Update to reevaluate these assumptions as development expectations shift. Table 1 and Exhibit 2 detail the Secondary subarea maximum development scenario.

Exhibit 1. Development Scenario A – Existing Conditions

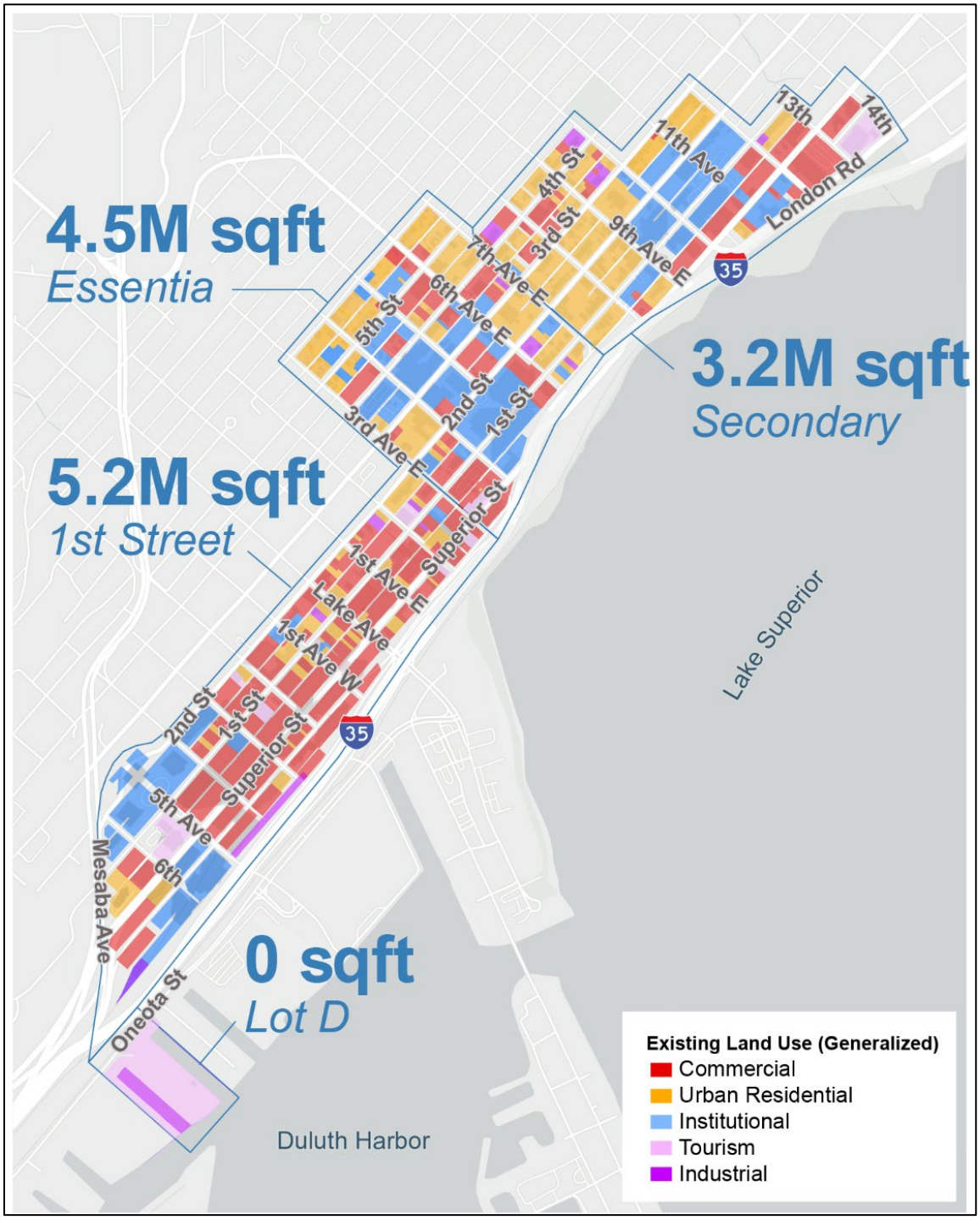
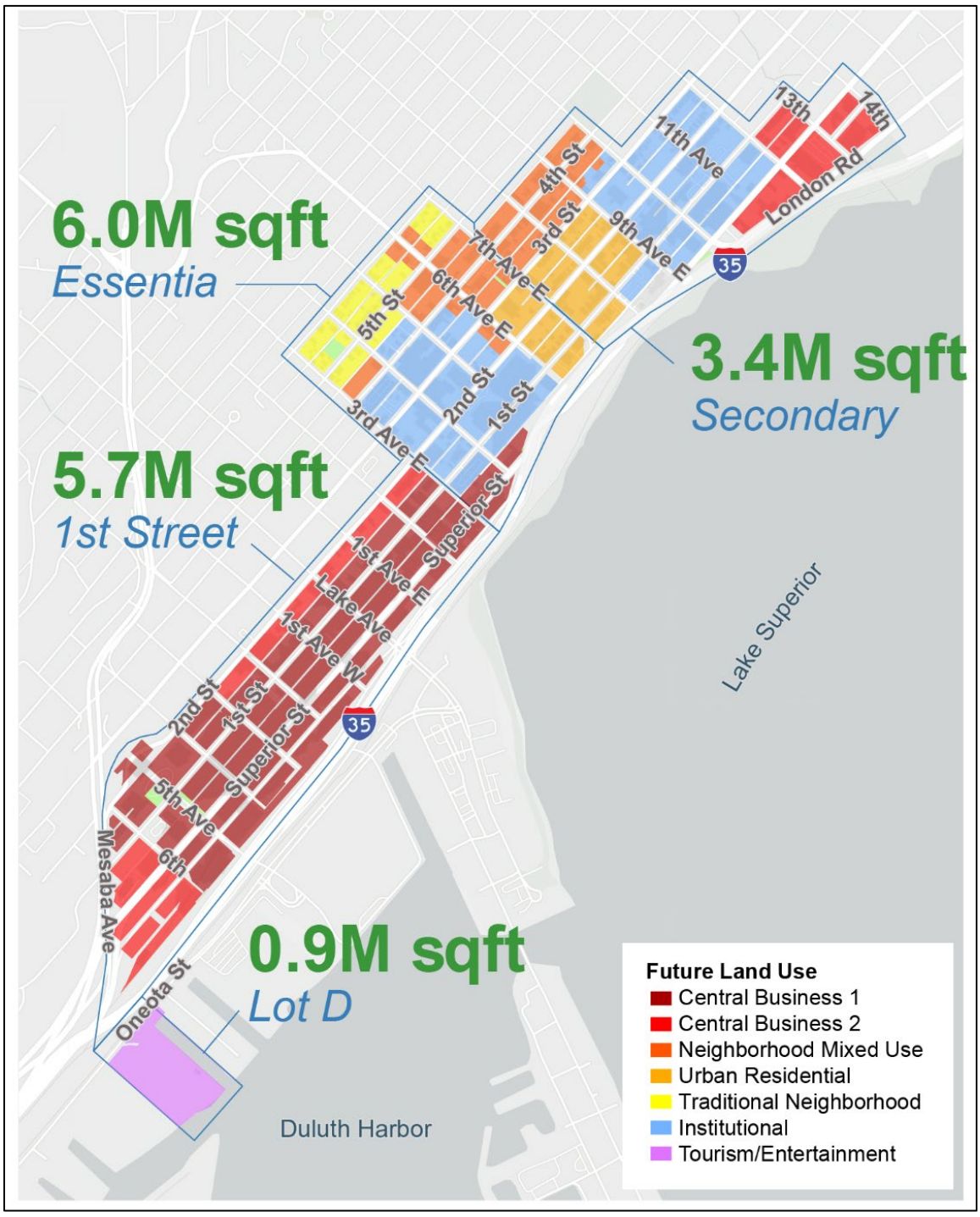


Exhibit 2. Development Scenario B – Maximum Development



Construction Activities

1) *Construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes*

Development Scenario B would include construction of new buildings and associated access roadways, parking areas, and utility infrastructure improvements. Construction activities will primarily be redevelopment of previously developed land. Site preparation may include demolition, grading, excavation and limited vegetation removal. Stormwater infrastructure would be modified or constructed depending on the change in impervious surface area. Construction activities associated with the reconstruction of the deteriorated seawall would likely include excavation, demolition, SSP and tieback system installation, backfilling, and potential installation or rehabilitation of stormwater systems and other utilities.

2) *Modifications to existing equipment or industrial processes*

Not applicable – no planned modifications to existing equipment or industrial processes.

3) *Significant demolition, removal or remodeling of existing structures*

The AUAR area encompasses a developed, urban core. It is anticipated that redevelopment of the AUAR area may require demolition, removal, or remodeling of existing buildings or structures, which would be confirmed at the time future projects are proposed within the AUAR area. Item 15 (Historic Properties) of the Draft AUAR evaluates properties listed or eligible for inclusion on the National Register of Historic Places (NRHP) and identifies additional surveys and mitigation measures that may be required if future developed proposed the demolition of NRHP-listed or eligible properties. Partial demolition and structural adjustments to the deteriorated seawall are also anticipated.

4) *Timing and duration of construction activities*

It is anticipated that initial site preparation for redevelopment of Lot D may occur as early as 2026, which would include reconstruction of the existing seawall, removal of the cement slab, and remediation and encapsulation of soil contamination. Reconstruction of the seawall is anticipated to take approximately six to eight months for the entire 1,350 linear feet of dock wall, subject to site conditions, contaminated material handling, utility work, regulatory requirements, and construction access. Construction of the Lot D Redevelopment Project is anticipated to be completed in 2031.

The timing and duration of development phases within the three other subareas is unknown and would be dependent on market conditions. However, it is DEDA's intention to procure developers for redevelopment of properties currently owned by DEDA in the 1st Street Subarea in 2026. For the purpose of the AUAR, the maximum build condition considered for Development Scenario B assumes a full buildout in ten years and is dependent on market conditions. The specific timing of the full buildout of the AUAR area is not known and may exceed ten years. The development assumptions and timeline would be re-assessed with the AUAR update in five years, based on anticipated conditions at that time.

c. **Project magnitude**

Table 1 summarizes the Project magnitude.

Table 1. Project Magnitude

Description	Scenario A - Existing Conditions	Scenario B – Maximum Development
Total Project Acreage	Total approx. 354	Total approx. 354
Linear Project length	Not applicable (N/A)	N/A
Residential building area (in square feet)	2,146,000	4,516,000
Commercial building area (in square feet)	6,003,000	6,073,000
Industrial building area (in square feet)	67,000	67,000
Institutional building area (in square feet)	4,160,000	4,435,000
Other uses – Tourism (in square feet)	540,000	869,000
Total Project Square Footage	12,916,000	15,960,000
Lot D Subarea		
Subarea Acreage	Approx. 19	Approx. 19
Residential building area (in square feet)	0	802,000
Commercial building area (in square feet)	0	0
Industrial building area (in square feet)	0	0
Institutional building area (in square feet)	0	0
Other uses – Tourism (in square feet)	0	93,000
Total Project Square Footage	0	895,000
Structure height (feet)	0	Up to 120 ft. (approx. 10 stories)
Essentia Subarea		
Subarea Acreage	Approx. 97	Approx. 97
Residential building area (in square feet)	618,000	1,568,000
Commercial building area (in square feet)	1,209,000	1,259,000
Industrial building area (in square feet)	14,000	14,000
Institutional building area (in square feet)	2,475,000	2,750,000
Other uses – Tourism (in square feet)	174,000	410,000
Total Project Square Footage	4,490,000	6,001,000
Structure height (feet)	Up to 18 stories (St. Mary's Medical Center)	Up to 200 ft. (approx. 20 stories)
1st Street Subarea		
Subarea Acreage	Approx. 141	Approx. 141
Residential building area (in square feet)	808,000	1,300,000
Commercial building area (in square feet)	3,985,000	4,005,000
Industrial building area (in square feet)	30,000	30,000
Institutional building area (in square feet)	48,000	48,000

Description	Scenario A - Existing Conditions	Scenario B – Maximum Development
Other uses – Tourism (in square feet)	312,000	312,000
Total Project Square Footage	5,183,000	5,695,000
Structure height (feet)	Up to 15 stories (Alworth Building)	Up to 200 ft. (approx. 20 stories)
Secondary Subarea		
Subarea Acreage	Approx. 98	Approx. 98
Residential building area (in square feet)	720,000	846,000
Commercial building area (in square feet)	809,000	809,000
Industrial building area (in square feet)	23,000	23,000
Institutional building area (in square feet)	1,637,000	1,637,000
Other uses – Tourism (in square feet)	54,000	54,000
Total Project Square Footage	3,243,000	3,369,000
Structure height (feet)	Up to 114 ft. (St. Luke's Hospital)	Up to 200 ft. (approx. 20 stories)

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 completing this AUAR is to holistically plan for and study potential redevelopment within the downtown area. The City anticipates that downtown could see significant infill and redevelopment within the coming years, and has elected to complete an AUAR to study the environmental impacts of development and prepare appropriate mitigation strategies. The City recognizes the environmental benefits of encouraging additional development within its urban core, especially housing development. The AUAR will help the City to appropriately manage this growth and development.

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

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

It is anticipated that redevelopment of the AUAR area would occur in phases based on market conditions. For the purpose of the analyses completed as part of the AUAR, it is assumed the full buildout contemplated in Development Scenario B would occur in the next ten years.

f. Is this Project a subsequent stage of an earlier Project? **☐ Yes X No**

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

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.

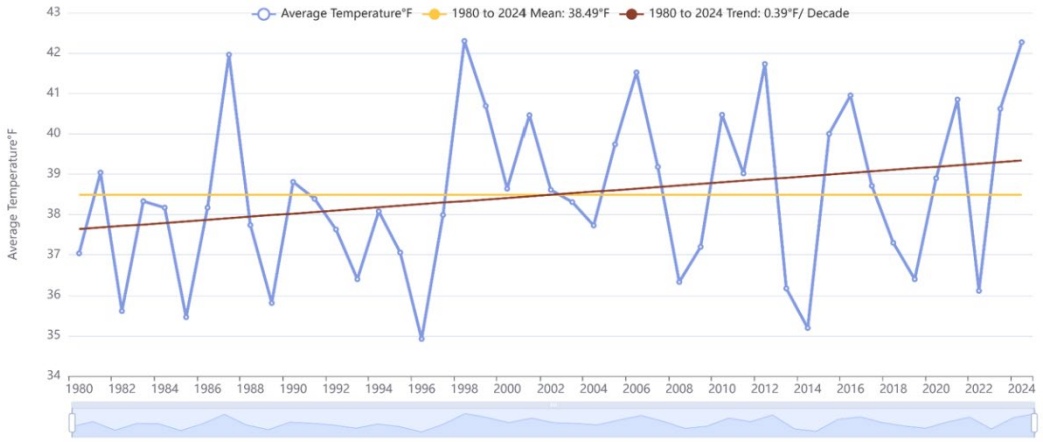
In general, Minnesota is anticipated to experience an increase in temperature, precipitation, and more frequent extreme precipitation events resulting from climate change. Between 1895 and 2020, annual average temperatures have risen three degrees Fahrenheit and precipitation has increased by an

average of 3.4 inches in Minnesota.[3] The highest average temperature increases have occurred during the winter. Since 1895, temperatures during the winter have increased at a rate two to three times higher than during the summer. [4] In particular, winter warming rates have risen more sharply in recent decades. Current climate warming trends, most notably during the winter, are anticipated to continue.

Heavy rain events have become more frequent in Minnesota and more intense. From 1973 to 2021, Minnesota experienced 16 mega-rain events with a notable increase since 2000.[5] Of these 16 events, three occurred in the 1970s, one in the 1980s, one in the 1990s, six mega-rain events occurred in the 2000s, four in the 2010s, and one in 2020. Between 2000 to 2021, more than twice as many mega rain events occurred compared to the prior 27 years (1973 to 1999).[6]

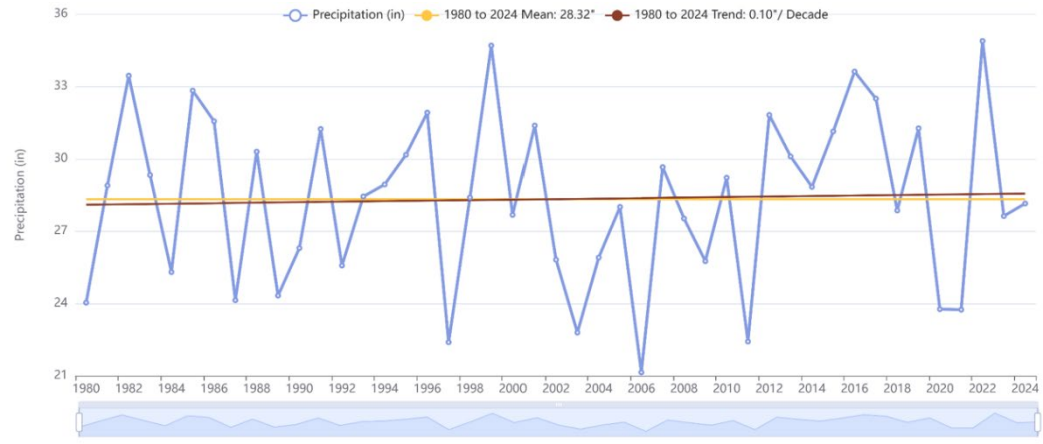
Climate trends in St. Louis County parallel the overall statewide trends, indicating Minnesota's climate is becoming warmer and wetter. Exhibit 3 and Exhibit 4 illustrate historical average annual temperature and annual precipitation trends from 1980 to 2024, respectively. During this time period, the county experienced an average annual temperature increase of 0.39 degrees Fahrenheit (°F) per decade and an annual precipitation increase of 0.10 inches per decade.

Exhibit 3. Historical Annual Average Temperature in St. Louis County (1950 – 2024)



Source: DNR Climate Explorer available at https://climate-explorer.dnr.state.mn.us/main/historical

Exhibit 4. Historical Annual Average Precipitation in St. Louis County (1950 – 2024)



[3] DNR, undated(a). Climate Trends. Available at: https://www.dnr.state.mn.us/climate/climate_change_info/climate-trends.html. Accessed November 2025.
[4] Ibid.
[5] Mega-rain events are defined as events in which six inches of rain covers more than 1,000 square miles and the core of the event tops eight inches. Definition is from the DNR's website cited in footnote 4.
[6] DNR, 2024(a). Historic Mega-Rain Events in Minnesota. Available at: https://www.dnr.state.mn.us/climate/summaries_and_publications/mega_rain_events.html. Accessed November 2025.

Source: DNR Climate Explorer available at https://climate-explorer.dnr.state.mn.us/main/historical

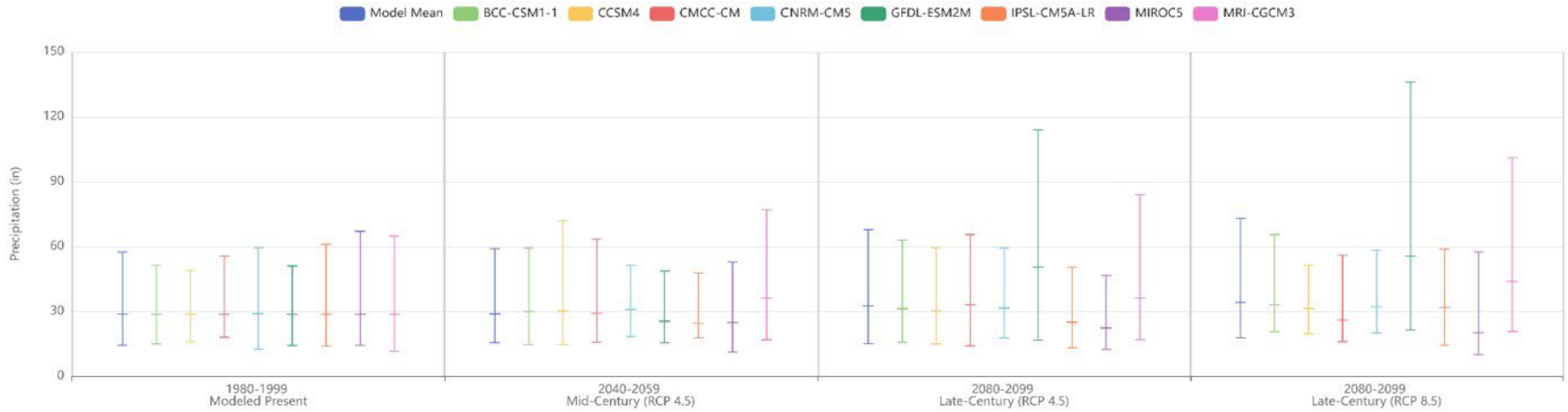
Projected climate trends indicate that temperatures within the County would continue to increase. Exhibit 4 above illustrates projected temperatures for the county. Several climate models are shown in the projected temperature analysis. The model mean, shown in blue on the first boxplot to the left in each model category, illustrates the average of all models included in the analysis. Exhibit 5 shows the modeled present condition, mid-century (2040-2059) at Representative Concentration Pathway (RCP) 4.5, late-century (2080-2099) at RCP 4.5, and late-century (2080-2099) at RCP 8.5. RCP is a greenhouse gas concentration scenario used by the Intergovernmental Panel on Climate Change in the fifth assessment report.[7] RCP 4.5 is an intermediate scenario in which emissions decline after peaking around 2040 and RCP 8.5 represents a worst-case scenario in which emissions continue rising through the 21st century.

Under the RCP 4.5 scenario, the annual temperature is anticipated to increase within the County from a modeled present mean of 38.2°F (1980-1999) to a mid-century (2040-2059) model mean of 41.8°F and a late-century (2080-2099) model mean of 43.7°F. Under the RCP 8.5 worst-case scenario, the County would experience a late-century (2080-2099) model mean temperature of 47.6°F. In comparison to the modeled present mean (1980-1999), the late-century (2080-2099) modeled mean annual temperature would increase by approximately 13.4 percent under the RCP 4.5 scenario and increase by approximately 21.9 percent under the RCP 8.5 scenario.

Exhibit 6 presents projected average annual precipitation for St. Louis County. Under the RCP 4.5 scenario, the annual precipitation is anticipated to increase within the County from a modeled present mean of 28.6 inches (1980-1999) to a mid-century (2040-2059) model mean of 28.8 inches and a late-century (2080-2099) model mean of 32.4 inches. Under the RCP 8.5 worst-case scenario, the County would experience a late-century (2080-2099) model mean precipitation of 34.2 inches. In comparison to the modeled present mean (1980-1999), the late-century (2080-2099) modeled mean annual precipitation would increase by approximately 11.8 percent under the RCP 4.5 scenario and increase by approximately 17.1 percent under the RCP 8.5 scenario.

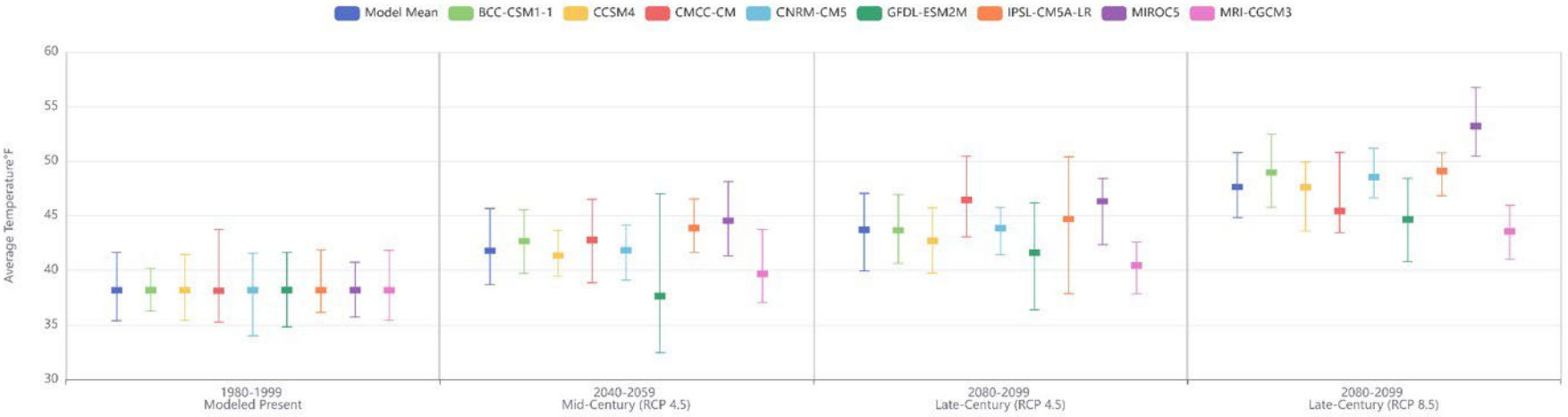
[7] IPCC, undated. Fifth Assessment Report. Available at: https://www.ipcc.ch/assessment-report/ar5/. Accessed September 2025.

Exhibit 5. Projected Precipitation in St. Louis County



Source: DNR Climate Explorer available at https://climate-explorer.dnr.state.mn.us/main/historical

Exhibit 6. Projected Temperatures in St. Louis County



Source: DNR Climate Explorer available at https://climate-explorer.dnr.state.mn.us/main/historical

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

Table 2 summarizes climate considerations related to the Project and adaptation considerations.

Table 2. Climate Considerations and Adaptations

Resource Category	Climate Considerations	Project Information	Adaptations
Project Design	Projected climate trends include increasing temperatures, precipitation, and frequency of heavy rainfall events. Minnesota is trending towards warmer temperatures. Urban heat islands occur when impervious surfaces, such as roofs and paved surfaces, absorb heat during the day and release it at night, amplifying the warming trend. A portion of the Lot D subarea is within the regulated 100-year coastal floodplain (Zone AE). Projected increases in storm intensity have the potential to increase localized flood risks particularly in vulnerable areas within flood hazard zones.	Construction of buildings, parking lots, and other impervious surfaces within the AUAR area may result in minor increases in impervious surface area. Given that the AUAR area consists of a developed, urban environment that is approximately 77 percent impervious, redevelopment would not result in significant increases in impervious surface area compared to existing conditions. Increased impervious surfaces would increase volume of stormwater runoff and potential flooding risk during heavy rain events. Impervious surfaces may create local heat island effects by absorbing heat during daytimes hours and radiating it at night leading to an increase in surface temperatures. The existing seawall along the shoreline of the Lot D subarea is beyond its life and has partially collapsed. Redevelopment of Lot D is anticipated to include	Redevelopment of the AUAR area and associated future projects would follow proposed and recommended actions based within the City of Duluth Population Vulnerability Assessment Framework (2018) [8], the Climate Action Work Plan (2022) [9], as well as the Duluth City Code 50-29 Standards for Sustainable Development.[10] More information on these plans and standards are included below the table. To mitigate anticipated projected temperature increases and local heat island effects, future projects should consider siting buildings to minimize loss of existing trees and natural areas within the AUAR area. Additional measures to minimize heat island effects may include strategically planting trees to increase shading near buildings to reduce energy use associated with air conditioning and incorporating green building design features such as green roofs or cool roofs to reduce energy costs, greenhouse gas (GHG) emissions, and improve stormwater runoff rates. A few green roofs are currently within the Essentia and 1st Street subareas.

[8] City of Duluth. Population Vulnerability Assessment and Climate Adaption Framework. 2018. Accessed December 2025. Available at: https://duluthmn.gov/sustain/news-updates/city-of-duluth-adopts-inaugural-climate-action-work-plan/

[9] City of Duluth. Climate Action Work Plan. 2022. Accessed December 2025. Available at: https://duluthmn.gov/media/12752/duluth-cawp_final_and_financememo.pdf

[10] City of Duluth. Unified Development Chapter Article 4 Section 50-29 - Sustainability Standards. 2025. Accessed December 2025. Available at: https://duluthmn.gov/media/13fntngd/50-29-sustainabilty-standards.pdf

Resource Category	Climate Considerations	Project Information	Adaptations
		repair of the seawall. Redevelopment within flood hazard zones should incorporate adequate stormwater management and site design features to plan for increases in storm intensity.	At the time that the seawall repair project is proposed, floodplain modeling would be developed to properly design the new seawall for resilience in case of a flood event. As part of the Lot D redevelopment project, adequate flood protection measures would need to be incorporated into the project design such as floodproofing, siting finished building floor elevations above the regulated floodplain elevation, and constructing adequate stormwater management features.
Land Use	Heavier rainfall expected to bring a higher risk of localized flooding. Increased temperatures may create public health crises primarily for vulnerable communities such as children and the elderly.	The AUAR area primarily consists of a highly developed urban core. Scenario B proposes a mix of commercial/office, retail, and residential uses in the infill, vacant, and underutilized areas of the downtown area. The existing impervious surfaces within the AUAR area contribute to the urban heat island effect. Additional increases in impervious surfaces may further contribute to local heat island effects.	The AUAR area does include proposed critical facilities such as hospitals and public utilities. Future projects associated with the redevelopment of the AUAR area would evaluate measures to avoid impacts to existing wetlands within the AUAR area. Future projects may mitigate potential increased risk of flooding associated with a projected increase in heavy rainfall events by constructing green infrastructure features such as green roofs, rain gardens, catch basin and infiltration systems. Local heat island effects from adding impervious surface to the AUAR area may be mitigated by avoiding removal of existing tree canopy and planting of new trees to increase shade in developed areas.
Water Resources	Addressed in Item 12.		

Resource Category	Climate Considerations	Project Information	Adaptations
Contamination/ Hazardous Materials/ Wastes	The AUAR area is projected to experience an increase in precipitation and heavy rainfall events.	The redevelopment anticipated in the AUAR area is not anticipated to involve the installation of chemical/ hazardous materials storage during operation. Redevelopment may include building demolition.	Increased precipitation may increase the chance of localized flooding. Storage of hazardous materials during operation is not anticipated with the AUAR area, however, if future projects propose storage of hazardous materials, proposers would need to implement safe storage measures in accordance with the MPCA and local regulations in place at the time that storage is proposed to prevent spills and releases of hazardous materials. Any hazardous materials and waste associated with building demolition during redevelopment would be disposed of properly and in a timely fashion.
Fish, wildlife, plant communities, and sensitive ecological resources (rare features)	Addressed in Item 14.		

The City of Duluth adopted the Duluth Population Vulnerability Assessment and Climate Adaptation Framework in 2018, as well as a Climate Action Work Plan in 2022. These documents identify strategies for reducing GHG emissions, increasing resilience, and adapting to climate related threats. Strategies from these plans that could be incorporated into future development of the AUAR area are summarized below:

- Consider strategic tree planting for heat island mitigation.
- Consider porous paving, de-paving, vegetation and/or more reflective surfaces in parking areas to reduce and cool impervious surfaces.
- Design stormwater infrastructure on-site to accommodate anticipated future storm levels (further discussion of this in Item 12, Water Resources).
- Consider using sustainable building guidelines for development within the AUAR area.
- Consider the installation and procurement of clean energy for residents and businesses.

The City of Duluth has also adopted sustainability standards in Chapter 50, Section 29, of the Duluth Legislative Code to promote sustainable development. Compliance with the City's sustainability standards are based on a point system, in which each new development is required to achieve at least three to four points based on the type of development (residential or non-residential and size of the development). Points may be earned through different development options such as location, energy efficiency, stormwater retention and urban agriculture, to name a few. Some potential options that could be incorporated into future development to earn points are summarized below:

- Development on previously used or developed land that is contaminated with waste or pollution (1.50 points)
- Development on previously used land that is not contaminated (0.75 points)
- Installation of a green vegetated roof on primary structures, or at least 50 percent of all primary buildings in a multi-building complex. Green or vegetated roofs shall include vegetation on at least 50 percent of the roof area and shall use only plant materials permitted by the Duluth landscaping standards (2.00 points)

Future redevelopment projects would be required to adhere to the City's sustainability standards.

8. Cover Types

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

The majority of the AUAR area (approximately 77 percent) consists of developed, impervious surface areas including buildings, roadways, and parking areas. Limited wooded areas are present within the AUAR area (approximately ten percent) and are primarily characterized as landscape trees and small wooded/vegetated areas adjacent to primarily residential uses. Table 3 and Figure 3, Appendix B summarize cover types within the AUAR area. Table 4 summarizes green infrastructure for each scenario and subarea.

Limited tree removal may be necessary as part of future redevelopment within the AUAR area. City Code Section 50-25.9[11] provides for the preservation and replacement of any trees removed during redevelopment. The number and percentage of new trees planted would be determined by the City's landscaping requirements in Article 4, Section 50-25 of the City's zoning code. Table 5 summarizes tree canopy change information.

Table 3. Cover Types

Cover Types	Scenario A Before (acreage)[1]	Scenario B After (acreage)
Lot D Subarea		
Wetlands and shallow lakes (<2 meters deep)	0.0 (0.0%)	0.0 (0.0%)
Deep lakes (>2 meters deep)	4.6 (24.7 %)	4.6 (24.7%)
Wooded/forest	0.5 (2.7%)	0.5 (2.7%)
Brush/grassland	0.0 (0.0%)	0.0 (0.0%)
Cropland	0.0 (0.0%)	0.0 (0.0%)
Lawn/landscaping[2]	11.5 (61.8%)	3.5 (18.8%)
Green infrastructure total (from table below*)	0.0 (0.0%)	0.0 (0.0%)
Impervious surface[3]	2.0 (10.8%)	10.0 (53.8%)
Stormwater basins[4]	0.0 (0.0%)	0.0 (0.0%)
Subarea Total	**18.6**	**18.6**
Essentia Subarea		
Wetlands and shallow lakes (<2 meters deep)	0.0 (0.0%)	0.0 (0.0%)
Deep lakes (>2 meters deep)	0.0 (0.0%)	0.0 (0.0%)
Wooded/forest	12.0 (12.4%)	12.0 (12.4%)
Brush/grassland	0.0 (0.0%)	0.0 (0.0%)
Cropland	0.0 (0.0%)	0.0 (0.0%)
Lawn/landscaping[2]	8.0 (8.3%)	6.0 (6.2%)
Green infrastructure total (from table below*)	0.5 (0.5%)	0.5 (0.5%)
Impervious surface[3]	76.1 (78.8%)	78.1 (89.9%)
Stormwater basins[4]	0.0 (0.0%)	0.0 (0.0%)

[11] City of Duluth. Unified Development Chapter Article 4 Section 50-25 – Landscaping and Tree Preservation. 2025. Available at: https://duluthmn.gov/media/sknpktnq/50-25-landscaping-and-tree-preservation.pdf. Accessed December 2025.

Cover Types	Scenario A Before (acreage)[1]	Scenario B After (acreage)
Subarea Total	**96.6**	**96.6**
1st Street Subarea		
Wetlands and shallow lakes (<2 meters deep)	0.7 (0.5%)	0.7 (0.5%)
Deep lakes (>2 meters deep)	0.0 (0.0%)	0.0 (0.0%)
Wooded/forest	8.8 (6.2%)	8.8 (6.2%)
Brush/grassland	0.0 (0.0%)	0.0 (0.0%)
Cropland	0.0 (0.0%)	0.0 (0.0%)
Lawn/landscaping[2]	8.8 (6.2%)	8.8 (6.2%)
Green infrastructure total (from table below*)	0.5 (0.4%)	0.5 (0.4%)
Impervious surface[3]	122.6 (86.7%)	122.6 (86.7%)
Stormwater basins[4]	0.0 (0.0%)	0.0 (0.0%)
Subarea Total	**141.4**	**141.4**
Secondary Subarea		
Wetlands and shallow lakes (<2 meters deep)	0.0 (0.0%)	0.0 (0.0%)
Deep lakes (>2 meters deep)	0.0 (0.0%)	0.0 (0.0%)
Wooded/forest	14.0 (14.3%)	14.0 (14.3%)
Brush/grassland	0.0 (0.0%)	0.0 (0.0%)
Cropland	0.0 (0.0%)	0.0 (0.0%)
Lawn/landscaping[2]	12.4 (12.7%)	12.4 (12.7%)
Green infrastructure total (from table below*)	0.0 (0.0%)	0.0 (0.0%)
Impervious surface[3]	71.2 (73.0%)	71.2 (73.0%)
Stormwater basins[4]	0.0 (0.0%)	0.0 (0.0%)
Subarea Total	**97.6**	**97.6**
Total AUAR area		
Wetlands and shallow lakes (<2 meters deep)	0.7 (0.2%)	0.7 (0.2%)
Deep lakes (>2 meters deep)	4.6 (1.3%)	4.6 (1.3%)
Wooded/forest	35.3 (10.0%)	35.3 (10.0%)
Brush/grassland	0.0 (0.0%)	0.0 (0.0%)
Cropland	0.0 (0.0%)	0.0 (0.0%)
Lawn/landscaping[2]	40.7 (11.5%)	30.7 (8.7%)
Green infrastructure total (from table below*)	1.0 (0.3%)	1.0 (0.3%)
Impervious surface[3]	271.8 (76.7%)	281.8 (79.5%)
Stormwater basins[4]	0.0 (0.0%)	0.0 (0.0%)
AUAR Area Total	**354.1**	**354.1**

[1] Before acreages are approximate and based on Duluth 1-Meter Land Cover 2016.
[2] "Lawn/landscaping" for Lot D would be better described as barren land based on site observations.
[3] Before acreages for "Impervious surface" area within Lot D are based on GIS and visual site observations and not on the Duluth 1-Meter Land Cover 2016. A substantial increase in Impervious surface area is not anticipated for the 1st Street and Secondary Subareas. Further studies would be completed as specific developments are proposed within these subareas.
[4] Item 12.b.ii provides conceptual proposed stormwater BMP acreage for subareas in which sufficient information was available from concept plans and planning documents to development assumptions.

Table 4. Green Infrastructure

Green Infrastructure	Before (acres)	After
Lot D Subarea		
Constructed infiltration systems[1] (infiltration basins/infiltration trenches/ rainwater gardens/bioretention areas without underdrains/swales with impermeable check dams)	0	0
Constructed tree trenches and tree boxes	0	0
Constructed wetlands	0	0

Green Infrastructure	Before (acres)	After
Constructed green roofs	0	0
Constructed permeable pavements	0	0
Other (describe):	0	0
Subarea Total	**0**	**0**
Essentia Subarea		
Constructed infiltration systems[1] (infiltration basins/infiltration trenches/ rainwater gardens/bioretention areas without underdrains/swales with impermeable check dams)	0	0
Constructed tree trenches and tree boxes	0	0
Constructed wetlands	0	0
Constructed green roofs[2]	0.5	0.5
Constructed permeable pavements	0	0
Other (describe):	0	0
Subarea Total	**0.5**	**0.5**
1st Street Subarea		
Constructed infiltration systems (infiltration basins/infiltration trenches/ rainwater gardens/bioretention areas without underdrains/swales with impermeable check dams)	0	. 0
Constructed tree trenches and tree boxes	0	0
Constructed wetlands	0	0
Constructed green roofs[2]	0.5	0.5
Constructed permeable pavements	0	0
Other (describe):	0	0
Subarea Total	**0.5**	**0.5**
Secondary Subarea		
Constructed infiltration systems (infiltration basins/infiltration trenches/ rainwater gardens/bioretention areas without underdrains/swales with impermeable check dams)	0	0
Constructed tree trenches and tree boxes	0	0
Constructed wetlands	0	0
Constructed green roofs	0	0
Constructed permeable pavements	0	0
Other (describe):	0	0
Subarea Total	**0**	**0**
AUAR Area Total	**1.0**	**1.0**

[1] Limited stormwater best management practice (BMP) measures are currently present in the AUAR area. The increase in impervious surface area associated with development in the Lot D and Essentia subareas would require the implementation of BMP measures such as constructed filtration and infiltration systems. Construction of infiltration systems is infeasible in most of the AUAR area due to shallow bedrock; however, infiltration systems such as stormwater basins may be constructed where it is feasible to meet regulatory requirements. Currently, specific acreages for BMP measures are unknown. See more in Section 12.b.ii.

[2] A few existing green roofs are present in the AUAR area which include the Essentia Health – St. Mary's Medical Center and the St. Louis County Motor Pool building. Construction of additional green roofs within the AUAR area would be considered for future development, but specifics are not known at this time.

Table 5. Tree Canopy

Trees	Percent/Number
Percent tree canopy removed, or number of mature trees removed during development	Significant removal of mature trees or tree canopy is not expected. Select landscape trees may be removed during redevelopment, as determined at the time specific development plans are proposed.
Number of new trees planted	The number of trees to be planted would be dependent on project-specific tree removal requirements. Per City Code Section 50-25.9 any trees removed would be replaced.

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 6 identifies anticipated permits and approvals that may be required for the proposed development within the AUAR area.

Table 6. Permits and Approvals

Unit of Government	Type of Application	Status
Federal		
U.S. Army Corps of Engineers (USACE)	Section 404 Permit	To be submitted, if required
USACE	Section 10 Permit	
U.S. Fish and Wildlife Service (USFWS)	Section 7 ESA Consultation (if federal nexus)	To be completed, if required
State		
Minnesota Department of Transportation (MnDOT)	(e.g., Drainage Permit, Right-of-way permit for work within or affecting MnDOT right-of-way)	To be submitted, if required
Minnesota Department of Health (MDH)	Water Main Plan Review	To be submitted, if required
Minnesota Department of Natural Resources (DNR)	Temporary Water Appropriation Permit for construction dewatering	To be submitted, if required
DNR	Public Waters Work Permit	To be submitted, if required.
DNR	Natural Heritage Information System (NHIS) concurrence	To be submitted, if required
MPCA	401 Water Quality Certification	To be submitted, if required
MPCA, City of Duluth	National Pollutant Discharge Elimination System (NPDES) MS4 Stormwater Discharge Permit, MS4 Statement of Compliance	To be submitted, if required
MPCA	Construction Site Stormwater Permit	To be submitted, if required
MPCA	Land Use Permit (under Brownfield Program)	To be submitted, if required.

Unit of Government	Type of Application	Status
Minnesota State Historic Preservation Office (SHPO)	Section 106 Consultation (if federal nexus)	To be submitted, if required.
Local		
City of Duluth	Preliminary and Final Plat, Minor Subdivision, and/or a CIC (Common Interest Communities) Plat	To be submitted, if required
City of Duluth	Planning Commission Review	To be completed, if required
City of Duluth	Sign Permits	To be submitted, if required
City of Duluth	Certificate of Occupancy	To be submitted, if required
City of Duluth	Fill Permit	To be submitted, if required
City of Duluth	Erosion and Sediment Control Permits	To be submitted, if required
City of Duluth	Shoreland Permit	To be submitted, if required.
City of Duluth	Floodplain Permit	To be submitted, if required.
City of Duluth	Water and Sewer Main Extension Permits	To be submitted, if required
City of Duluth	Water and Sewer Connection Permits	To be submitted, if required
City of Duluth	Utility Easement Dedications	To be submitted, if required
City of Duluth	Building Permits	To be submitted, if required
City of Duluth	Blasting Permit/ Blasting Plan	To be submitted, if required
City of Duluth	Wetland Conservation Act (Boundary Approval/Replacement Plan)	To be submitted, if required

10. Land Use

a. Describe:

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

Lot D Subarea

Lot D is a former industrial site and the existing land use consists of mostly vacant land, with a remnant cement building pad and foundations. These are anticipated to be removed in anticipation of redevelopment. Additionally, the property has a deteriorating seawall, which will be replaced prior to redevelopment of the site. It is anticipated that repair and replacement of the existing seawall would include reclamation of a portion of the land that has eroded and replacement of the dock wall around the entire property. Lot D is located on Railroad Street between the Pier B hotel and Compass Minerals, an industrial site. The I-35 corridor creates a barrier between the Lot D site and downtown, while Lake Superior generally forms the eastern boundary of the site. Lot D is separated from Bayfront Park to the north by Pier B and the small mooring areas in between each of these areas. The Baywalk Trail connects Canal Park to Pier B, while the Cross City Trail connects the Lakewalk to the Lincoln Park neighborhood. No cemeteries or prime or unique farmlands are within the subarea.

Essentia Subarea

Existing land uses in the Essentia area include the medical campus and a variety of housing and commercial uses. This area is adjacent to the downtown core to the southwest, also within the AUAR area (1st Street subarea). The area to the northeast is also within the AUAR area (Secondary subarea). Areas uphill of the Essentia subarea generally consist of lower density housing. Lake Superior is downhill (to the east) from the Essentia Subarea. The Superior Street Boulevard connects over I-35 in this subarea with the Lakewalk along Lake Superior. The North Shore Scenic Drive also intersects this subarea. No cemeteries or prime or unique farmlands are within the subarea.

1st Street Subarea

The 1st Street subarea includes Duluth's historic downtown core, including a mix of office, commercial, hospitality uses, and high density housing. Several surface and structure parking lots are also present within this subarea, along with a limited amount of light industrial uses. Many historic buildings are located within the 1st Street subarea, which are described further in Item 15 of this AUAR. Parks and open spaces within this subarea include Civic Center, the University of Minnesota Duluth Ordean Court, Gateway Park, Rail Park, Minnesota Power Plaza and Lake Superior Plaza. The North Shore Scenic Drive also extends through this subarea. A spur of the Cross City Trail connects through the 1st Street subarea. No cemeteries or prime or unique farmlands are within the subarea.

Secondary Subarea

Existing land uses in the Secondary subarea include high, medium, and low density housing, the Aspirus St. Lukes Hospital campus, and a mix of commercial uses mostly located along Superior Street. Land use in the southwest portion of the subarea generally coincides with the Essentia subarea described above and uses to the north are mostly residential. Lake Superior is generally to the east. The Lakewalk, Leif Erikson Park and the Rose Gardens are adjacent to the subarea. No cemeteries or prime or unique farmlands are within the subarea.

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

Lot D Subarea

The Lot D Subarea is guided tourism/entertainment in the City's Comprehensive Plan (Imagine Duluth 2035). Figure 7, Appendix A shows this Future Land Use guidance. This land use category provides for mixed waterfront development land uses including retail, entertainment, lodging, meeting facilities, waterfront-related uses, and open space, with flexibility for housing development.

Essentia Subarea

The Essentia Subarea is guided a variety of residential, office, and institutional land uses in Imagine Duluth 2035. Specific land uses include Institutional (mainly the Essentia Campus) which allows for a mix of medical, school, government and related support commercial and residential uses. Traditional Neighborhood, Urban Residential and Neighborhood Mixed Use (residential areas on the north and eastern sides of the Subarea) allow a variety of residential densities and commercial uses. Central Business Primary (on either side of Superior Street) allows a broad range of uses including governmental campus, retail, entertainment and lodging, high density housing, central plaza, public/open space and public parking facilities.

1st Street Subarea

The 1st Street Subarea is guided a mix of Central Business Primary, Central Business Secondary and Open Space in Imagine Duluth 2035. This area allows a mix of uses, including those described above for Central Business Primary. Central Business Secondary on the fringes of the Subarea allows for

mixed regional and neighborhood retail, employment centers, public spaces, medium density residential, and public parking facilities.

Secondary Subarea

The Secondary Subarea is guided a mix of residential, institutional and commercial land uses in Imagine Duluth 2035. The residential areas include Urban Residential and Neighborhood Mixed Use allowing a variety of residential densities and commercial uses. Institutional is mostly concentrated around the Aspirus St. Luke's Hospital Campus and allows for a mix of medical, school, government and related support commercial and residential uses. Finally, Central Business Secondary allows for mixed regional and neighborhood retail, employment centers, public spaces, medium density residential, and public parking facilities.

Local Planning Documents

The City has other adopted plans that are relevant to the subareas. These plans and their relevance are described below:

Imagine Duluth 2035

Imagine Duluth 2035 is the City's adopted Comprehensive Plan. This plan sets overall policy direction for the city on issues related to land use, transportation and mobility, open space, economic development, housing, and energy and conservation. The Comprehensive Plan provides a future land use map that guides future development – this land use within the AUAR is described above.

Vision Northland Master Plan & Duluth Market Study (Cushman Wakefield)

The Vision Northland Master Plan and associated Duluth Market Study (Cushman Wakefield) provides additional guidance for how Essentia Health intends to prioritize redevelopment of their excess properties in the Essentia Subarea. These studies indicate that there is potential for more than 600 new housing units, 50,000SF of retail space, up to 480 hotel rooms and 275,000 SF of medical office and classroom space. These development assumptions have been built into Scenario 2 – Maximum Development for this AUAR.

Essential Spaces – Duluth Parks, Recreation, Open Space & Trails Plan

The Essential Spaces Plan includes priorities for park, recreation, open space, and trails within the city, including the Downtown area. Specific improvements highlighted in this plan, which could be incorporated into development plans for Downtown include enhanced waterfront access, improved trail connectivity into downtown, public realm upgrades in existing parks, mini-master plans for parks, community gathering spaces and community gathering spaces.

Comprehensive Housing Needs Analysis for Duluth, MN

This plan was conducted by Maxfield Research and Consulting in July 2025 and identified Duluth's housing needs through 2035. The study identifies demand for over 8,000 new housing units in Duluth, including senior housing. This AUAR is intended to respond to the need for new housing by preparing and studying the environmental impacts of adding new housing development within Downtown.

Climate Action Work Plan

The relevance of this plan to the AUAR is discussed further in Item 7 – Climate.

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

Lot D Subarea

Lot D is zoned MU-W Mixed Use Waterfront. A large portion of the Lot D subarea is also within the City's shoreland overlay zone associated with the Duluth/Superior Habor Shoreline. Zoning surrounding this subarea includes industrial to the southwest and west, and MU-W to the northeast. Figure 8, Appendix B identifies the zoning districts within the AUAR area. Figure 13, Appendix B shows the water resources within the AUAR area and the City's shoreland overlay zones.

Essentia Subarea

Zoning within the Essentia subarea includes predominately MU-I Mixed Use Institutional, with other districts including F-8 Downtown Mix, F-7 Downtown Shopping, F-6 Mid-Rise Neighborhood Shopping, MU-N Mixed Use Neighborhood, and R-2 Residential Urban. A portion of the Essentia subarea is also within the shoreland overlay zone associated with the Duluth/Superior Habor Shoreline. Figure 8, Appendix B identifies the zoning districts within the AUAR area. Figure 13, Appendix B shows the water resources within the AUAR area and the City's shoreland overlay zones.

1st Street Subarea

Zoning within the 1St Street subarea includes predominately F-8 Downtown Mix, with other districts including F-7 Downtown Shopping, F-5 Mid-Rise Community Shopping and Office, and MU-C Mixed Use Commercial. A portion of the 1st Street subarea is also within the shoreland overlay zone associated with the Duluth/Superior Habor Shoreline. Figure 8, Appendix B identifies the zoning districts within the AUAR area. Figure 13, Appendix B shows the water resources within the AUAR area and the City's shoreland overlay zones.

Secondary Subarea

Zoning within the Secondary subarea includes a mix of MU-I Mixed Use Institutional, F-8 Downtown Mix, F-6 Mid-Rise Neighborhood Shopping, F-4 Mid-Rise Community Mix, MU-N Mixed Use Neighborhood, and R-2 Residential Urban. A portion of the Secondary subarea is also within the shoreland overlay zone associated with Chester Creek and the Duluth/Superior Habor Shoreline. Figure 13, Appendix B shows the water resources within the AUAR area and the City's shoreland overlay zones.

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

The maximum development scenario anticipates housing within the AUAR area. The AUAR area also includes critical facilities such as hospitals and public utilities. Portions of each subarea are within the shoreland overlay district and flood hazard zones. Appendix D provides the FEMA FIRMettes which are discussed in further detail in Item 12 (Water Resources). As discussed in Item 7 (Climate) heavier rainfall is expected to bring a higher risk of localized flooding. As discussed in Item 12.a.i (Water Resources), few existing wetland resources are present within the AUAR area based on desktop National Wetlands Inventory (NWI) and, therefore, it is anticipated that wetland impacts would largely be avoided by future redevelopment. Future projects may also mitigate potential increased risk of flooding associated with a projected increase in heavy rainfall events by constructing green infrastructure features such as green roofs, rain gardens, catch basin and infiltration systems. This aligns with goals related to flood vulnerability in the City's Population Vulnerability Assessment and Climate Adaptation Framework, as well as the Climate Action Work Plan.

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

The Maximum Development Scenario (Development Scenario B) studied in this AUAR is aligned with the City's Future Land Use as shown in Imagine Duluth 2035. While there may be some site-specific Future Land Use or zoning modifications needed at the point specific projects are proposed, the general direction of increasing housing density in the Downtown area is fully supported by the Comprehensive Plan and its future land use direction. The future land use guidance described in 9.a.ii. above encourages housing within each of the Subareas, including high density housing within both the 1st Street and Essentia Subareas.

The Maximum Development Scenario studied in this AUAR is also compatible with the City's other adopted plans including the Essential Spaces plan and the City's other adopted parks and trails plans. As development occurs within the downtown area, the City will focus resources on implementation of the improvements identified in these plans. As the downtown area adds additional residents through housing development identified in the Maximum Development Scenario, improvements to public open space and connectivity will be prioritized further.

The Maxfield Housing Needs Assessment identified above is also compatible with this AUAR, as additional housing downtown will help to address the demand for new housing identified in the report.

Finally, the Maximum Development Scenario is compatible with the City's Climate Action Work Plan. Generally, redevelopment downtown can cut vehicle emissions by putting more people close to jobs and shops, where walking and biking are easy alternatives to driving. Additionally, redevelopment of the downtown has the opportunity to limit sprawl and utilize established infrastructure. Redevelopment also offers opportunities to incorporate green infrastructure into a heavily impervious area. Additional details can be found in Item 7 – Climate.

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

Specific mitigation measures are included in the list below.

Item 10 Mitigation Strategies

The following mitigation strategies should be considered at the time specific development is proposed within any of the AUAR subareas.

- If needed, the City will initiate a Comprehensive Plan Amendment to reguide specific parcels to accommodate the housing development planned for in the Maximum Development Scenario.
- If needed, future developers will apply for a Rezoning for specific parcels where zoning is not compatible with the housing development planned for in the Maximum Development Scenario.
- The City will work with developers to reduce the amount of impervious surface on specific development sites through the use of green infrastructure.
- Ensure that lighting, building form and façade, landscaping and tree preservation meet specifications in Article 4 of Chapter 50 of the City Code.
- As housing development occurs, the City will work with future developers to incorporate open space into redevelopment projects and/or upgrade existing open space and improve pedestrian connectivity within downtown.
- The City should proactively identify and pursue open space and greenway opportunities downtown to create more green space and increase livability in the heavily impervious downtown area.

11. Geology, Soils and Topography/Land Forms

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

Lot D Subarea

The surficial geology across the Lot D subarea has been mapped by the Minnesota Geological Survey's (MGS) Geologic Atlas of St. Louis County[12] as consisting mostly of constructed land deposited anthropogenically. The northwestern portion of Lot D near the railroad and I-35 has been mapped as post-glacial floodplain and channelized fluvial deposits consisting of sand, gravel, cobbles, boulders, and sandy loam to silt loam. The southeastern portion of Lot D includes the Duluth/Superior Harbor shoreline and has been mapped as post-glacial lacustrine sediments consisting of silt, sand and clay (Figure 9, Appendix B).

The bedrock geology has been mapped by MGS as being Mesoproterozoic age igneous rocks from the Duluth Complex of the Midcontinent Rift Intrusive Supersuite. Specifically, the bedrock is part of the Anorthositic Series, a suite of plagioclase-rich cumulates emplaced relatively synchronously across the entire Duluth Complex just prior to the emplacement of the layered series. The Anorthositic Series can contain anorthosite, troctolitic anorthosite, olivine gabbroic anorthosite, leucogabbro and leucotroctolite (Figure 10, Appendix B).

The depth to bedrock is mapped by MGS as being between 101 and 250 feet. According to the Minnesota Department of Health (MDH) Minnesota Well Index (MWI),[13] no wells were identified within the Lot D subarea (Figure 11, Appendix B).

The igneous bedrock formations in the Lot D subarea are not susceptible to the formation of karst features.

Essentia Subarea

The surficial geology across the Essentia subarea has been mapped by MGS as glacial lacustrine sediments of the Barnum Formation, consisting of clay and silty clay. These sediments are deposits associated with the Superior lobe and occur inland at the surface within approximately four miles of the present-day Lake Superior shoreline (Figure 9, Appendix B).

The bedrock geology has been mapped by MGS as being mostly Mesoproterozoic age igneous rocks from the Keweenawan Supergroup of the Midcontinent Rift Intrusive Supersuite. The components of the North Shore Volcanic Group identified within the Keweenawan Supergroup include undifferentiated basalt to basaltic andesite flows and porphyritic basalt. There is also a mapped intrusion called the Tunnel intrusion consisting of diabase in the southeastern portion of the Essentia subarea (Figure 8, Appendix B).

The depth to bedrock is mapped by MGS as being between zero and 50 feet. According to the MDH MWI, ten verified wells were identified within the Essentia subarea (Figure 11, Appendix B). Five of these wells have well logs and stratigraphic records which indicate the wells intersected bedrock between zero and five feet beneath the surface. The well logs and stratigraphic records are available in Appendix E.

[12] MGS. Geologic Atlas of St. Louis County, Minnesota, C-51, Bauer, E.J.; Jirsa, M.A.; Block, A.R.; Boerboom, T.J.; Chandler, V.M.; Peterson, D.M.; Wagner, K.G.; McDonald, J.M.; Dengler, E.L.; Meyer, G.N.; Hamilton, J.D. 2022. Retrieved from the University of Minnesota Digital Conservancy. Available at: https://conservancy.umn.edu/items/1cea310b-ca8d-4345-acfa-450ab8ca17e6. Accessed September 2025.

[13] MDH. Minnesota Well Index. Undated. Available at: https://www.health.state.mn.us/communities/environment/water/mwi/index.html. Accessed September 2025.

The igneous bedrock formations in the Essentia subarea are not susceptible to the formation of karst features.

1st Street Subarea

The surficial geology across the 1st Street subarea has been mapped by MGS as mostly being glacial lacustrine sediments of the Barnum Formation, consisting of clay and silty clay. A small portion in the southeast has been mapped as post-glacial floodplain and channelized fluvial deposits consisting of sand, gravel, cobbles, boulders, and sandy loam to silt loam. (Figure 9, Appendix B).

The bedrock geology has been mapped by MGS as being Mesoproterozoic age igneous rocks from the Midcontinent Rift Intrusive Supersuite. Specifically, the bedrock includes units from the Anorthositic Series, miscellaneous intrusions, and components of the Keweenawan Supergroup. The Anorthositic Series can contain anorthosite, troctolitic anorthosite, olivine gabbroic anorthosite, leucogabbro and leucotroctolite. The miscellaneous intrusions include two unnamed intrusions containing porphyritic ophitic olivine leucogabbro and ferromonzodiorite to granophyre, and a third intrusion identified as the Tunnel intrusion which contains diabase. The components of the North Shore Volcanic Group identified within the Keweenawan Supergroup include icelandite, undifferentiated basalt to basaltic andesite, and porphyritic basalt (Figure 10, Appendix B).

The depth to bedrock is mapped by MGS as being between zero and 50 feet. According to the MDH MWI, 13 verified wells were identified within the 1st Street subarea (Figure 11, Appendix B). Ten of these wells have well logs and stratigraphic records which indicate the wells intersected bedrock between zero and 18 feet beneath the surface. The well logs and stratigraphic records are available in Appendix E.

The igneous bedrock formations in the 1st Street subarea are not susceptible to the formation of karst features.

Secondary Subarea

The surficial geology across the Secondary subarea has been mapped by MGS as glacial lacustrine sediments of the Barnum Formation, consisting of clay and silty clay (Figure 9, Appendix B).

The bedrock geology has been mapped by MGS as being Mesoproterozoic age igneous rocks from the Keweenawan Supergroup of the Midcontinent Rift Intrusive Supersuite. The components of the North Shore Volcanic Group identified within the Keweenawan Supergroup include undifferentiated basalt to basaltic andesite flows, porphyritic basalt, and interflow sandstone, siltstone, and conglomerate (Figure 8, Appendix B).

The depth to bedrock is mapped by MGS as being between zero and 50 feet. According to the MDH MWI, no wells were identified within the Secondary subarea (Figure 11, Appendix B).

The igneous bedrock formations in the Secondary subarea are not susceptible to the formation of karst features.

Potential for Blasting and Mitigation

The Essentia, 1st Street, and Secondary subareas are underlain by shallow igneous bedrock. Excavation for building foundations, utilities or other infrastructure as part of future redevelopment may encounter the bedrock. Mechanical removal of bedrock may be impractical in some locations, necessitating controlled blasting. Prior to any blasting, geotechnical investigations would be completed to confirm bedrock depth, composition, and structural characteristics, which would inform excavation methods and blasting design. Blasting can generate vibration, noise, and air overpressure that may affect nearby structures and residents. To mitigate these impacts, contractors should develop and implement a blasting plan that complies with state and local regulations, including pre-blast surveys of adjacent structures, vibration monitoring during blasting, and adherence to established vibration limits. Additional measures may include notifying nearby property openers in advance, scheduling blasts during daytime hours, and using blast mats to control flyaway rock. Where feasible, alternative excavation methods such as hydraulic

hammers should be considered to minimize blasting. If blasting is necessary during redevelopment, a Blasting Permit would need to be obtained through the City's Fire Department.

b. Soils and topography - Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from Project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after Project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/ sedimentation control related to stormwater runoff should be addressed in response to Item 12.b.ii.

Table 7 below describes the 2024 United States Department of Agriculture (USDA) Soil Survey Geographic Database (SSURGO)[14] soil map units within each subarea of the AUAR area. Based on the SSURGO soils data, the majority of the AUAR area soils are expected to have shallow bedrock and large areas of disturbance related to previous development.

Lot D Subarea

Most of the Lot D subarea (approximately 74 percent) is mapped as some mix of Urban Land, Udorthents soils, and Aquents soil. The remaining area is mapped as water. The "Urban Land" designation is used to indicate areas of urban development and disturbance. These areas are highly altered from their natural condition and typically feature soils impacted by cutting, grading, filling, compaction, and impervious cover. Udorthents are also disturbed soils and are often found in areas affected by human activity. Aquents are soils formed in areas with frequent water saturation and are often found in coastal areas.

The Lot D subarea features a generally flat terrain, with an average elevation of approximately 610 feet. While most of the area maintains this elevation, the land transitions into a steep slope as it approaches the water's edge, indicating a sharp drop in elevation near the shoreline.

Essentia Subarea

The entirety of the Essentia subarea is mapped as some mix of Urban Land, Rock Outcrop, Mesaba soil and Barto soil. As described above, Urban Land indicates highly disturbed and urbanized areas. Rock Outcrop areas feature surficial (at or near surface) bedrock with little or no soil cover. Mesaba and Barto are glacial till soils formed in bedrock-controlled surfaces and feature approximately 12 to 30 inches of gravelly sandy loam or gravelly loam over bedrock.

The Essentia subarea features a steep slope, descending from approximately 840 feet in the northwest to around 620 feet in the southeast. The northern portion near St. Mary's Hospital Heliport sits on higher ground while the terrain gets steeper near the southeastern edge as the land drops towards lower elevations near I-35 and the lakefront.

1st Street Subarea

Most of the 1st Street subarea (approximately 76 percent) is mapped as a mix of Urban Land, Rock Outcrop, Mesaba soil, and Barto soil. Approximately 24 percent is mapped as a mix of Urban Land, Udorthents, and Aquents.

Similar to the Essentia subarea, the 1st Street subarea features a steep slope, descending from approximately 710 feet in the northwest to approximately 610 feet in the southeast.

Secondary Subarea

Most of the Secondary subarea (approximately 76 percent) is mapped as a mix of Urban Land, Rock

[14] NRCS USDA. Soil Survey Geographic Database. 2024. Accessed September 2025 via ESRI ArcGIS Online Services

Outcrop, Mesaba soil, and Barto soil. Approximately 22 percent of the subarea is mapped as a mix of Urban Land, Amnicon soils, and Rock Outcrop. Amnicon is clayey glacial till formed through a combination of glacial processes, clay accumulation and climate-driven soil development.

The Secondary subarea also features a steep slope, descending from northwest to southeast. The highest elevation is approximately 800 feet on the western corner and the lowest elevation is approximately 650 feet near the eastern edge.

Table 7. Soil within the AUAR area

Map Unit Symbol	Map Unit Name	Hydrologic Group	Wind Erodibility Group	Water Erodibility Factor (K*f*)	Acres	% of AUAR area
Lot D Subarea						
1028A	Urban land-Udorthents-Aquents complex, 0 to 8 percent slopes	No Rating	5	No Rating	13.7	73.9
W	Water	N/A	N/A	N/A	4.8	26.1
				Total	**18.5**	**100.0**
Essentia Subarea						
F163D	Urban land-Mesaba-Rock outcrop complex, 1 to 18 percent slopes	No Rating	5	No Rating	96.6	100.0
				Total	**96.6**	**100.0**
1st Street Subarea						
F163D	Urban land-Mesaba-Rock outcrop complex, 1 to 18 percent slopes	No Rating	5	No Rating	105.7	74.8
1028A	Urban land-Udorthents-Aquents complex, 0 to 8 percent slopes	No Rating	5	No Rating	33.5	23.7
F160F	Rock outcrop-Mesaba-Barto complex, 18 to 60 percent slopes	No Rating	5	No Rating	2.1	1.5
				Total	**141.3**	**100.0**
Secondary Subarea						
F163D	Urban land-Mesaba-Rock outcrop complex, 1 to 18 percent slopes	No Rating	5	No Rating	75.8	76.2
E25D	Urban land-Amnicon-Rock outcrop complex, 0 to 18 percent slopes	No Rating	6	No Rating	20.1	22.0
E23F	Miskoaki-Udifluvents, flooded, complex, 1 to 45 percent slopes	D	6	0.43	1.7	1.8
				Total	**97.6**	**100.0**

The hydrologic soil groups are:

- **Group A**: Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
- **Group B**: Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained, or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
- **Group C**: Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
- **Group D**: Soils having a very slow infiltration rate (high runoff potential). These consist chiefly of soils with high clay content, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.
- **Dual Groups**: Dual Group designations (A/D, B/D, or C/D) are used to indicate wet soils that belong to Group D due to a high water table but would meet the drainage or textural criteria for Group A, B, or C if drained. Dual Group soils should be treated as Group D soils in the absence of effective artificial drainage.

The soil erodibility factors are:

- **Wind Erodibility Group**: Soils are assigned a Wind Erodibility Group (WEG) rating based on their inherent vulnerability to soil particle detachment from wind forces. Values range from 1 (most erodible) to 8 (least erodible).
- **Water Erodibility Factor (K*f*):** The Soil Erodibility Factor (K*f*) is a unitless quantitative description of the inherent vulnerability of a soil to water erosion. It provides a measurement of soil particles' susceptibility to detachment from rain drops or surface runoff. Values range from 0.02 (least erodible) to 0.69 (most erodible).

Shallow bedrock, disturbed soils, gravelly soils, wet soils, and steep slopes create risks for water erosion, sloughing, and overall soil stability. Most of the soils throughout the AUAR area experienced significant disturbance due to past development. Cutting, filling, grading, and construction of impervious surfaces have likely altered soil characteristics beyond what can be interpreted from the SSURGO data. Runoff rates may be high on steep slopes, previously disturbed areas, and areas of very shallow or exposed bedrock.

To address the risks identified above, a combination of structural and non-structural measures could be implemented. Best practices may include installing temporary erosion control devices such as silt fences, sediment traps, and wattles during construction to prevent soil loss. On steep slopes and areas with high runoff potential, best practices may include reinforced erosion control blankets, turf reinforcement mats, or geotextiles to stabilize exposed soils. Where feasible, minimization of cut and fill operations should be considered, and vegetative buffers should be maintained to reduce erosion. Mitigation measures may also include implementation of phased grading and limiting the extent of exposed soils at any given time. Permanent measures could include re-vegetation with deep rooted native species, hydroseeding, and mulching to restore soil structure and reduce long-term erosion. In areas with shallow bedrock or high groundwater, proper drainage design should be implemented to prevent sloughing and frost heave.

Item 11 Mitigation Strategies

Geology

- If blasting is required to complete construction within the bedrock, a geotechnical investigation should be completed beforehand. Impacts relating to blasting should be mitigated through development of blasting plans that comply with local and state regulations. Other mitigation measures should include vibration monitoring, notification of blasting to nearby property owners, scheduled blasting during daytime hours, and use of blast mats to control flyway rock. Where feasible, alternative excavation methods such as hydraulic hammers should be considered.

Soils/Topography/Erosion Control

- Land alteration and site restoration activities would be regulated by federal, state, and/or local rules. The regulatory requirements described below would be sufficient to prevent groundwater contamination, excessive erosion, and excessive sediment migration. Other potential mitigation measures and best practices are described above and may include temporary erosion control devices, maintaining vegetative buffers, phased grading, and re-vegetation.
- Redevelopment of the AUAR area would require a Construction Stormwater Permit for stormwater management. The permit application would include a Stormwater Pollutions Prevention Plan (SWPPP) with detailed erosion and sediment control plans for all aspects of the Project, including post-construction permanent stormwater management.
- Redevelopment of the AUAR area would also require compliance with the following provisions set forth in the City of Duluth Legislative Code Unified Development Chapter (City Code): Prior to site disturbance, the developer must obtain City permits appropriate for their proposed development. The City will require a detailed Geotechnical investigation to determine strength, stability, and bearing capacity of the site's soils to ensure that stability risks are accounted for in the civil design. The City will require a comprehensive Erosion & Sediment Control (ESC) plan and stormwater management plan. The City will apply post-construction stormwater performance standards meant to limit the quality, rate, and volume of runoff leaving the site. The City may impose stricter controls than the MPCA permit conditions or City Code standards if deemed necessary by the City Engineer. The Code requires ongoing monitoring of ESC and stormwater management during and after construction. Responsibility for permanent maintenance and operations of the stormwater system will be determined during the permitting process.

  Erosion and sediment control practices must be maintained throughout construction and must be subject to both routine and storm-event inspections by the applicant. Regulatory representatives must be allowed on site to conduct their own inspections as deemed necessary by the regulatory authority.

12. Water Resources

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

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

Table 8 summarizes surface waters, wetlands, DNR Public Waters, Class 2A waters (cold water habitat or trout waters) and other waters with special designations within the AUAR area. The following paragraphs provide a summary of these features for each of the four subareas.

Lot D Subarea

A review of DNR geospatial data determined that there is one lake, the Duluth/Superior Harbor (also called the St. Louis River Estuary), within the Lot D subarea. The St. Louis River Estuary is designated as a lake of biological significance,[15] classified as outstanding. There are no state designated trout streams or lakes,[16] wildlife lakes,[17] or migratory waterfowl feeding/resting lakes[18]

[15] DNR. Lakes of Biological Significance. 2020. Available at: https://gisdata.mn.gov/dataset/env-lakes-of-biological-significe. Accessed September 2025.
[16] DNR. State Designated Trout Streams. 2020. Available at: https://gisdata.mn.gov/dataset/env-trout-stream-designations. Accessed September 2025.
[17] DNR. Designated Wildlife Lakes. 2016. Available at: https://gisdata.mn.gov/dataset/env-designated-wildlife-lakes. Accessed September 2025.
[18] DNR. Migratory Waterfowl Feeding and Resting Areas. 2016. Available at: https://gisdata.mn.gov/dataset/env-migratory-waterfowl-areas. Accessed January 2025.

within the Lot D Subarea. The shoreland overlay zone associated with Lake Superior encompasses portions of Lot D.

The City of Duluth Streams dataset and the DNR Hydrography Dataset did not identify any streams or watercourses within the Lot D subarea.

Essentia Subarea

A review of DNR geospatial data determined that there are no lakes, state designated trout streams or lakes, wildlife lakes, migratory waterfowl feeding/resting lakes, or lakes of biological significance within the Essentia subarea.

The City of Duluth Streams dataset indicates Brewery Creek is located within the Essentia subarea.

1st Steet Subarea

A review of DNR geospatial data determined that there are no lakes, state designated trout streams or lakes, wildlife lakes, migratory waterfowl feeding/resting lakes, or lakes of biological significance within the 1st Street subarea.

The City of Duluth Streams dataset indicates Clarkhouse Creek is located within the 1st Street subarea.

Secondary Subarea

A review of DNR geospatial data determined that there are no lakes, migratory waterfowl feeding/resting lakes, or lakes of biological significance within the Secondary Subarea.

The City of Duluth Streams dataset indicates Chester Creek, Greys Creek, and Brewery Creek are located within the Secondary subarea. Chester Creek is a trout stream, impaired water, and a DNR Public Water Watercourse that primarily runs through underground culverts through the Secondary subarea. Additionally, Miller Creek and Golf Course Pond are within one-mile of the Lot D subarea and 1st Street subarea, respectively. Designated Class 2A waters (cold water habitat or trout waters) are subject to MPCA water quality standards pursuant to Minnesota Rules Chapter 7050. Class 2A waters includes Buckingham Creek, Chester Creek, Miller Creek, Lake Superior, Upper Twin Pond, and Lower Twin Pond.

Table 8. Surface Waters, Public Waters, and other Special Designations within One-Mile of the AUAR area

Water Resource	Type	PW ID / Kittle No. / Duluth Stream ID	Special Designation
Lot D Subarea			
Duluth/Superior Harbor (St. Louis River Estuary)	Lake	69129101 (69129100)	Public Water Basin, Impaired Lake, Lake of Biological Significance
St. Louis Bay	Lake	69-1291-02	Impaired Lake
Miller Creek	Stream	04010201-512	Public Water Watercourse, Impaired Stream, Trout Stream
Buckingham Creek	Stream	04010201-B02, headwaters to Twin Ponds only	Public Water Watercourse, Trout Stream
Lower Twin Pond	Pond	69096702	Trout lake
Upper Twin Pond	Pond	69096701	Trout lake
Essentia Subarea			

Water Resource	Type	PW ID / Kittle No. / Duluth Stream ID	Special Designation
Brewery Creek	Stream	E003470	None
1st Street Subarea			
Clarkhouse Creek	Stream	W000110	None
Golf Course Pond	Pond	69-1345-00	None
Secondary Subarea			
Chester Creek	Stream	693861 / S-003 / E005930	Public Water Watercourse, Impaired Stream, Trout Stream
Greys Creek	Stream	E003980	None
Brewery Creek	Stream	E003470	None

DNR Public Waters

Figure 13, Appendix B identifies DNR Public Waters within and near the AUAR area. Based on a review of aerial photographs, the streams indicated in the City of Duluth Streams Dataset and DNR Public Waters inventory flow primarily through underground culverts through the AUAR subareas.

Lot D Subarea

According to the DNR National Wetland Inventory (NWI) Wetland Finder[19] and geospatial data, one DNR Public Water Basin, Duluth/Superior Harbor (69129101), is located within the Lot D subarea. No Public Watercourses are located with the Lot D subarea.

Essentia Subarea

According to the DNR NWI Wetland Finder and geospatial data, there are no DNR Public Water Basins or Watercourses located within the Essentia subarea.

1st Steet Subarea

According to the DNR NWI Wetland Finder and geospatial data, there are no DNR Public Water Basins or Watercourses located within the 1st Street subarea.

Secondary Subarea

According to the DNR NWI Wetland Finder and geospatial data, one DNR Public Watercourse, Chester Creek (693861), is located within the Secondary Subarea. No Public Water Basins are located within the Secondary subarea.

Wetland Resources

The DNR NWI geospatial data identified two wetlands within the AUAR area. Figure 14, Appendix B shows NWI wetlands within and near the AUAR area. Table 9 identifies NWI wetlands within the AUAR area.

Lot D Subarea

The DNR NWI geospatial data identified one NWI feature, Lake Superior, within the Lot D subarea.

[19] DNR. NWI Wetland Finder. 2024. Available at: https://wetland-finder.dnr.state.mn.us. Accessed October 2025.

Essentia Subarea

No DNR NWI features were identified within the Essentia subarea.

1st Steet Subarea

The DNR NWI geospatial data identified one wetland feature, a seasonally flooded basin, within the 1st Street subarea.

Secondary Subarea

No DNR NWI features were identified within the Secondary subarea.

Table 9. Wetlands within the AUAR area

Subarea	Circular 39	Cowardin	Eggers and Reed	Acres within the Subarea
Lot D	Type 5	L1UBH	Lake	4.65
1St Street	Type 1	PEM1A	Freshwater Emergent Wetland	0.82

MPCA 303d Impaired Waters List

A review of the MPCA's 2024 Impaired Waters List[20] identified two impaired waters within one mile of the AUAR area (Figure 13, Appendix B). Lake Superior, Assessment Unit Identification (AUID 16-0001-00, is located adjacent to the AUAR area and is impaired for aquatic consumption due to the presence of mercury (Hg) and polychlorinated biphenyls (PCB). No Total Maximum Daily Load (TMDL) has been established for Lake Superior. Several aquatic invasive species (AIS) have been identified in Lake Superior and the St. Louis River including Eurasion watermilfoil, New Zealand mudsnail, round goby, ruffe, spiny waterflea, viral hemorrhagic septicemia (VHS), white perch and zebra mussels.[21] Table 10 identifies impaired waters within the AUAR area.

Lot D Subarea

A review of the MPCA's Impaired Waters List identified one impaired lake, Duluth Superior Harbor, within the Lot D subarea. Duluth Superior Harbor, AUID 69-1291-01, is impaired for aquatic consumption due to the presence of toxaphene, PCB, dioxin, dichloro-diphenyl-trichloroethane (DDT), dieldrin, and mercury (Hg). No Total Maximum Daily Load (TMDL) has been established. Within one mile of the Lot D subarea, Lake Superior (AUID 16-0001-00), is impaired for aquatic consumption due to presence of PCB and mercury. No total Maximum Daily Load (TMDL) has been established. Several invasive species have been identified in Lake Superior including Eurasion watermilfoil, New Zealand mudsnail, round goby, ruffe, spiny waterflea, viral hemorrhagic septicemia (VHS), white perch and zebra mussel.

Essentia Subarea

A review of the MPCA's Impaired Waters List identified no impaired waters in the Essentia subarea. Within one mile of the Essentia subarea, Lake Superior (AUID 16-0001-00), is impaired for aquatic consumption due to presence of PCB and mercury. No total Maximum Daily Load (TMDL) has been established. Several invasive species have been identified in Lake Superior including Eurasion watermilfoil, New Zealand mudsnail, round goby, ruffe, spiny waterflea, viral hemorrhagic septicemia (VHS), white perch and zebra mussel.

[20] MPCA. Impaired Wates Viewer. 2024. Available at: https://mpca.maps.arcgis.com/apps/webappviewer/index.html?id=fcfc5a12d2fd4b16bc95bb535d09ae82. Accessed October 2025.
[21] St. Louis County. County Land Explorer GIS map. 2023. Available at: https://www.stlouiscountymn.gov/departments-a-z/economic-community-development/enterprise-gis/county-land-explorer. Accessed October 2025.

1st Street Subarea

A review of the MPCA's Impaired Waters List identified no impaired waters in the 1st Street subarea. Within one mile of the 1st Street subarea, Lake Superior (AUID 16-0001-00), is impaired for aquatic consumption due to presence of PCB and mercury. Several invasive species have been identified in Lake Superior including Eurasion watermilfoil, New Zealand mudsnail, round goby, ruffe, spiny waterflea, viral hemorrhagic septicemia (VHS), white perch and zebra mussel. Also, within one mile of the 1st Street subarea, Duluth Superior Harbor, AUID 69-1291-01, is impaired for aquatic consumption due to the presence of toxaphene, PCB, dioxin, dichloro-diphenyl-trichloroethane (DDT), dieldrin, and mercury (Hg). No Total Maximum Daily Load (TMDL) has been established.

Secondary Subarea

A review of the MPCA's Impaired Waters List identified one impaired stream, Chester Creek, in the Secondary subarea. Chester Creek, Assessment Unit Identification (AUID) 04010102-545, is impaired for aquatic recreation due to the presence of Escherichia coli (E. coli) and for aquatic life due to chloride (Cl-). No Total Maximum Daily Load (TMDL) has been established. Within one mile of the Secondary subarea, Lake Superior (AUID 16-0001-00), is impaired for aquatic consumption due to presence of PCB and mercury. Several invasive species have been identified in Lake Superior including Eurasion watermilfoil, New Zealand mudsnail, round goby, ruffe, spiny waterflea, viral hemorrhagic septicemia (VHS), white perch and zebra mussel.

Table 10. Impaired Waters within One-Mile of the AUAR area

Waterbody Name	AUID	Affected Designated Use	Pollutant or Stressor	TMDL ID
Lot D Subarea				
Duluth/ Superior Harbor	69-1291-01	Aquatic Consumption	Toxaphene, PCB-Fish tissue, PCB-Water column, Dioxin, DDT, Dieldrin, Hg-F, Hg-W	None
St. Louis Bay	69-1291-02	Aquatic Consumption	DDT; Dieldrin; Dioxin; Hg-Fish tissue; Hg-Water column; PCB-Fish tissue; PCB-Water column; Toxaphene	None
Miller Creek*	04010201-512	Aquatic Consumption, Life, and Recreation	Chloride, benthic macroinvertebrates bioassessments, PFOS, temperature	*E.coli*, Temp
1st Street Subarea				
Golf Course Pond	69-1345-00	Aquatic Consumption	PCB-Fish tissue	HG-Fish tissue
Secondary Subarea				
Chester Creek*	04010102-545	Aquatic Life and Aquatic Recreation	*E. coli* and Chloride	*E. coli*
Leif Erickson Park Beach	04010102-C21	Aquatic Recreation	*E. coli*	*E. coli*

Notes: Assessment Unit Identification (AUID), Total Maximum Daily Load (TMDL), Perfluorooctane sulfonate (PFOS), Escherichia coli (E. coli), Polychlorinated bipehyls (PCBs), Mercury (Hg), Dichlorodiphenyltrichloroethane (DDT)

**It is anticipated that a chloride TMDL for Chester Creek and Miller Creek will be approved in 2026.*

Floodway/Floodplain

Portions of the AUAR area along the Lake Superior shoreline and Chester Creek are within the

regulated 100-year floodplain and 500-year floodplain. Figure 13, Appendix B shows 100-year floodplain and 500-year floodplain areas within the AUAR area.

Lot D Subarea

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel 27137C3788E generated through the National Flood Hazard Layer (NFHL) mapping tool[22] indicates that the southern and eastern portions of the Lot D subarea is within Zone AE (coastal floodplain), an area regulated 100-year floodplain (one percent annual chance of flooding). The remainder of the Lot D subarea is within Zone X (area of minimal flood hazard). Appendix D provides the FEMA FIRMette for the Lot D subarea.

Essentia Subarea

The FEMA FIRM panels 27137C3786E and 27137C3790E generated through the NFHL mapping tool indicates that the Essentia subarea is within Zone X (area of minimal flood hazard). Appendix D provides the FEMA FIRMette for the Essentia subarea.

1st Steet Subarea

The FEMA FIRM panels 27137C3788E and 27137C3786E generated through the NFHL mapping tool indicate that the 1st Street subarea is within Zone X (area of minimal flood hazard). Appendix D provides the FEMA FIRMette for the 1st Street subarea.

Secondary Subarea

The FEMA FIRM panel 27137C3790E generated through the NFHL mapping tool indicates that the Secondary subarea is within Zone X (area of minimal flood hazard). Appendix D provides the FEMA FIRMette for the Secondary subarea.

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

A review of the MDH MWI identified 23 verified wells within the AUAR area.[23] These wells are presented in Table 11 and Figure 11, Appendix B.

Lot D Subarea

A review of the MDH MWI identified no wells within the Lot D subarea. Based on a review of some wells located near the Lot D subarea, the depth to static water level ranges from approximately two to six feet below ground surface.

Essentia Subarea

A review of the MDH MWI identified 10 verified wells within the Essentia subarea. Based on a review of the wells located in the Essentia subarea, where reported, the depth to static water level ranges from approximately six to nine feet below ground surface.

1st Street Subarea

A review of the MDH MWI identified 13 verified wells within the 1st Street subarea. Based on a review of the wells located in the 1st Street Subarea, where reported, the depth to static water level ranges

[22] FEMA. NFHL Viewer. 2025. Available at: https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd. Accessed October 2025.
[23] MDH. Minnesota Well Index (MWI) Version 2.2.0. undated. Available at: https://www.health.state.mn.us/communities/environment/water/mwi/index.html. Accessed September 2025.

from approximately six to 10 feet below ground surface.

Secondary Subarea

A review of the MDH MWI identified no verified wells within the Secondary subarea**.** Based on a review of the wells located in the Secondary subarea, which is adjacent to the Secondary subarea, where reported, the depth to static water ranges from approximately six to nine feet below ground surface.

Table 11. MDH Well Records within the AUAR area

Well ID	Use Type	Status	Depth (ft.)	Static Water Level (ft.)
Essentia Subarea				
704162	Elevator	Active	50	-
758411	Monitoring	Sealed	9	6
669263	Monitoring	Sealed	12	-
669264	Monitoring	Sealed	12	-
698994	Monitoring	Sealed	10.5	9
669262	Monitoring	Sealed	12	-
704151	Elevator	Active	24	-
704152	Elevator	Active	42	-
739033	Elevator	Active	60	-
739032	Elevator	Active	54	-
1st Street Subarea				
701046	Monitoring	Sealed	10	-
701047	Monitoring	Sealed	13	-
703163	Monitoring	Sealed	16	10
454658	Air Conditioning	Sealed	312	-
533479	Elevator	Active	35	-
739031	Elevator	Active	56	-
644513	Domestic	Active	11	-
704170	Elevator	Active	42	6
533478	Elevator	Active	34	-
739042	Elevator	Active	49	-
739041	Elevator	Active	49	10
533480	Elevator	Active	36	-
764826	Elevator	Active	34	-

According to the MDH Source Water Protection Map, the AUAR area is not within a MDH Wellhead Protection Area (WHPA) or Drinking Water Supply Management Area (DWSMA). The AUAR area is within a Historical Source Water Assessment Area for surface water.[24]

Based on the reported static water levels, groundwater in the AUAR area could be relatively shallow, which is a potential risk to groundwater. If groundwater is encountered during construction, dewatering could be necessary. Pumping shallow groundwater may affect nearby wells. Other potential risks to groundwater may include residual contamination from historic industrial land uses

[24] DNR. Source Water Protection Web Map Viewer. undated. Available at: https://experience.arcgis.com/experience/14825b159b2e4dc686736d98e39ebce7. Accessed October 2025.

being exacerbated by redevelopment which could mobilize contaminants during excavation or dewatering.

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

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

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

Resource Renew, previously known as Western Lake Superior Sanitary District (WLSSD), serves a 530-square mile area that includes 17 municipal customers, including the City of Duluth. Resource Renew conveys and treats approximately 36 million gallons per day (MGD) of wastewater. The flow and peak flow design capacity of the wastewater treatment facility (WWTF) is 48.4 MGD and 100 MGD, respectively.[25] The Total suspended solids (TSS) and biochemical oxygen demand (BOD) design capacity of the WWTF is 112,000 lbs. per day and 121,000 lbs. per day, respectively.

The City of Duluth owns, operates, and maintains 53 wastewater pumping stations including five storage facilities with a storage capacity of 14 million gallons. The City's sanitary sewer infrastructure system is comprised of approximately 440 miles of collection sewer interceptors. Under existing conditions, the AUAR area is comprised of developed land that is connected to the City's sanitary sewer infrastructure.

It is anticipated that the AUAR area would connect to the City of Duluth's sanitary sewer collection system at location(s) to be determined by the City. The connection point(s) would be selected based upon available capacity and/or feasibility to construct or improve downstream infrastructure to accommodate the additional flow.

Based on a preliminary assessment of the existing sanitary collection infrastructure, it is anticipated that wastewater generated by the proposed Lot D development would be conveyed to a potential connection point existing near Railroad Street. This connection may require improvements to the sewer collection infrastructure system to expand pipe capacity. At the time that a development application is submitted and design specifics are known, the City of Duluth would determine the appropriate improvements needed to accommodate increased wastewater flows generated by development.

From the connection point, wastewater will be conveyed to the existing WWTF located at 2626 Courtland Street in the City of Duluth, approximately three miles southwest of the AUAR area. The WWTF is permitted by the MPCA to treat industrial and domestic wastewater prior to discharge into the St. Louis River.

Two development scenarios are proposed for the AUAR Area. Scenario A evaluates the existing conditions, while Scenario B evaluates 4 sub-areas that include developments that increase of residential, commercial, industrial, institution, and tourism areas. Wastewater flow estimates were prepared for both scenarios based on estimated building square footages and numbers of housing units for specific uses. Total average annual day flow was estimated to be 1,740,224 gallons per day (GPD) for Scenario A, and 2,359,134 GPD for scenario B. Calculations were based upon square footage estimates, number of housing units, and Resource Renew 's Capacity Availability Fee (CAF) Manual.

The additional wastewater flow for Scenario B will contribute an additional 982 lbs. per day of

[25] WLSSD. Comprehensive Wastewater Plan. Adopted in 2023, amended in 2025. Available at: https://wlssd.com/wp-content/uploads/2025/04/WLSSD-Wastewater-Comprehensive-Plan-Amended-2025.pdf. Accessed October 2025.

biochemical oxygen demand (BOD) and 1085 lbs. per day of total suspended solids (TSS).

The existing WWTF is permitted for an average wet weather design flow (AWWDF) of 48.4 MGD with a carbonaceous biological oxygen demand of 300 milligrams per liter (mg/L). According to the WLSSD Draft Comprehensive Wastewater Plan (April 2025), the projected 2042 annual average influent flow is 35.5 MGD, and the projected 2042 average daily loads of BOD and TSS are 59,860 lbs. per day and 57,888 lbs. per day, respectively. Therefore, the current WWTF would have sufficient capacity through the 2042 design period to treat the proposed wastewater flows from the AUAR Area.

An early coordination meeting with Resource Renew and City Public Works and Utilities staff was held on December 2, 2025. Wastewater flow estimates associated with Scenario B were provided to Resource Renew and City staff for review. Based on a preliminary review, Resource Renew indicated that wastewater flow estimates are generally consistent with modeled basin data which incorporates standard growth assumptions. Interceptor capacity concerns were not identified. However, future developers will be required to coordinate with the City through the permitting process, to confirm sewer capacity and necessary infrastructure improvements to serve proposed development.

Any new sanitary sewer in the AUAR Area would be constructed in accordance with City standards. Developers would be responsible for sanitary sewer connection fees related to the proposed developments, construction of local sewer components to serve the developments, and MPCA/NPDES sanitary sewer extension permits.

2) *If the wastewater discharge is to a subsurface sewage treatment systems (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system. If septic systems are part of the Project, describe the availability of septage disposal options within the region to handle the ongoing amounts generated as a result of the Project. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion.*

   A subsurface sewage treatment system would not be proposed for Development Scenario B. The AUAR area would not be allowed to utilize SSTS, per City of Duluth ordinance, disallowing SSTS in areas served by municipal sewer.

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.*

   Wastewater conveyed and treated by Resource Renew is ultimately discharged into the St. Louis River. Resource Renew treatment system staff closely monitor effluent discharged to the St. Louis River to prevent pollution. The Resource Renew laboratory conducts regular sampling of effluent to ensure compliance with all State and Federal water quality standards.

Climate Trends

Considering current and future climate trends, increasing temperatures and precipitation could have an impact on sewer infrastructure and operations by increasing pressure on the existing capacity of the wastewater treatment and conveyance system. More frequent mega-rain events have the potential to increase the frequency of sanitary sewer overflow (SSO) events. Additionally, increasing occurrences of precipitation and melting snow may result in increasing inflow and infiltration (I&I) sanitary sewer system issues. In general, climate trends may result in increasing challenges to wastewater infrastructure and operations.[26] Ongoing monitoring,

[26] WLSSD. Draft Comprehensive Wastewater Plan. March 2023. Accessed December 2025. https://wlssd.com/wp-

maintenance, and replacement of sanitary infrastructure would minimize occurrence and identify sources I&I.

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.

Existing Conditions

Lot D Subarea

Lot D subarea is a 12-acre lot located along Duluth's waterfront in the Bayfront District adjacent to Lake Superior. The subarea is approximately 44 percent impervious, primarily consisting of a cement slab and associated gravel roadways. The area contains contaminated soils, which is planned for remediation in 2026. The proposed remediation plan includes encapsulating the contaminated soil and constructing new developments atop the resulting soil cap.

Essentia Subarea

The Essentia subarea encompasses approximately 83 acres with approximately 85 percent impervious surface coverage. The area includes three primary land use zones: institutional mixed-use, neighborhood mixed use and urban residential.

1st Street Subarea

The 1st Street subarea covers approximately 141 acres with approximately 85 percent impervious surface. Land use within this area is predominantly commercial business.

Secondary Subarea

The Secondary subarea spans approximately 92 acres with approximately 74 percent impervious surface coverage. The area includes a mix of institutional mixed-use and residential land uses.

Proposed Conditions

Development in all four subareas will be required to comply with applicable stormwater management requirements and Duluth zoning regulations. Available information for the areas indicates limited stormwater best management practice (BMP) measures are currently present in the subareas. A few large-scale sediment channels are present under I-35 that were constructed to manage runoff generated from the public roads, however, these channels also receive runoff that drains down the hillside from 6th Avenue West to 1st Avenue East.

content/uploads/2025/04/WLSSD-Wastewater-Comprehensive-Plan-Amended-2025.pdf

All potential and future development within the AUAR area is located below the bluff line in downtown Duluth, within one mile of Lake Superior, a designated impaired water and DNR Public Water Basin and Lake of Biological Significance. All subareas are in close proximity to and drain to Lake Superior. Due to the area's history of industrial activity, numerous MPCA-listed contamination sites may require further investigation and mitigation. All future development within the AUAR area must comply with regulations from the City of Duluth, MPCA, DNR, and USACE as applicable. While general stormwater management standards apply across all subareas, mitigation will be anticipated in the AUAR and site-specific requirements may be addressed with AUAR updates as development plans are refined.

Stormwater management must meet both temporary and permanent requirements for volume control, rate control, and water quality treatment, as outlined in:

- City of Duluth Natural Resources Overlay (Section 50-18), which includes additional standards for areas below the bluff line.
- MPCA's NPDES/SDS Construction Stormwater Permit, including Section 23 provisions for discharges to Lake Superior, a designated Outstanding Resource Water.

Lot D Subarea

Inland's preliminary concept plan proposes two multifamily buildings and a hotel with parking. Lot D, an undeveloped parcel, may be subject to stricter water quality standards than redevelopment sites under City rules. It is anticipated that the proposed development would be 72 percent impervious, which results in approximately 8.6 acres of impervious surface. Due to its proximity to Lake Superior the development will need to consider shoreland setback requirements, floodplain requirements, and public waters regulations.

Essentia Subarea

The Essentia subarea includes 18 potential redevelopment sites. Figure 4, Appendix A identifies potential redevelopment sites. Due to the variability of development plans and site-specific conditions related to stormwater infrastructure implementation, most sites will require an individual treatment system. Impervious cover was estimated for proposed conditions based on planning documents overlayed onto existing conditions to estimate impervious cover. The resulting changes in building footprints are reflected in Table 14 below. Sites that are decreasing impervious from existing to proposed conditions will likely meet Stormwater Regulations that are set based on predevelopment conditions.

1st Street Subarea

The 1st Street subarea anticipates redevelopment of properties with high impervious cover (85 percent or greater) such as existing parking lots, vacant land, or unoccupied buildings. Table 14 describes changes from existing to proposed impervious for two potential redevelopment sites shown in Figure 3, Appendix A. These sites are expected to be converted to mixed-use residential and commercial land uses, which typically have a maximum impervious percentage of 85 percent. As a result, changes to impervious areas – whether decreasing or increasing - will impact the stormwater requirements (e.g. rate and water quality) and selection of appropriate stormwater BMP(s) (e.g. pond or pond with filter bench). An existing trench drain system serves the 1st Street subarea, which is in poor condition, resulting in high maintenance costs. The City is planning to replace the trench drain which could tie in with BMPs proposed as part of future redevelopment within the 1st Street subarea.

Secondary Subarea

While most of the Secondary subarea watershed drains directly to Lake Superior, the northern portion of the site is adjacent to Chester Creek, a designated trout stream. It is anticipated that additional site-specific stormwater BMPs requirements in proximity to Chester Creek would be required related

to temperature and construction timing.

Stormwater Regulations

The tables below show requirements for new and redeveloped sites. It is anticipated that the majority of the AUAR area would be considered redevelopment. The City has different requirements above and below the Bluff Line (Skyline Pkwy); the development is located below the Bluff Line and would need to follow those requirements as referenced below.

Volume Management

The two regulatory bodies (City and MPCA) have different stormwater management requirements (Table 12). The AUAR assumes the development would meet the most stringent stormwater requirements set by the regulatory bodies. Due to the restrictions of volume for development near Lake Superior it is prudent for developers to identify low impact development methods to reduce volume discharge through reductions in impervious surface. Increases to impervious surface would require retention on site. Infiltration practices should be explored, as infiltration practices retain runoff on-site; however, infiltration may be difficult within the AUAR area due to the soil types, existing shallow and exposed bedrock, and shallow groundwater conditions. Failing to meet the volume management would require justification and evidence submitted to the City Engineer for review. Additionally, given the proximity of development to impaired waters, additional BMPs may be required as part of the Construction Stormwater Permit.

Table 13 summarizes changes in impervious surfaces within identified developable areas. It estimates stormwater volume requirements for MPCA and City of Duluth design storm depths over new and reconstructed impervious surfaces for each development scenario. Additional requirements may apply based on site layouts and potential exemptions, which will be addressed during design.

Table 12. Volume Control

Regulatory Agency	Requirements
MPCA	One-inch times the net increase in impervious surface.*
City of Duluth	The volume of stormwater runoff discharged from a proposed project shall not exceed the pre-development site conditions

Table 13. Estimated Volume Control for Potential Development Sites

Site	Existing Impervious Footprint (Acres)	Proposed Impervious Footprint (Acres)	Change (Acres)	MPCA 1-inch Abstraction Requirement (ft^3)	2-yr (2.7-inch) Abstraction Requirement (ft^3)	10-yr (4-inch) Abstraction Requirement (ft^3)	100-yr (6.4-inch) Abstraction Requirement (ft^3)
Lot D	5.28	8.64	3.36	12,197	32,931	48,787	78,060
Essentia 1	0.43	0.43	0.00	0	0	0	0
Essentia 2	0.41	0.41	0.00	0	0	0	0
Essentia 3	0.46	0.46	0.00	0	0	0	0
Essentia 4	0.28	0.28	0.00	0	0	0	0
Essentia 5	0.94	1.02	0.08	294	795	1,177	1,883
Essentia 6	2.55	2.55	0.00	0	0	0	0
Essentia 7	0.68	0.76	0.08	281	758	1124	1798
Essentia 8	0.45	0.45	0.00	0	0	0	0
Essentia 9	1.01	1.15	0.13	487	1,316	1,949	3,118
Essentia 10	0.77	0.86	0.09	334	902	1,336	2,138
Essentia 11	0.26	0.34	0.08	300	811	1,202	1,923
Essentia 12	0.16	0.23	0.07	252	679	1,006	1,610
Essentia 13	0.35	0.59	0.24	857	2,315	3,429	5,487
Essentia 14	0.40	0.40	0.00	0	0	0	0
Essentia 15	0.24	0.24	0.00	0	0	0	0
Essentia 16	0.25	0.25	0.00	0	0	0	0
Essentia 17	1.04	1.80	0.76	2,741	7,400	10,963	17,541
Essentia 18	2.44	2.85	0.41	1,501	4,054	6,005	9,608
1st Street 53	0.26	0.32	0.06	206	557	825	1320
1st Street 56	0.65	0.65	0.00	0	0	0	0

Rate Control

The City of Duluth has established rate control requirements based on predevelopment rates and varies for new or redevelopment (Table 14). These rates are required to be met for all ATLAS 14 Type II storm events (Table 15). The City also requires rate calculations and modeling to consider:

- All impervious areas to be connected
- Curve numbers cannot be weighted unless approved by the City

Flow cannot be diverted from one minor or major system to another minor or major system

Table 14. Rate Control Requirements for New Development and Redevelopment

Development Type	Post-Development Peak Flow Rates at Each Discharge Point Shall Not Exceed
New Development	75% of predevelopment peak flow rates for 10- and 100-year events; and 90% of predevelopment peak flow rate for 2- year event
Redevelopment	Predevelopment peak flow rates for all storm events

Table 15. Storm Events and Precipitation Values for Rate Control Requirements

NOAA ATLAS-14 24-hour NRCS Type II Storm Event	Precipitation
2-Year	2.7 inches
10-Year	4.0 inches
100-Year	6.4 inches
100-year 10-day snow melt*	8.1 inches

** Frozen ground conditions*

Water Quality Treatment

The City requires water quality treatment based on Total Suspended Solids (TSS) and Total Phosphorus (TP) removals in proposed conditions (Table 16). The City also requires at least ninety-five (95) percent of newly added impervious runoff to be directed to water quality treatment areas. If it is impractical to direct 95 percent of the added impervious surface to water quality area, alternate methods may be used in combination so long as 95 percent is treated, and all peak flow requirements are fulfilled.

Table 16. Water Quality Treatment Requirements

Development Type	New and Existing Impervious Surface	Required Treatment
New Development	> 3,000 sq. ft.	No net increase of TSS/TP from predevelopment conditions.
Redevelopment	≤ 1 acre	10% reduction in an impervious surface or 50% TSS removal. No net increase in TP from pre-project condition.
Redevelopment	≥ 1 acre	50% TSS removal. No net increase in TP from pre-project condition.*

**If the site contains an existing impervious surface area greater than one acre, the drainage report must include a determination of the current total suspended solids removal across the entire site. If the current TSS removal is below 50 percent, the drainage report must include an evaluation of the feasibility of increasing the TSS removal to 50 percent on an annual basis across the entire site.*

Climate Trends

Considering current and future climate trends, it is likely that the volume and frequency of large rainfall events will increase over time. This trend will be a necessary consideration when designing and implementing stormwater infrastructure and BMPs, including the need to review adjustments to comprehensive site plans during potential phases of construction. The stormwater management plan should be designed so that emergency overflows are routed away from adjacent development, especially openings of structures, allowing for continual access for emergency vehicles. Additionally, the overflow system should be designed to avoid directing or concentrating flows that negatively impact public infrastructure or natural resources. Maximizing green infrastructure should be considered during design.

Chloride Management

The substantial increase in impervious area along with climate trends would increase the application of chloride within the AUAR area compared to existing conditions. Future proposed development should apply MPCA and local agency guidance, such as smart salting, to manage the increase in chloride.

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 MnDNR 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.

The AUAR area is connected to municipal water services. The City of Duluth owns, operates, and maintains the Lakewood Water Treatment Plant which provides city water sourced from Lake Superior. The City also owns, operates, and maintains 15 water reservoirs. The water system is capable of providing a maximum of approximately 68 MGD of treated water. On average, the Lakewood Water Treatment Plant provides approximately 13 MGD of treated water. Projected water demands for the area would be utilized in planning additional distribution infrastructure.

It is estimated that Scenario A generates a water demand of 1,740,224 GPD and Scenario B would generate a water demand of 2,359,134 GPD on an average day basis. Projected water demands for the area would be utilized in planning additional distribution infrastructure, if needed.

Any new distribution infrastructure would be constructed in accordance with the City of Duluth's current Water Master Plan or Comprehensive Plan and according to the City's Engineering Guidelines

Construction-related water appropriations within the AUAR area include the potential for construction dewatering. As described in Item 11.a, the depth to groundwater is shallow. If dewatering is necessary for construction activities, a DNR Water Appropriation Permit would be required for any dewatering of volumes that meet or exceed 10,000 gallons per day or one million gallons per year.

Climate Trends

Climate change trends may affect surface water and groundwater interactions that may lead to long-term uncertainty regarding surface and groundwater levels, aquifer recharge, and groundwater flow.

This may result in impacts to groundwater supply availability, quality, and quantity. Surface and groundwater quantity is driven by the balance of atmospheric input from precipitation (recharge) and losses due to evapotranspiration.[27] Opportunities to utilize water efficient fixtures and equipment, along with water reuse and recycling measures should be considered at the time that a specific project is proposed to minimize water supply needs.

iv. Surface Waters

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

Anticipated physical effects or alterations to wetland features are based on a review of the NWI dataset. A wetland delineation may be needed to verify the presence and extent of wetlands within the AUAR area to verify potential impacts.

Lot D Subarea

The Duluth-Superior Harbor within Lake Superior occupies 4.65 acres within the Lot D subarea. No other wetlands are indicated in the NWI. Some construction activities within the subarea and near the shoreline, for example while rebuilding the existing seawall or reclaiming shoreline, could impact wetland plants on the shoreline of the Duluth-Superior-Harbor. Impacts to wetlands are regulated by the Minnesota Wetland Conservation Act (WCA) and the USACE under Section 404 of the Clean Water Act. The City of Duluth is the WCA local governmental unit (LGU) for the AUAR area. Future development would be required to demonstrate avoidance and minimization of wetland impacts to the greatest extent practicable. The USACE, LGU, and other appropriate stakeholders would be consulted during this process.

Essentia Subarea

No wetlands are present based on the NWI, therefore no wetland impacts or other physical effects or alterations to wetlands are anticipated. Indirect impacts, such as from changes to catchment sizes, would be evaluated during individual project design. Best management practices would be detailed in a project Stormwater Pollution Prevention Plan (SWPPP), which would be prepared in consultation with the City of Duluth.

1st Street Subarea

One wetland is located within AUAR area, specifically within the 1st Street subarea. Given the limited size of the wetland (0.82 acres), it is anticipated that future development would be able to avoid impacting the wetland. If wetland impacts associated with future development of the AUAR subarea are unavoidable, a wetland replacement plan would be required. Impacts to wetlands are regulated by the Minnesota Wetland Conservation Act (WCA) and the USACE under Section 404 of the Clean Water Act. The City of Duluth is the WCA local governmental unit (LGU) for the AUAR area. Future developers would be required to demonstrate avoidance and minimization of wetland impacts to the greatest practicable extent. The USACE, LGU, and other appropriate stakeholders would be consulted during this process. The AUAR area is located within Bank Service Area (BSA) 1. Purchase of wetland bank credits may be used to provide mitigation if future proposed development were to result in unavoidable wetland impacts.

[27] DNR. *Climate's Impact on Water Availability*. Updated October 19, 2021 https://www.dnr.state.mn.us/climate/water_availability.html

Secondary Subarea

No wetlands are present based on the NWI, therefore no wetland impacts or other physical effects or alterations to wetlands are anticipated. Indirect impacts, such as from changes to catchment sizes, would be evaluated during individual project design. Best management practices would be detailed in a project SWPPP, which would be prepared in consultation with The City of Duluth.

Climate Trends

Climate trends in all AUAR subareas predict wetter, warmer climate, and more intense precipitation events. Wetlands are important natural features that attenuate and store runoff from precipitation events. In addition to maintaining wetlands within the AUAR area, any proposed development scenarios would be required to incorporate stormwater features to mitigate the impacts of runoff from precipitation events on wetlands and other water features within the AUAR area

b) Other surface waters- Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the Project may influence the effects. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed to avoid or minimize turbidity/ sedimentation while physically altering thewater features. Discuss how the Project will change the number or type of watercraft on any water body, including current and Projected watercraft usage.

Lot D Subarea

The Lot D subarea abuts Duluth Superior Harbor. As planned, a seawall within Duluth Superior Harbor would be rebuilt. A new steel sheet pile (SSP) dock wall would be built around the existing seawall. This work would involve clearing of the top five feet of the mudline where the SSP would be installed. A vibratory hammer would be used to drive in the sheet piles, and once the SSP is installed, portions of the old seawall would be demolished, and the area behind the SSP would be excavated to allow for installation of the tieback system. Silt curtains would be used to minimize turbidity and sedimentation during in water work and slow start of the vibratory hammer would be utilized to reduce underwater impacts to wildlife. Once constructed, the area between the new and existing dock would be filled with crushed stone. The Project is not anticipated to change the number nor types of watercraft within Lake Superior Harbor.

Essentia Subarea

Brewery Creek crosses through the northeast corner of the Essentia subarea. The creek is not anticipated to be impacted directly by development in any of the AUAR subareas. Per Section 50-18 (Natural Resources Overlay District) of the City of Duluth Legislative Code, future development would be required to comply with the minimum building and impervious surface setbacks for General Development Waters and Natural Environmental Waters which would apply to all creeks in all subareas. City stormwater rules would require no increase in flow rate or volume to these creeks or any storm sewer systems.

1st Street Subarea

Clarkhouse Creek bisects the 1st Street Subarea. Creeks are not anticipated to be impacted

directly by development in any of the AUAR subareas. Per Section 50-18 (Natural Resources Overlay District) of the City of Duluth Legislative Code, future development would be required to comply with the minimum building and impervious surface setbacks for General Development Waters and Natural Environmental Waters which would apply to all creeks in all subareas. City stormwater rules would require no increase in flow rate or volume to these creeks or any storm sewer systems.

Secondary Subarea

Brewery Creek crosses through the southwest portion of the Secondary subarea. Greys Creek crosses through the western portion of the Secondary Subarea. Chester Creek crosses through the eastern edge of the Secondary Subarea.

The creeks are not anticipated to be impacted directly by development in any of the AUAR subareas. Per Section 50-18 (Natural Resources Overlay District) of the City of Duluth Legislative Code, future development would be required to comply with the minimum building and impervious surface setbacks for General Development Waters and Natural Environmental Waters which would apply to all creeks in all subareas. City stormwater rules would require no increase in flow rate or volume to these creeks or any storm sewer systems.

Climate Trends

All AUAR subareas are predicted to experience warmer and wetter conditions, with more frequent intense precipitation events due to climate change. Runoff to surface water during intense precipitation events can cause water quality impacts. Stormwater management features within the AUAR area would be required to mitigate impacts by slowing and reducing the amount of stormwater that flows offsite per City stormwater rules.

Construction and erosion control BMPs such as silt fence, sediment control logs, and rock construction entrances, would be used during construction to protect surface waters from runoff and sedimentation. Stormwater management would be designed to treat stormwater runoff and control runoff volume to minimize impacts to water resources and is further described section 12b.ii. above. Future development is not anticipated to change the number or type of watercraft on any waterbodies.

Item 12 Mitigation Strategies

Wetlands / Surface Waters

- Wetland impacts are not anticipated under the proposed development scenarios for any AUAR subareas.
- A wetland delineation may be required to accurately identify the extent of wetlands within the AUAR area.
- If future proposed development within any AUAR subareas would result in wetland impacts, a wetland replacement plan may be required in accordance with all regulations and requirements in place at the time of final design and permitting. A project alternatives analysis and avoidance and minimization analysis for proposed impacts to wetlands would be required as part of the wetland replacement plan application.
- Seawall reclamation would require an analysis of floodplain impacts.
- Work in water and vibratory hammer work would be required to occur outside of trout spawning dates for the Lake Superior Watershed (September 15-June 30).
- Surveys for freshwater mussels under a DNR permit may need to be conducted prior to construction.
- Vibratory hammer usage would utilize a soft start to minimize underwater noise impacts.
- Dredged material that would be stored onsite would require a NPDES/SDS permit from the Minnesota

Pollution Control Agency per Minn. Stat. § 105G.005. Any pile of dredged material would be spread out, seeded, mulched and stabilized in place, along with considerations for stormwater runoff described in section 12b.ii.

- Reclamation of the southeast corner of the dock wall in the Lot D subarea may be required. This would require consultation and additional permitting with DNR and USACE.
- A DNR Public Waters Work Permit may be required for work in water depending on the final extent of the work. Coordination with the DNR would be required to confirm permit requirements for work in regulated DNR Public Waters.
- Proposed projects must comply with the City's shoreland standards in City Code 50-18.1D.

Groundwater

- Any wells encountered during construction of the AUAR area that are no longer in use (or are not planned to be used following completion of construction) are required to be sealed by a licensed well contractor according to Minnesota Well Code. Wells may be allowed to remain open if an annual Unused Well Permit is obtained and conditions of the permit are followed.
- Groundwater dewatering may be necessary if groundwater is encountered during construction. An NPDES permit would be obtained for any dewatering discharge.
- Depending on the potential for contamination to be present at proposed development sites, developer may need to complete Phase I Environmental Site Assessment (ESA) and Phase II investigations prior to construction. If warranted, a contingency plan should be implemented for contaminated groundwater encountered during construction.

Stormwater Management

- BMPs (e.g., silt fence, sediment control logs, etc.) will be required during construction to avoid and minimize turbidity, sedimentation, stormwater runoff, and other potential effects to surface waters in the vicinity of the AUAR area. Additional BMPs may be required as part of the Construction Stormwater Permit given the proximity of impaired waters to the AUAR area.
- Future development will be required to implement stormwater BMPs in compliance with the City of Duluth and MPCA regulations in place at the time that the project is proposed. Future developments will require a City-approved stormwater management plan for each phase that, among other requirements, must show how projected water flows will not exceed the capacity of the downstream system.
- The City strongly recommends that project developers consider current and future climate trends in the design of future projects. Proposed stormwater infrastructure and BMPs should be designed to accommodate an increase in stormwater discharge and emergency overflows associated with an increased frequency of large rainfall events.
- Developers should consider incorporating green infrastructure measures in the project design when feasible.
- Additional BMPs may be required as part of the Construction Stormwater Permit given the AUAR area ultimately drains to Lake Superior. Specific BMP requirements would be identified based on the specific conditions of future development and the regulations and requirements in place at the time that development is proposed.
- BMPs and wildlife-friendly erosion and sediment control devices shall be used during construction activities as required by the NPDES Permit, SWPPP, and Construction Site Stormwater Permit to prevent sediment-laden stormwater runoff from the AUAR area into receiving wetlands and waterbodies, which could adversely impact habitats of aquatic species.
- Future proposers should apply MPCA and the local agency guidance, such as smart salting, to manage the increase in chloride.
- The city will consider working with landowners in downtown to develop a proactive snow removal strategy.

Wastewater

- Based on coordination with the City and Resource Renew, sewer interceptor capacity constraints were not identified. However, future developers will be required to coordinate with the City of Duluth Public Works and Utilities Department as development is proposed to confirm the need for improvements to the City's sewer collection infrastructure system.

Water Appropriation

- The DNR is the state permitting agency for water appropriations. Temporary dewatering that exceeds 10,000 gallons per day or 1,000,000 gallons per year would require a permit from the Minnesota DNR.
- If water utilized for dust control is taken from a river or stream, a DNR water appropriation permit would be required. Products containing chloride for dust suppression in areas draining to DNR Public Waters should be avoided.
- Pressure boosting systems may be needed for buildings to increase low water pressure and ensure adequate flow (especially for residential buildings) and should be confirmed as development is proposed.

13. Contamination/Hazardous Materials/Wastes

a. Pre-Project site conditions - Describe existing contamination or potential environmental hazards on or in close proximity to the Project site such as soil or ground water contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-Project site conditions that would be caused or exacerbated by Project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.

A review of MPCA's *What's in My Neighborhood* (WIMN) database[28] was conducted to identify documented potentially contaminated sites within or in the vicinity of the AUAR area. Appendix F tabulates data from the WIMN database and Figure 15; Appendix B illustrates the location of potentially contaminated sites in close proximity to the AUAR area.

An additional review of the Minnesota Department of Agriculture (MDA) WIMN database[29] was conducted to identify documented potentially contaminated sites within or in the vicinity of the AUAR area. Three MDA spills or release sites were identified within the AUAR area or within a quarter-mile radius.

Lot D has a complex history of industrial use including lime manufacturing, scrap metal handling, oil storage, electrical equipment manufacturing, and warehouse/cold storage operations between the late 1800s and 1980s. Multiple environmental site assessments and investigations have been conducted since the early 1990s. These studies have identified contamination in soil, groundwater, and soil vapor, including exceedances of state and federal screening values for metals (arsenic, lead, mercury, cadmium, manganese), petroleum, hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), dioxins/furans, polychlorinated biphenyls (PCBs), and volatile organic compounds. Soil vapor investigations have also indicated potential vapor intrusion risks.[30]

Remedial actions have been implemented in both upland and adjacent harbor areas. In 2016, soils with elevated arsenic and PAH concentrations were excavated, and a clean fill cap was placed over portions of the property. In 2018, the MPCA directed dredging and capping of approximately 6,700 cubic yards of contaminated sediment, addressing impacts from PAHs, PCBs, metals, and dioxins. Despite these actions, residual contamination remains in the Lot D subarea. A Response Action Plan and Construction Contingency Plan (RAP/CCP) was prepared in June 2025 by Braun Intertec, detailing planned redevelopment of Lot D, removal of existing concrete slab/foundations, soil response actions including the

[28] MPCA, 2025. What's in My Neighborhood. Available at: What's in My Neighborhood | Minnesota Pollution Control Agency (state.mn.us). Accessed October 2025.
[29] MDA, 2025. What's in my Neighborhood? – Agricultural. Available at: What's In My Neighborhood (arcgis.com). Accessed October 2025.
[30] Barr Engineering Co. 2024. *Lot D Historical and Contamination Summary*. Memorandum prepared for the City of Duluth, May 21, 2024.

import of approved dredge materials from nearby sites and spot removals to maintain clean soil buffers, repairing of the seawall, installation of utilities/roadways/stormwater features, and vapor controls under buildings dependent upon end use. The MPCA Voluntary Brownfield Programs approved the RAP/CCP with conditions by letter dated October 7, 2025. Following implementation of the response actions/development, a RAP Implementation report will be prepared describing completed response actions, sampling results, soil management and disposal and imported soils. The RAP Implementation Report will be submitted to the MPCA requesting applicable liability assurance/closure letters.

More broadly, development activities across the AUAR area may also involve demolition of existing structures, which presents additional considerations related to regulated hazardous building materials. If future development proposes demolition of existing buildings within the AUAR area, there is potential for regulated hazardous building materials to be encountered. Common regulated materials in older structures include asbestos-containing materials, lead-based paint, mercury thermostats, fluorescent light ballasts containing PCBs, and other items subject to federal and state management requirements.

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.

Construction

Future proposed development may require demolition of existing structures in the AUAR area such as buildings, parking lots and road systems serving the AUAR area. Pre-demolition regulated building materials surveys would be needed prior to the demolition of any existing structures. Identified asbestos-containing materials and other regulated materials would be removed by licensed contractors prior to demolition. Appropriate permits and notifications would be submitted to the MPCA and/or MDH prior to completing abatement and demolition activities.

The disposal of solid waste generated by clearing the construction area is a common occurrence associated with construction projects. Construction waste would be primarily non-hazardous and would be managed as municipal solid waste (MSW) or construction/demolition debris. Additional items that may require removal and offsite recycling/disposal include existing vegetation (e.g., trees and shrubs), outdated utility infrastructure, fencing, and other items present in the AUAR area.

Post-Construction

The maximum mixed use (commercial and residential) development scenario was used as the basis for estimating MSW generation. This scenario consists of 1,727 residential units, 620 hotel units, 70,000 square feet of commercial development, and 275,000 square feet of institutional development.

The California Department of Resources and Recovery (CalRecycle) provides a list of estimated solid waste generation rates for commercial and institutional establishments for general planning purposes and should be reviewed at the time specific future projects are proposed to estimate the approximate amount of MSW produced on a yearly basis. For commercial and institutional waste, CalRecycle provides waste generation rates of 10.53 pounds per employee per day (lb./employee/day) and 3.55 lb./employee/day, respectively. For residential waste, a default waste generation rate of 4.9 pounds per person per day (lb./person/day) was obtained from the U.S. EPA's Fact Sheet, 2018 – Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2018. These rates are assigned to residential units (assuming four residents per unit), commercial development, education/institutional (assuming 1,000 people), and tourism/hotels (assuming an average of two guests per room).

For commercial development, it is assumed that each of the developments (20,000 square feet in the 1st Street area, and 50,000 square feet in Essentia) are grocery stores. The number of employees assumed for the 1st Street and Essentia grocery stores is 50 and 100, respectively.

Based on the estimated solid waste generation rates, it was estimated that the Scenario B (maximum

mixed use development) would produce approximately 8,315 tons of MSW per year. The collection of MSW would be managed by a licensed waste hauler. Future development would adhere to all MPCA requirements and other regulations pertaining to the use, handling, and disposal of solid waste. Recycling areas would be provided in compliance with the Minnesota State Building code.

Future proposed development would be required to undertake acceptable methods to minimize excess waste materials. When and where feasible, items would be evaluated for recycling or reuse prior to disposal at an offsite landfill. All solid waste minimization, avoidance and disposal measures would be handled by a contractor under provisions outlined in their contract. Solid waste generated during future operations would be subject to compliance with local, state, and federal regulations on waste reduction and recycling.

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

Hazardous materials in the form of used oils/lubricants, waste paints, or other materials may be used and stored during construction. The contractor would be required to manage and store all hazardous materials for construction in accordance with MPCA requirements and other applicable regulatory requirements be met. Fueling activities during construction will comply with the MPCA operating and containment requirements. Prior to any construction activities, it is recommended to prepare a spill prevention plan to provide best management plans to minimize and mitigate petroleum and hazardous materials spills. If aboveground or underground storage tanks are identified within the AUAR prior to construction, they should be removed in accordance with local, state, and federal requirements.

Based on the current understanding, the maximum development would be mixed use of commercial and residential. The types of chemicals, storage volumes, and locations of potential future operators in the AUAR area need to be reviewed at the time a future project is proposed. No aboveground or underground storage tanks would be installed within the AUAR area as part of post-construction operations. If necessary, a spill prevention plan would be prepared to provide best management plans to minimize and mitigate petroleum and hazardous material spills following construction activities.

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

No significant amount of generated or stored hazardous waste is anticipated to result from construction activities. The contractor would be required to manage and dispose of hazardous waste consistent with applicable laws and regulations during construction. Any amount of hazardous materials or waste would be stored in locked containers during construction.

Upon review of available information, various construction materials that are regulated by the MPCA and the EPA may be present within the buildings currently in the AUAR Area. In accordance with requirements by the MPCA and EPA, the buildings under consideration for demolition require a comprehensive survey conducted by an MDH accredited Asbestos Inspector to identify accessible suspect asbestos-containing material (ACM) and other regulated materials as defined by the MPCA. Per State of Minnesota and federal regulations regarding ACM, all friable and non-friable materials that may become friable, with greater than one percent asbestos which would be disturbed, must be identified and removed prior to renovation or demolition. All rules and regulations would need to be followed, including, but not limited to notification, permit acquisition, abatement and disposal of ACM at a landfill approved to accept asbestos-containing waste. Asbestos abatement activities at the AUAR area would follow rules

and regulations by the State of Minnesota and the EPA including notification and payment of applicable permit fees. Based upon the findings of the survey, an EPA Identification Number for Regulated Waste Activity may need to be obtained for the disposal of regulated materials. At the conclusion of the abatement and building decommissioning activities, a report summarizing the activities would be generated and given to the building owner.

The MPCA allows, without sampling, disposal of demolition debris that may contain Lead Based Paint (LBP) coatings. Therefore, if a building is scheduled for demolition, suspect LBP coatings do not require sampling. In addition, the MPCA allows, without sampling, disposal of demolition debris that may contain PCB-containing caulks, sealants and coatings. Therefore, if a building was constructed after 1979 or is scheduled for demolition, suspect PCB-containing caulks do not require sampling. A final report documenting the findings of the survey shall be completed. Based on the findings of the building survey, if a project specification is generated, it must be written by an MDH accredited Asbestos Project Designer.

Hazardous waste which may include household hazardous waste may be generated post-construction at future facilities in the AUAR area. If hazardous waste is generated by the post-construction facility in the AUAR area, proper storage and handling would occur onsite, and the facilities would adhere to county and EPA regulations for disposal.

Item 13 Mitigation Strategies

- Future projects within the AUAR area may warrant completion of a Phase I Environmental Site Assessment (ESA) to be completed by the developer based on the project specific details and site history to evaluate the potential for contamination to be present at proposed development sites. The need for additional Phase II investigations would be determined based on the results of the Phase I ESA.
- If soil contamination is discovered through due diligence testing or during development, the developer or other responsible party will be required to report the release to the MN Duty Officer and appropriately mitigate the contaminants according to the type of development planned and in compliance with state and federal requirements.
- For contaminated sites within the AUAR area in which a RAP/CCP has not been prepared, completion of a RAP/CCP that details appropriate methods to handle and dispose of any such materials that are encountered within the AUAR area may be necessary. The RAP would be prepared by the developer and submitted to the MPCA for review and approval.
- Demolition and construction waste shall either be recycled or disposed of in the proper facilities. Solid waste shall be managed according to MPCA and other regulatory requirements.
- In the event demolition is required, complete a pre-demolition Hazardous Building Materials Survey of the existing buildings in accordance with MDH and MPCA requirements prior to the start of demolition activities to determine if any regulated materials are present. Mitigate any identified regulated material prior to demolition for proper disposal according to local, State and federal requirements. Demolition waste will either be recycled or disposed in the proper state-licensed facilities.
- Aboveground or underground storage tanks identified within the AUAR area prior to or during construction should be removed in accordance with local, state, and federal requirements.
- Fueling activities during construction will comply with MPCA operating and containment requirements. Prior to construction activities, a spill prevention control and countermeasure (SPCC) plan will be prepared to provide best management plans to minimize and mitigate petroleum and hazardous materials spills.
- Depending on the type of final development, a spill prevention plan will be prepared to provide best management plans to minimize and mitigate petroleum and hazardous material spills following construction activities.

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.

The AUAR area is in the North Shore Highlands Subsection (212Lb) of the Northern Superior Uplands Section (212L) within the Laurentian Mixed Forest Province (212) , and as defined by the DNR in the *Field Guide to the Native Plant Communities of Minnesota – The Laurentian Mixed Forest Province*.[31] Pre-settlement vegetation was primarily fire dependent forest communities, conifer bogs, and swamps. Approximately two to three percent of the North Shore Highlands Subsection is covered by lakes, and numerous streams run through the highland to the shores of Lake Superior. The subsection represents a larger area, extending beyond the boundaries of the AUAR area. Current land use within the AUAR area consists of a developed, downtown setting that includes a mix of residential, commercial, institutional, industrial, and other uses . Natural communities remaining are affected by past forest management, development, and recreational use.

Land cover within the AUAR area was reviewed and is described in Item 8 (Cover Types). The majority of the AUAR area, approximately 77 percent (272 acres), consists of impervious surface. Other cover types present within the AUAR area include forest (10 percent, 35 acres), deep lakes (1.3 percent, 5 acres), wetlands (0.2 percent, 1 acre). Figure 5 illustrates land cover types within the AUAR area based on geospatial data. Figure 13 shows the location of Clarkhouse Creek, Brewery Creek, Greys Creek, and Chester Creek.

The presence of grassland/brush, forested areas, lakes, wetlands, and various creeks is likely to provide nesting, foraging, and/or travel habitat for a variety of urban wildlife species, including squirrels, mice, rabbits, deer, coyotes, foxes, passerine birds, raptors, and other small mammals. Suitable roosting habitat for bats may be present within the forested areas. Creeks and lakes may provide habitat for aquatic species, such as mussels, turtles, fish, frogs, and toads. Overall, any habitat is anticipated to be limited due to past and ongoing disturbance from urban development.

b. Describe rare features 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 and/or correspondence number from which the data were obtained and attach the Natural Heritage Review letter from the MnDNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.

A formal NHIS review request was submitted to the DNR through the Minnesota Conservation Explorer (MCE) system[32] for the AUAR area. An initial response for the AUAR area (MCE No. 2025-00850) was received from the DNR on October 15, 2025, indicating that further review by DNR NHIS staff was needed. The final response from the DNR was received on December 12, 2025. Appendix G provides copies of the DNR MCE response letter. Specific rare features identified by the DNR in this letter are described in this section (14b). Potential impacts are described in Item 14c and proposed mitigation measures are described in Item 14d.

Native Plant Communities and Sites of Biodiversity Significance

Based on a review of the MCE portal and NHIS database, no native plant communities are present within one mile of the AUAR area. One Minnesota Biological Survey (MBS) site and one Lake of Biological Significance overlap the AUAR area.

One Minnesota Biological Survey (MBS) site (Duluth Lakewalk to Lester River) overlaps the AUAR area starting in the 1st Street Subarea and extends to the southern boundary of the Secondary Subarea along the Lake Superior shoreline. This MBS site has been determined to be below the minimum biodiversity threshold for statewide significance.

One Lake of Biological Significance, Lake Superior, overlaps the AUAR area at the south end of the Lot D Subarea. This feature has been given a rank of outstanding by the DNR. [33]

[31] Aaseng, N. (2003). *Field Guide to the Native Plant Communities of Minnesota – The Laurentian Mixed Forest Province*. St. Paul: DNR.
[32] DNR. undated(b). Minnesota Conservation Explorer. Available at: https://mce.dnr.state.mn.us/content/explore. Accessed October 2025.
[33] DNR (3)

State – Listed Species

The DNR letter identified one state-listed species that has historically been observed within the AUAR area: the peregrine falcon (*Falco peregrinus*; state special concern).

Peregrine Falcon

The peregrine falcon historically nested along cliff ledges along lakes or rivers, but now utilizes buildings, bridges, and select historic cliff eyries. For foraging, peregrine falcons utilize open, non-forested areas to pursue prey.[34] The AUAR area does not contain natural cliff edges. However, according to the DNR letter, peregrine falcons have been documented nesting on Greysolon Plaza, a building located within the AUAR area in 1st Street Subarea. The open area over Lot D may also act as hunting grounds for this species. Given the presence of a known artificial peregrine falcon nest site within the AUAR area, impacts on the peregrine falcon may occur.

Federally – Listed Species

A review of the United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool[35] was conducted in October 2025 to identify federally listed species, those species proposed for federal listing, and candidates for federal listing with the potential to occur within the AUAR area. Six species and one critical habitat were identified from this review: Canada lynx (*Lynx canadensis*; threatened and final critical habitat), gray wolf (*Canis lupus*; threatened), piping plover (*Charadrius melodus*; endangered), rufa red knot (*Calidris canutus rufa*; threatened), monarch butterfly (*Danaus plexippus*; proposed threatened), and Suckley's cuckoo bumble bee (*Bombus suckleyi*; proposed endangered). Appendix G includes the species list generated through the USFWS IPaC tool.

Canada Lynx

In Minnesota, the Canada lynx inhabits boreal spruce-fir forests, also known as taiga, that are characterized by deep snow, dense forest cover, and stable populations of snowshoe hares.[36] While the AUAR contains approximately 35 acres of forest (Figure 5), it is located in a highly developed area with limited forest density that would not provide suitable habitat for the Canada lynx. As such, this species is unlikely to occur in the AUAR area. Tree clearing amounts, if required, will need to be determined, but impacts are not anticipated for this species or its designated critical habitat.

Gray Wolf

The gray wolf inhabits a wide range of habitats, including temperate forests, mountains, tundra, taiga, grasslands, and deserts.[37] While some forest areas (approximately 35 acres) are present within the AUAR area (Figure 5), they are located in a developed area that would not provide suitable habitat for the gray wolf. Additionally, gray wolves are known to be more successful where human and road densities are low.[38] As such, this species is unlikely to occur in the AUAR area. Tree clearing, if required, will need to be determined, but impacts are not anticipated for this species.

[34] DNR. undated(h). Rare Species Guide: Peregrine Falcon (Falco peregrinus). Available at: https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABNKD06070. Accessed October 2025.
[35] USFWS. 2025. Information for Planning and Consultation. Available at: https://ipac.ecosphere.fws.gov/. Accessed October 2025.
[36] USFWS. 2023a. Canada Lynx. Available at: https://www.fws.gov/species/canada-lynx-lynx-canadensis. Accessed January 2024.
[37] USFWS. 2023b. Gray Wolf. Available at: https://www.fws.gov/species/gray-wolf-canis-lupus. Accessed January 2024.
[38] Mech, L. D. 1989. Wolf population survival in an area of high road density. *American Midland Naturalist*, 387-389.

Piping Plover

The piping plover is a small migratory shorebird that exists in three populations each occupying a different geographic area: the Great Lakes, the Northern Great Plains, and the Atlantic Coast. Their habitat varies in response to local weather and tidal conditions. For foraging grounds, the piping plover uses sandy mudflats, ephemeral pools, and seasonally emergent seagrass beds to hunt for invertebrates. The piping plover nests along coastal areas, including sand spits, small islands, tidal flats, shoals, sandbars with inlets, shorelines of alkaline lakes, reservoirs, and river sandbars.[39] The Lot D portion of the AUAR area runs up to Lake Superior and includes some sandy shoreline. Proposed seawall repair in this area may affect potential piping plover nesting habitat. Therefore, impacts on the piping plover may occur as a result of development in the AUAR area.

Rufa Red Knot

Rufa red knots are a coastal species of shorebird that utilize muddy or sandy coastal areas, bays, estuaries, tidal flats, tidal inlets, sand spits, islets, shoals, and sandbars with abundant opportunities for mollusk foraging. Nesting occurs in tundra habitats with little vegetation, often within 600 feet of a freshwater wetland. Inland saline lakes, and potentially inland freshwater habitats, such as wetlands and riverine sandbars, may provide stopover sites for this species during migration.[40] The Lot D portion of the AUAR area runs up to Lake Superior and includes some sandy shoreline. Proposed seawall repair in this area may affect potential rufa red knot habitat. Therefore, impacts on the rufa red knot may occur as a result of development in the AUAR area.

Monarch butterfly

The monarch butterfly is a migratory butterfly that exists in two main populations within the United States divided by the Rocky Mountains: the eastern population that overwinters in the mountains of Mexico, and the western population that overwinters along the southern pacific coast of California.[41] Monarch butterflies are a widespread species found in fields, prairies, savannahs, and most places where their host plant milkweed (*Asclepias* spp.) occurs throughout the United States and southern Canada. This species generally occurs in areas with high densities of native nectar sources. During late summer and migration, adults use nectar species such as black-eyed Susan (*Rudbeckia hirta*), narrow-leaved coneflower (*Echinacea angustifolia*), and rough blazing star (*Liatris aspera*).[42] However, the presence of milkweed is required as it is the only plant on which monarch caterpillars can feed.[43]

Native nectar sources and milkweed are likely limited in this area due to historical disturbance from urban development. Therefore, the monarch butterfly may occur within the AUAR area but impacts as a result of development are unlikely. The monarch butterfly is proposed for federal listing; therefore, impacts would need to be reassessed if and when a listing status is finalized.

Suckley's Cuckoo Bumble Bee

The Suckley's cuckoo bumble bee (SCBB) is a parasitic species that relies exclusively on other bumble bees as hosts. The SCBB historically occurs across a wide variety of habitats, including woodlands, prairies, meadows, agricultural areas, and urban areas where host bumble bee nests are present. While this species has historically occurred in portions of western and northern Minnesota, no extant populations are known to occur in Minnesota at present. The last confirmed sighting in the United States was in 2016 in Oregon.[44] Due to the urban setting the AUAR is located in and that this species does not currently have any known extant populations in Minnesota, impacts on the SCBB as a result of

[39] USFWS. 2024a. Piping Plover. Available at: https://www.fws.gov/species/piping-plover-charadrius-melodus. Accessed October 2025.
[40] USFWS. 2023c. Rufa Red Knot. Available at: https://www.fws.gov/species/rufa-red-knot-calidris-canutus-rufa. Accessed January 2024.
[41] United States Department of Agriculture [USDA] Forest Service. undated-a. Migration and Overwintering. Available at: https://www.fs.fed.us/wildflowers/pollinators/Monarch_Butterfly/migration/. Accessed November 2021.
[42] DNR. 2022. Butterfly Gardens. Available at: https://www.dnr.state.mn.us/gardens/butterfly/index.html. Accessed March 2022.
[43] National Wildlife Federation. undated. Monarch Butterfly. Available at: https://www.nwf.org/Educational-Resources/Wildlife-Guide/Invertebrates/Monarch-Butterfly. Accessed December 2021.
[44] USFWS. 2024b. Endangered Species Status for Suckley's Cuckoo Bumble Bee. Available at: https://www.fws.gov/species-publication-action/endangered-species-status-suckleys-cuckoo-bumble-bee. Accessed October 2025.

development in the AUAR area are not anticipated. The SCBB is proposed for federal listing; therefore, impacts would need to be reassessed if and when a listing status is finalized.

Migratory birds

Nineteen migratory bird species listed as a USFWS Birds of Conservation Concern (BCC) and two eagle species have the potential to occur within the AUAR area according to the USFWS IPaC review (Appendix G). These species and their habitat requirements are detailed in Table 17 using data from the Cornell Lab of Ornithology.[45]

Table 17. Migratory Birds Listed as BCC with the Potential to Occur within the AUAR area

Common Name	Scientific Name	Nesting, Foraging, and/or Migration Habitat
Bald eagle*	*Haliaeetus leucocephalus*	Forested areas (conifers and deciduous trees) near large bodies of open water. Open uplands near open water in winter.
Black tern	*Chlidonias niger surinamensis*	Large (>50 acres), dense marshes for breeding. Lagoons, river edges, lakes, marshes, and beaches during migration.
Black-billed cuckoo	*Coccyzus erythropthalmus*	Dense woodlands, forest, thickets, and scrub.
Bobolink	*Dolichonyx oryzivorus*	Breeds in open areas (grasslands, tallgrass and mixed prairie, hayfields, meadows); coastal areas pre-migration.
Canada warbler	*Cardellina canadensis*	Breeds in mixed conifer and deciduous forest with shrubby and mossy understory near water; forested wetlands. Found in parks, forest edges, and woodlots during migration.
Chimney swift	*Chaetura pelagica*	Breeds in rural and urban settings in chimneys, tree cavities, and caves. Forages over open habitats, forests, ponds, and residential areas.
Common tern	*Sterna hirundo*	Nests on rocky islands, barrier beaches, and saltmarshes. Forages over open water.
Connecticut warbler	*Oporornis agilis*	Breeds in forests with dense undergrowth, vine tangles, and forest gaps. Most preferred habitat is wet; including poplar forests; spruce bogs; and stands of willow, dogwood, or alder.
Eastern whip-poor-will	*Antrostomus vociferus*	Breeds in open woodlands in dry deciduous or evergreen-deciduous forest with little to no underbrush near open areas. Dense, contiguous forest is avoided.
Evening grosbeak	*Coccothraustes vespertinus*	Breeds in mature and second growth coniferous forests, including spruce-fir, pine-oak, pinyon-juniper, and aspen forests. Winters in coniferous and deciduous forests and urban/suburban areas in woodlots near feeders.

[45] Cornell Lab of Ornithology. 2025. All About Birds. Ithaca, New York. Available at: https://www.allaboutbirds.org/news/#. Accessed October 2025.

Common Name	Scientific Name	Nesting, Foraging, and/or Migration Habitat
Golden eagle*	*Aquila chrysaetos*	Nests are generally built on cliffs. General habitat consists of open and semi-open grasslands, mountains, canyonlands, rimrock terrain, and riverside cliffs and bluffs. Developed areas and uninterrupted forested areas are avoided.
Golden-winged warbler	*Vermivora chrysoptera*	Breeds in open woodlands, wet thickets, shrub, tamarack bogs, aspen or willow stands, and wetlands.
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*	Tidal mudflats, sandflats, saltmarshes, lagoons, estuaries, rocky shorelines, marshes, meadows, fields, and dunes.
Le Conte's sparrow	*Ammospiza leconteii*	Marshes and wet meadows with dense grasses and sedges as well as drainage ditches and dikes between wild rice paddies in agriculture-dominated areas.
Lesser yellowlegs	*Tringa flavipes*	Breeds in open woodlands with marshes, bogs, and/or ponds; during migration found in fresh and brackish wetlands.
Long-eared owl	*Asio otus*	Coniferous or deciduous woodlands with dense vegetation for roosting. Grasslands and shrublands for hunting.
Olive-sided flycatcher	*Contopus cooperi*	Breeds in openings or edges of boreal and coniferous forests, including spruce, fir, Douglas-fir, hemlock, red cedar, and tamarack forests. They can be found near water and on exposed perches foraging for insects.
Pectoral sandpiper	*Calidris melanotos*	Breeds in wet coastal tundra. Migrants are found in wet, grassy environments, including sewage ponds, plowed farm fields, sod farms, rice fields, flooded golf courses, and fresh and saltwater marshes with grassy cover.
Ruddy turnstone	*Arenaria interpres morinella*	Migrants are observed along coastal rocky and sandy beaches, mudflats, and shorelines of freshwater lakes.
Veery	*Catharus fuscescens fuscescens*	Breeds in dense, damp, deciduous woodlands near rivers, streams, and/or swampy areas. This species is often found in disturbed forests with dense understory.
Wood thrush	*Hylocichla mustelina*	Mature deciduous and mixed forests with trees that are at least 50 feet tall, a moderate understory, open forest floor with moist soil and decaying leaf litter, and nearby water.

*This species is not listed as BBC but warrants special attention under the Bald and Golden Eagle Protection Act (BGEPA).

Two of the 21 migratory bird species with the potential to occur in the AUAR area are the bald eagle and the golden eagle. These species are not listed as BCC but warrant special attention under the Bald and Golden Eagle Protection Act (BGEPA). Forested areas within the AUAR area are limited and likely to be unsuitable for nesting bald eagles. However, Lake Superior provides open water habitat for hunting. Cliffs

are not present within the AUAR area, and the developed environment would not be suitable for nesting golden eagles.

Open water, limited shoreline, and wetlands may provide habitat, particularly migration habitat, for the black tern, common tern, lesser yellowlegs, pectoral sandpiper, ruddy turnstone, and Hudsonian whimbrel. The urban setting provides suitable habitat for the chimney swift. Grasslands/open areas, particularly in Lot D, may provide suitable habitat for the bobolink and LeConte's sparrow. Forested areas are present, but they are limited and not contiguous. Therefore, the AUAR area likely would not support the black-billed cuckoo, Canada warbler, Connecticut warbler, eastern whip-poor-will, evening grosbeak, golden winged-warbler, long-eared owl, olive-sided flycatcher, veery, or wood thrush. However, these species may migrate through the AUAR area, as described further below.

Duluth is located within the Mississippi Flyway, one of four major migration paths used by birds during spring and fall migration.[46] When migrating birds reach neighboring Lake Superior, many species are more likely to follow the lakeshore than cross open water; flying over land provides opportunities to stop and refuel while the open water frequently does not.[47,48] Given that the AUAR area borders and overlaps the Lake Superior shore, it is anticipated that large numbers of migrating birds pass over or near the AUAR area each spring and fall.

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.

Impacts Analysis for Native Plant Communities and Sites of Biodiversity Significance

Based on the review of the DNR MCE portal, no native plant communities are located within the AUAR area. One MBS site, the Duluth Lakewalk to Lester River, and one Lake of Biological Significance, Lake Superior, overlap the AUAR area. The MBS site has been determined to be below the minimum biodiversity threshold for statewide significance, and Lake Superior is ranked as outstanding by the DNR. While the MBS site would remain as open space, Lake Superior may be impacted as a result of seawall repair off Lot D that would require in-water work.

Impacts Analysis for State-Listed Species

<u>Peregrine falcon</u>

According to the DNR letter, a nest box for peregrine falcons is located on Greysolon Plaza, which is located within the AUAR area in the 1st Street Subarea. The open area over Lot D may also act as hunting grounds for this species. While direct impacts on Greysolon Plaza are not anticipated, the proximity of construction activities will need to be determined at the time of a future project is proposed. Construction activities can lead to distress in these birds, especially during their breeding season (April through July). Notably, peregrine falcons also migrate through the region every fall. The addition of structures with glass into this environment may result in in-flight collisions. As such, impacts on this species may occur.

Given the warming climate trend in Minnesota, overall suitable habitat for the peregrine falcon is anticipated to increase, but this comes at the expense of a loss of wintering grounds for the species.[49]

[46] Fritts, R. 2022. Avian Superhighways: The Four Flyways of North America. American Bird Conservancy. Available at: https://abcbirds.org/blog/north-american-bird-flyways/. Accessed January 2024.
[47] Smith, J. 2017. The Ocean Flyway: The Surprising Open Water Routes of Songbird Migrations. The Nature Conservancy. Available at: https://blog.nature.org/2017/09/21/ocean-flyway-surprising-open-water-routes-songbird-migrations/. Accessed January 2024.
[48] Hawk Ridge. undated. About the Migration. Available at: https://www.hawkridge.org/birds-migration/about-the-migration/. Accessed January 2024.
[49] Audubon. 2019. Climate Threatened – Peregrine Falcon. Available at: https://climate2014.audubon.org/birds/perfal/peregrine-falcon. Accessed January 2024.

Impacts Analysis for Federally-Listed Species

Canada lynx

Development in the AUAR area is not anticipated to impact the Canada lynx. The presence of human habitation and urban development reduces forest density and creates conditions that Canada lynx avoid.[50] Tree clearing within the AUAR area, if proposed, will need to be quantified.

Deep snow habitats used by the Canada lynx are anticipated to become less common as the climate trends warmer. Besides decreasing the amount of suitable habitat available to this species, this opens previously inaccessible habitat to other species, such as the bobcat (*Lynx rufus*) and the coyote (*Canis latrans*). This added competition for resources would put further stress on this species.[51]

Gray wolf

Development within the AUAR is not anticipated to impact the gray wolf. Existing forest density is low and surrounding residential and commercial development reduces available habitat for this species. Tree clearing within the AUAR area, if proposed, will need to be quantified.

Given the wide range of habitats and climates the gray wolf can inhabit, they are thought to be resilient to climate change according to a 2017-2020 winter tracking survey and climate change/land use prediction study conducted in Michigan, Wisconsin, and Minnesota. It was found that wolf habitat is anticipated to remain stable or even increase under average global temperature increases of 3-5 degrees Celsius.[52]

Piping plover

The Lot D portion of the AUAR area runs up to Lake Superior and includes some sandy shoreline. Proposed seawall repair in this area may affect potential piping plover nesting habitat. Therefore, impacts on the piping plover may occur as a result of development in the AUAR area. Migrants of this species could also pass through this area during migration. These migrants may be at slight risk for window collision when flying through a newly developed area.

According to the Cornell Lab of Ornithology[53], one of the major threats to the piping plover is changing water levels which affect the amount of available nesting habitat.

Rufa red knot

The Lot D portion of the AUAR area runs up to Lake Superior and includes some sandy shoreline. Proposed seawall repair in this area may affect potential rufa red knot habitat. Therefore, impacts on the rufa red knot may occur as a result of development in the AUAR area. Migrants of this species could also pass through this area during migration. These migrants may be at slight risk for window collision when flying through a newly developed area.

According to the Cornell Lab of Ornithology[54], migratory stopover sites for the rufa red knot are anticipated to be impacted the most by climate change and sea-level rise in comparison to breeding and overwintering habitats for this species.

[50] Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication Number R1-00-53, Missoula, Montana, USA.
[51] Marrotte, R. R., & Bowman, J. 2021. Seven decades of southern range dynamics of Canada lynx. *Ecology and Evolution*, *11*(9), 4644-4655.
[52] Learn, Joshua Rapp. 2024. Great Lakes Wolves Resilient to Climate, Land Use Change. The Wildlife Society. Available at: https://wildlife.org/great-lakes-wolves-resilient-to-climate-land-use-change/. Accessed January 2024.
[53] Cornell Lab of Ornithology. 2025. All About Birds – Piping Plover Conservation. Ithica, New York. Available at: https://www.allaboutbirds.org/guide/Piping_Plover/lifehistory#conservation. Accessed December 2025.
[54] Cornell Lab of Ornithology. 2024. All About Birds – Red Knot Conservation. Ithaca, New York. Available at: https://www.allaboutbirds.org/guide/Red_Knot/lifehistory#conservation. Accessed January 2024.

Monarch butterfly

Nectar sources and milkweed are likely limited in the AUAR area due to historical disturbance from urban development. Therefore, the monarch butterfly may occur within the AUAR area given its wide range of habitats, but impacts as a result of development are unlikely. This species is proposed for federal listing; therefore, impacts would need to be reassessed if and when a listing status is finalized.

Climate change is anticipated to result in increasing temperatures in Minnesota, which may increase the number of days and the area in which monarch butterfly populations would be exposed to unsuitably high temperatures. This can result in them using up fat stores too quickly and may result in them incorrectly judging when to enter and exit states of dormancy (diapause).[55]

Suckley's cuckoo bumble bee

Due to the urban setting the AUAR is located in and that this species does not currently have any known extant populations in Minnesota, impacts on the SCBB as a result of development in the AUAR area are not anticipated. The SCBB is proposed for federal listing; therefore, impacts would need to be reassessed if and when a listing status is finalized.

Climate change is anticipated to impact the SCBB in a variety of ways. Drought events are anticipated to increase and bloom dates for floral resources are occurring earlier, resulting in frost damage and overall fewer nectar species for SCBB and the host species it depends on. According to various different climate scenarios, widespread declines in bumble bee species are also predicted.[56]

Migratory Birds

Construction activities and development within the AUAR area may cause impacts to migratory birds and/or their nests. Based on the IPaC species review results (Appendix G), the majority of the BCC species with the potential to occur in the AUAR area are most likely to be nesting in the AUAR area between May 1 and August 31, if present. Exceptions include the lesser yellowlegs, pectoral sandpiper, ruddy turnstone, and Hudsonian whimbrel, which breed elsewhere. If construction activities occur within vegetated areas of the AUAR area, it may cause impacts to migratory birds, eggs, young, and/or active nests if conducted during the bird nesting timeframe in Minnesota. Additionally, the risk of collision with man-made structures, especially those with glass, is predicted to be present within the AUAR area given the large number of migrants that pass through the Duluth lakeshore area to avoid crossing over Lake Superior.

Urban Wildlife

Urban wildlife such as squirrels, mice, rabbits, raccoons, deer, coyotes, foxes, and other small mammals may be impacted by the development within the AUAR area, such as through the removal of grasslands, forest, and/or wetlands. Additionally, lighting may have the potential to negatively impact wildlife. These species are generally adaptable to change and would likely relocate to other undeveloped areas.

Invasive Species

Noxious weeds and invasive species in Minnesota are managed through the Minnesota Department of Agriculture (MDA) under Minnesota Statutes Section 18.78, the DNR, and local ordinances. Best management practices (BMPs) during construction activities and operation within the AUAR area should be implemented where practicable to minimize the introduction or spread of noxious weeds and invasive species. These practices include cleaning vehicles and equipment of mud and dirt from other construction areas, removing seeds that attach to clothing or equipment, minimizing soil disturbance, not moving

[55] Kobilinksy, Dana. 2019. Watch: Temperature Drives Internal Clock for Monarchs. The Wildlife Society. Available at: https://wildlife.org/watch-temperature-drives-internal-clock-for-monarchs/. Accessed January 2024.
[56] USFWS. 2024c. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Suckley's Cuckoo Bumble Bee. 89 FR 102074. December 17, 2024.

potentially contaminated materials between sites, and staying on designated roads/trails.[57,58]

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

Specific mitigation measures are included in the list below.

Item 14 Mitigation Strategies

- Per the DNR MCE response letter, tree clearing should be avoided from June 1 through August 15 to avoid the destruction of bat maternity roosting colonies during the pup rearing season.
- Tree clearing, if needed, should be specified in Project plans, demarcated in the field, and contractors should understand clearing limits.
- When possible, removal of vegetation should occur outside of the bird nesting window to minimize potential impacts to migratory birds, if present.
- The Minnesota B3 Guidelines identify strategies for developing bird-safe buildings, including the option of fritted glass. Bird safe outdoor lighting fixtures, such as fully-shielded, downward facing lighting and motion-sensor lighting, is recommended. The City will strongly encourage future developers to consider incorporating bird-safe building design measures when feasible.
- At the time of project proposal, the proximity of work to the historic peregrine falcon nesting site on Greysolon Plaza should be determined. The DNR recommends contacting the DNR Regional Nongame Specialist if these birds exhibit unusual behaviors or signs of potential distress during construction, especially during the breeding season (April through July).
- Given that the AUAR area overlaps Lake Superior, a lake of outstanding biological significance, the DNR recommends that any native vegetation buffer zone be maintained or enhanced. If a native vegetation buffer zone is not present, the DNR recommends that one be established.
- Native seed should be incorporated into revegetation plans for landscaping open spaces within the AUAR area to enhance wildlife habitat and to help prevent the establishment of invasive plants and noxious weeds.
- Herbicide, fungicide, and insecticide use within the AUAR area will be minimized to the extent practicable. If the application of these products is necessary during construction or operation within the AUAR area, application should be limited to targeted outbreaks and will be targeted toward the nuisance species.
- Invasive species prevention measures should be implemented during construction to prevent the movement of invasive species on trucks, heavy equipment, off-highway vehicles, and equipment and tools to reduce the likelihood of introducing invasive species from off site. Measures may include requiring contractors and others working on site to arrive and leave with clean equipment that is free of visible plants, seeds, mud, and dirt clods. Other measures may include using weed-free seed and mulch products and avoiding the re-use of the top six inches of stockpiled materials (mulch, soil, gravel) that may contain more weed seeds.
- The city will consider a coordinated plan for invasive species mitigation on public lands within the downtown area and will work with landowners to encourage and provide resources for invasive species mitigation on private property.
- Implement BMPs and wildlife-friendly erosion and sediment control devices where practicable as required by the NPDES Permit, SWPPP, and Construction Site Stormwater Permit to prevent sediment-laden stormwater runoff from entering wetlands and waterbodies, which could adversely affect habits of aquatic and semi-aquatic species.
- The results of the DNR NHIS review are typically valid for one year. The NHIS database must be consulted prior to the commencement of construction activities within the AUAR area to identify new

[57] USDA National Invasives Species Information Center. undated. Best Management Practices. Available at: https://www.invasivespeciesinfo.gov/subject/best-management-practices. Accessed January 2023.
[58] DNR. 2023. Terrestrial Invasive Species. Available at: https://www.dnr.state.mn.us/invasives/terrestrial/index.html. Accessed January 2023.

records of rare or otherwise significant species, native plant communities, and other natural features within the AUAR area vicinity.

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 on historic properties during Project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects on historic properties.

Desktop Literature Review

Methodology

Stantec reviewed the Minnesota State Historic Preservation Office (SHPO) previous survey report data and Minnesota State Historic Inventory (MnSHIP) Portal[59] as well as the Office of the State Archaeologist (OSA) Portal[60] in December 2025. The literature search focused on previously recorded cultural resources (archaeological sites and above-ground historic resources) within and adjacent to the AUAR area. Traditional Cultural Properties within or adjacent to the AUAR area are unknown as a Tribal Cultural Property identification survey has not been conducted for this Project.

Previous Surveys

Two previously conducted archaeological surveys (SL-1996-20; SL-1997-25; SL-2017-16) are documented within the AUAR area. HNTB-Barr-Gerwick Great Lakes and River Solution, Duluth Archaeology Center, L.L.C., and WolfsHead Research Logistics conducted a Phase I survey along Minnesota Slip and Slip 3 in the Duluth-Superior Harbor in 2017, intersecting with a portion of the Lot D Subarea. Terrestrial survey methodology was limited to pedestrian walkover due to both land access restrictions and previous construction disturbance. The survey did not identify any archaeological resources; however, the investigators acknowledged the potential for buried features in their project area and recommended remote sensing to identify potential subsurface cultural resources.[61] The Institute for Minnesota Archaeology conducted a survey and evaluation of underwater and water's-edge cultural resources along the Duluth-Superior Harbor in 1995. Only visible and previously recorded cultural resources were investigated and no subsurface archaeological investigation was conducted.[62,63]

Two Pines Resources Group, LLC conducted archaeological monitoring of pre-construction soil borings in 2018 and 2019 (SL-2019-06); the soil bores overlapping the AUAR area are limited to West Railroad Street, within the Lot D and 1st Street subareas. Soil borings along West Railroad Street indicated fill material up to 10 feet in four borings. The exact location of the soil borings along West Railroad Street are not displayed on the survey map. Two Pines Resource Group, LLC recommended no additional archaeological work along West Railroad Street.[64]

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[59] Minnesota State Historic Preservation Office (SHPO). 2017. *Historic and Architectural Survey Manual.* https://mn.gov/admin/assets/surveymanual082017_tcm36-327675.pdf.

[60] Minnesota Office of the State Archaeologist (OSA). 2025. Office of the State Archaeologist Portal. Electronic database, https://osaportal.gisdata.mn.gov/, accessed December 11, 2025.

[61] Mulholland, Susan C. and Randolph Beebe. 2017. Y17 Red Sites Archaeological Survey St. Louis River, RAP, Duluth, ST. Louis County, Minnesota. HNTB-Barr-Gerwick Great Lakes and River Solution, Duluth Archaeology Center, L.L.C., and WolfsHead Research Logistics. Prepared for the U.S. Army Corps of Engineers, Detroit District. Minnesota State Historical Society Project Number SL-2017-16.

[62] Ward, Jeanne A. and John P. McCarthy. 1996. A National Register Evaluation of Underwater and Water's Edge Cultural Resources Duluth Harbor, Minnesota. Institute for Minnesota Archaeology, Reports of Investigations No. 373. Prepared for the Minnesota Historical Society. Minnesota State Historical Society Project Number SL-1996-20.

[63] Ward, Jeanne A. and John P. McCarthy. 1997. A National Register Evaluation of Underwater and Water's Edge Cultural Resources Duluth Harbor, Minnesota. Institute for Minnesota Archaeology, Reports of Investigations No. 373. Prepared for the Minnesota Historical Society. Minnesota State Historical Society Project Number SL-1997-25.

[64] Two Pines Resources Group, LLC. 2019. Twin Ports Interchange, Duluth, St. Louis County, Minnesota. SP 6982-322. Minnesota State Historical Society Project Number SL-2019-06.

One cultural resource study conducted along the Duluth Harbor for the USACE by David A. Walker and Stephen P. Hall overlaps with small portions of the AUAR area (SL-1976-01). The study focused on above-ground resources and did not include subsurface investigations but provides thorough historical research to inform further archaeological investigations as Project plans are refined.

According to research conducted by David A. Walker and Stephen P. Hall (SL-1976-01), three destroyed structures are located within the AUAR area; further investigation is required to determine the significance and potential for intact, subsurface cultural deposits.

- Iver Wisted Sash, Door, and Blind Factory, constructed ca. 1880s, demolished ca. 1890.
- W.H. Richards Feed & Sawmill, constructed ca. 1884 to 1886, demolished ca. 1888.
- Minnesota Iron Co. and Duluth & Iron Range Railroad Offices, construction date unknown, demolished in 1924.

Archaeological Resources

No previously recorded archaeological sites are located within the AUAR area on the OSA portal. Six previously recorded archaeological sites are located within one mile of the AUAR area. Site types within one mile of the AUAR area include one historic shipwreck/submerged feature (21SL1019), one precontact single artifact (21SL1117), three historical structural ruins (21SL0816, 21SL0817, and 21SL0818), and one historic structural ruin and artifact scatter site (21SL1269). Site 21SL1019, Thomas Wilson Shipwreck, was listed on the National Register of Historic Places (NRHP) in 1991 and site 21SL0817 was recommended eligible for the NRHP in 1996. Site 21SL1117 is unevaluated for the NRHP and sites 21SL0816, 21SL0818, and 21SL1269 were recommended not eligible for the NRHP.[65]

According to the MnModel data available on the OSA portal, the AUAR area is located in a well surveyed area with a low probability for archaeological sites. The MnModel dataset classifies archaeological site potential based on the number and distribution of archaeological sites and surveys, the resolution of environmental data, and the degree to which the environmental data represents the historic and precontact landscape. According to the OSA Portal, during the precontact period the AUAR area was mostly forested, while the Lot D Subarea was located within a wetland and lake.[66]

Historic Resources

A total of 1,493 previously recorded above-ground historic resources are located within the AUAR area, which includes eight resources that are located in more than one AUAR subarea. Of the 1,485 resources, 142 are listed in the NRHP and 139 are eligible for listing in the NRHP.

Additionally, 1,006 previously recorded above-ground historic resources are located within 1/4-mile of the AUAR area, which includes 14 resources individually listed in the NRHP and one resource located within the Duluth Civic Center Historic District (SL-DUL-02731). Furthermore, 18 previously recorded above-ground historic resources within 1/4-mile of the AUAR area are eligible for listing in the NRHP.

Appendix H provides a table that identifies historic resources identified in the AUAR area.

<u>Lot D Subarea</u>

The Lot D Subarea contains 29 previously recorded above-ground historic resources. One NRHP-listed historic district, “Slips 1, 2, and 3 Historic District” (SL-DUL-00329), and six NRHP-eligible resources are located within the Lot D Subarea. It is anticipated that USACE permitting related to the seawall repair project would potentially require Section 106 consultation that would occur at the time that a permit application is submitted.

[65] OSA (2), Ward (5)
[66] OSA (2)

Essentia Subarea

The Essentia Subarea contains 423 previously recorded above-ground historic resources. A portion of the "Duluth Commercial Historic District" (SL-DUL-03592), consisting of seven resources, overlaps with the Essential Subarea; three resources within the district are eligible for listing in the NRHP.

1st Steet Subarea

The 1st Street Subarea contains 524 previously recorded above-ground historic resources; four of the resources are individually listed in the NRHP and two resources are historic districts listed in the NRHP. Of the two NRHP-listed historic districts, the Duluth Commercial Historic District (SL-DUL-03592) contains 117 resources that are located within the 1st Street Subarea and the Duluth Civic Center Historic District (SL-DUL-02731) contains two resources located within the 1st Street Subarea. Additionally, 11 individual resources within the 1st Street Subarea are eligible for listing in the NRHP.

Secondary Subarea

The Secondary Subarea contains 567 previously recorded above-ground historic resources. Four resources are individually listed in the NRHP; a small portion of the Duluth Commercial Historic District (SL-DUL-03592) containing one resource overlaps the Secondary Subarea.

Recommendations

The AUAR area is characterized by impervious surfaces and extensive disturbance from urban, commercial, and industrial development. Sparse previous archaeological investigations in the AUAR area suggest buried features, including demolished building foundations, may be present below disturbed contexts. Therefore, construction monitoring is recommended of ground disturbing work in areas with a potential for intact, subsurface deposits following the guidelines set forth in the State Archaeologist's Survey Manual.[67] Portions of the AUAR area which may yield a high potential for intact, subsurface cultural resources would be determined through consultation with the OSA and SHPO.

At the time a project is proposed, an OSA-approved Project-specific Unanticipated Discovery Plan may be needed if disturbance will occur within areas of high potential. Approximately one-half acre of the AUAR area is owned by the Fond du Lac Band of Lake Superior Chippewa. If future development has the potential to impact this area, coordination with their Tribal Historic Preservation Officer (THPO) would be required.

As future development has the potential to impact previously identified NRHP-listed and NRHP-eligible above-ground historic resources located within the AUAR area, a historic architectural survey is recommended for all eligible and listed NRHP resources depending on project specifics and proximity to historic resources. The historic architectural survey would be required to follow the guidelines set forth in the SHPO Historic and Architectural Survey Manual[68] and include both properties individually listed in the NRHP and NRHP-listed Historic Districts, including both contributing and non-contributing resources. The survey would verify NRHP eligibility and/or contributing and non-contributing status for each resource within the historic districts.

Item 15 Mitigation Strategies

- If a project is proposed within areas of high potential for intact, subsurface cultural resources, a Phase I archaeological survey is recommended. A survey may not be necessary if the disturbance area can be documented as previously surveyed or disturbed. If historic, cultural, or archaeologically significant features are uncovered in the Phase I Survey, a Phase II survey may be required. Coordination and consultation with the SHPO will be necessary.
- Construction monitoring of ground disturbing work is recommended in areas with a potential for intact,

[67] Anfinson, Scott. 2011. *State Archaeologist's Manual for Archaeological Projects in Minnesota.* Office of the State Archaeologist, St. Paul, Minnesota. https://mn.gov/admin/assets/OSAmanual_tcm36-186982.pdf.
[68] Minnesota State Historic Preservation Office (SHPO). 2017. *Historic and Architectural Survey Manual.* https://mn.gov/admin/assets/surveymanual082017_tcm36-327675.pdf.

subsurface deposits following the guidelines set forth in the State Archaeologist's Survey Manual.

- Ground disturbing activities have the potential to uncover previously unknown archaeological site and human skeletal remains. In the event that possible archaeological materials or suspected human skeletal remains are identified during ground disturbing activities, work shall stop immediately in the area of discovery. No cultural material shall be transported from its original location and the area of discovery shall be treated as potentially significant and kept intact until a formal determination of significance is made.
- If a project is proposed at or near sites in which identified NRHP-listed and NRHP-eligible above-ground historic resources are located, the developer should consult with a qualified architectural historian to determine if a historic architectural survey may be needed.
- If a project is determined to have the potential to adversely affect the physical features or historic character of NRHP-listed or eligible resources, SHPO consultation may be required in accordance with Minn. Statute. 138.665, subd. 2.
- The City will proactively encourage future developers to adhere to the Duluth Commercial Historic District Design Guidelines.[69]
- If a future project takes advantage of federal funding, or requires a federal permit or license, a Section 106 review will be required along with consultation with the SHPO.

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 AUAR area consists of a developed, urban environment. The natural environment is largely limited to landscaped vegetation within limited lawn space and wooded areas. The AUAR area includes approximately two miles of Lake Superior shoreline. Residential neighborhoods surround the AUAR area. Views of Lake Superior from residences uphill (north and west) from the AUAR area may be affected by development within AUAR area.

In Duluth, views of Lake Superior are of high visual quality and all views could be considered scenic. Therefore, a qualitative analysis was conducted to identify scenic views or vistas within or near the AUAR area that could warrant additional protection. It should be noted that not ALL views can be protected everywhere. For example, even a one-story building could block views of the lake for an adjacent property. In order to preserve viewsheds it is necessary to determine what views should be preserved and from where. The City has identified that Skyline Parkway (not within or near the AUAR area) and its status as a historic byway warrants additional protections. The City has an overlay district to protect views of the lake from this area. A similar scan for areas or views of importance was conducted for the AUAR area. Views identified include those of Lake Superior from the Lakewalk, Canal Park and Lift Bridge. All of these areas are outside of the AUAR area and will be unimpacted by development within the AUAR area.

Additionally, there are historic buildings within the Downtown area (described further in Item 15 – Historic Resources), which could be considered for view protection on a case-by-case basis. As these resources already receive some protection due to their status, the city will have the ability to consider whether views of Lake Superior from any of these historic buildings warrant additional protection. Additional protection measures are suggested in the mitigation strategies below.

In addition to viewshed protection, the Maximum Development Scenario has the potential for other project related visual effects including lighting, additional impervious surface, blank façades etc. These are also addressed below in the mitigation strategies.

[69] City of Duluth. Duluth Commercial Historic District Design Guidelines. Accessed January 2026. https://duluthmn.gov/media/12043/duluth-commercial-hd-guidelines-final-draft-opt.pdf

Item 16 Mitigation Strategies

- For developments within the 1st Street and Essentia Subareas, the City will analyze historic structures in the vicinity on a case-by-case basis and determine whether additional protections should be made for their view of Lake Superior.
- The City will proactively encourage future developers to adhere to the Duluth Commercial Historic District Design Guidelines.[70]
- The City shall ensure that lighting, building form and façade, landscaping and tree preservation meet specifications in Article 4 of Chapter 50 of the City Code.

17. Air

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

In accordance with the EQB's AUAR guidance document[71], this item is not applicable to an AUAR as any stationary air emission sources large enough to merit environmental review would require individual review. Development in the AUAR area would consist of residential and commercial uses, and no industrial uses are proposed. Therefore, no stationary sources are anticipated.

No industrial uses were considered as part of this AUAR. If future heavy industrial uses are proposed within the AUAR area, this AUAR process would not replace the preparation of a state Environmental Assessment Worksheet (EAW) or Environmental Impact Statement (EIS) if mandatory thresholds are met, including Minnesota Rules 4410.4300, Subpart 15 which defines mandatory environmental review thresholds related to air pollution.

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.

Motorized vehicles affect air quality by emitting airborne pollutants. Development resulting in changes in traffic volumes, travel patterns, and roadway locations for may have the potential to affect air quality by changing the number of vehicles and the congestion levels.

Criteria pollutants identified by the U.S. Environmental Protection Agency (EPA) are ozone, particulate matter (PM), carbon monoxide (CO), nitrogen dioxide (NO_2), lead, and sulfur dioxide (SO_2). In Minnesota, air quality analysis for transportation projects primarily addresses localized CO emissions and Mobile Source Air Toxics (MSATs). The AUAR area (St. Louis County) is not located within a nonattainment area for criteria pollutants. The AUAR area is located within a maintenance area for Carbon Monoxide (1971 standard), designated in June 1994.[72]

Motorized vehicles affect air quality by emitting airborne pollutants. Development in the AUAR area as part of Scenario B is mostly within already developed areas and, thus, significant changes in traffic volumes, travel patterns, and roadway locations are not anticipated. The Lot D subarea will include development of a vacant site and, therefore, changes in traffic volumes and travel patterns may occur

[70] City of Duluth. Duluth Commercial Historic District Design Guidelines. Accessed January 2026. https://duluthmn.gov/media/12043/duluth-commercial-hd-guidelines-final-draft-opt.pdf
[71] EQB. Alternative Urban Areawide Review Documents: Recommended Content and Format. Updated September 2008. https://www.eqb.state.mn.us/sites/eqb/files/documents/AUAR%20guidance%20%28form%29%20-9-09.pdf. Accessed September 2025.
[72] Environmental Protection Agency. EPA Green Book. Updated August 2025. Available at: https://www3.epa.gov/airquality/greenbook/anayo_mn.html. Accessed September 2025.

within this subarea. However, based on the results of the Lot D Traffic Impact Study (Appendix J, Item 20), it is not anticipated that traffic generated by redevelopment of Lot D would result in significant traffic congestion and the associated effect on air quality would be expected to be negligible. It is not anticipated that Scenario B would include transportation improvement projects that would be considered regionally significant per 40 CFR Part 93. Therefore, no further air quality analysis is warranted.

Criteria pollutants identified by the U.S. Environmental Protection Agency (EPA) are ozone, particulate matter (PM), carbon monoxide (CO), nitrogen dioxide (NO_2), lead, and sulfur dioxide (SO_2). In Minnesota, air quality analysis for transportation projects primarily addresses localized CO emissions and Mobile Source Air Toxics (MSATs). The AUAR area (St. Louis County) is not located within a nonattainment area for criteria pollutants.

Carbon Monoxide

The AUAR area is located within a CO maintenance area. Future development within the Lot D subarea is expected to generate increased vehicular traffic, which would result in a relatively small increase in CO emissions and other vehicle-related emissions. The EPA has approved a CO hot spot screening method designed to identify intersections that may result in CO emissions that exceed air quality standards. This screening method assumes that intersections with a total daily traffic volume exceeding 82,300 vehicles per day may result in potential CO impacts that exceed air quality standards.

A Traffic Impact Study (TIS) was completed for the Lot D subarea and a qualitative analysis on the current volumes and existing capacity of traffic was completed for the rest of the AUAR area, which are discussed in Item 20 of this AUAR. It is not expected that the redevelopment of the AUAR would generate traffic exceeding 82,300 vehicles per day. Therefore, it is not anticipated that vehicle emissions generated by the development scenario would have the potential to significantly impact CO air pollution. At the time specific projects in the AUAR area are proposed, further traffic analyses would be conducted to identify trips per day and the potential for impacts.

Mobile Source Air Toxics (MSAT)

In addition to the criteria air pollutants, the EPA also regulates air toxics. The Federal Highway Administration (FHWA) provides guidance for the assessment of Mobile Source Air Toxic (MSAT) effects for transportation projects. A qualitative evaluation of MSATs has been performed for the AUAR, the scope and methods of which have been developed in collaboration with MnDOT, MPCA, and FHWA.

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA assessed this expansive list in its rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are part of EPA's Integrated Risk Information System (IRIS).[73] In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the 2011 National Air Toxics Assessment (NATA).[74] These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority mobile source air toxics, the list is subject to change and may be adjusted in consideration of future EPA rules.

Motor Vehicle Emissions Simulator (MOVES)

The EPA's Motor Vehicle Emissions Simulator (MOVES) model is an emission modeling system that estimates emissions for mobile sources for air toxics. According to EPA, MOVES3 is a major revision to MOVES2014 and improves upon it in many respects. MOVES3 includes new data, new emissions standards, and new functional improvements and features. It incorporates substantial new data for

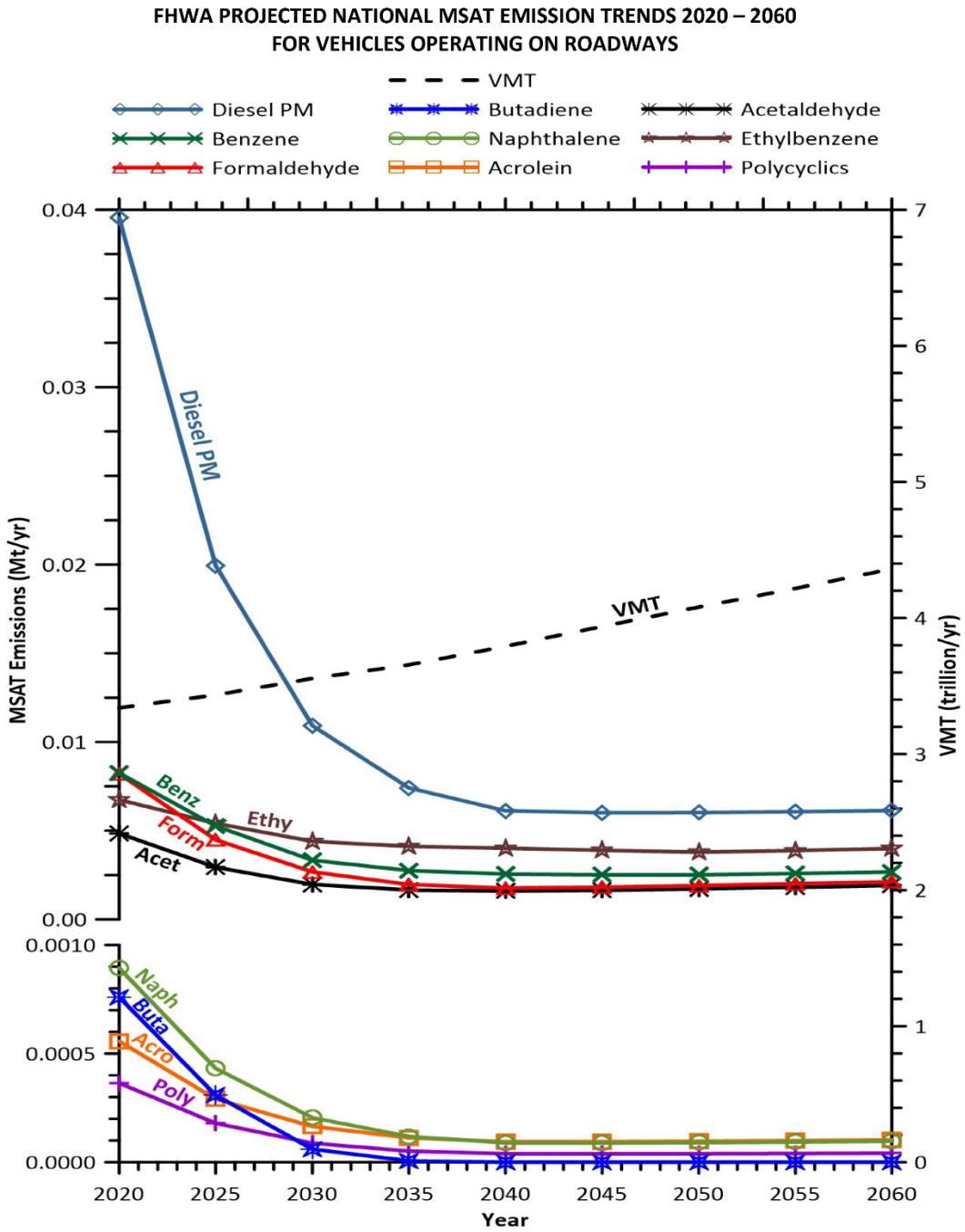
[73] US EPA. IRIS Tool. Accessed December 2025. Available at: https://www.epa.gov/iris

[74] US EPA. NATA. Accessed December 2025. Available at: https://www.epa.gov/national-air-toxics-assessment

emissions, fleet, and activity developed since the release of MOVES2014. These new emissions data are for light- and heavy-duty vehicles, exhaust and evaporative emissions, and fuel effects. MOVES3 also adds updated vehicle sales, population, age distribution, and vehicle miles travelled (VMT) data. In the November 2020, EPA issued MOVES3 Mobile Source Emissions Model Questions and Answers.[75] EPA states that for on-road emissions, MOVES3 updated heavy-duty (HD) diesel and compressed natural gas (CNG) emission running rates and updated HD gasoline emission rates. They updated light-duty (LD) emission rates for hydrocarbon (HC), carbon monoxide (CO) and nitrogen oxide (NOx) and updated light-duty (LD) particulate matter (PM) rates, incorporating new data on Gasoline Direct Injection (GDI) vehicles. Using EPA's MOVES3 model, as shown in Exhibit 7, FHWA estimates that even if VMT increases by 31 percent from 2020 to 2060 as forecast, a combined reduction of 76 percent in the total annual emissions for the priority MSAT is projected for the same time period.

[75] US EPA. MOVES3 Q&A. Accessed December 2025. Available at: https://www.epa.gov/sites/default/files/2020-11/documents/420f20050.pdf

Exhibit 7. FHWA Projected National MSAT Emission Trends 2020 - 2060 for Vehicles Operating on Roadways



Note: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.
Source: EPA MOVES3 model runs conducted by FHWA, March 2021.

Note: Trends for specific locations may be different, depending on locally derived information representing vehicle miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors
Source: EPA MOVES3 model runs conducted by FHWA, March 2021.

Diesel PM is the dominant component of MSAT emissions, making up 36 to 56 percent of all priority MSAT pollutants by mass, depending on calendar year. Users of MOVES3 will notice some differences in emissions compared with MOVES2014. MOVES3 is based on updated data on some emissions and pollutant processes compared to MOVES2014 and also reflects the latest Federal emissions standards in place at the time of its release. In addition, MOVES3 emissions forecasts are based on slightly higher VMT projections than MOVES2014, consistent with nationwide VMT trends.

Qualitative MSAT Analysis

For the development scenario in this AUAR, the amount of MSAT emitted would be proportional to the average daily traffic (ADT), assuming that other variables such as fleet mix are the same for the development scenario. The ADT estimated for the development scenario is higher than that if there was No Build in the AUAR, because future development in the Lot D subarea would generate trips that would not otherwise occur in the area. The ADT for future development in the other subareas is not expected to be higher than if there was No Build in the AUAR area, because these subareas are already highly developed and future redevelopment in these subareas are not expected to generate a significant increase in traffic. Appendix J provides the Traffic Impact Study for the Lot D development which presents trip generation estimates associated with the development scenario within the Lot D subarea. This increase in ADT means MSAT under the development scenario would probably be higher than if there was No Build in the Lot D subarea. There could also be localized differences in MSAT from indirect effects of the development scenario such as associated access traffic, emissions of evaporative MSAT (e.g., benzene) from parked cars, and emissions of diesel particulate matter from delivery trucks.

For the development scenario, emissions are virtually certain to be lower than present levels in the design year as a result of the EPA's national control programs that are projected to reduce annual MSAT emissions by over 76 percent from 2020 to 2060 (Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents, Federal Highway Administration, January 18, 2023)[76]. Local conditions may differ from these national projections in terms of fleet mix and turnover, ADT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for ADT growth) that MSAT emissions in the study area are likely to be lower in the future than they are today.

Potential Impacts

Future development in the 1st Street, Essentia, and Secondary subareas is not expected to generate a significant increase in vehicular traffic as these areas are already highly developed. Future development in the Lot D subarea is expected to generate increased vehicular traffic, which may result in a relatively small increase in CO emissions and other vehicle-related emissions.

The increase in traffic associated with future development in the Lot D subarea was considered in a qualitative evaluation of MSATs. The increased traffic could lead to higher MSAT emissions near the Lot D subarea. Therefore, there may be localized areas where ambient concentrations of MSATs would be higher than under existing conditions. However, the magnitude and duration of these potential differences cannot be reliably quantified, due to incomplete or unavailable information in forecasting project-specific health impacts. On a region-wide basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial reductions over time that in almost all cases the MSAT levels in the future will be significantly lower than today.

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.

The Development Scenario B is not anticipated to produce dust or odors during operation but may

[76] FHWA. Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents. 2023. Available at: https://www.fhwa.dot.gov/environMent/air_quality/air_toxics/policy_and_guidance/msat/. Accessed December 2025.

generate temporary dust and odors during construction. The majority of the AUAR area consists of highly developed urban land consisting of a variety of commercial, hospitality, office and residential uses as well as a medical campus. Nearby sensitive receptors would include the hospitals within the Essentia and Secondary subareas and low, medium, and high-density housing within the Essentia, 1st Street, and Secondary subareas. There is additional lower density housing uphill of the AUAR area.

Potential odors would likely be associated with exhaust from diesel engines and fuel storage. Dust generated during construction would be minimized through standard dust control measures such as applying water to exposed soils and limiting the duration of exposed soils to the extent possible. Construction contractors would be required to comply with the City's Construction Standards[77] which include implementing adequate dust control measures to meet all air quality regulations and minimize the potential to create a nuisance to adjacent property owners. Dust levels, after construction is complete, would be minimal as all surfaces would be paved or revegetated. With these control measures in place, the quality of life for nearby residents is not anticipated to be affected.

Item 17 Mitigation Strategies

- BMPs shall be implemented during construction to control dust, which may include the following minimization and mitigation measures:
    - Minimization of land disturbance during site preparation
    - Use of watering trucks to minimize dust
    - Covering of trucks while hauling soil/debris off-site, or transferring materials
    - Stabilization of dirt piles if they are not removed immediately
    - Use of dust suppressants on unpaved areas
    - Minimization of unnecessary vehicle and machinery idling
    - Products containing chloride would be avoided as a dust suppressant in areas that drain to wetlands or public waters

18. Greenhouse Gas (GHG) Emissions/Carbon Footprint

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

The GHG emissions for the Project are calculated using the Simplified Greenhouse Gas Emissions Calculator (SGEC) tool and based on the methodologies for developing a carbon footprint described in Minnesota Environmental Quality Board's (EQB's) EAW Guidance (June 2024). Table 18 shows the GHG emission categories included for the development scenarios.

Table 18. Emission Categories for Carbon Footprint

Category	Scope	Project Phase	Type of Emissions
Direct Emissions	Scope 1	Construction	Combustion (Mobile Sources)
	Scope 1	Operations	Combustion (Mobile Sources)

[77] City of Duluth. Construction Standards. 2019. Accessed December 2025. Available at: https://duluthmn.gov/media/fokpomwo/2019-construction-standards.pdf

Category	Scope	Project Phase	Type of Emissions
	Scope 1	Operations	Combustion (Stationary Sources)
Indirect Emissions	Scope 2	Operations	Off-site Electricity
	Scope 3	Operations	Off-site Waste Management

Construction emissions are associated with the total square footage of additional development associated with Scenario B compared to existing conditions. All areas (Lot D, Essentia, 1st Street and Secondary) are combined to determine total Project GHG emissions. Operational emissions are also calculated using the net increase of square footage of each of the following categories: residential, commercial, industrial, institutional (educational), and "other" (assumed to be a hotel/tourism).

A description of the carbon footprint associated with the increased development from the Project is provided below.

Construction Emissions

GHG emissions from new construction in Scenario B are associated with fuel combustion in the mobile construction equipment and on-road vehicles. For on-road vehicles (commuting construction workers, dump trucks and semi-trucks), emissions are calculated by estimating the number of vehicles, miles traveled (estimated to be 20 miles per day for workers, 60 miles per day for heavy duty trucks), gallons of fuel used (using default mileage rates), and emission factors from the U.S. EPA's Emission Factors Hub (https://www.epa.gov/climateleadership/ghg-emission-factors-hub, updated January 2025).

For off-road vehicles, the quantity and horsepower of cranes, backhoes, loaders, bulldozers, excavators, and skid steers was estimated based on other similar development projects. The default fuel consumption rate of 0.05 gallons per horsepower-hour[78] is used to determine the fuel usage for all equipment. Similar to the on-road vehicles, emission factors from the Emission Factors Hub are used to calculate GHG emissions.

Per EQB's Revised EAW Guidance, total construction emissions are divided by the lifetime of the project, estimated to be 50 years.

Operational Emissions – Mobile Sources

Average daily trips associated with the additional development in Scenario B are provided in Table 19. Table 22 and Table 24 in Item 20 (Transportation) provides detailed trip generation estimates for the subareas. These estimates are conservative and based on data from the Institute of Transportation Engineers, which is more indicative of suburban traffic conditions. Development Scenario B proposes an increase in housing in the Downtown, which would be expected to reduce vehicle miles traveled (VMT) for commuting to work and downtown destinations (i.e., retail, commercial, and restaurants). Actual trips generated by Scenario B is anticipated to be less than the calculated trip estimates presented in Table 19.

Table 19. Average Trips per Day

Development	Vehicle Type	Trips/Day[1]
Residential	Light Duty Vehicles (passenger cars, small trucks, SUVs)	7,743
Commercial	Light Duty Vehicles	3,812

[78] Based on South Coast Air Quality Management District CEQA Air Quality Handbook, Table A9-3E.

Development	Vehicle Type	Trips/Day[1]
	Heavy Duty Trucks	70
Institutional	Light Duty Vehicles	9,358
Other – Tourism (Hotel)	Light Duty Vehicles	3,922

[1] Light duty vehicles' data based on traffic study in Transportation Section of the AUAR for Scenario B. Heavy duty trucks' data is an estimate for delivery trucks.

It is conservatively estimated that daily trips take place for 365 days per year. The daily commute for residential and commercial is estimated to be 10 miles round trip. Delivery trucks and hotel guests are assumed to travel 100 miles per trip.

Gas mileage for light duty vehicles is estimated based on the U.S. Department of Transportation's Bureau of Transportation Average Fuel Efficiency for Light Duty Vehicles. Delivery trucks and shipping vehicles are assumed to be heavy-duty diesel trucks. Gas mileage for the diesel trucks are based on U.S. Department of Transportation, Federal Highway Administration data from 2020. GHG emissions associated with these trips are calculated using the Emission Factors Hub.

Operational Emissions – Stationary Combustion

The projected natural gas usage for the buildings associated with each scenario is estimated using the U.S. Energy Information Administration's Commercial Buildings Energy Consumption Survey (CBECS, 2018). The CBECS provides natural gas intensities in standard cubic feet per square foot per year for several different building activity categories.

Natural gas combustion GHG emissions are calculated using emission factors from the Emission Factors Hub.

Operational Emissions – Offsite Electricity Production

Similar to natural gas usage, electricity needs for the proposed buildings are estimated using the CBECS, which provides electricity usage intensity in kilowatt-hours per square foot of building space per year. GHG emissions occur offsite (Scope 2) when the electricity is generated. The SGEC tool calculates GHG emissions from electricity generation on a regional basis (defined by U.S. EPA using data from the EIA and the North American Electric Reliability Corporation (NERC)), using average emission factors based on the mix of fuels used to generate the electricity in each region. For this project, the Midwest Reliability Organization West (MROW) region is used. Based on 2023 data,[79] the electricity generation in MROW is comprised of approximately 50 percent fossil fuels (coal and natural gas), eight percent nuclear and approximately 42 percent renewables (hydro, wind, and solar).

Operational Emissions - Waste Management

GHG emissions from waste management are associated with the waste generation estimates and how that waste is handled. For residential waste, a default waste generation rate of 4.9 pounds per person per day (lb./person/day) was obtained from the U.S. EPA's Fact Sheet, 2018 – Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2018. The report breaks down the waste generation rate into recycled (1.2 lb./person/day), composted (0.4 lb./person/day), landfilled (2.4 lb./person/day), combusted (0.6 lb./person/day) and other food management (0.3 lb./person/day). These rates are assigned to residential units (assuming four residents per unit), commercial development, education/institutional (assuming 1,000 people), and tourism/hotels (assuming an average of two guests per room).

[79] Emissions & Generation Resource Integrated Database (eGRID) released June 12, 2025.

For commercial development, it is assumed that the number of employees assumed for the 1st Street and Essentia areas are 50 and 10, respectively.

GHG emissions for each waste management type are estimated based on emission factors from the U.S. EPA's Waste Reduction Model (WARM).

Summary

A summary of GHG emissions are provided in Table 20. Emissions are presented in tons per year of carbon dioxide equivalent, which takes into account each GHG's global warming potential (GWP). Detailed emission calculations are provided in Appendix I Greenhouse Gas Analysis Calculations.

Table 20. Project GHG Emissions Increase

Category	Scope	Emission Source	GHG Emissions (CO_2e, ton/yr)
Direct Emissions	Scope 1	Construction Combustion (Mobile Sources)	2,861
	Scope 1	Operations Combustion (Mobile Sources)	115,836
	Scope 1	Operations Combustion (Stationary Sources)	7,898
Indirect Emissions	Scope 2	Off-site Electricity	21,591
	Scope 3	Off-site Waste Management	3,229
Total			151,415

b. GHG Assessment

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

Specific mitigation measures are included in the list below.

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

GHG emission mitigation measures have not yet been selected. At the time that specific projects are proposed within the AUAR and design details are available, potential GHG emissions reductions may be quantified.

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

The Project lifetime is estimated at 50 years. Without accounting for potential mitigation measures, the conservative estimates of GHG emissions increase associated with the Project are approximately 151,415 tons of CO_2e per year.

Over the 50-year lifetime of the Project, approximately 7.5 million tons of CO_2e would be emitted (without accounting for mitigation measures and/or clean energy implementation). The Project's GHG will have minimal effect on the State of Minnesota's Next Generation Energy Act goals or the local area's GHG reduction goals, such as those outlined in the City of Duluth's Climate Action Work Plan 2022-2027.

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- Minimizing engine idling for construction vehicles through the use of idle management systems, signage, and preparing a plan for monitoring and/or enforcement of idling reduction policies.
- Minimizing removal of existing trees to the extent possible, and planting new trees along downtown avenues and streets where feasible Future developers will be required to comply with tree replacement requirements per Chapter 50-25.9 of the City's Legislative Code.
- Energy-efficient lighting in buildings and parking lots.
- Use of energy-efficient building materials.
- Installation of energy-efficient appliances, windows and heating, ventilation and air conditioning (HVAC) units, and programmable thermostats.
- Encourage use of renewable energy sources, such as solar, use of electric/hybrid vehicles, and installation of electric vehicle charging stations.
- Encourage proposers to include multi-modal transportation improvements to expand pedestrian and bicyclist connection proposed development.
- Compliance with the Sustainability Standards established in Chapter 50-29 of the City's Legislative Code will be required for new residential developments containing three or more units and non-residential development with a gross floor area of 10,000 square feet or more.
- Developers and the City should consider whether new construction (or redevelopment) in the downtown area can take advantage of the Duluth Energy Systems (DES), as 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.

In accordance with the EQB's AUAR guidance document[80], it is not required to address construction noise unless there is some unusual reason to do so. No unusual circumstances are anticipated for the development scenarios that would warrant conducting a quantitative noise analysis.

The State of Minnesota's noise rules (Minn. Rules Ch. 7030) establish noise limits by noise area classifications (NACs) based on land use at the location of the person that hears noise. The MPCA enforces noise standards at industrial facilities for which it has issued an air permit. MnDOT is responsible for state highway noise mitigation and coordinates with the Federal Highway Administration (FHWA) and the MPCA to evaluate road projects for noise impacts and possible mitigation measures.

Noise impacts in Minnesota are evaluated by measuring and/or modeling the noise levels that are exceeding 10 percent and 50 percent of the time during the hours of the day and/or night that have the loudest scenario. These numbers are identified as the L10 and L50 levels, respectively. The L10 value is the noise level that is exceeded for a total of 10 percent, or six minutes, of an hour. The L50 value is the noise level that is exceeded for a total of 50 percent, or 30 minutes, of an hour.

For traffic noise analyses, traffic volume, types of vehicles, operating speed, topography, and distance from the road to the receptor influences the traffic noise level at the receptor. The sound level decreases as distance from a source increases. A general rule regarding sound level decrease due to increasing distance from a line source (roadway) that is commonly used is: beyond approximately 50 feet from the sound source,

[80] EQB. Alternative Urban Areawide Review Documents: Recommended Content and Format. Updated September 2008. https://www.eqb.state.mn.us/sites/default/files/documents/AUAR%20guidance%20%28form%29%20-9-09.pdf

each doubling of distance from the line source over hard ground (such as pavement or water) will reduce the sound level by 3 dBA, whereas each doubling of distance over soft ground (such as vegetated or grassy ground) results in a sound level decrease of 4.5 dBA.

1) Existing noise levels/sources in the area

Existing noise is dominated by I-35 through downtown Duluth, Mesaba Avenue, London Road, and downtown arterial streets. Secondary sources include port and industrial activity along the waterfront, commercial loading/unloading activities in downtown, and event activity at the Bayfront Festival Park and Canal Park. Additionally, noise is generated by the existing heliports at the Essentia Health Medical Campus and Aspirus St. Luke's Hospital.

Lot D Subarea

Current noise levels are influenced by adjacent port facilities, I-35 vehicle traffic, Bayfront Festival Park traffic and event noise, and rail corridors.

Essentia Subarea

The existing medical campus produces noise from patient and visitor vehicle traffic, helicopters, ambulance and emergency vehicles, and service deliveries.

1st Street Subarea

Noise is currently generated by vehicle traffic, transit operations, and downtown commercial activity.

Secondary Subarea

East of downtown, traffic on London Road and adjacent commercial uses are the dominant noise contributors.

2) Nearby sensitive receptors

Sensitive receptors within and adjacent to the AUAR area include residential neighborhoods west of downtown, hillside neighborhoods overlooking the central business district, residences and hotels in Canal Park, the Essentia Health Medical Campus, nearby schools and waterfront recreational areas.

Lot D Subarea

Sensitive receptors in proximity include Canal Park hotels and residences, and recreational/event users at Bayfront Festival Park. Pier B Hotel is adjacent to the Lot D subarea.

Essentia Subarea

Sensitive receptors would include patients and facilities at the hospital and medical campus, and hotels and residences, including the Sheraton Duluth Hotel, and nearby residential neighborhoods.

1st Street Subarea

Receptors include mixed-use, residential buildings, and hotels within the corridor and adjacent hillside neighborhoods. Hotels in the 1st Street subarea include the Radisson Hotel Duluth – Harborview and Holiday Inn & Suites Downtown.

Secondary Subarea

Receptors include residential blocks east of downtown, Aspirus St. Luke's Hospital, schools along London Road, and parks and trails along the Lakewalk.

3) Conformance to State noise standards

Minnesota's noise pollution rules[81] are based on statistical measurements that describe noise levels over a one-hour monitoring period. Two key values are used: $L_{10,}$ the sound level exceeded 10 percent of the time (equivalent to six minutes per hour), and L_{50} the sound level exceeded 50 percent of the time (30 minutes per hour). The rules do not establish an absolute maximum noise level.

For residential locations (Noise Area Classification 1), the daytime limits (7:00 a.m. – 10:00 p.m.) are 65 dBA for L_{10} and 60 dBA for L_{50} while the nighttime limits (10:00 p.m. – 7:00 a.m.) are 55 dBA for L_{10} and 50 dBA for $L_{50.}$ In practice, this means that during a one-hour period, daytime noise levels cannot exceed 65 dBA for more than 10 percent of the time or 60 dBA for more than 50 percent of the time. Table 21 provides a summary of the Noise Area Classifications and associated standards.

Table 21. Noise Area Classifications

NAC	Common land use associated with the Noise Area Classification	Daytime (dBA)		Nighttime (dBA)	
		L_{10}	L_{50}	L_{10}	L_{50}
1	Residential housing, religious activities, camping and picnicking areas, health services, hotels, educational services	65	60	55	50
2	Retail, business and government services, recreational activities, transit passenger terminals	70	65	70	65
3	Manufacturing, fairgrounds and amusement parks, agricultural and forestry activities	80	75	80	75

NACs are determined by the land use at the location where the noise is received, which does not always correspond to the zoning designation of the area. As a result, noise generated by an industrial facility adjacent to residential properties is subject to NAC 1 standards if it can be heard on those residential parcels.

The development scenario primarily proposes residential uses with some minimal commercial and hospitality uses. The urban nature of the development locations will allow for reduced dependency on vehicles given the existing bicycle and pedestrian facilities. These proposed development uses are not significant noise sources. Residential noise would be negligible compared to existing noise sources downtown. No road improvements are proposed that would be considered Type 1 noise sources. Should a transportation improvement project be proposed that meets the criteria of a Type 1 project, a quantitative noise analysis would be required at that time. As such, operational noise from maximum development is not expected to exceed NAC limits.

By state law, all future development within the AUAR area must comply with Minnesota's noise standards. In addition, future land uses must comply with local noise requirements under Duluth's Legislative Code, which incorporates the City's ordinances. Chapter 50-25 of the City's Legislative Code[82] establishes landscaping and tree preservation requirements. Pursuant to Section 50-25.5, buffer areas are required to be provided when specific types of differing land uses occur adjacent to each other, including where boundaries of mixed use are adjacent to a residential zone district. A landscape buffer may consist of natural landscape materials or an opaque wall, berm, fence or dense vegetative screen is required. Specific landscape buffer requirements are described in Sections 50-25.5.A and 50-25.5.C for proposed multi-family residential and industrial uses abutting residential uses, respectively.

4) Quality of life

Maximum development would likely increase background noise levels. However, these changes are

[81] More information on Minnesota Noise rules, Minn. Rules Ch. 7030, may be found at: https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf

[82] City of Duluth. Unified Development Chapter Article 4 Section 50-25 - Landscaping and Tree Preservation. 2025. Available at: https://duluthmn.gov/media/sknpktnq/50-25-landscaping-and-tree-preservation.pdf. Accessed December 2025.

anticipated to remain consistent with those of a typical urban environment. Quality of life considerations would focus on residential livability in adjacent hillside neighborhoods, lodging and residential uses in Canal Park, the sensitivity of medical campus operations within the Essentia Health Medical Campus, and recreational use of the waterfront and Lakewalk.

It is anticipated that blasting may be required during construction of utilities and building foundations as a result of shallow bedrock within the AUAR area. Necessary notifications would be sent to adjacent property owners prior to blasting, and these activities would be managed to the extent possible and only occur during the day between 8:00 a.m. and 5:00 p.m. in accordance with the City's Standard Construction Specifications. Construction contractors would be required to comply with the City's rock blasting and vibration control standards. Additional mitigation measures related to blasting are detailed below.

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- Landscape buffers would be required to be implemented where differing land uses occur in accordance with Chapter 50-25.5 of the City's Legislative Code.
- Scenario B primarily proposes residential uses with some a mix of commercial office, and retail uses. Scenario B would not introduce significant new sources of noise and would not be expected to result in noise levels that would exceed state noise standards. Where residential uses are proposed in close proximity to sources of noise (i.e., industrial areas, highways, event venues) a noise assessment may be warranted to evaluate noise impacts to proposed residential developments, which would be considered sensitive receptors. The need for a noise assessment and sound proofing measures will be determined by the City through the local permitting and approval process based on project specific details.
- Equipment used for any future construction-related activities should be fitted with the appropriate mufflers.
- Construction contractors would be required to comply with rock blasting and vibration control requirements in accordance with the City's 2019 Standard Construction Specifications, which includes compliance with Occupational Safety and Health Administration (OSHA) Safety and Health Standards 29 CRF, Part 1926, Subpart U (Blasting and Use Explosives). All blasting operations are required to be performed in accordance with the provisions of the City's Standard Construction Specifications and all other applicable federal, state, and local regulations. A Blasting Plan is required to be submitted not less than three weeks prior to any drilling or blasting operations to the City Engineer.
- Additional mitigation measures outlined in the California Department of Transportation (Caltrans) Transportation and Construction Vibration Guidance Manual (2020) may be applied to minimize adverse impacts of vibration and air overpressure associated with blasting. These measures include, but are not limited to, conducting a pre-blast survey, informing the public about any blasting activities, and avoiding blasting during windy conditions.

20. Transportation

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

Lot D Subarea

1) Existing and proposed parking spaces

Currently, there are no formal parking areas within this subarea. The proposed project includes 189 parking stalls.

2) *Estimated total average daily traffic generated*

Total average daily traffic generated by the Project is estimated to be 3,430 trips per day.

3) *Estimated maximum peak hour traffic generated and time of occurrence*

The estimated maximum peak hour traffic generated by the Project is estimated to be 282 trips during the p.m. peak hour (4:30 p.m. to 5:30 p.m.).

4) *Source of trip generation rates*

Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers was used to develop trip generation estimates.

5) *Availability of transit and/or other alternative transportation modes*

Duluth Transit Authority (DTA) operates several bus routes throughout Duluth.[83] No bus routes currently include stops in close proximity to Lot D. Several bus routes along W. Superior Street extend from the Gary/ New Duluth neighborhood to the Lakeside/ Lester Park neighborhood. The Green Line route extends from W. Superior Street in downtown along Central Entrance Drive to the Miller Hill Mall area. The Port Town Trolley, seasonally available early June through Labor Day, provides service between W. Superior Street and Canal Park, with stops near the Duluth Entertainment Convention Center (DECC), Bayfront Festival Park, Great Lake Aquarium, and other popular destinations. The nearest stop to Lot D is the Port Town Trolley stop along S. 5th Avenue W.

Several local trail facilities are in close proximity to Lot D. Less than one-half mile east of Lot D, the Bayfront Walkway, a multi-purpose paved facility, extends from Bayfront Festival Park, eastward along the lakeshore, connecting with the Baywalk facility along the DECC and the Lakewalk trail facility within Canal Park. Additionally, multi-purpose trail facilities extend along W. Railroad Street as part of the City's Cross City Trail, connecting to trail facilities along W. Superior Street and W. Michigan Street via the pedestrian bridge crossing I-35 (Bridge No. 69885).

<u>Essentia Subarea</u>

1) *Existing and proposed parking spaces*

Currently, off-street and on-street parking is provided for existing uses. Future development and redevelopment would be required to comply with the parking provisions of City Code Section 50-24, which establish maximum parking requirements..

2) *Estimated total average daily traffic generated*

Total average daily traffic generated by new development in Scenario B is estimated to be 17,560 trips per day.

3) *Estimated maximum peak hour traffic generated and time of occurrence*

The estimated maximum peak hour traffic generated by new development in Scenario B is estimated to be 1,710 trips during the p.m. peak hour (4:30 p.m. to 5:30 p.m.).

4) *Source of trip generation rates*

Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers was used to

[83] Duluth Transit Authority. Route and Schedules. Accessed December 2025. https://www.duluthtransit.com/home/getting-there/routes-schedules/

develop trip generation estimates.

5) *Availability of transit and/or other alternative transportation modes*

Several DTA bus routes extend along W. Superior Street ultimately connecting the Gary/ New Duluth neighborhood to the Lakeside/ Lester Park neighborhood. Multiple bus stops are located within the Essentia subarea along W. Superior Street and E. 4th Street. The Green Line route intersects the Essentia subarea with stops along N. 6th Avenue E, providing service to the Miller Hill Mall area.

Sidewalks are available throughout the Essentia subarea and vary between poor and good condition.[84] The Lakewalk extends from the Fitger's Parking Ramp to W. Superior Street, terminating near the Essentia Medical Campus. While pedestrian infrastructure is available, operations and maintenance issues create a pedestrian network that is not reliably accessible.

Further, limited protected bicycle infrastructure (i.e., buffered or curb protected bike facilities) are available within the downtown. Paved, off-road separated multi-use paths are primarily concentrated east of I-35.[85] The lack of protected bicycle infrastructure creates safety concerns resulting from vehicular conflicts and speeds, which limits bicyclists in the downtown to those who are most confident and comfortable navigating on-street conditions.

The City of Duluth in partnership with MnDOT and stakeholders, is developing an Active Transportation Action Plan for the 2nd Street Corridor between Mesaba Avenue and 6th Avenue East which guides future multimodal investments along the corridor.[86] Safety concerns noted in the plan include excessive vehicle speeds and conflicts with vehicles entering/exiting parking ramps near the Essential Health Medical Campus where many pedestrians are crossing intersections along 2nd Street.

<u>1st Street Subarea</u>

1) *Existing and proposed parking spaces*

Currently, off-street and on-street parking is provided for existing uses. Future uses would be required to comply with City parking requirements.

2) *Estimated total average daily traffic generated*

Total average daily traffic generated by new development in Scenario B is estimated to be 3,283 trips per day.

3) *Estimated maximum peak hour traffic generated and time of occurrence*

The estimated maximum peak hour traffic generated by new development in Scenario B is estimated to be 313 trips during the p.m. peak hour (4:30 p.m. to 5:30 p.m.).

4) *Source of trip generation rates*

Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers was used to develop trip generation estimates.

5) *Availability of transit and/or other alternative transportation modes*

[84] City of Duluth. Duluth-Superior Sidewalk Conditions and Sidewalk Gaps. Accessed December 2025. https://www.arcgis.com/apps/mapviewer/index.html?webmap=a06bafcfda8847679dbab16d80d12c01
[85] City of Duluth. Duluth – Superior Bike Routes. Accessed January 2026. https://www.arcgis.com/apps/OnePane/basicviewer/index.html?appid=a095a4b0b25841ffa38e08bfb45a0de9
[86] City of Duluth. 2nd Street Active Transportation Action Plan. January 2026. Accessed January 2026. https://duluthmn.gov/media/zrflmc1h/draft-duluth-2nd-street-action-plan-8jan2026.pdf

Several DTA bus routes extend along W. Superior Street ultimately connecting the Gary/ New Duluth neighborhood to the Lakeside/ Lester Park neighborhood. Multiple bus stops are located within the 1st Street subarea along W. Superior Street. Approximately two blocks north of the 1st Street subarea, bus stops are available along W. 4th Street associated with Route 114, which extends to W. Skyline Parkway. Along the northern boundary of the 1st Street subarea along N. 3rd Avenue, the Green Line route provides service to the Miller Hill Mall area. The Duluth Transit Center (DTC) is located at 224 W. Michigan Street and services as the main transit hub in the City of Duluth. The Blue Line runs between downtown and the University of Minnesota Duluth via the Plaza and Mount Royal commercial districts. Other routes connect downtown to the College of St. Scholastica, Lake Superior College, the University of Wisconsin Superior, and Northwood Technical College - Superior.

Sidewalks are available throughout the 1st Street subarea and vary between poor and good condition.[87] A multi-purpose trail facility extends along the southeastern side of W. Michigan Street, under I-35, crosses the Northern Pacific Railroad, and ultimately connects to trails along W. Railroad Street. Two connections are available from W. Superior Street to the Lakewalk near N. 1st Avenue E. and N. 2nd Avenue E, which cross over I-35. There are also skyway connections in downtown that facilitate pedestrian movement between buildings above the street level. As described in the preceding 1st Street subarea discussion, pedestrian infrastructure in the downtown is available, however, operations and maintenance issues create a pedestrian network that is not reliably accessible.

Additionally, limited protected bicycle infrastructure (i.e., buffered or curb protected bike facilities) are available within the downtown. Barriers and opportunities identified in the City's Active Transportation Action Plan for the 2nd Street Corridor within the 1st Street subarea include the need for a two-lane bikeway along the corridor and improved connectivity near the west end of the corridor due to sidewalk gaps, poor sidewalk condition, limited crossing infrastructure, and high traffic volumes near the Courthouse and Mesaba Avenue.[88]

Secondary Subarea

1) *Existing and proposed parking spaces*

Currently, off-street and on-street parking is provided for existing uses. Future uses would be required to comply with City parking requirements.

2) *Estimated total average daily traffic generated*

Total average daily traffic generated by new development in Scenario B is estimated to be 562 trips per day.

3) *Estimated maximum peak hour traffic generated and time of occurrence*

The estimated maximum peak hour traffic generated by new development in Scenario B is estimated to be 48 trips during the p.m. peak hour (4:30 p.m. to 5:30 p.m.).

4) *Source of trip generation rates*

Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers was used to develop trip generation estimates.

5) *Availability of transit and/or other alternative transportation modes*

Several DTA bus routes extend along W. Superior Street ultimately connecting the Gary/ New

[87] City of Duluth. Duluth-Superior Sidewalk Conditions and Sidewalk Gaps. Accessed December 2025. https://www.arcgis.com/apps/mapviewer/index.html?webmap=a06bafcfda8847679dbab16d80d12c01
[88] City of Duluth. 2nd Street Active Transportation Action Plan. January 2026. Accessed January 2026. https://duluthmn.gov/media/zrflmc1h/draft-duluth-2nd-street-action-plan-8jan2026.pdf

Duluth neighborhood to the Lakeside/ Lester Park neighborhood. Multiple bus stops are located within the Secondary subarea along W. Superior Street and E. 4th Street.

Sidewalks are available throughout the Secondary subarea and vary between poor and good condition.[89] South of Aspirus St. Luke's Hospital there is a connection to the Lakewalk located on London Road just southeast of the E. Superior Street and N. 10th Avenue E. intersection. London Road also offers access to the Rose Garden trail facility at Leif Erickson Park near S. 12th Avenue E, which ultimately connects to the Lakewalk. The Superior Hiking Trail extends along the west side of S. 14th Avenue E. and connects to the Rose Garden trail facility near S. 13th Ave E, ultimately connecting to the Lakewalk.

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.

Lot D Subarea

A complete Traffic Impact Study with existing and future volumes is included in Appendix J. This appendix includes relevant figures including existing traffic volumes, future peak traffic volumes, proposed development layout, and access locations.

The study examined weekday a.m. and p.m. peak hour traffic impacts of the proposed project at the following intersections:

- Garfield Avenue/Railroad Street
- Railroad Street/5th Avenue W
- Harbor Drive/5th Avenue W
- I-35 northbound ramps/Harbor Drive
- I-35 southbound ramps/Harbor Drive
- Railroad Street/Harbor Drive

Trip Generation Estimates

Expected trips generated by the proposed development were calculated based on data presented in Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers. These calculations represent total trips that will be generated by the proposed development based on Inland's concept plan, which assumes a total of 509 multi-family units and 140 hotel rooms. Table 22 presents the resultant trip generation estimates.

Table 22. Lot D Weekday Trip Generation Estimates

Land Use	Size	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekday Daily Total
		In	Out	Total	In	Out	Total	
Multi-family residential (ITE 221)	509 units	43	145	188	121	78	199	2,311
Hotel (ITE 310)	140 rooms	36	28	64	42	41	83	1,119
	Total	79	173	252	163	119	282	3,430

[89] City of Duluth. Duluth-Superior Sidewalk Conditions and Sidewalk Gaps. Accessed December 2025. https://www.arcgis.com/apps/mapviewer/index.html?webmap=a06bafcfda8847679dbab16d80d12c01

Intersection Operations Analysis

Capacity analysis results are presented in terms of level of service (LOS), which is defined in terms of traffic delay at the intersection. LOS ranges from A to F. LOS A represents the best intersection operation, with little delay for each vehicle using the intersection. LOS F represents the worst intersection operation with excessive delay. In accordance with MnDOT traffic study guidelines, this analysis used the LOS D/E boundary as an indicator of acceptable traffic operations. Table 23 summarizes the results of the intersection operations analysis for the year 2031 conditions.

Table 23. Year 2031 No Build and Build Intersection Operations Analysis

Intersection	Traffic Control	2031 No Build LOS		2031 Build LOS	
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Railroad Street/ Harbor Drive	EB/WB stop	A/B	A/B	A/B	A/B
Harbor Drive/ 5th Avenue W	NB stop	A/A	A/B	A/B	A/B
Railroad Street/ 5th Avenue W	WB stop	A/B	A/B	A/B	A/C
I-35 northbound ramps/ Harbor Dr	Signal	B/B	B/C	B/C	B/C
I-35 southbound ramps/ Harbor Dr	Signal	A/B	B/C	A/B	B/C
Garfield Avenue/ Railroad Street	WB stop	A/B	A/B	A/B	A/B
Railroad Street/ access	WB stop	N/A	N/A	A/B	A/B

Note: Level of service results presented with overall intersection LOS followed by worst movement LOS.
AM peak hour = 8:30 to 9:30 a.m., PM peak hour = 3:30 to 4:30 p.m.

Under the 2031 No-Build conditions, all intersections operate at an acceptable LOS B or better and all movements operate at LOS C or better during the a.m. and p.m. peak hours. Under the 2031 Build conditions, all intersections operate at an acceptable LOS B or better and all movements operate at LOS C or better during the a.m. and p.m. peak hours.

Essentia, 1st Street, and Secondary Subareas

Trip Generation Estimates

Trips generated by Development Scenario B for the Essentia, 1st Street, and Secondary subareas was estimated based on land use type and building area assumptions in accordance with the Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers. Table 24 presents trip generation estimates for these subareas based on the Development Scenario full buildout condition. It is noted that these estimates are based on conservative development conditions at full buildout. It is anticipated that actual trip generation would be less given that standard trip generation calculations are more typical of suburban development and do not consider the downtown setting of the AUAR area. Additionally, trip generation calculations for medical office are typical of medical clinic facilities, whereas it is anticipated that future medical office development would include educational facilities that would be expected to result in fewer trips generated.

Table 24. Trip Generation Estimates for Essentia, 1st Street, and Secondary Subareas

Land Use	Size	Weekday Daily Total
Essentia Subarea		
Multi-family residential (ITE 221)	600 units	2,676
Retail commercial (ITE 822)	50,000 sq. ft.	2,723
Medical office (ITE 720)	275,000 sq. ft.	9,358
Hotel (ITE 310)	480 rooms	2,803
	Total	**17,560**
1st Street Subarea		
Multi-family residential (ITE 221)	492 units	2,194
Retail commercial (ITE 822)	20,000 sq. ft.	1,089
	Total	**3,283**
Secondary Subarea		
Multi-family residential (ITE 221)	126 units	562
	Total	**562**

Traffic Volume Capacity

Given that specific development plans are not currently available, a qualitative review of the existing transportation network and the capacity of major roadway corridors was completed. Existing AADT data was obtained from the MnDOT Transportation Data Management System[90] and compared to the planning level roadway capacity thresholds presented in Table 25 for each of the subareas.

Table 25 shows the typical planning-level annual average daily traffic (AADT) capacity ranges and maximum AADT volume ranges for each facility type. These volume ranges are based upon guidance from the Highway Capacity Manual and professional engineering judgment.

Table 25. Planning Level Roadway Capacities by Facility Type

Facility Type	Planning Level Daily Capacity Ranges (AADT)	Under Capacity			Approaching Capacity		Over Capacity
		LOS A 0.2	LOS B 0.4	LOS C 0.6	LOS D 0.85	LOS E 1.0	LOS F >1.0
Two-lane undivided urban	8,000–10,000	2,000	4,000	6,000	8,500	10,000	> 10,000
Two-lane divided urban (Three-lane)	14,000–17,000	3,400	6,800	10,200	14,450	17,000	> 17,000
Four-lane undivided urban	18,000–22,000	4,400	8,800	13,200	18,700	22,000	> 22,000
Four-lane divided urban (Five-lane)	28,000–32,000	6,400	12,800	19,200	27,200	32,000	> 32,000

90 MnDOT. Transportation Data Management System. Traffic Viewer. Accessed January 2026. https://mndot.public.ms2soft.com/TDMS.UI_Core/trafficviewer

Essentia Subarea

The existing AADT volumes and capacity levels for major streets in the subarea are shown in Table 26.

Table 26. Roadway Volume and Capacities for Major Streets (Essentia Subarea)

Street	Extents	Number of Lanes	Current AADT (Year)	Capacity Level
Superior Street	4th Ave E to 6th Ave E	2	9,260 (2024)	Approaching
2nd Street (one-way)	5th Ave E to 6th Ave E	3	8,427 (2024)	Under
2nd Street (one-way)	6th Ave E to 7th Ave E	3	5,029 (2024)	Under
3rd Street	5th Ave E to 6th Ave E	2	6,633 (2024)	Under
3rd Street	6th Ave E to 7th Ave E	2	4,390 (2024)	Under
6th Ave E	2nd St to 3rd St	2	No data*	No data*
6th Ave E	3rd St to 2nd St	4 undivided	3,941 (2024)	Under
6th Ave E	4th St to 3rd St	4 undivided	6,790 (2024)	Under
4th Ave E	1st St to Superior St	2	1,011 (2024)	Under
4th Ave E	3rd St to 2nd St	2	1,424 (2024)	Under

**The section of 6th Ave E between 2nd St to 3rd St was recently constructed in 2025. Therefore, no data is available from MnDOT.*

As shown, Superior Street is approaching capacity in this subarea.

1st Street Subarea

The existing AADT volumes and capacity levels for major streets in the subarea are shown in Table 27.

Table 27. Roadway Volume and Capacities for Major Streets (1st Street Subarea)

Street	Extents	Number of Lanes	Current AADT (Year)	Capacity Level
Superior Street	Mesaba Ave to 5th Ave W	2	6,723 (2024)	Under
Superior Street	5th Ave W to 4th Ave W	2	6,617 (2024)	Under
Superior Street	1st Ave W to Lake Ave	2	6,399 (2024)	Under
Superior Street	Lake Ave 1st Ave E	2	10,467 (2024)	Over
Superior Street	2nd Ave E to 3rd Ave E	2	9,386 (2024)	Approaching
1st Street	Mesaba Ave to 6th Ave W	2	3,709 (2024)	Under
1st Street	3rd Ave W to 2nd Ave W	2	3,188 (2024)	Under
1st Street	2nd Ave E to 3rd Ave E	2	3,079 (2024)	Under
2nd Street (one-way)	5th Ave W to 4th Ave W	3	2,576 (2024)	Under
5th Ave W	Superior St to Michigan St	2	3,195 (2024)	Under
5th Ave W	Michigan St to I-35	2	5,239 (2024)	Under
Lake Ave	1st St to Superior St	4 undivided	11,679 (2024)	Under
Lake Ave	Superior St to Michigan St	4 divided	19,916 (2024)	Under

As shown, Superior Street is over capacity in one location and approaching capacity in another location in this subarea.

Secondary Subarea

The existing AADT volumes and capacity levels for major streets in the subarea are shown in Table 28.

Table 28. Roadway Volume and Capacities for Major Streets (Secondary Subarea)

Street	Extents	Number of Lanes	Current AADT (Year)	Capacity Level
4th Street	8th Ave E to 9th Ave E	2	9,009 (2024)	Approaching
1st Street	10th Ave E to 12th Ave E	2	2,998 (2024)	Under
Superior Street	9th Ave E to 10th Ave E	2	8,783 (2024)	Approaching
12th Ave E	1st St to Superior St	2	3,800 (2025)	Under
London Rd	12th Ave E to 13th Ave E	3	7,344 (2024)	Under

As shown, 4th Street and Superior Street are approaching capacity in this subarea.

Special Event Traffic

The I-35/Bayfront Area Traffic Modeling and Special Event Traffic Control Plan (dated May 15, 2019) was prepared by Alliant Engineering on behalf of the Duluth-Superior Metropolitan Interstate Council (MIC) to identify recommendations to improve parking, traffic, and wayfinding during medium and large-scale events at the Bayfront, DECC, and Canal Park area. Key improvements including parking management and system improvements; wayfinding, parking access, and vehicle traffic improvements; transit improvements, and pedestrian/bicyclist improvements, and truck traffic route and access management. Recommendations to 5th Avenue West/ Harbor Drive included reconstructing the roadway and sidewalk to potentially add a bike lane and reconfiguring the northbound/eastbound 5th Avenue West exit off I-35 to add an additional right turn lane.

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

Specific mitigation measures are included in the list below.

Item 20 Mitigation Strategies

Lot D Subarea

- Based on the traffic impact study for the proposed Lot D development, there is adequate capacity at the intersections evaluated in the study to accommodate the development. It is expected that these intersections and movements will operate at acceptable levels of service under the Build condition. It is recommended to construct a dedicated westbound left turn lane at the intersection of Railroad Street and the proposed development access to accommodate trips entering/existing the Lot D development.
- The Lot D traffic impact study is based on the development assumptions presented in Inland's concept plan. Should future proposed development deviate from the development assumptions considered in this traffic impact study, resulting in a 20percent or greater increase in traffic volumes, additional traffic analysis may be needed and would need to be determined in consultation with the City Engineer.

Essentia Subarea

- If future proposed development is anticipated to result in peak hour traffic that exceeds 250 vehicles, 2,500 total daily trips, or 200 daily heavy vehicle trips, a Traffic Impact Analysis would be required in accordance with MnDOT's Traffic Impact Study Guidance[91] determine if specific

[91] MnDOT. Access Management Manual, Chapter 8: Corridor Study TIS Guidance. December 18, 2025. Accessed January 2026. https://dot.state.mn.us/accessmanagement/resources.html

transportation improvements are needed in this subarea.

- Future proposed development anticipated to generate 100 trips per hour or 1,000 daily trips, may be required to complete a traffic impact study at the discretion of the City Engineer.
- If future proposed development is anticipated to generate traffic on roadways identified as approaching or exceeding capacity (Table 26), a traffic impact study may be required in consultation with the City Engineer.
- The City of Duluth will encourage future developers to incorporate improvements to expand multimodal connections and install intersection crossing features to improve bicyclist/pedestrian reliability, access, and safety.
- The City will work with DTA as development occurs to identify transit improvements that increase access to everyday goods and services.

1st Street Subarea

- If future proposed development is anticipated to result in peak hour traffic that exceeds 250 vehicles, 2,500 total daily trips, or 200 daily heavy vehicle trips, a Traffic Impact Analysis would be required in accordance with MnDOT's Traffic Impact Study Guidance[92] determine if specific transportation improvements are needed in this subarea.
- Future proposed development anticipated to generate 100 trips per hour or 1,000 daily trips, may be required to complete a traffic impact study at the discretion of the City Engineer.
- If future proposed development is anticipated to generate traffic on roadways identified as approaching or exceeding capacity (Table 25), a traffic impact study may be required in consultation with the City Engineer.
- The City of Duluth will encourage future developers to incorporate improvements to expand multimodal connections and install intersection crossing features to improve bicyclist/pedestrian reliability, access, and safety.
- As applicable, the city will evaluate skyway connections between buildings downtown as development occurs.
- If future proposed development significantly impacts traffic volume or congestion at 5th Ave W, changes to the interchange, including signals and roadway configuration, may be warranted. In order to alleviate existing and future event congestion. In addition, the City will continue to support transit, alternative transportation, and coordinated event parking.
- The City will work with DTA as development occurs to identify transit improvements that increase access to everyday goods and services.

Secondary Subarea

- If future proposed development is anticipated to result in peak hour traffic that exceeds 250 vehicles, 2,500 total daily trips, or 200 daily heavy vehicle trips, a Traffic Impact Analysis would be required in accordance with MnDOT's Traffic Impact Study Guidance[93] determine if specific transportation improvements are needed in this subarea.
- Future proposed development anticipated to generate 100 trips per hour or 1,000 daily trips, may be required to complete a traffic impact study at the discretion of the City Engineer.
- If future proposed development is anticipated to generate traffic on roadways identified as approaching or exceeding capacity (Table 26), a traffic impact study may be required in consultation with the City Engineer.
- The City will work with DTA as development occurs to identify transit improvements that increase access to everyday goods and services.

[92] MnDOT. Access Management Manual, Chapter 8: Corridor Study TIS Guidance. December 18, 2025. Accessed January 2026. https://dot.state.mn.us/accessmanagement/resources.html
[93] MnDOT. Access Management Manual, Chapter 8: Corridor Study TIS Guidance. December 18, 2025. Accessed January 2026. https://dot.state.mn.us/accessmanagement/resources.html

21. Cumulative Potential Effects

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

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

Full buildout of the AUAR area is anticipated to occur in phases over several years and be driven by market conditions. It is anticipated that initial site preparation for the Lot D Redevelopment Project may occur as early as 2026 with construction completion anticipated by 2028. The timing and duration of development phases within the three other subareas is unknown and would be dependent on market conditions. For the purpose of the AUAR, the maximum build condition considered for Development Scenario B assumes a full buildout in ten years. The development assumptions and timeline would be reassessed with the AUAR update in five years, based on anticipated conditions at that time.

The cumulative potential effects analysis will consider land adjacent to and within approximately a one-mile radius of the AUAR area. This scale captures the neighborhoods, commercial districts, waterfront, and transportation corridors most likely to experience the combined effects of the development within the AUAR area. The cumulative potential effects analysis will consider reasonably foreseeable projects that are funded or planned for construction within the next ten years.

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.

The following resources were used to complete a review of any reasonably foreseeable future projects near the AUAR area, and the interaction of potential environmental effects:

- City of Duluth's Transportation Projects[94,95]
- St. Louis County Public Works Projects[96]
- Minnesota EQB Environmental Review Projects Database[97]
- MnDOT Northeast Minnesota Regional Information, District 1 Projects Webpage[98]

City of Duluth Transportation Projects

4th Street Reconstruction – Mesaba Avenue to 6th Avenue East

- Development Location: 4th Street between Mesaba Avenue and 6th Avenue East. Located partially within the Essentia subarea.
- Proposer: City of Duluth
- Project Description: Full reconstruction of the street, sidewalks, and utilities.
- Schedule: Construction is scheduled to begin in 2027 and be completed in 2028.

West Superior Street Reconstruction

- Development Location: West Superior Street between Carlton Street and West Michigan Street. Located less than a half mile west of the Lot D subarea.

[94] City of Duluth. Engineering Projects. Available at: https://duluthmn.gov/engineering/projects/. Accessed December 2025.
[95] City of Duluth. Transportation Project. Available at: https://duluthmn.gov/planning-development/long-range-planning/transportation/. Accessed December 2025.
[96] Saint Louis County. Public Works Projects. Available at: https://engage.stlouiscountymn.gov/active-project-list. Accessed December 2025.
[97] EQB. Environmental Review Projects Database. Available at: https://webapp.pca.state.mn.us/eqb-search/search. Accessed December 2025.
[98] MnDOT. Northeast Minnesota Regional Information – District 1. Available at: https://www.mndot.org/d1/projects.html. Accessed December 2025.

- Proposer: City of Duluth
- Project Description: Full reconstruction of the roadway and utilities. Construction of sidewalks, bike facilities, vehicle parking, EV charging stations, green infrastructure and stormwater management, seating and outdoor dining, public area, lighting etc.
- Schedule: Construction began in 2025 and is anticipated to be complete by 2028.

1st Street Improvements Project

- Development Location: 1st Street between Mesaba Avenue and 6th Avenue East.
- Proposer: City of Duluth
- Project Description: Roadway resurfacing, stormwater improvements, potential slow street (i.e., traffic calming and pedestrian safety) improvements.
- Schedule: Potential improvements planned for 2026 - 2030

St. Louis County Public Works Projects

40th Avenue West Reconstruction

- Development Location: 40th Avenue West (CSAH 91) between Grand Avenue and the railroad crossing (USDOT #251887W). Located approximately three miles southwest of the Lot D subarea.
- Proposer: St. Louis County
- Project Description: Reconstruction of the roadway including construction of a roundabout, a median, a path and sidewalk, and enhanced pedestrian crossing. A separate roadway construction project is planned for 2027 in conjunction with another project.
- Schedule: Construction planned for 2026

EQB Projects Database

Duluth Central High School

- Development Location: The former Central High School near Central Entrance and H. Courtnay Drive in the City of Duluth. Located approximately three quarters of a mile northwest of the Essentia subarea.
- Proposer: City of Duluth
- Project Description: Redevelopment of the former high school as a mixed residential and commercial use.
- Schedule: Construction had already begun but the project has since been put on hold. Construction would occur over several years. Full buildout is dependent on market conditions.

I-535 Blatnik Bridge

- Development Location: John A. Blatnik Bridge (Minnesota Bridge No. 9030, Wisconsin Bridge No. B-16-5) on I-535 over the St. Louis Bay between Duluth, Minnesota and Superior, Wisconsin. Located a little over a mile southwest of the Lot D subarea.
- Proposer: MnDOT and WisDOT
- Project Description: Full reconstruction with the same alignment.
- Schedule: Estimated for fall 2026 to 2031. Complete bridge closure for approximately 4-5 years starting in 2027.

Sofidel America Duluth Facility Expansion

- Development Location: Sofidel America Facility located in Duluth, MN approximately one and a half miles southwest of the Lot D subarea.
- Proposer: Sofidel America Corporation
- Project Description: Expansion of the existing facility to include a new process for conversion of

parent tissue rolls and materials into various commercial products. Proposes four building additions for manufacturing, packaging, warehousing and shipping.
- Schedule: Construction is currently in progress and is expected to be completed in 2026.

MnDOT Projects

Twin Ports Interchange

- Development Location: I-35/I-535/Highway 53 Interchange, Highway 53 between I-35 and Old Piedmont Ave, and I-535/Garfield Avenue. Located approximately one mile southwest of the Lot D subarea.
- Proposer: MnDOT
- Project Description: Reconstruction of I-35, I-535, and Highway 53
- Schedule: Reconstruction of I-35, I-535, and Highway 53 are complete. Miscellaneous activities such as landscaping and cleanup will occur Summer 2026.

Highway 194 / West Central Entrance

- Development Location: West Central Entrance (Highway 194) from Trinity Road to Mesaba Avenue. Located less than a half mile northwest of the AUAR area.
- Proposer: MnDOT
- Project Description: Reconstruction of West Central Entrance/Highway 194 including pedestrian safety and business access.
- Schedule: Estimated for 2031 to 2033

London Road / Highway 61

- Development Location: London Road (Highway 61) from 26th Avenue East to Lester River just beyond 60th Avenue East in Duluth. Located a little over a mile northeast of the Secondary subarea.
- Proposer: MnDOT
- Project Description: Installation of roundabouts at 26th Avenue East and 40th Avenue East, intersection improvements, pavement, pedestrian amenities, lighting improvements and more.
- Schedule: Construction is scheduled for 2026 to 2027.

I-35 Pedestrian Bridge

- Development Location: The pedestrian bridge over the I-35/Mesaba Avenue interchanges in Duluth. Located approximately 500 feet southwest of the Lot D subarea.
- Proposer: MnDOT
- Project Description: Replacement of the pedestrian bridge. The new bridge will meet vertical clearance standards for I-35, will meet current ADA and trail width standards, and include aesthetic improvements.
- Schedule: Construction is scheduled for 2026.

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.

Based on the information obtained for and summarized in Item 21.b., potential cumulative effects may include:

Stormwater

Stormwater travels along the ground surface in a different manner once lawn/grass is replaced by impervious surfaces including building rooftops and paved roads and parking areas. The proposed development projects would have the potential to increase impervious surface area with the development

of buildings, parking lots, and roadways. Additionally, the proposed West Central Entrance Reconstruction Project may have the potential to increase impervious surface area compared to existing conditions. Collectively, these projects along with the development scenario described in this AUAR would be required to meet stormwater management requirements, including BMPs, falling under the authority of the MPCA and City of Duluth.

Wastewater/Water Appropriation

Item 12.b.i and iii. outlines the wastewater generation and water demand estimates that would be associated with the development scenarios described in this AUAR. It is anticipated that the City's water supply system has sufficient capacity to accommodate future development. Other proposed developments within the City of Duluth such as redevelopment of the Duluth Central High School and expansion of the Sofidel America Facility would increase the overall demand on the City's sewer collection infrastructure system. As described in the mitigation strategies in Item 12, developers will need to closely coordinate with City Engineering staff to ensure system capacity and determine if improvements to existing infrastructure would be required. As additional development is proposed, further analysis and modeling of the sewer collection infrastructure system may be required.

Transportation/Traffic

The proposed development scenario in this AUAR, specifically the future development of the Lot D subarea, and other nearby developments may result in additional vehicle trips/traffic on local roadways, as well as temporary road closures and detours during construction. A traffic analysis was prepared for the Lot D subarea as part of this AUAR and it was determined that traffic generated by the proposed development would have minimal impact on traffic operations at the nearby intersections included in the study. Construction of a dedicated southbound left turn lane on Railroad Street for access to the proposed development was recommended, and no other mitigation measures would be needed for construction of the Lot D development. It is required that this AUAR is updated every five years. At the time that this AUAR is updated and specific projects are proposed in the other subareas, traffic impact analysis should be conducted for the Essentia, 1st Street, and Secondary subareas. Other future projects proposed in the area that are expected to result in substantial traffic generation would need to complete any required traffic analysis to obtain all permits and approvals from the City and other agencies.

Climate Adaption

Redevelopment within and near the AUAR area presents opportunities to advance the City of Duluth's climate adaptation and resiliency goals, as outlines in the Duluth Climate Action Work Plan[99] and supported by the City standards for sustainable development.[100] As redevelopment occurs on previously developed parcels within the downtown core, it reduces pressure to expand development into new areas of Duluth and supports more efficient use of existing infrastructure systems, which is consistent with climate-resilient urban growth strategies. Construction of new developments creates opportunities to incorporate green infrastructure and nature-based design features that help manage localized climate stressors such as flooding, urban heat island effects, and air quality improvements. In addition, redevelopment of the downtown urban core helps concentrate housing, employment, and commercial activity in an area with existing and planned multimodal transportation infrastructure such as bicycle facilities and pedestrian networks. This reduces the need for system expansion, vehicle trips, and the associated greenhouse gas emissions. However, as discussed in Item 20 (Transportation), this assumes that planned multimodal improvements are implemented to expand bicyclist and pedestrian access in the downtown. Collectively, redevelopment projects within the urban core as well as nearby transportation projects increase the community's resilience to future climate conditions.

[99] City of Duluth. Climate Action Work Plan. 2022. Accessed December 2025. Available at: https://duluthmn.gov/media/12752/duluth-cawp_final_and_financememo.pdf

[100] City of Duluth. Unified Development Chapter Article 4 Section 50-29 - Sustainability Standards. 2025. Accessed December 2025. Available at: https://duluthmn.gov/media/13fntngd/50-29-sustainabilty-standards.pdf

22. Other Potential Environmental Effects

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

No other potential environmental effects are anticipated that are not addressed by Items 1 through 21.

Appendix A

List of Parcels within the AUAR area

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
1st St	010-0173-00040
1st St	010-0410-00010
1st St	010-0410-00020
1st St	010-0410-00050
1st St	010-0410-00055
1st St	010-0410-00080
1st St	010-0410-00150
1st St	010-0410-00180
1st St	010-0410-00210
1st St	010-0410-00220
1st St	010-0410-00240
1st St	010-0410-00250
1st St	010-0410-00270
1st St	010-0410-00320
1st St	010-0410-00390
1st St	010-0410-00420
1st St	010-0410-00530
1st St	010-0410-00540
1st St	010-0410-00550
1st St	010-0410-00570
1st St	010-0410-00580
1st St	010-0410-00590
1st St	010-0410-00630
1st St	010-0410-00640
1st St	010-0410-00650
1st St	010-0410-00660
1st St	010-0410-00680
1st St	010-0410-00690
1st St	010-0410-00700
1st St	010-0410-00710
1st St	010-0410-00720
1st St	010-0410-00730
1st St	010-0410-00750
1st St	010-0410-00760
1st St	010-0410-00780
1st St	010-0410-00790
1st St	010-0410-00800
1st St	010-0410-00840
1st St	010-0410-00860
1st St	010-0410-00880
1st St	010-0410-00930
1st St	010-0410-00990
1st St	010-0410-01035
1st St	010-0410-01090
1st St	010-0410-01110
1st St	010-0410-01130
1st St	010-0410-01150
1st St	010-0410-01170
1st St	010-0410-01200

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
1st St	010-0410-01210
1st St	010-0410-01250
1st St	010-0410-01290
1st St	010-0410-01330
1st St	010-0410-01340
1st St	010-0410-01350
1st St	010-0410-01370
1st St	010-0410-01390
1st St	010-0410-01411
1st St	010-0910-00020
1st St	010-0910-00090
1st St	010-0910-00180
1st St	010-0910-00200
1st St	010-0910-00220
1st St	010-0910-00230
1st St	010-0910-00240
1st St	010-0910-00260
1st St	010-0910-00270
1st St	010-0910-00280
1st St	010-0910-00290
1st St	010-0910-00420
1st St	010-0910-00435
1st St	010-0920-00020
1st St	010-0920-00030
1st St	010-0920-00050
1st St	010-0920-00060
1st St	010-0920-00070
1st St	010-0920-00080
1st St	010-0920-00120
1st St	010-0920-00125
1st St	010-0920-00130
1st St	010-0920-00140
1st St	010-0920-00160
1st St	010-0920-00180
1st St	010-0920-00210
1st St	010-0920-00230
1st St	010-0920-00260
1st St	010-0920-00270
1st St	010-0920-00280
1st St	010-0920-00300
1st St	010-0920-00320
1st St	010-0920-00410
1st St	010-0920-00421
1st St	010-0920-00422
1st St	010-0920-00440
1st St	010-0920-00450
1st St	010-0920-00460
1st St	010-0920-00470
1st St	010-0920-00480

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
1st St	010-0920-00490
1st St	010-0920-00500
1st St	010-0920-00510
1st St	010-0920-00540
1st St	010-0920-00550
1st St	010-0920-00625
1st St	010-0930-00010
1st St	010-0930-00030
1st St	010-0930-00040
1st St	010-0930-00050
1st St	010-0930-00060
1st St	010-0930-00070
1st St	010-0930-00090
1st St	010-0930-00095
1st St	010-0930-00170
1st St	010-0930-00175
1st St	010-0930-00240
1st St	010-0930-00270
1st St	010-0930-00290
1st St	010-0930-00320
1st St	010-0930-00330
1st St	010-0930-00340
1st St	010-0930-00440
1st St	010-0930-00452
1st St	010-0930-00500
1st St	010-0930-00510
1st St	010-0930-00520
1st St	010-0930-00530
1st St	010-0930-00535
1st St	010-0930-00540
1st St	010-0930-00550
1st St	010-0930-00560
1st St	010-0930-00580
1st St	010-0930-00600
1st St	010-0930-00620
1st St	010-0930-00622
1st St	010-0930-00630
1st St	010-0930-00640
1st St	010-0930-00650
1st St	010-0930-00670
1st St	010-0930-00680
1st St	010-0930-00700
1st St	010-0930-00720
1st St	010-0930-00740
1st St	010-0930-00760
1st St	010-0930-00780
1st St	010-0930-00800
1st St	010-0930-00810
1st St	010-0930-00840

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
1st St	010-0940-00010
1st St	010-0940-00030
1st St	010-0940-00040
1st St	010-0940-00060
1st St	010-0940-00062
1st St	010-0940-00065
1st St	010-0940-00066
1st St	010-0940-00085
1st St	010-0940-00086
1st St	010-0940-00090
1st St	010-0940-00130
1st St	010-0940-00150
1st St	010-0940-00160
1st St	010-0940-00180
1st St	010-0940-00200
1st St	010-0940-00220
1st St	010-0940-00240
1st St	010-0940-00290
1st St	010-0940-00300
1st St	010-0940-00302
1st St	010-0940-00303
1st St	010-0940-00320
1st St	010-0940-00330
1st St	010-0940-00340
1st St	010-0940-00350
1st St	010-0940-00360
1st St	010-0940-00380
1st St	010-0940-00420
1st St	010-0940-00430
1st St	010-0940-00450
1st St	010-0940-00460
1st St	010-0940-00480
1st St	010-0940-00570
1st St	010-0940-00580
1st St	010-0940-00590
1st St	010-0940-00610
1st St	010-0940-00630
1st St	010-0940-00650
1st St	010-0940-00670
1st St	010-0940-00680
1st St	010-0940-00690
1st St	010-0940-00700
1st St	010-0940-00710
1st St	010-0940-00712
1st St	010-0940-00720
1st St	010-0940-00725
1st St	010-0940-00730
1st St	010-0940-00770
1st St	010-0940-00790

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
1st St	010-0940-00820
1st St	010-0940-00840
1st St	010-0940-00850
1st St	010-0940-00860
1st St	010-0940-00870
1st St	010-0940-00880
1st St	010-0940-00920
1st St	010-0940-00960
1st St	010-0940-00980
1st St	010-0940-00985
1st St	010-0940-01020
1st St	010-0940-01070
1st St	010-0940-01100
1st St	010-0940-01120
1st St	010-0940-01130
1st St	010-0940-01150
1st St	010-0940-01170
1st St	010-0940-01200
1st St	010-0940-01245
1st St	010-0940-01250
1st St	010-0940-01255
1st St	010-0950-00520
1st St	010-0950-00550
1st St	010-0950-00560
1st St	010-0950-00570
1st St	010-0950-00580
1st St	010-0950-00590
1st St	010-0950-00600
1st St	010-0950-00620
1st St	010-0950-00622
1st St	010-0950-00660
1st St	010-0950-00700
1st St	010-0950-00720
1st St	010-0950-00740
1st St	010-0950-00790
1st St	010-0950-00820
1st St	010-0950-00830
1st St	010-0950-00850
1st St	010-0950-00870
1st St	010-0950-00880
1st St	010-0960-00490
1st St	010-0960-00510
1st St	010-0960-00530
1st St	010-0960-00560
1st St	010-0960-00580
1st St	010-0960-00600
1st St	010-0960-00640
1st St	010-0960-00760
1st St	010-0960-00790

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
1st St	010-0960-00800
1st St	010-0960-00820
1st St	010-0960-00830
1st St	010-0960-00850
1st St	010-0960-00870
1st St	010-0960-00890
1st St	010-0960-01010
1st St	010-0960-01050
1st St	010-0960-01055
1st St	010-0960-01060
1st St	010-0960-01070
1st St	010-0960-01080
1st St	010-1250-00300
1st St	010-1270-00050
1st St	010-1230-00052
1st St	010-1230-00055
1st St	010-1230-00083
1st St	010-1230-00085
1st St	010-1230-00087
1st St	010-1230-00088
1st St	010-1230-00089
1st St	010-1230-00140
1st St	010-1230-00145
1st St	010-1230-00200
1st St	010-1230-00201
1st St	010-1230-00220
1st St	010-1230-00230
1st St	010-1230-00250
1st St	010-1230-00260
1st St	010-1230-00280
1st St	010-1230-00380
1st St	010-1230-00440
1st St	010-1230-00480
1st St	010-1230-00490
1st St	010-1230-00500
1st St	010-1230-00550
1st St	010-1230-00580
1st St	010-1230-00660
1st St	010-1230-00670
1st St	010-1230-01700
1st St	010-1230-01710
1st St	010-1230-01720
1st St	010-1230-01900
1st St	010-1230-01902
1st St	010-1230-01910
1st St	010-1230-01960
1st St	010-1230-02000
1st St	010-1230-02002
1st St	010-1230-02100

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
1st St	010-1230-02105
1st St	010-1230-02330
1st St	010-1230-02340
1st St	010-1230-02360
1st St	010-1230-02380
1st St	010-1230-02400
1st St	010-1230-02460
1st St	010-2710-06505
1st St	010-2710-06506
1st St	010-2710-06507
1st St	010-3595-00010
1st St	010-3595-00020
1st St	010-3595-00020
1st St	010-3595-00020
1st St	010-3595-00030
1st St	010-3595-00040
1st St	010-3595-00050
1st St	010-3943-00010
1st St	010-3957-00010
1st St	010-3957-00020
1st St	010-3964-00050
1st St	010-4448-00001
1st St	Unidentified
1st St	Unidentified
1st St	010-0410-00120
1st St	010-0410-00130
Essentia	010-0172-00930
Essentia	010-0172-00940
Essentia	010-0172-00950
Essentia	010-0990-00320
Essentia	010-0990-00420
Essentia	010-0990-00440
Essentia	010-0990-00460
Essentia	010-0990-00490
Essentia	010-0990-00510
Essentia	010-0990-00520
Essentia	010-0990-00540
Essentia	010-0990-00570
Essentia	010-0990-00580
Essentia	010-0990-00585
Essentia	010-0990-00610
Essentia	010-0990-00620
Essentia	010-0990-01120
Essentia	010-0990-01180
Essentia	010-0990-01210
Essentia	010-0990-01310
Essentia	010-0990-01320
Essentia	010-0990-01350
Essentia	010-0990-01360

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Essentia	010-0930-00370
Essentia	010-1010-00810
Essentia	010-1010-00860
Essentia	010-1010-00870
Essentia	010-1010-00880
Essentia	010-1010-00900
Essentia	010-1010-00930
Essentia	010-1010-00950
Essentia	010-1010-00960
Essentia	010-1010-00970
Essentia	010-1010-00980
Essentia	010-1010-01700
Essentia	010-1010-01710
Essentia	010-1010-01760
Essentia	010-1010-01800
Essentia	010-1010-01815
Essentia	010-1010-01830
Essentia	010-1010-01920
Essentia	010-1010-01930
Essentia	010-1010-01940
Essentia	010-1010-01950
Essentia	010-0950-00330
Essentia	010-0950-00980
Essentia	010-0950-01010
Essentia	010-0950-01020
Essentia	010-0950-01030
Essentia	010-0950-01040
Essentia	010-0970-00320
Essentia	010-0970-00340
Essentia	010-0970-00360
Essentia	010-0970-00370
Essentia	010-0970-00390
Essentia	010-0970-00400
Essentia	010-0970-00520
Essentia	010-0970-00780
Essentia	010-0970-00860
Essentia	010-0970-00930
Essentia	010-3820-01321
Essentia	010-3820-01330
Essentia	010-3820-01340
Essentia	010-3820-01342
Essentia	010-3820-01500
Essentia	010-3820-01520
Essentia	010-3820-01530
Essentia	010-3830-00200
Essentia	010-3830-00290
Essentia	010-3830-00310
Essentia	010-3830-02500
Essentia	010-3830-02520

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Essentia	010-3830-02560
Essentia	010-3830-02580
Essentia	010-3830-02650
Essentia	010-3830-02750
Essentia	010-3830-02860
Essentia	010-3830-02870
Essentia	010-3830-02900
Essentia	010-3830-02940
Essentia	010-3830-03050
Essentia	010-3830-03090
Essentia	010-3830-03100
Essentia	010-3830-03110
Essentia	010-3830-03120
Essentia	010-3830-03140
Essentia	010-3830-03150
Essentia	010-3830-03170
Essentia	010-3830-03240
Essentia	010-3830-03260
Essentia	010-3830-03360
Essentia	010-3830-03770
Essentia	010-3830-03780
Essentia	010-3830-03800
Essentia	010-3830-03810
Essentia	010-3830-03820
Essentia	010-3830-03830
Essentia	010-3830-03850
Essentia	010-3830-03870
Essentia	010-3830-03880
Essentia	010-3830-06160
Essentia	010-3830-06180
Essentia	010-3830-06190
Essentia	010-3830-06200
Essentia	010-3830-06205
Essentia	010-3830-06240
Essentia	010-3830-06360
Essentia	010-3830-06400
Essentia	010-3830-06760
Essentia	010-3830-06900
Essentia	010-3830-06930
Essentia	010-3830-07000
Essentia	010-3830-07020
Essentia	010-3830-17840
Essentia	010-3830-17860
Essentia	010-3830-17870
Essentia	010-3830-17880
Essentia	010-3830-17890
Essentia	010-3830-17910
Essentia	010-3830-17940
Essentia	010-3830-17970

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Essentia	010-3830-18000
Essentia	010-3830-18010
Essentia	010-3830-18020
Essentia	010-3830-18030
Essentia	010-3830-18050
Essentia	010-3830-07030
Essentia	010-3830-07180
Essentia	010-3830-07200
Essentia	010-3915-00070
Essentia	010-3915-00080
Essentia	010-3830-09870
Essentia	010-3830-09980
Essentia	010-3830-10060
Essentia	010-3830-10110
Essentia	010-3830-10155
Essentia	010-3830-10160
Essentia	010-3830-10380
Essentia	010-3830-10420
Essentia	010-3830-10540
Essentia	010-3830-10590
Essentia	010-3830-10595
Essentia	010-3830-10600
Essentia	010-3830-10620
Essentia	010-3830-10640
Essentia	010-3830-10650
Essentia	010-3830-10670
Essentia	010-3830-10690
Essentia	010-3830-10691
Essentia	010-3830-13880
Essentia	010-3830-13889
Essentia	010-3830-13890
Essentia	010-3830-13940
Essentia	010-3830-13970
Essentia	010-3830-13980
Essentia	010-3830-14070
Essentia	010-3830-14100
Essentia	010-3830-14110
Essentia	010-3830-14140
Essentia	010-3830-14190
Essentia	010-3830-14230
Essentia	010-3830-14410
Essentia	010-0160-00590
Essentia	010-3830-00320
Essentia	010-0160-00550
Essentia	010-0160-00555
Essentia	010-0160-00560
Essentia	010-0160-00575
Essentia	010-1010-00560
Essentia	010-1010-00570

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Essentia	010-1010-00580
Essentia	010-1010-00590
Essentia	010-1010-00600
Essentia	010-1010-00605
Essentia	010-1010-00610
Essentia	010-1010-00620
Essentia	010-1010-00630
Essentia	010-1010-00640
Essentia	010-1010-00650
Essentia	010-1010-00660
Essentia	010-1010-00665
Essentia	010-1010-00670
Essentia	010-1010-00680
Essentia	010-1010-00700
Essentia	010-1010-00710
Essentia	010-1010-00720
Essentia	010-1010-00730
Essentia	010-1010-00740
Essentia	010-1010-00740
Essentia	010-1010-00750
Essentia	010-1010-00755
Essentia	010-1010-00760
Essentia	010-1010-00770
Essentia	010-1010-00780
Essentia	010-1010-00790
Essentia	010-1010-00800
Essentia	010-1010-00805
Essentia	010-1010-01490
Essentia	010-1010-01500
Essentia	010-1010-01520
Essentia	010-1010-01530
Essentia	010-1010-01550
Essentia	010-1010-01570
Essentia	010-1010-01580
Essentia	010-1010-01590
Essentia	010-1010-01600
Essentia	010-1010-01610
Essentia	010-1010-01620
Essentia	010-1010-01630
Essentia	010-1010-01635
Essentia	010-1010-01640
Essentia	010-1010-01660
Essentia	010-1010-01680

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Essentia	010-1030-01370
Essentia	010-1030-01390
Essentia	010-1030-01420
Essentia	010-1030-01440
Essentia	010-1030-01450
Essentia	010-1030-01460
Essentia	010-1030-01470
Essentia	010-1030-01480
Essentia	010-1030-01490
Essentia	010-1030-01500
Essentia	010-1030-01525
Essentia	010-1030-01526
Essentia	010-1030-01540
Essentia	010-1030-01560
Essentia	010-1030-01580
Essentia	010-1030-01630
Essentia	010-1030-01640
Essentia	010-1030-01650
Essentia	010-1030-01660
Essentia	010-1030-01665
Essentia	010-1030-01670
Essentia	010-1030-01680
Essentia	010-1030-01690
Essentia	010-1030-01695
Essentia	010-1030-01700
Essentia	010-1030-01710
Essentia	010-1030-01720
Essentia	010-1030-01730
Essentia	010-1030-01740
Essentia	010-1030-01770
Essentia	010-1030-01790
Essentia	010-1030-01830
Essentia	010-1030-01840
Essentia	010-1030-01850
Essentia	010-1030-01860
Essentia	010-1030-01880
Essentia	010-1030-01890
Essentia	010-1030-01920
Essentia	010-1030-01921
Essentia	010-1030-01930
Essentia	010-1030-01940
Essentia	010-1030-01950
Essentia	010-1030-01952

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Essentia	010-3490-00040
Lot D	010-0200-01490
Lot D	010-0210-00010
Lot D	010-0210-00220
Lot D	010-0210-00340
Lot D	Unsurveyed Land
Lot D	Unsurveyed Land
Lot D	010-0210-00300
Secondary	010-0190-00030
Secondary	010-0190-00050
Secondary	010-0190-00060
Secondary	010-0190-00140
Secondary	010-0190-00150
Secondary	010-0190-00170
Secondary	010-0190-00180
Secondary	010-0190-00200
Secondary	010-0190-00250
Secondary	010-0190-00290
Secondary	010-0190-00330
Secondary	010-0190-00560
Secondary	010-0190-00590
Secondary	010-0190-00600
Secondary	010-0190-00610
Secondary	010-0190-00640
Secondary	010-0190-00650
Secondary	010-0190-00750
Secondary	010-0190-00770
Secondary	010-0190-00790
Secondary	010-0190-00840
Secondary	010-0190-00860
Secondary	010-0190-00890
Secondary	010-0190-01120
Secondary	010-0190-01140
Secondary	010-0190-01160
Secondary	010-0190-01220
Secondary	010-0190-01250
Secondary	010-3830-00970
Secondary	010-3830-01090
Secondary	010-3830-01110
Secondary	010-3830-01120
Secondary	010-3830-01140
Secondary	010-3830-01150
Secondary	010-3830-01160
Secondary	010-3830-01170
Secondary	010-3830-01180
Secondary	010-3830-01190
Secondary	010-3830-01220
Secondary	010-3830-01230
Secondary	010-3830-01240

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Secondary	010-3830-01250
Secondary	010-3830-01302
Secondary	010-3830-01530
Secondary	010-3830-01540
Secondary	010-3830-01560
Secondary	010-3830-01600
Secondary	010-3830-01620
Secondary	010-3830-01645
Secondary	010-3830-01660
Secondary	010-3830-01670
Secondary	010-3830-01675
Secondary	010-3830-01680
Secondary	010-3830-01740
Secondary	010-3830-01800
Secondary	010-3830-01820
Secondary	010-3830-01880
Secondary	010-3830-02000
Secondary	010-3830-02070
Secondary	010-3830-02080
Secondary	010-3830-02100
Secondary	010-3830-02110
Secondary	010-3830-02120
Secondary	010-3830-02130
Secondary	010-3830-02162
Secondary	010-3830-02195
Secondary	010-3830-02280
Secondary	010-3830-02340
Secondary	010-3830-02370
Secondary	010-3830-02390
Secondary	010-3830-02410
Secondary	010-3830-02430
Secondary	010-3830-02450
Secondary	010-3830-02470
Secondary	010-3830-03920
Secondary	010-3830-03955
Secondary	010-3830-03965
Secondary	010-3830-03980
Secondary	010-3830-04000
Secondary	010-3830-04010
Secondary	010-3830-04020
Secondary	010-3830-04070
Secondary	010-3830-04080
Secondary	010-3830-04240
Secondary	010-3830-04460
Secondary	010-3830-04690
Secondary	010-3830-04695
Secondary	010-3830-04940
Secondary	010-3830-05080
Secondary	010-3830-05140

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Secondary	010-3830-05280
Secondary	010-3830-05420
Secondary	010-3830-05450
Secondary	010-3830-05480
Secondary	010-3830-05490
Secondary	010-3830-05510
Secondary	010-3830-05520
Secondary	010-3830-05530
Secondary	010-3830-05550
Secondary	010-3830-05580
Secondary	010-3830-05600
Secondary	010-3830-05620
Secondary	010-3830-05640
Secondary	010-3830-05650
Secondary	010-3830-05675
Secondary	010-3830-05695
Secondary	010-3830-05730
Secondary	010-3830-05770
Secondary	010-3830-05780
Secondary	010-3830-05800
Secondary	010-3830-05860
Secondary	010-3830-05930
Secondary	010-3830-05930
Secondary	010-3830-05980
Secondary	010-3830-06010
Secondary	010-3830-07250
Secondary	010-3830-07280
Secondary	010-3830-07290
Secondary	010-3830-07300
Secondary	010-3830-07330
Secondary	010-3830-07340
Secondary	010-3830-07350
Secondary	010-3830-07360
Secondary	010-3830-07380
Secondary	010-3830-07390
Secondary	010-3830-07400
Secondary	010-3830-07420
Secondary	010-3830-07470
Secondary	010-3830-07480
Secondary	010-3830-07490
Secondary	010-3830-07500
Secondary	010-3830-07510
Secondary	010-3830-07520
Secondary	010-3830-07560
Secondary	010-3830-07580
Secondary	010-3830-07590
Secondary	010-3830-07630
Secondary	010-3830-07640
Secondary	010-3830-07730

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Secondary	010-3830-07840
Secondary	010-3830-07900
Secondary	010-3830-09450
Secondary	010-3830-09471
Secondary	010-3830-09480
Secondary	010-3830-09510
Secondary	010-3830-09520
Secondary	010-3830-09530
Secondary	010-3830-09560
Secondary	010-3830-09560
Secondary	010-3830-09580
Secondary	010-3830-09600
Secondary	010-3830-09630
Secondary	010-3830-09632
Secondary	010-3830-09642
Secondary	010-3830-09660
Secondary	010-3830-09670
Secondary	010-3830-09680
Secondary	010-3830-09720
Secondary	010-3830-09760
Secondary	010-3830-09770
Secondary	010-3830-09780
Secondary	010-3830-09790
Secondary	010-3830-09800
Secondary	010-3830-09810
Secondary	010-3830-09820
Secondary	010-3830-09830
Secondary	010-3830-09840
Secondary	010-3830-09860
Secondary	010-3830-09860
Secondary	010-3830-10710
Secondary	010-3830-10720
Secondary	010-3830-10730
Secondary	010-3830-10750
Secondary	010-3830-10770
Secondary	010-3830-10840
Secondary	010-3830-10860
Secondary	010-3830-10880
Secondary	010-3830-10900
Secondary	010-3830-10930
Secondary	010-3830-10940
Secondary	010-3830-10950
Secondary	010-3830-10980
Secondary	010-3830-11000
Secondary	010-3830-11010
Secondary	010-3830-11020
Secondary	010-3830-11030
Secondary	010-3830-11040
Secondary	010-3830-11052

Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Secondary	010-3830-11060
Secondary	010-3830-11120
Secondary	010-3830-11160
Secondary	010-3830-11190
Secondary	010-3830-11210
Secondary	010-3830-11220
Secondary	010-3830-11230
Secondary	010-3830-11240
Secondary	010-3830-11250
Secondary	010-3830-11330
Secondary	010-3830-11335
Secondary	010-3830-11360
Secondary	010-3830-11380
Secondary	010-3860-00020
Secondary	010-3860-00040
Secondary	010-3860-00090
Secondary	010-3860-00130
Secondary	010-3860-00160
Secondary	010-3860-00180
Secondary	010-3860-00210
Secondary	010-3860-00220
Secondary	010-3830-13180
Secondary	010-3830-13230
Secondary	010-3830-13250
Secondary	010-3830-13260
Secondary	010-3830-13300
Secondary	010-3830-13350
Secondary	010-3830-13380
Secondary	010-3830-13410
Secondary	010-3830-13440
Secondary	010-3830-13480
Secondary	010-3830-13540
Secondary	010-3830-13550
Secondary	010-3830-13560
Secondary	010-3830-13610
Secondary	010-3830-13640
Secondary	010-3830-13660
Secondary	010-3830-13680
Secondary	010-3830-13740
Secondary	010-3830-13750
Secondary	010-3830-13760
Secondary	010-3830-13770
Secondary	010-3830-13780
Secondary	010-3830-13790
Secondary	010-3830-13810
Secondary	010-3830-13820
Secondary	010-3830-13821
Secondary	010-3830-13830
Secondary	010-3830-14560

Downtown Duluth AUAR area Parcels

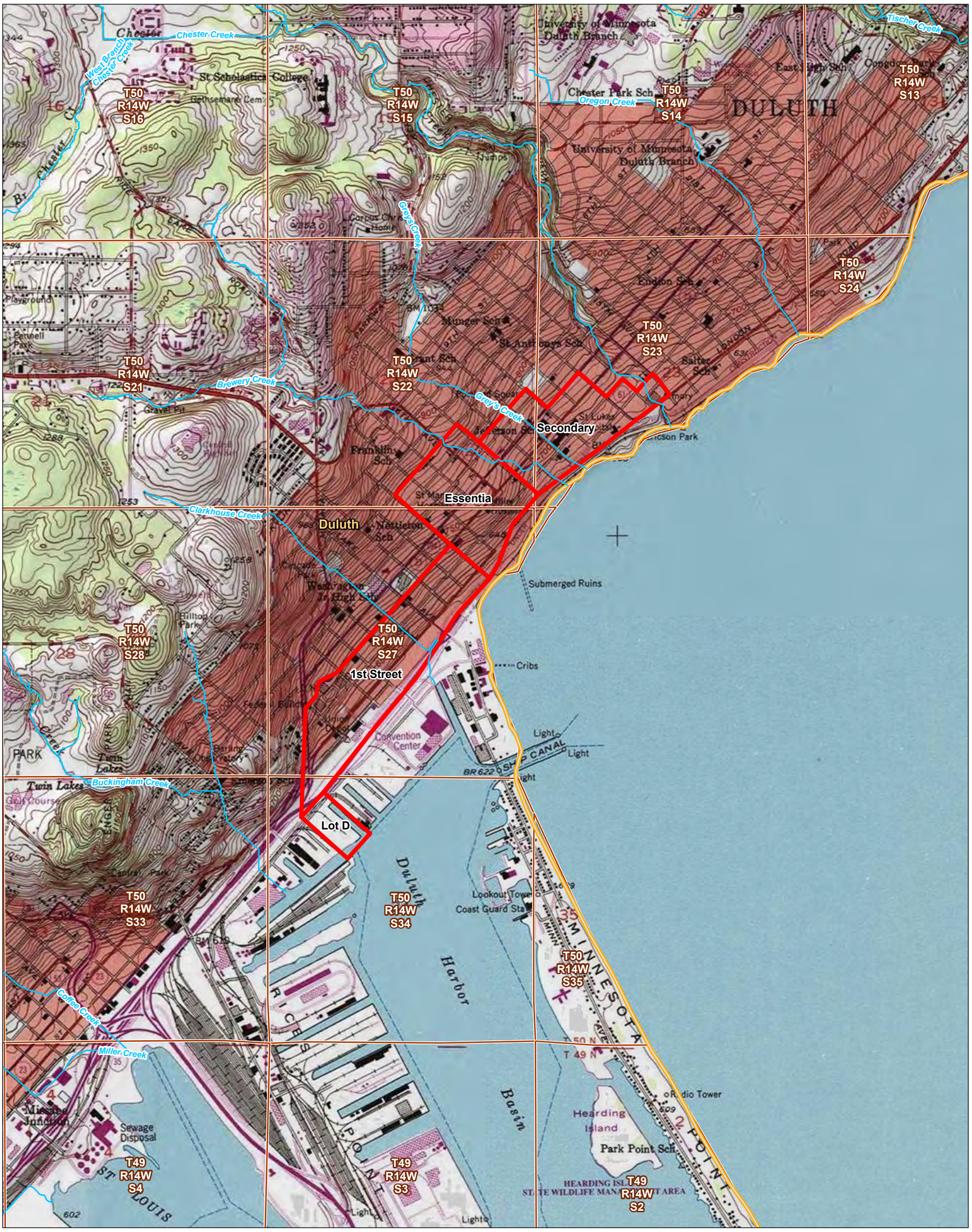
Subarea	Parcel ID No.
Secondary	010-3830-14570
Secondary	010-3830-14630
Secondary	010-3830-14640
Secondary	010-3830-14710
Secondary	010-3830-14770
Secondary	010-3830-14780
Secondary	010-3830-14790
Secondary	010-3830-14800
Secondary	010-3830-14910
Secondary	010-3830-14930
Secondary	010-3830-14950
Secondary	010-3830-14970
Secondary	010-3830-15010
Secondary	010-3830-15030
Secondary	010-3830-15050
Secondary	010-3830-15070
Secondary	010-3830-15090
Secondary	010-3830-15150
Secondary	010-3830-08090
Secondary	010-3830-08110
Secondary	010-3830-08120
Secondary	010-3830-08140
Secondary	010-3830-08160
Secondary	010-3830-08180
Secondary	010-3830-08200
Secondary	010-3830-08220
Secondary	010-3830-08240
Secondary	010-3830-08690
Secondary	010-3830-08720
Secondary	010-3830-08730
Secondary	010-3830-08750
Secondary	010-3830-08760
Secondary	010-3830-08770
Secondary	010-3830-08780
Secondary	010-3830-08800
Secondary	010-3830-08810
Secondary	010-3830-08820
Secondary	010-3830-08820
Secondary	010-3830-08830
Secondary	010-3830-08870
Secondary	010-3830-08880
Secondary	010-3830-08890
Secondary	010-3830-08910
Secondary	010-3830-08930
Secondary	010-3830-08940
Secondary	010-3830-08980
Secondary	010-3830-09020
Secondary	010-3830-09060
Secondary	010-3830-09120

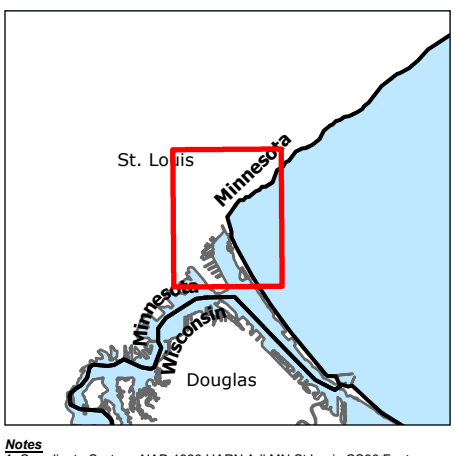
Downtown Duluth AUAR area Parcels

Subarea	Parcel ID No.
Secondary	010-3830-09130
Secondary	010-3830-09150
Secondary	010-3830-09160
Secondary	010-3830-09180
Secondary	010-3830-09190
Secondary	010-3830-09220
Secondary	010-3830-09250
Secondary	010-3830-09280
Secondary	010-3830-09310

Appendix B

Figures





Legend

- City of Duluth Streams
- AUAR Area
- Municipal Boundary
- Township, Range & Section Boundary

0 1,000 2,000 Feet

(At original document size of 11x17)
1:24,000

N

Stantec

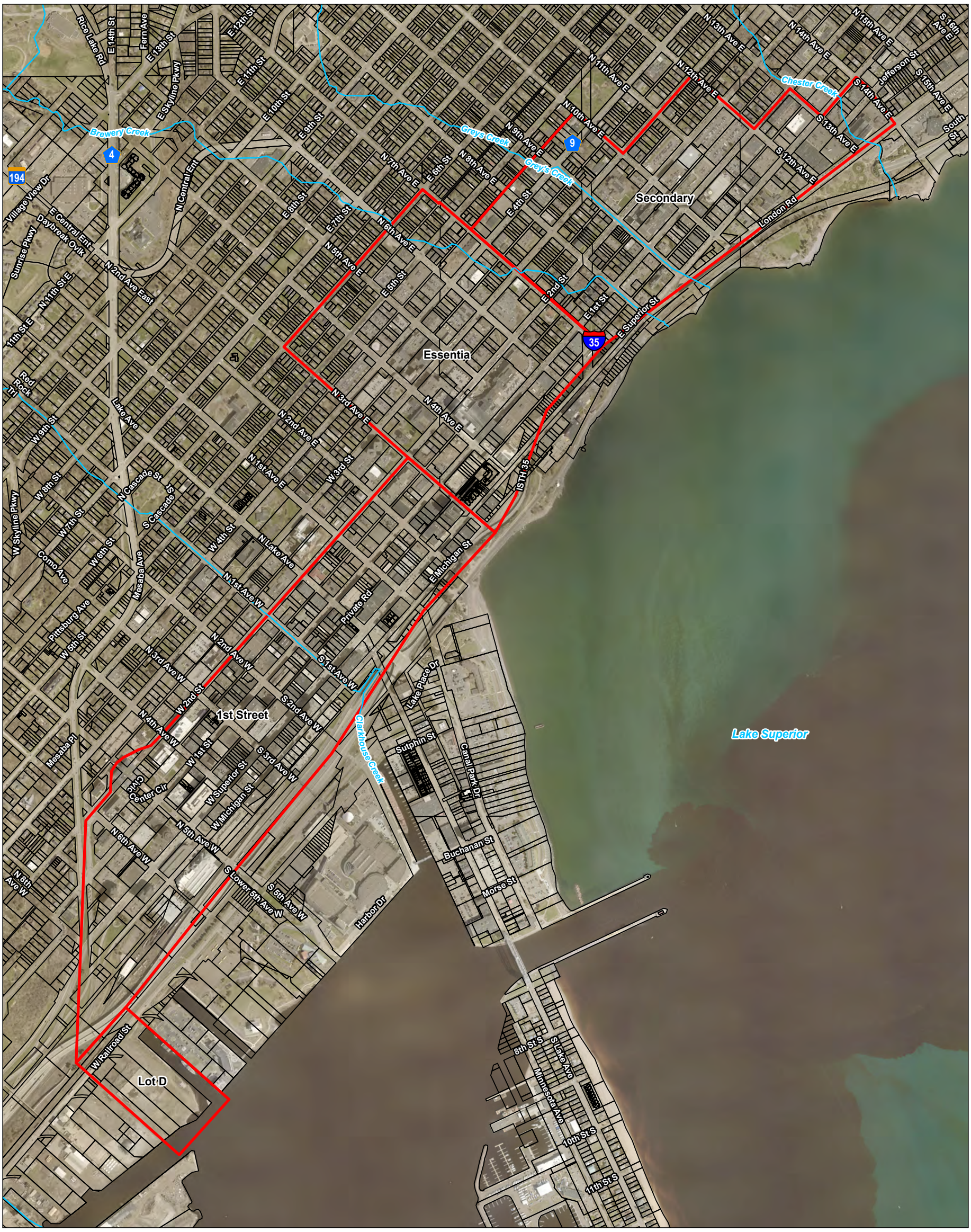
Notes

1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnGeo
3. Background: USGS 7.5' Quadrangle

Project Location	Prepared by KJM on 2025-10-30
T50N, R14W, S22, 23, 27 & 34	TR by LW on 2025-10-30
C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309
City of Duluth, MN	
Downtown Duluth	
AUAR	
Figure No.	
1	
Title	
Project Location USGS Topo Map	

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Notes
1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT
3. Background: 2023 St. Louis Co.

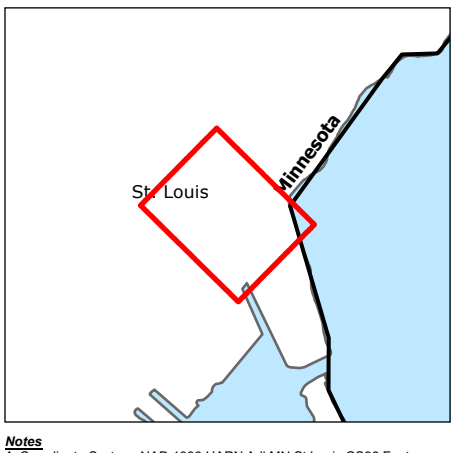
Stantec

Project Location	Prepared by KJM on 2025-10-30
T50N, R14W, S22, 23, 27 & 34	TR by LW on 2025-10-30
C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309
City of Duluth, MN	
Downtown Duluth	
AUAR	
Figure No.	
2	
Title	
Project Location Aerial Map	

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Legend

- AUAR Area
- Parcel Boundary
- Redevelopment Target Area

0 110 220 Feet

(At original document size of 11x17)
1:2,640

Notes

1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT
3. Background: 2023

Stantec

Project Location	Prepared by LAH on 2025-10-30
T50N, R14W, S22, 23, 27 & 34	TR by LW on 2025-10-30
C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309

City of Duluth, MN
Downtown Duluth
AUAR

Figure No.

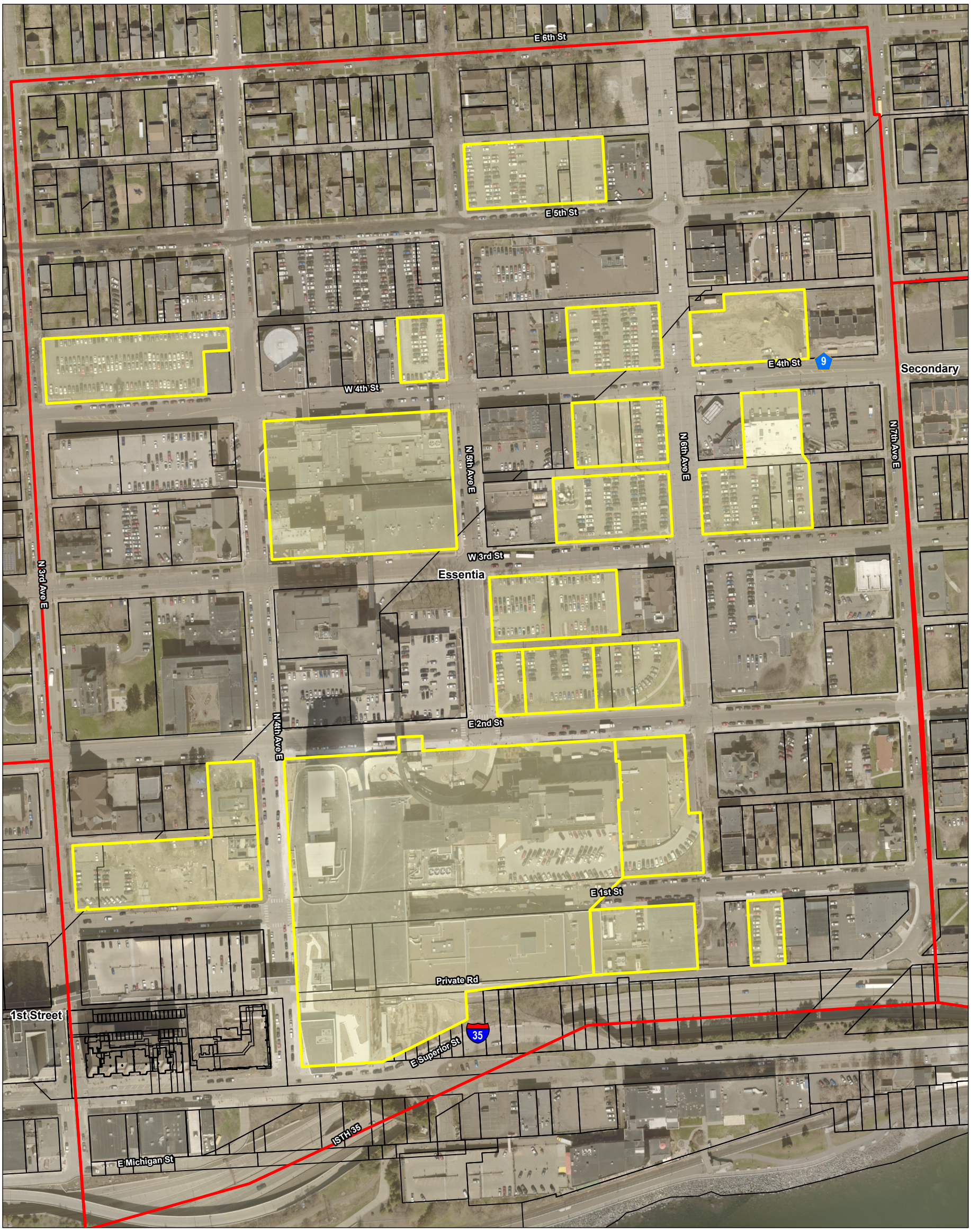
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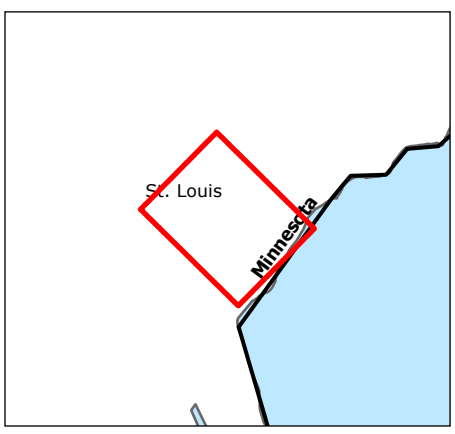
Title

1st St Redevelopment Properties

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Legend

- AUAR Area
- Parcel Boundary
- Redevelopment Target Area

0 110 220 Feet

(At original document size of 11x17)
1:2,640

N

Stantec

Notes

1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT
3. Background: 2023

Project Location
T50N, R14W, S22, 23, 27 & 34
C. of Duluth, St. Louis Co., MN

Prepared by LAH on 2025-10-30
TR by LW on 2025-10-30
IR by ES on 2025-10-30

Client/Project
227708309

City of Duluth, MN
Downtown Duluth
AUAR

Figure No.

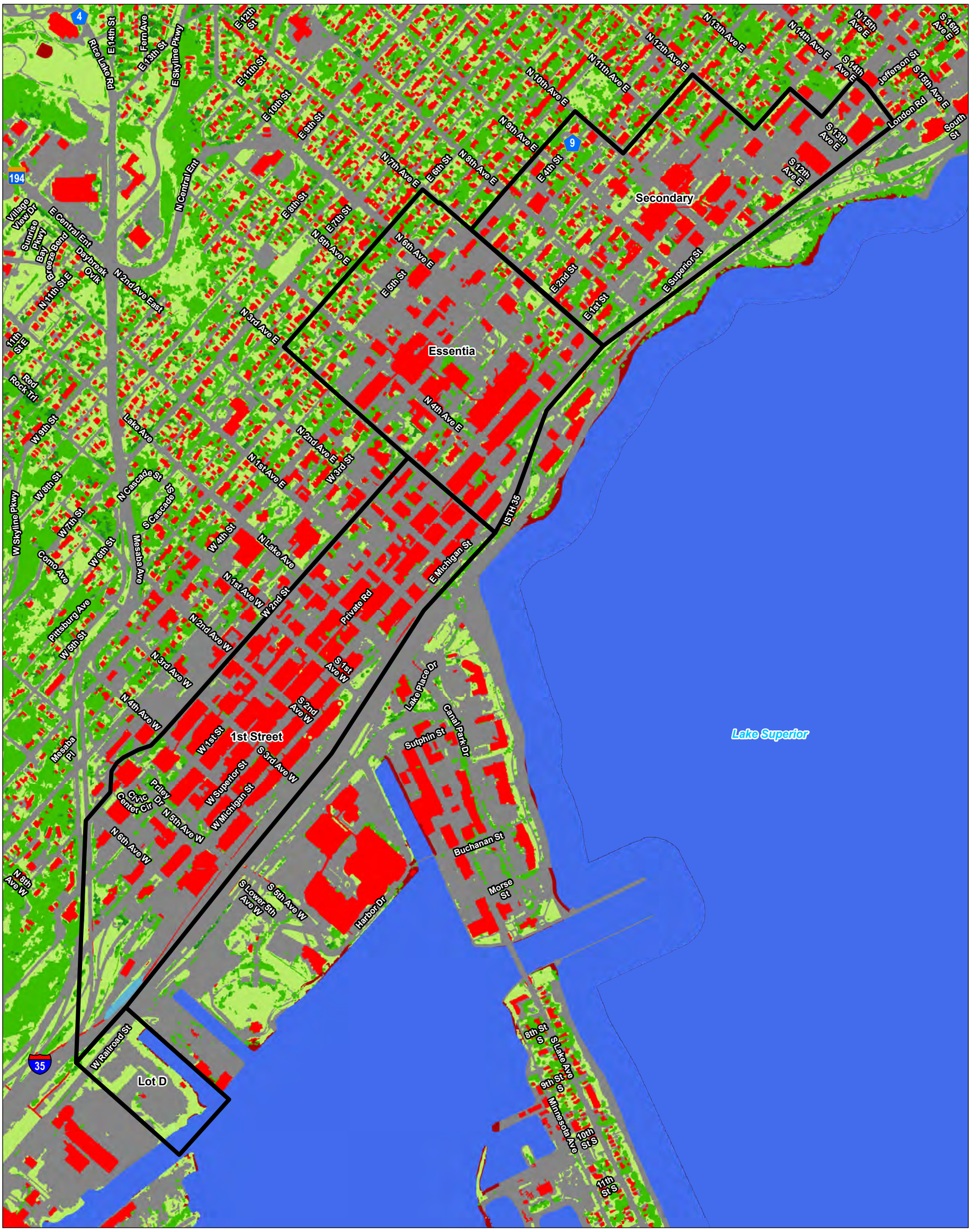
4

Title

Essentia Redevelopment Properties

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Legend

- AUAR Area

Duluth Land Cover 2016

- Grass/Shrub
- Bare Soil
- Buildings
- Roads/Paved Surfaces
- Lakes/Ponds
- Deciduous Tree Canopy
- Coniferous Tree Canopy
- Emergent Wetland

0 450 900 Feet

(At original document size of 11x17)
1:10,800

N

Stantec

Notes

1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT
3. Background: UMN Duluth 1-meter Land Cover 2016

Project Location	Prepared by KJM on 2025-10-30
T50N, R14W, S22, 23, 27 & 34	TR by LW on 2025-10-30
C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309

City of Duluth, MN
Downtown Duluth
AUAR

Figure No.

5

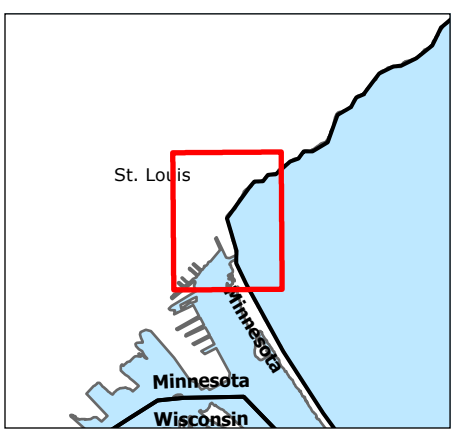
Title

Land Cover

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Legend

- Existing Trail
- Minnesota Scenic Byways
- Minnesota Water Trails
- Park Boundary
- AUAR Area

0 450 900 Feet

(At original document size of 11x17)
1:10,800

N

Stantec

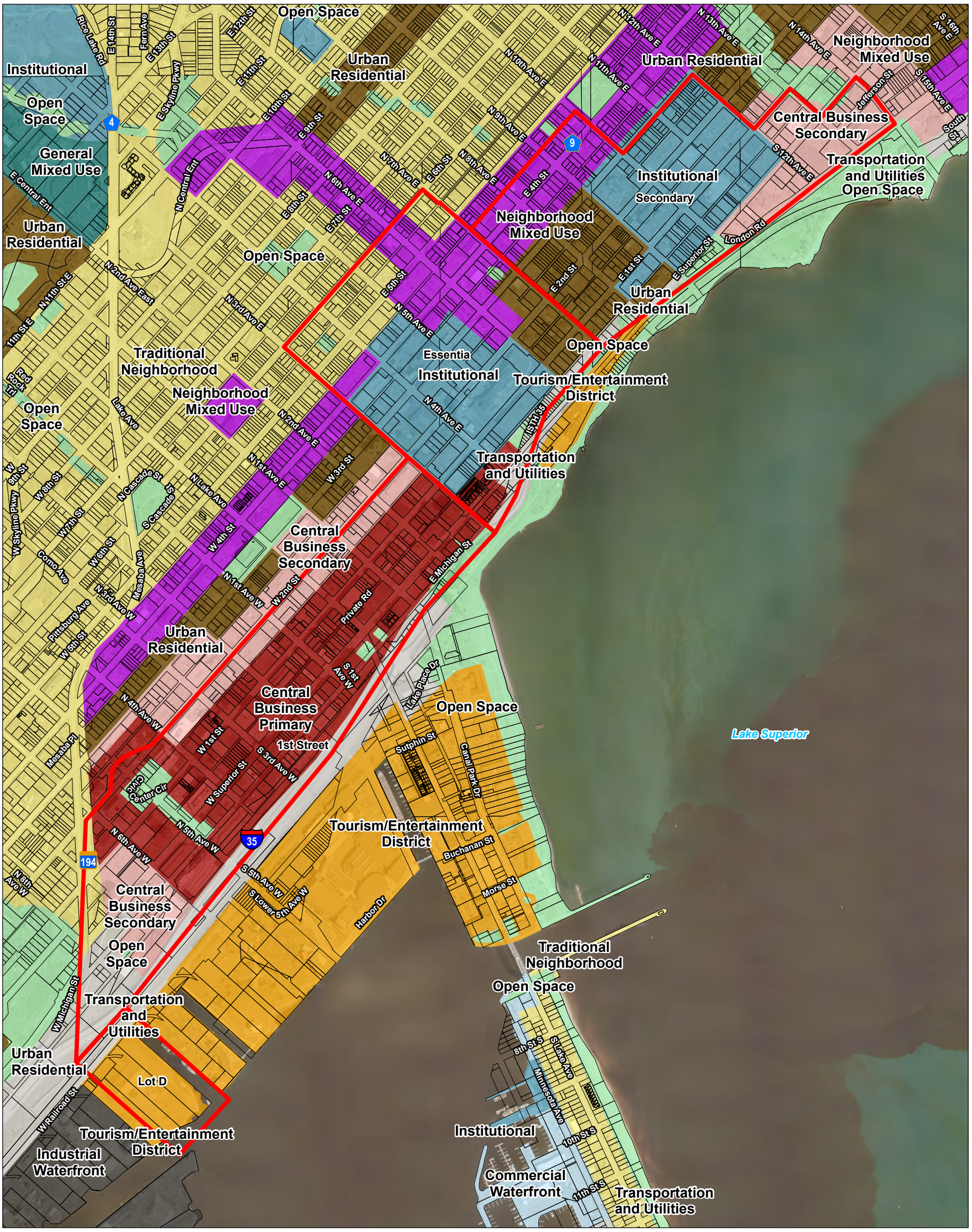
Project Location	Prepared by KJM on 2025-10-30
T50N, R14W, S22, 23, 27 & 34	TR by LW on 2025-10-30
C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309
City of Duluth, MN	
Downtown Duluth	
AUAR	
Figure No.	
6	
Title	
Parks, Trails and Other Recreational Areas	

Notes

1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT
3. Background: 2023 St. Louis Co.

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Notes
1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT
3. Background: 2023 St. Louis Co.

Legend
- AUAR Area
- Parcels

Future Land Use
- Central Business Primary
- Central Business Secondary
- Commercial Waterfront
- General Mixed Use
- Industrial Waterfront
- Institutional
- Neighborhood Mixed Use
- Open Space
- Tourism/Entertainment District
- Traditional Neighborhood
- Transportation and Utilities
- Urban Residential

0 450 900 Feet

(At original document size of 11x17)
1:10,800

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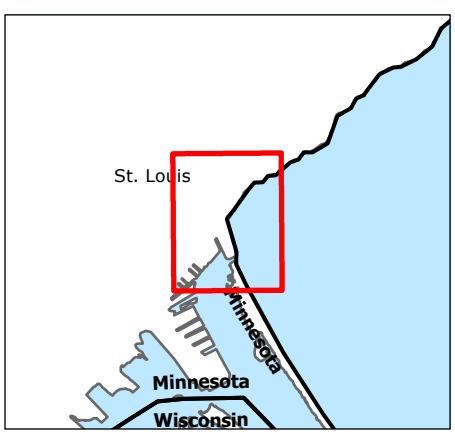
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Project Location	Prepared by KJM on 2025-10-30
T50N, R14W, S22, 23, 27 & 34	TR by LW on 2025-10-30
C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309
City of Duluth, MN	
Downtown Duluth	
AUAR	
Figure No.	
7	
Title	
Future Land Use	

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Notes
1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT
3. Background: 2023 St. Louis Co.

Legend
- AUAR Area
- Parcels

City of Duluth Zoning
- F-2 (Low-Rise Neighborhood Mix)
- F-3 (Mid-Rise Community Shopping)
- F-4 (Mid-Rise Community Mix)
- F-5 (Mid-Rise Community Shopping and Office)
- F-6 (Mid-Rise Neighborhood Shopping)
- F-7 (Downtown Shopping)
- F-8 (Downtown Mix)
- F-9 (Canal Park Lakefront)
- I-G (Industrial General)
- I-W (Industrial Waterfront)
- MU-B (Mixed Use Business Park)
- MU-C (Mixed Use Commercial)
- MU-I (Mixed Use Institutional)
- MU-N (Mixed Use Neighborhood)
- MU-P (Mixed Use Planned)
- MU-W (Mixed Use Waterfront)
- P-1 (Park)
- R-1 (Residential Traditional)
- R-2 (Residential Urban)
- R-P (Residential Planned)

0 450 900 Feet

(At original document size of 11x17)
1:10,800

N

Stantec

Project Location
T50N, R14W, S22, 23, 27 & 34
C. of Duluth, St. Louis Co., MN

Prepared by KJM on 2025-10-30
TR by LW on 2025-10-30
IR by ES on 2025-10-30

Client/Project 227708309

City of Duluth, MN
Downtown Duluth
AUAR

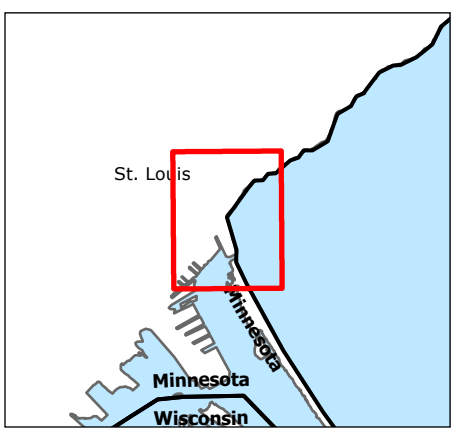
Figure No.
8

Title
Zoning

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Notes
1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT, MGS C-51
3. Background: 2023 St. Louis Co.

Legend

- AUAR Area

Surficial Geology

map_label,Descriptn

- bt - Glacial Till
- cs - Glacial Stream Sediment, Outwash
- ct - Glacial Till
- ctx - Diamicton, Sand/Gravel, Lacustrine Complex
- bl - Glacial Lacustrine Sediment
- sa - Floodplain and Channelized Fluvial Deposits
- mf - Constructed Land
- Water

0 450 900 Feet

(At original document size of 11x17)
1:10,800

N

Stantec

Project Location	Prepared by KJM on 2025-10-30
T50N, R14W, S22, 23, 27 & 34	TR by LW on 2025-10-30
C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309

City of Duluth, MN
Downtown Duluth AUAR
AUAR

Figure No.

9

Title

Surface Geology Map

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2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT, MGS C-51
3. Background: 2023 St. Louis Co.

Legend
- AUAR Area

Bedrock Geology
- Mns, interflow sandstone, siltstone, and conglomerate
- Mtd, Tunnel intrusion - Diabase
- Mdo, Porphyritic ophitic olivine leucogabbro
- Mes,Diabase
- Mdu, Upper contact zone - ferrodiorite, ferromonzodiorite, ferrogabbro
- Mda, Anorthosite, troctolitic anorthosite, olivine gabbroic anorthosite, anorthositic gabbro
- Mdg, Ferromonzodiorite to granophyre
- Mnb, Undifferentiated basalt to basaltic andesite flows
- Mnp, Porphyritic basalt
- Mni, Icelandite

0 450 900 Feet

(At original document size of 11x17)
1:10,800

N

Stantec

Project Location	Prepared by KJM on 2025-10-30
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C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309

City of Duluth, MN
Downtown Duluth
AUAR

Figure No.
10

Title
Bedrock Geology Map

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Legend

- AUAR Area

Field Verified Wells

- Domestic
- Monitoring Well
- Environmental Bore Hole
- Air Conditioning
- Elevator

0 450 900 Feet

(At original document size of 11x17)
1:10,800

N

Stantec

Project Location	Prepared by KJM on 2025-10-30
T50N, R14W, S22, 23, 27 & 34	TR by LW on 2025-10-30
C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309

City of Duluth, MN
Downtown Duluth
AUAR

Figure No.

11

Title

Minnesota Well Index

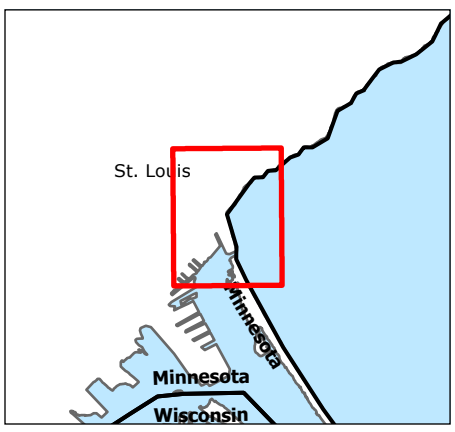
Notes

1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT, MDA, MGS
3. Background: 2023 St. Louis Co.

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Legend

- AUAR Area
- Soil Map Unit
- Farmland Classification
- Not prime farmland

0 450 900 Feet

(At original document size of 11x17)
1:10,800

N

Stantec

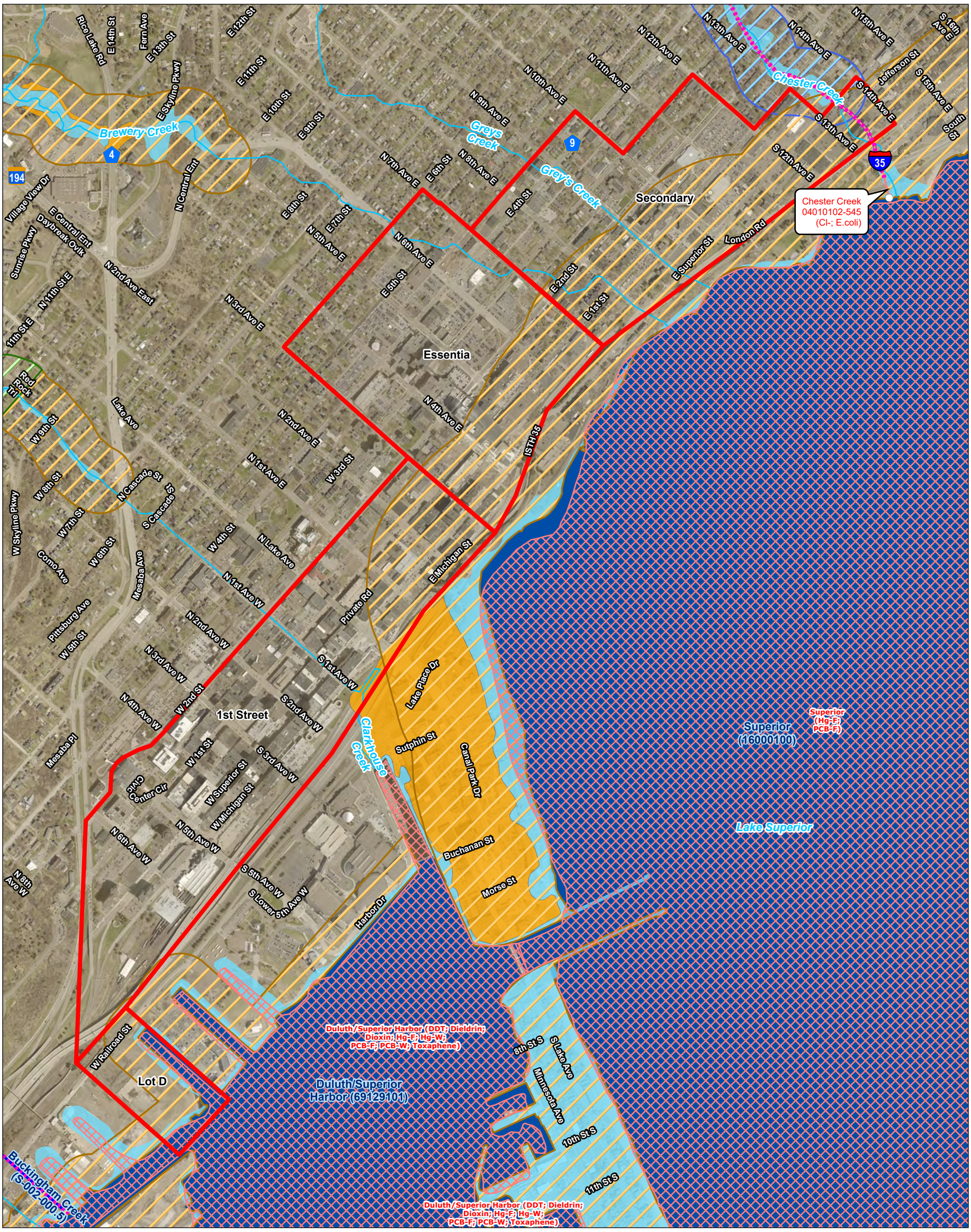
Project Location	Prepared by KJM on 2025-10-30
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C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309
City of Duluth, MN	
Downtown Duluth	
AUAR	
Figure No.	
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Title	
Soil and Farmland Classification	

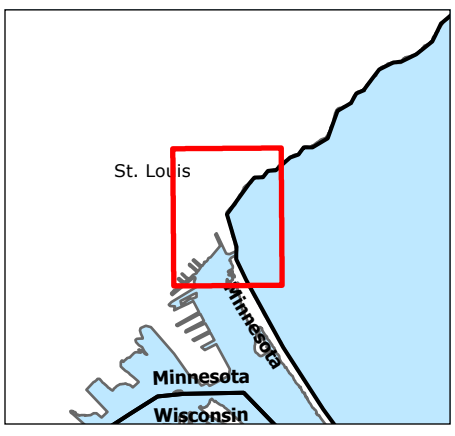
Notes

1. Coordinate System: NAD 1983 HARN Adj MN St Louis CS96 Feet
2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT, NRCS
3. Background: 2023 St. Louis Co.

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Notes
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2. Data Sources: Stantec, City of Duluth, St. Louis Co., MnDOT, MNDNR, MPCA
3. Background: 2023 St. Louis Co.

Legend

- AUAR Area
- 2024 MPCA Impaired Lakes
- 2024 MPCA Impaired Streams
- Trout Stream
- City of Duluth Streams

Shoreland Management Zones

- Cold Water
- General Development
- NE

Minnesota Public Waters Delineations

- Public Water Watercourse
- Public Waters Basins

City of Duluth Flood Hazard

- 100 Year Flood Hazard
- 500 Year Flood Hazard

0 450 900 Feet

(At original document size of 11x17)
1:10,800

N

Stantec

Project Location	Prepared by KJM on 2025-10-30
T50N, R14W, S22, 23, 27 & 34	TR by LW on 2025-10-30
C. of Duluth, St. Louis Co., MN	IR by ES on 2025-10-30
Client/Project	227708309
City of Duluth, MN	
Downtown Duluth	
AUAR	

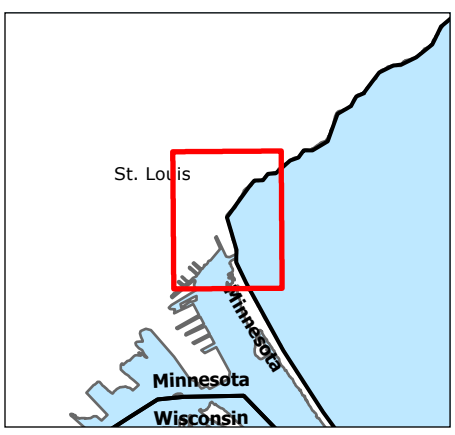
Figure No.
13

Title
Water Resources Map

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3. Background: 2023 St. Louis Co.

Legend
- City of Duluth Streams
- National Wetlands Inventory Feature
- AUAR Area

0 450 900 Feet

(At original document size of 11x17)
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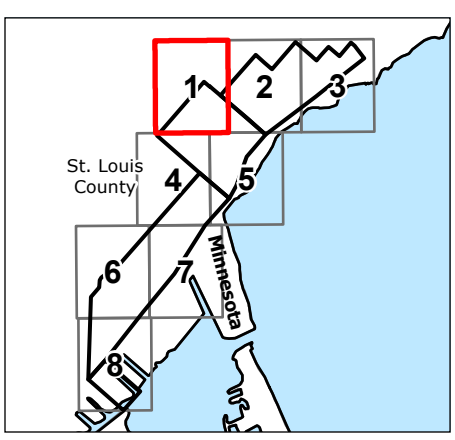
Stantec

Project Location	Prepared by KJM on 2025-10-30
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Client/Project	227708309
City of Duluth, MN	
Downtown Duluth	
AUAR	
Figure No.	
14	
Title	
Wetlands Map	

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Legend

- AUAR Area

MPCA Sites

Program Name

- Multiple Programs
- Hazardous Waste
- Investigation and Cleanup
- Solid Waste
- Stormwater
- Tanks

0 100 200 Feet

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City of Duluth, MN
Downtown Duluth
AUAR

Figure No.

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Title

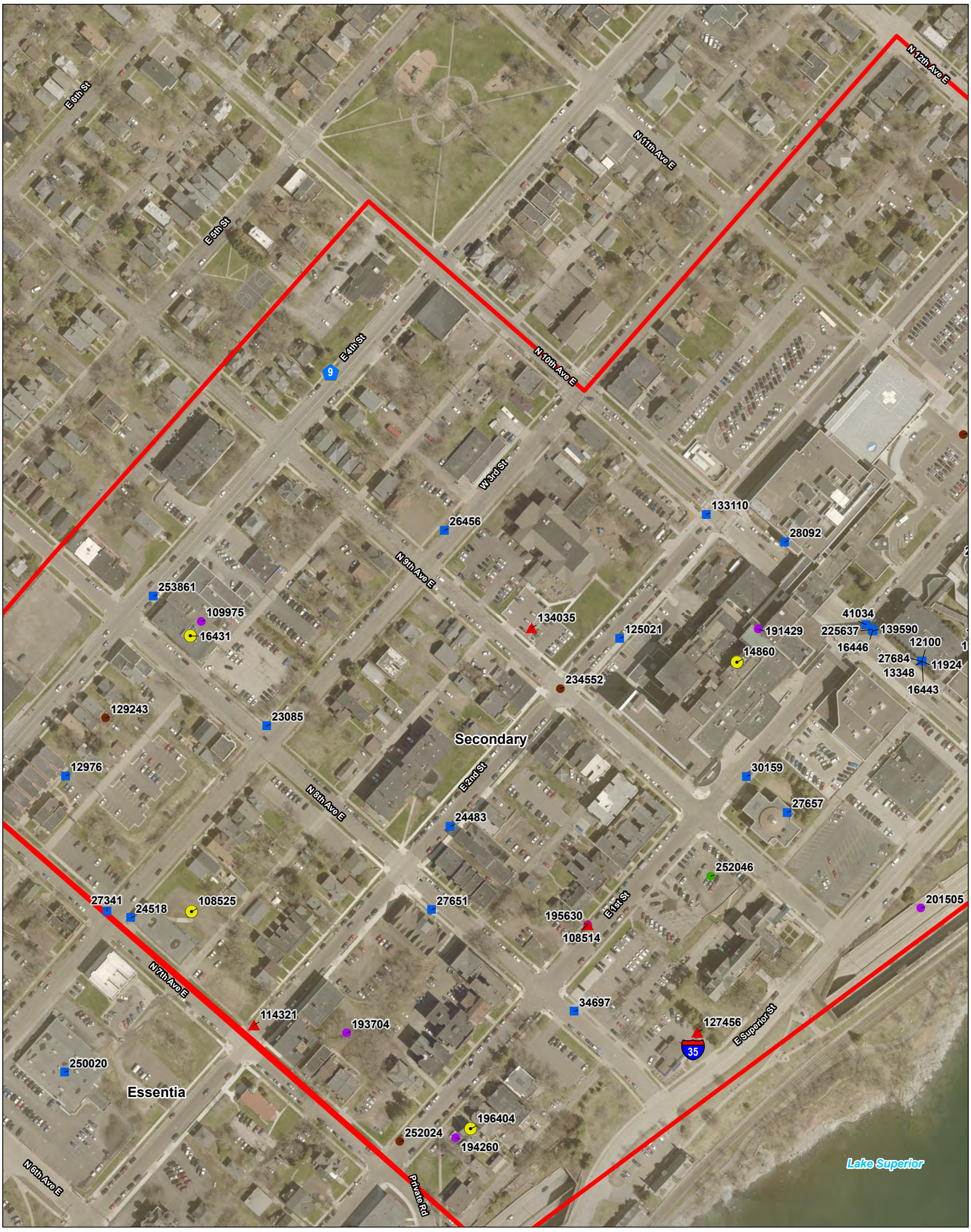
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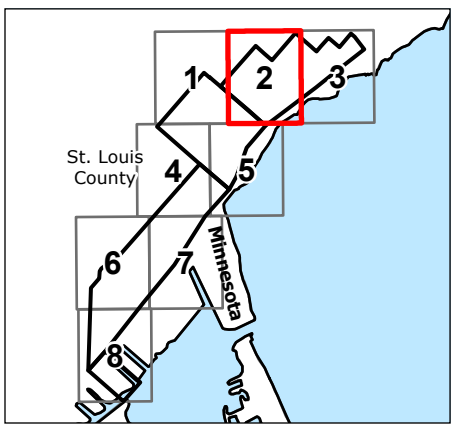
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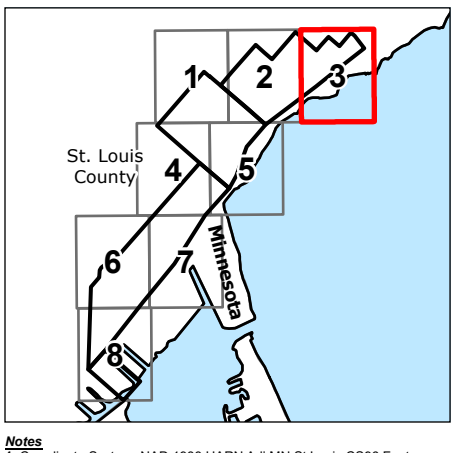
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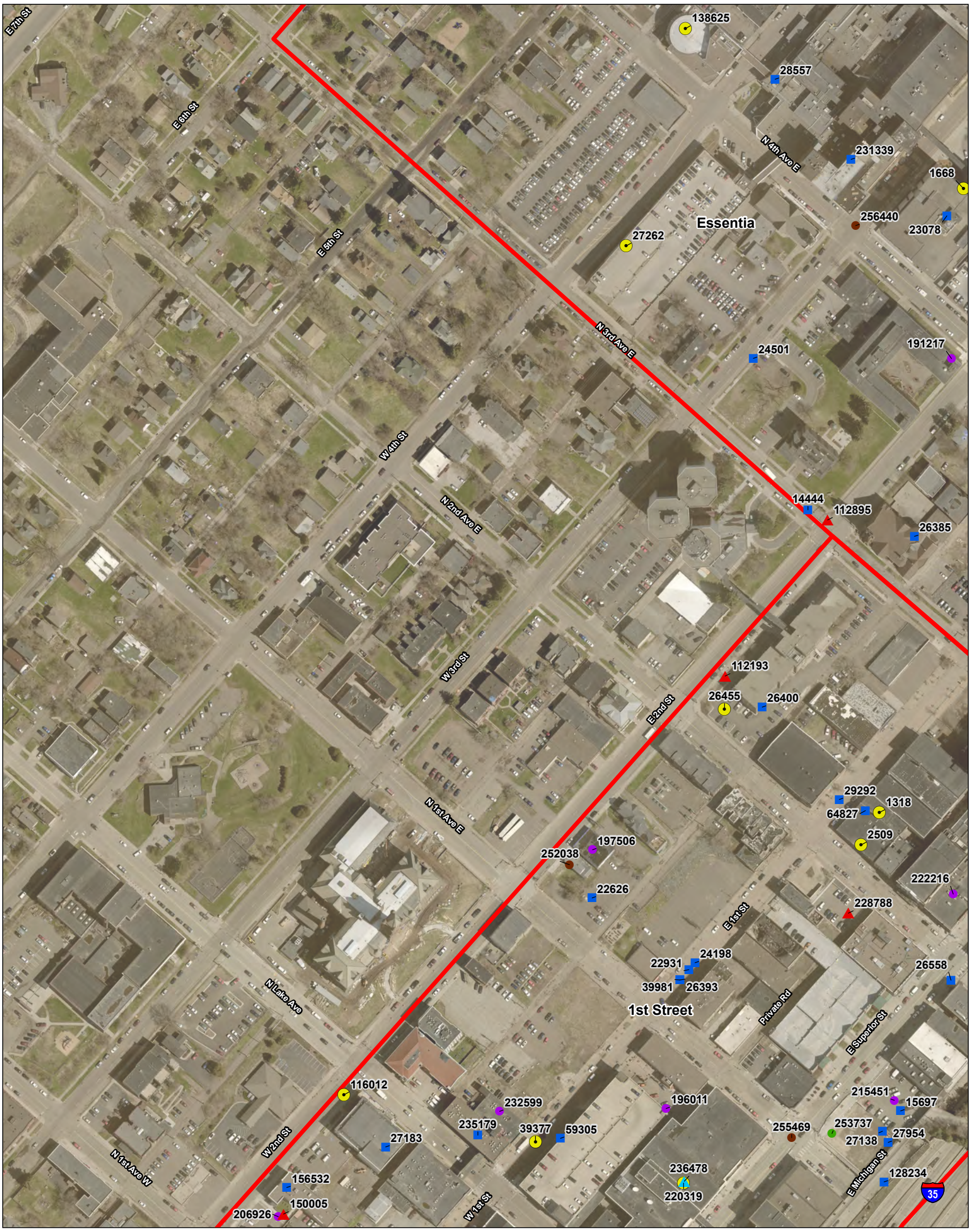
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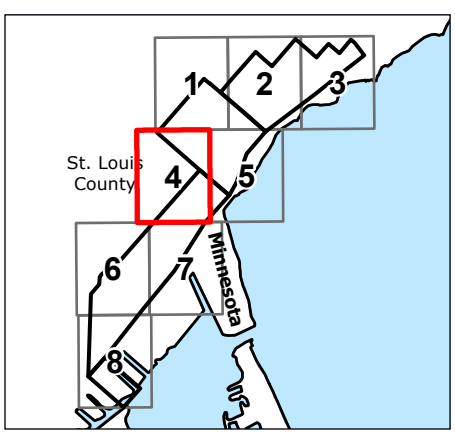
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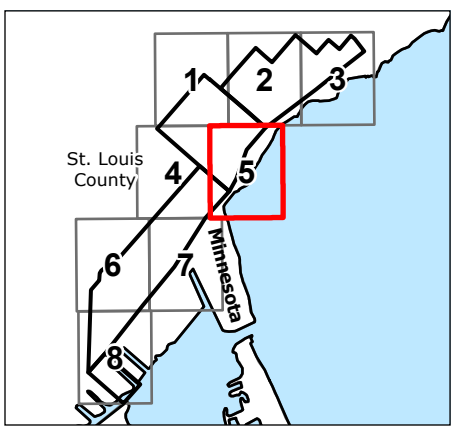
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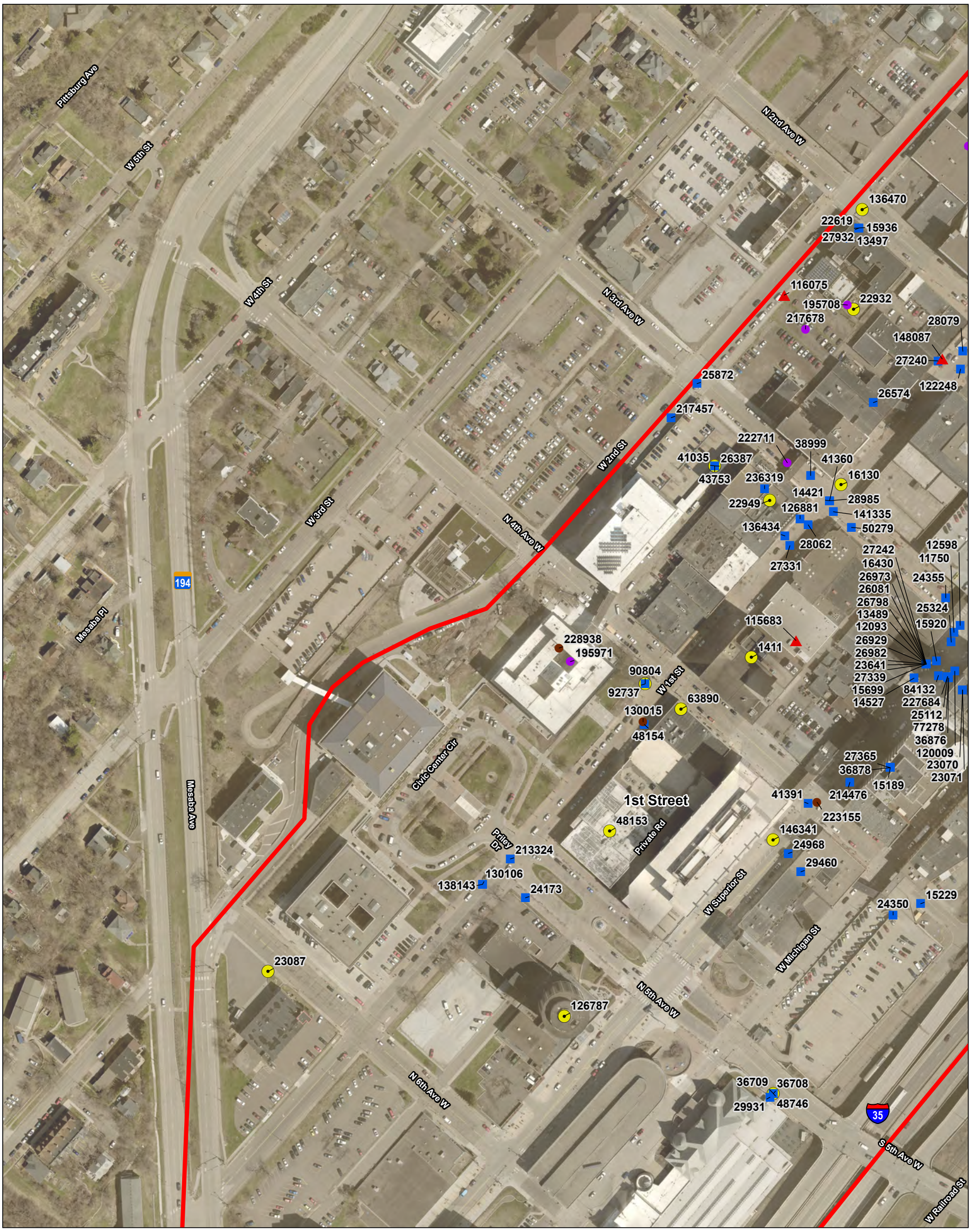
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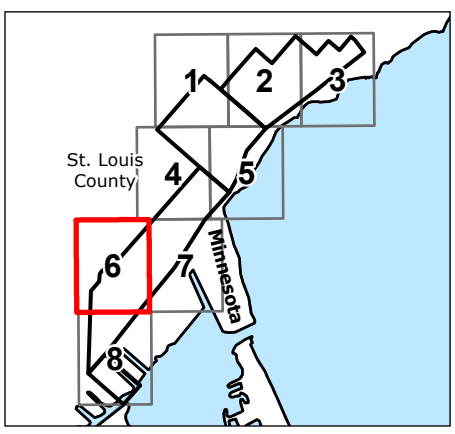
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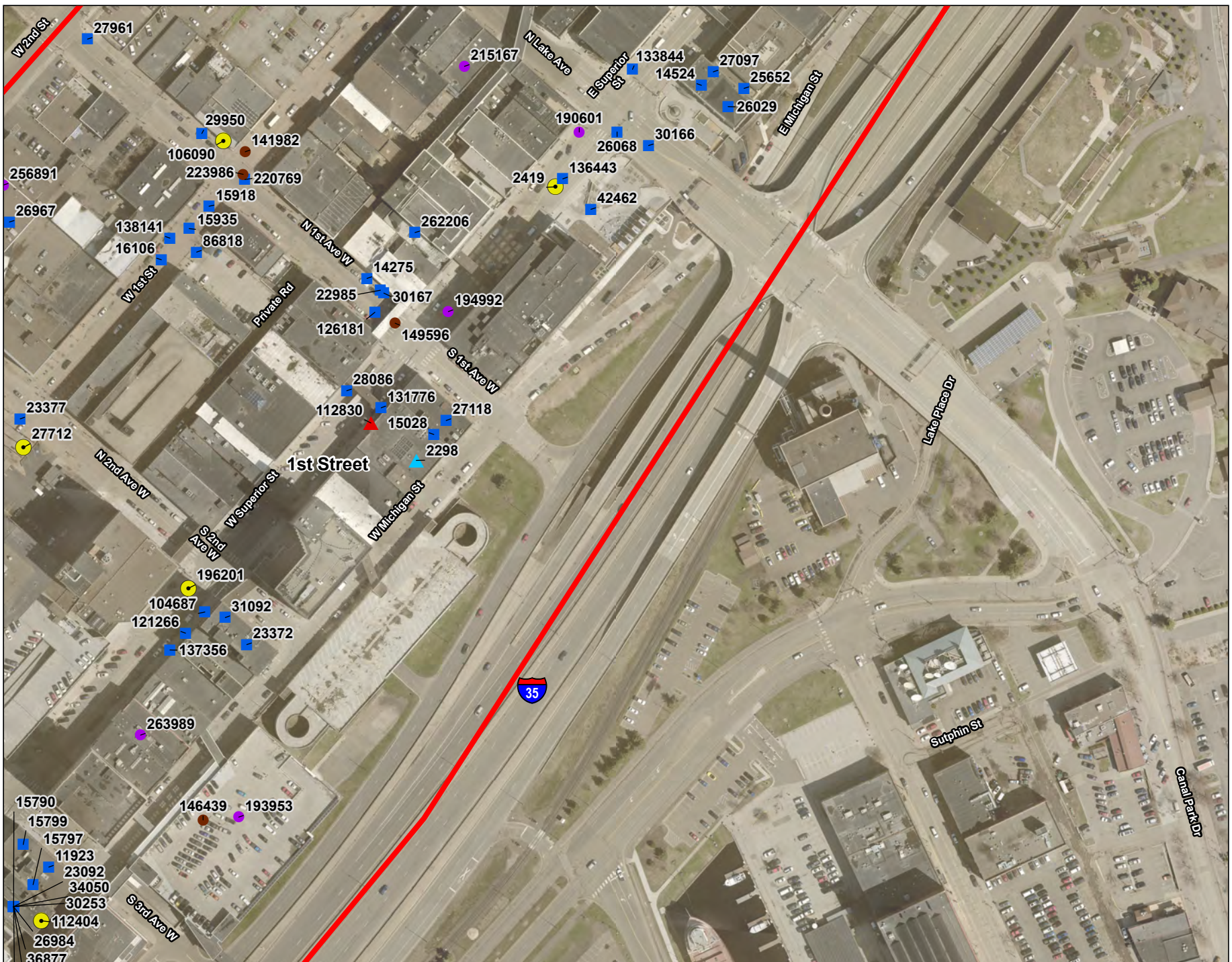
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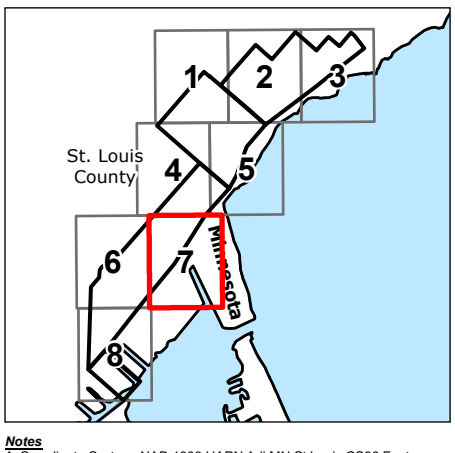
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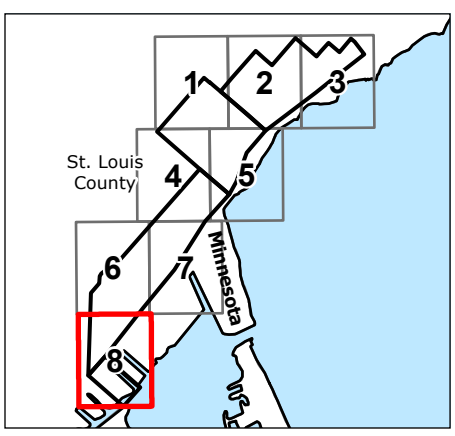
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Appendix C

Lot D Concept Plan

IDP Inland Development Partners

LOT D PROPERTY HISTORY

Lot D is a 12-acre parcel currently owned by the Duluth Economic Development Agency (DEDA). The property is located at 500 – 1000 Railroad Street in the Bayfront District of Duluth. Lot D is in the Bayfront District of Duluth. It is the last remaining undeveloped property that is guided for mixed-use development along Duluth's 26 miles of waterfront. Lot D is situated on the St. Louis River just within the Harbor side of Lake Superior. Historically used for industrial and cold storage purposes, the property is currently vacant and occupied by a one-acre industrial building concrete slab and foundation. The property is encumbered by significant buried debris and contaminants. Surrounding seawalls are in marginal and poor condition.

Inland Development Partners (IDP) and Doran Companies are proposing a multi-phased and mixed use multifamily and hospitality redevelopment plan for Lot D in the City of Duluth. IDP and DEDA have operated under a Predevelopment Agreement (PDA) for this redevelopment since 2023.

Under the current PDA, DEDA has the opportunity to review and approve the Finance Plan for the Lot D project. The Finance Plan outlines the scope of work to prepare the site for redevelopment and the current concept plan for Lot D development.

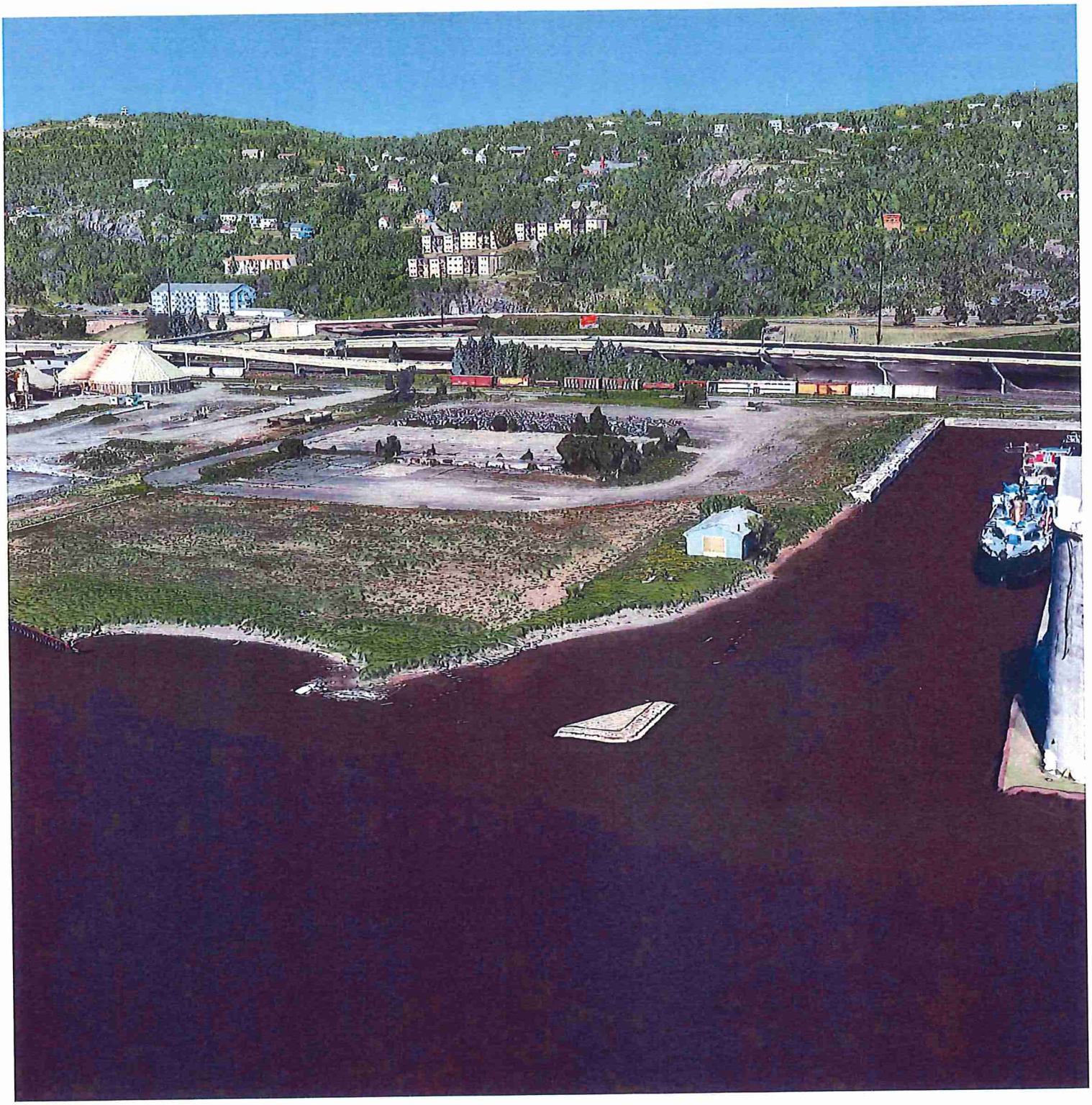
LOT D SITE PREPARATION PLANNING

In 2025, after approval of the Finance Plan, DEDA will release an RFP for removal of the existing reinforced concrete slab on Lot D property. It is anticipated that DEDA will contract for and fund the removal with DEDA funds. This removal work is anticipated to be completed during third quarter of 2025. In 2025, a request for the MPCA to approve a proposed Response Action Plan (RAP) will be submitted to secure the approval for the remediation plan of soil contamination on Lot D. The approval is anticipated to be secured in 2025 with remediation work to be started and completed in 2026.

In 2026, engineering plans and specifications will be completed for the repair and reconstruction of the deteriorated seawalls on Lot D. The repair work will be contracted for and completed in 2026. The seawall repair will include backfilling the repaired seawall where portions of the Lot D site have been eroded. After the seawall repair and back fill has been completed, the Lot D site will be soil encapsulated to contain the contaminated soil and allow new construction according to the approved MPCA RAP.







IDP Inland Development Partners

LOT D PLANNED DEVELOPMENT PHASING

The planned redevelopment of the Lot D site includes a total of 509 market rate multifamily apartments in two buildings built in two phases. The first phase multifamily development will contain 333 units, two levels of above grade parking for residents with 410 stalls, five stories of wood frame apartments with studio, alcove, one bedroom, one bedroom plus den, two bedroom and three-bedroom units. Average unit size is expected to be approximately 835 square feet. Construction will start in December of 2026 and be completed in August of 2028.

The phase two multifamily development will contain 176 units, two levels of above grade parking for residents with 240 stalls, five stories of wood frame apartments with alcove, one bedroom, one bedroom plus den, two bedroom and three-bedroom units. Average unit size is expected to be approximately 881 square feet. Phase 2 construction will start in September of 2027 and be completed in April of 2029.

In addition to the multifamily buildings, the redevelopment will include a pad ready site for 189 extended stay hotel rooms in a standalone building. This pad ready site is expected to be sold to a hotel development company who will own the site and construct their hotel building.

The proposed development has an overall estimated real estate investment of $157.7 million and will take approximately four (4) years to complete. City entitlement for the project is expected to start by late 2025 and continue into mid-2026. Vertical construction is expected to start in early 2027 after the seawalls are repaired and the site soil work is completed.

LOT D CURRENT COMPREHENSIVE PLAN & ZONING

Lot D is guided by the City's Comprehensive Plan for "Tourism/Entertainment" (TE). This land use designation includes retail, entertainment, lodging facilities, meeting facilities, waterfront, and open space land uses. Specifically, the TE category supports medium to high density development patterns and greater building heights.

Zoning

Lot D is currently zoned Mixed Use Waterfront (MU-W). This district is intended to provide for waterfront dependent commercial uses and medium to high density residential development. Intended non-residential uses include visitor-related retail and services, lodging, recreational facilities, and maritime uses, as well as retail and services use that take advantage of the waterfront settings. Development may include horizontal or vertical mixed use. Development density should include transit and pedestrian connections between developments and the surrounding areas.

IDP *Inland Development Partners*

LOT D OWNERSHIP

Under the terms of the current Preliminary Development Agreement, Inland Development Partners will acquire the Lot D site from DEDA on a date established by the formal Development Agreement to be agreed upon between DEDA and Inland Development Partners (IDP).

At the time of land acquisition by IDP, a Minnesota Limited Liability Partnership will be created including the Partners/Owners of IDP and other investment partners.

LOT D SITE DATA

Monday, June 30, 2025 — 43560.000

LVL		Square Feet	Parking Capacity Required	Parking Capacity Indoor	Parking Capacity Surface	Multi-Family Units	Multi-Family Bedrooms	Std. Bay Hotel Units	Notes
	MULTI-FAMILY #1	**522,000**	**383**	**410**	**32**	**333**	**439**	**0**	**1.33**
L1	Parking Garage	96,000	0	260		0	0	0	Unit Parking Ratio
L2	Parking Garage	96,000	0	150		5	7	0	
L3	Multi-Family Residential	70,000	0	0		64	84	0	
L4	Multi-Family Residential	65,000	0	0		66	87	0	
L5	Multi-Family Residential	65,000	0	0		66	87	0	
L6	Multi-Family Residential	65,000	0	0		66	87	0	
L7	Multi-Family Residential	65,000	0	0		66	87	0	
	MULTI-FAMILY #2	**280,000**	**202**	**240**	**44**	**176**	**225**	**0**	**1.61**
L1	Parking Garage	50,000	0	115		0	0	0	Unit Parking Ratio
L2	Parking Garage	50,000	0	125		0	0	0	
L3	Multi-Family Residential	36,000	0	0		32	41	0	
L4	Multi-Family Residential	36,000	0	0		36	46	0	
L5	Multi-Family Residential	36,000	0	0		36	46	0	
L6	Multi-Family Residential	36,000	0	0		36	46	0	
L7	Multi-Family Residential	36,000	0	0		36	46	0	
	HOTEL #1 - PRIMARY	**92,750**	**186**	**0**	**189**	**0**	**0**	**140**	**1.35**
L1	Hotel Amenities	18,550	0	0		0	0	0	Unit Parking Ratio
L2	Hotel Units	18,550	0	0		0	0	35	
L3	Hotel Units	18,550	0	0		0	0	35	
L4	Hotel Units	18,550	0	0		0	0	35	
L5	Hotel Units	18,550	0	0		0	0	35	

TOTALS	**Square Feet**	**Required**	**Provided**	**Provided**	**MF Units**	**MF Beds**	**Hotel Units**	
	894,750	**771**	**650**	**265**	**509**	**664**	**140**	**1.41**
								Unit Parking Ratio

Surfcae Stalls Required to Suppliment :

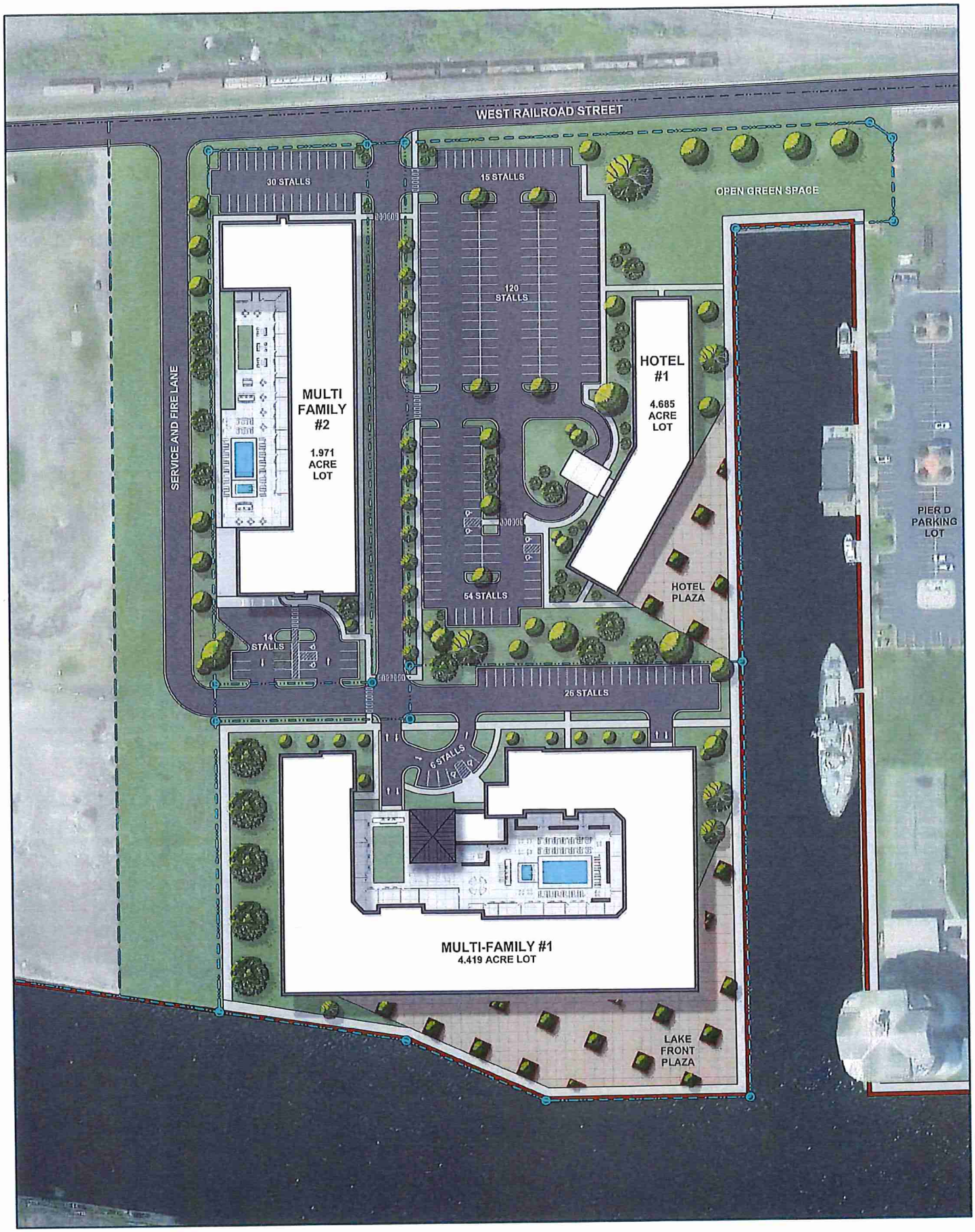
Sub-Lot Sizes

MULTI-FAMILY #1	204,100	4.685	410	32	0	0	0	Unit Parking Ratio
MULTI-FAMILY #2	85,859	1.971	240	44	0	0	0	Unit Parking Ratio
HOTEL #1 - PRIMARY	192,512	4.419	0	189	0	0	0	Unit Parking Ratio
ROAD	27,790	0.638	0	0	0	0	0	Unit Parking Ratio

TOTALS	**Square Feet**	**Acres**			**MF Units**	**MF Beds**	**Hotel Units**
	482,471	**11.714**	**650**	**265**	**36**	**46**	**0**
	510,804	11.726					

In the City of Duluth, Minnesota, parking requirements for hotels and motels are based on the number of guest rooms and the gross floor area of accessory uses. Specifically, two parking spaces are required for every three guest rooms, plus one additional space for every 200 square feet of gross floor area in all accessory uses, according to the City of Duluth's parking ordinance.

In the City of Duluth, Minnesota, apartment parking requirements are based on the number of bedrooms. Generally, residents are required to provide 0.7 parking spaces per bedroom, with a minimum of one space per dwelling unit. Additionally, 15% of the required resident parking spaces should be visitor parking.



DORAN **DULUTH - LOT D** CONCEPT SITE PLAN 06.30.2025

LOT D: THE WHARF



THE WHARF

THE CITY OF DULUTH MINNESOTA



Appendix D

FEMA FIRMette

National Flood Hazard Layer FIRMette

FEMA

92°6'40"W 46°46'45"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

92°6'2"W 46°46'20"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

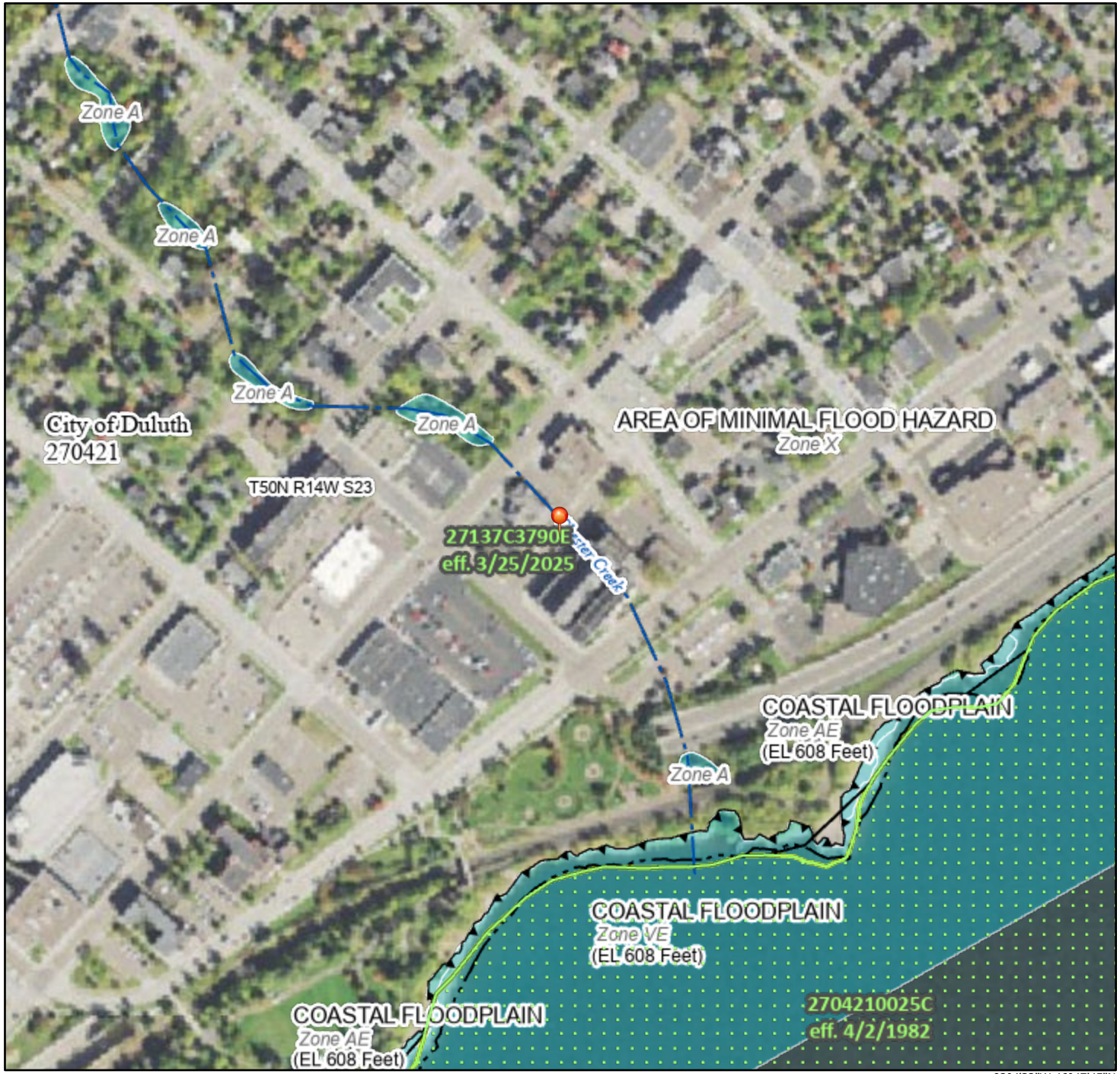
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/3/2025 at 2:47 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

92°5'10"W 46°48'10"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

92°4'32"W 46°47'45"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/3/2025 at 3:15 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

92°5'51"W 46°47'41"N



92°5'13"W 46°47'17"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/3/2025 at 3:10 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix E

MDH Well Log Reports

Minnesota Unique Well No.

454658

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 10/31/1990
Update
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
BOWMAN	50	14	W	27	CABCDC	air conditioning	S	312 ft.	312 ft.	05/11/1989	69183

Elevation 697 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** Duluth Complex **Depth to Bedrock** 10 ft **Open Hole** 25 - 312 ft **Static Water Level** ft

Field Located By Minnesota Geological Survey
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method Digitization (Screen) - Map (1:24,000) (15 meters
Input Source Minnesota Geological Survey
Input Date 04/24/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568310
UTM Northing (Y) 518160
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
SAND FILL	BROWN	SOFT	0	10	10	697	687	man-made fill	fill	sand	
GABBRO	BLACK	MEDIUM	10	312	302	687	385	Duluth Complex	icelandite	volcanics,	

Minnesota Unique Well No.

533478

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 06/16/1994
Update
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
3	50	14	W	27	ACACBC	elevator	A	34 ft.	33.5 ft.	12/28/1993	L0006

Elevation 648 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 0 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568855
UTM Northing (Y) 518202
Interpretaion Method Geologic study 1:24k to 1:100k

			Depth (ft.)			Elevation (ft.)					
Geological Material	**Color**	**Hardness**	**From**	**To**	**Thickness**	**From**	**To**	**Stratigraphy**	**Primary Lithology**	**Secondary**	**Minor Lithology**
FRACTURED BEDROCK	RED		0	5	5	648	643	upper southwest volc	basalt	basaltic andesite	
BLUE GRANITE	BLUE		5	34	29	643	614	upper southwest volc	basalt	basaltic andesite	

Minnesota Unique Well No.

533479

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 06/16/1994
Update
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
JAUSS, JAMES	50	14	W	27	CACADC	elevator	A	35 ft.	34.5 ft.	02/04/1994	L0006

Elevation 650 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 18 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Agency (Interpretation) Amy Block

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568412
UTM Northing (Y) 518145
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
SAND & COBBLES			0	18	18	650	632	sand +larger	sand	cobble	
ROCK	BLUE		18	35	17	632	615	upper southwest volc	icelandite		

Minnesota Unique Well No.

533480

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 07/03/1995
Update
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
NEW APOLLO APT.	50	14	W	27	ACABCD	elevator	A	36 ft.	36 ft.	07/27/1994	L0006

Elevation 654 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 2 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568874
UTM Northing (Y) 518207
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
CLAYEY SAND & COBBLES	BROWN		0	2	2	654	652	pebbly sand/silt/clay-	sand	cobble	clay
GRANITE	BLUE	HARD	2	36	34	652	618	upper southwest volc	basalt	basaltic andesite	

Minnesota Unique Well No.

644513

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 05/29/2001
Update
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
OFFICE DEPOT,	50	14	W	27	CAADBA	domestic	A	11 ft.	11 ft.	04/08/2000	L0004

Elevation 642 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 4 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568577
UTM Northing (Y) 518164
Interpretaion Method Geologic study 1:24k to 1:100k

			Depth (ft.)			Elevation (ft.)					
Geological Material	**Color**	**Hardness**	**From**	**To**	**Thickness**	**From**	**To**	**Stratigraphy**	**Primary Lithology**	**Secondary**	**Minor Lithology**
CLAY/GRAVEL	RED	MEDIUM	0	4	4	642	638	pebbly sand/silt/clay-	clay	gravel	
KEWEENAWAN FORMATION	BLACK	HARD	4	11	7	638	631	upper southwest volc	icelandite		

Minnesota Well Index - Stratigraphy Report **644513** Printed on 09/30/2025

Minnesota Unique Well No.

701046

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 02/21/2008
Update 07/05/2007
Received Date 02/26/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
MW-2	50	14	W	27	CDBBCA	monitor well	S	10 ft.	9.31 ft.	06/28/2007	1381

Elevation 644 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** ft **Open Hole** - ft **Static Water Level** ft

Field Located By Minnesota Geological Survey
Unique No. Verified Site Plan
Geological Interpretation Agency (Interpretation) Bruce Bloomgren

Locate Method Digitization (Screen) - Map (1:12,000) (>15
Input Source Minnesota Geological Survey
Input Date 03/17/2016

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568268
UTM Northing (Y) 518129
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
SANDY FILL MATEIAL	BROWN	SOFT	0	10	10	644	634	man-made fill	fill	sand	clay

Minnesota Unique Well No.

701047

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date
Update 07/05/2007
Received Date 02/26/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
MW-3	50	14	W	27	CDBBCA	monitor well	S	13 ft.	12.17 ft.	06/28/2007	1381

Elevation 644 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** Quat. Water Table **Depth to Bedrock** ft **Open Hole** - ft **Static Water Level** ft

Field Located By Minnesota Geological Survey
Unique No. Verified Site Plan
Geological Interpretation Agency (Interpretation) Bruce Bloomgren

Locate Method Digitization (Screen) - Map (1:12,000) (>15
Input Source Minnesota Geological Survey
Input Date 03/17/2016

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568284
UTM Northing (Y) 518128
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
SANDY FILL MATERIAL	BROWN	SOFT	0	3	3	644	641	man-made fill	fill	sand	
CLAY W/SAND & SILT FIRM	RED/BRN		3	13	10	641	631	clay/sand/silt-no peb.	clay	sand	silt

Minnesota Unique Well No.

703163

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 02/28/2008
Update 06/27/2007
Received Date 02/26/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
MW-1	50	14	W	27	CDBBCA	monitor well	S	16 ft.	16 ft.	05/04/2007	1688

Elevation 643 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** Quat. Water Table **Depth to Bedrock** ft **Open Hole** - ft **Static Water Level** 10 ft

Field Located By Minnesota Geological Survey
Unique No. Verified Site Plan
Geological Interpretation Agency (Interpretation) Bruce Bloomgren

Locate Method Digitization (Screen) - Map (1:12,000) (>15
Input Source Minnesota Geological Survey
Input Date 03/17/2016

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568281
UTM Northing (Y) 518129
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
SAND/GRAVEL	BROWN	SOFT	0	16	16	643	627	sand +larger-brown	sand	gravel	

Minnesota Unique Well No.

704170

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date
Update 01/17/2006
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
A & L DOWNTOWN	50	14	W	27	ACBDCD	elevator	A	42 ft.	42 ft.	01/05/2006	L0008

Elevation	Elev. Method	Aquifer	Depth to Bedrock	Open Hole	Static Water Level
655 ft.	LiDAR 1m DEM (MNDNR)		2 ft	- ft	6 ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568790
UTM Northing (Y) 518196
Interpretaion Method Geologic study 1:24k to 1:100k

			Depth (ft.)			Elevation (ft.)					
Geological Material	**Color**	**Hardness**	**From**	**To**	**Thickness**	**From**	**To**	**Stratigraphy**	**Primary Lithology**	**Secondary**	**Minor Lithology**
CONCRETE	GRAY	M.HARD	0	2	2	655	653	pavement	pavement (man-made)		
ROCK	GRAY	HARD	2	42	40	653	613	upper southwest volc	basalt		

Minnesota Unique Well No.

739031

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date
Update 05/08/2006
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
SHERMAN	50	14	W	27	CAACDC	elevator	A	56 ft.	56 ft.	04/28/2006	L0008

Elevation 639 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 0 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568517
UTM Northing (Y) 518156
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
GRANITE	GRAY	HARD	0	28	28	639	611	upper southwest volc	icelandite		
GRANITE	RED	HARD	28	56	28	611	583	upper southwest volc	volcanics,		

Minnesota Unique Well No.

739041

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 06/29/2009
Update 10/29/2007
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
A & L PROPERTIES	50	14	W	27	ACDABB	elevator	A	49 ft.	49 ft.	10/10/2007	1832

Elevation 614 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** upper southwest **Depth to Bedrock** 2 ft **Open Hole** - ft **Static Water Level** 10 ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 10/11/2017

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568951
UTM Northing (Y) 518195
Interpretaion Method Geologic study 1:24k to 1:100k

			Depth (ft.)			Elevation (ft.)					
Geological Material	**Color**	**Hardness**	**From**	**To**	**Thickness**	**From**	**To**	**Stratigraphy**	**Primary Lithology**	**Secondary**	**Minor Lithology**
GRAVEL	GRAY	MEDIUM	0	2	2	614	612	gravel (+larger)-gray	gravel		
BROKEN ROCK	DK. GRY	MEDIUM	2	9	7	612	605	upper southwest volc	basalt	basaltic andesite	crevice
GRANITE	DK. GRY	HARD	9	49	40	605	565	upper southwest volc	basalt	basaltic andesite	

Minnesota Unique Well No.

739042

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 06/30/2009
Update 10/29/2007
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
A & L PROPERTIES	50	14	W	27	ACDABB	elevator	A	49 ft.	49 ft.	10/18/2007	1832

Elevation 615 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** upper southwest **Depth to Bedrock** 2 ft **Open Hole** - ft **Static Water Level** 10 ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 10/11/2017

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 568946
UTM Northing (Y) 518195
Interpretaion Method Geologic study 1:24k to 1:100k

			Depth (ft.)			Elevation (ft.)					
Geological Material	**Color**	**Hardness**	**From**	**To**	**Thickness**	**From**	**To**	**Stratigraphy**	**Primary Lithology**	**Secondary**	**Minor Lithology**
GRAVEL	GRAY	MEDIUM	0	2	2	615	613	gravel (+larger)-gray	gravel		
BROKEN ROCK	DK. GRY	MEDIUM	2	8	6	613	607	upper southwest volc	basalt	basaltic andesite	crevice
GRANITE	DK. GRY	HARD	8	49	41	607	566	upper southwest volc	basalt	basaltic andesite	

Minnesota Unique Well No.

764826

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 07/28/2009
Update 10/23/2009
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
HURLBUT-ZEPPA	50	14	W	27	ADBBBA	elevator	A	34 ft.	34 ft.	03/03/2009	1832

Elevation 628 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 0 ft **Open Hole** - ft **Static Water Level** ft

Field Located By Minnesota Geological Survey
Unique No. Verified Address verification
Geological Interpretation Agency (Interpretation) Amy Block

Locate Method Digitization (Screen) - Map (1:12,000) (>15
Input Source Minnesota Geological Survey
Input Date 04/28/2016

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 569103
UTM Northing (Y) 518213
Interpretaion Method Geologic study 1:24k to 1:100k

			Depth (ft.)			Elevation (ft.)					
Geological Material	**Color**	**Hardness**	**From**	**To**	**Thickness**	**From**	**To**	**Stratigraphy**	**Primary Lithology**	**Secondary**	**Minor Lithology**
BROKEN GRANITE	BLACK	HARD	0	5	5	628	623	upper southwest volc	basalt	basaltic andesite	crevice
GRANITE	BLACK	HARD	5	34	29	623	594	upper southwest volc	basalt	basaltic andesite	

Minnesota Well Index - Stratigraphy Report **764826** Printed on 09/30/2025

Minnesota Unique Well Number

454658

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 10/31/1990
Update Date 12/05/2019
Received Date

Well Name	Township	Range	Dir	Section	Subsection
BOWMAN	50	14	W	27	CABCDC

Elevation 697 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 330 2ND ST W DULUTH MN 55802
Contact 700 FIRST BANK PL DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SAND FILL	0	10	BROWN	SOFT
GABBRO	10	312	BLACK	MEDIUM

Remarks

HOLE PRODUCED VERY LITTLE WATER, WAS ABANDONED.
WELL SEALED 5-12-1989 BY 69183.

Well Depth 312 ft. **Depth Completed** 312 ft. **Date Well Completed** 05/11/1989

Drill Method Air Rotary **Drill Fluid** Foam

Use air conditioning **Status** Sealed

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint** Welded
Drive Shoe? Yes ☒ No ☐ **Above/Below** 1 ft.

Casing Diameter		Weight		Hole Diameter	
6 in. To 25 ft.		19.4 lbs./ft.		6 in. To 312 ft.	

Open Hole From 25 ft. To 312 ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☒ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☒ No ☐ Not Specified

Nearest Known Source of Contamination

100 feet East Direction Septic tank/drain field Type

Well disinfected upon completion? ☒ Yes ☐ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock upper southwest volc Aquifer Duluth Complex
Last Strat Duluth Complex Depth to Bedrock 10 ft
Located by Minnesota Geological Survey
Locate Method Digitization (Screen) - Map (1:24,000) (15 meters or
System UTM - NAD83, Zone 15, Meters X 568310 Y 5181602
Unique Number Verification Address verification Input Date 04/24/2018

Angled Drill Hole

Well Contractor

Petersen Well Co.	69183	PETERSEN, D.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

533478

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 06/16/1994
Update Date 12/05/2019
Received Date

Well Name	Township	Range	Dir	Section	Subsection
3	50	14	W	27	ACACBC

Elevation 648 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

C/W 32 1ST ST E DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
FRACTURED BEDROCK	0	5	RED	
BLUE GRANITE	5	34	BLUE	

Remarks

Well Depth 34 ft. **Depth Completed** 33.5 ft. **Date Well Completed** 12/28/1993

Drill Method Non-specified Rotary **Drill Fluid** Foam

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
16 in. To 32 ft.	62.5 lbs./ft.	20 in. To 33.5 ft.

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	20 Sacks	0 ft.	32.5 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 0 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 568855 Y 5182026
Unique Number Verification Address verification Input Date 04/06/2018

Angled Drill Hole

Well Contractor

Rudy's Contracting, Inc	L0006	ZIMBAUER, R.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

533479

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 06/16/1994
Update Date 12/05/2019
Received Date

Well Name	Township	Range	Dir	Section	Subsection
JAUSS, JAMES	50	14	W	27	CACADC

Elevation 650 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Contact 1931 2ND ST E DULUTH MN 55812
Well 403 SUPERIOR ST W DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SAND & COBBLES	0	18		
ROCK	18	35	BLUE	

Remarks

Well Depth 35 ft. **Depth Completed** 34.5 ft. **Date Well Completed** 02/04/1994

Drill Method Cable Tool **Drill Fluid** Foam

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Step down **Joint**
Drive Shoe? Yes ☐ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
12 in. To 34 ft.	lbs./ft.	20 in. To 34.5 ft.
20 in. To 18 ft.	lbs./ft.	

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	40 Sacks	0 ft.	34.5 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 18 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 568412 Y 5181452
Unique Number Verification Address verification Input Date 04/06/2018

Angled Drill Hole

Well Contractor

Rudy's Contracting, Inc L0006 ZIMBAUER, R.
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

533480

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 07/03/1995
Update Date 12/05/2019
Received Date

Well Name	Township	Range	Dir	Section	Subsection
NEW APOLLO	50	14	W	27	ACABCD

Elevation 654 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 102 1ST ST E DULUTH MN 55802
Contact P.O. BOX 39 DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
CLAYEY SAND &	0	2	BROWN	
GRANITE	2	36	BLUE	HARD

Remarks

START OF HOLE IN APPROX. 12 FT BELOW NORTH SIDEWALK.

Well Depth	Depth Completed	Date Well Completed
36 ft.	36 ft.	07/27/1994

Drill Method Non-specified Rotary **Drill Fluid** Foam

Use elevator **Status** Active

Well Hydrofractured? **Yes** ☐ **No** ☐ **From** **To**

Casing Type Single casing **Joint** Welded
Drive Shoe? **Yes** ☐ **No** ☒ **Above/Below**

Casing Diameter	Weight	Hole Diameter
16 in. To 35 ft.	lbs./ft.	19 in. To 36 ft.

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	30 Sacks	0 ft.	36 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 2 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 568874 Y 5182072
Unique Number Verification Address verification Input Date 04/06/2018

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Rudy's Contracting, Inc	L0006	ZIMBAUER, R.

Minnesota Unique Well Number

567858

County St. Louis
Quad
Quad ID

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 09/16/2008
Update Date 12/05/2019
Received Date

Well Name	Township	Range	Dir	Section	Subsection
MW-2 CITY OF	50	14	W	27	null

Elevation **Elev. Method**

Address

C/W 411 W. 1ST. ST MN

Stratigraphy Information

Well Depth null **Depth Completed** null **Date Well Completed**

Drill Method **Drill Fluid**

Use **Status**

Well Hydrofractured? **Yes** ☐ **No** ☐ **From** **To**

Casing Type **Joint**
Drive Shoe? **Yes** ☐ **No** ☐ **Above/Below**

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☐ No ☒ Not Specified

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock Aquifer

Last Strat Depth to Bedrock ft

Located by

Locate Method

System UTM - NAD83, Zone 15, Meters X Y

Unique Number Verification Input Date

Angled Drill Hole

Well Contractor

Earth Burners, Inc. M0142

Licensee Business Lic. or Reg. No. Name of Driller

Remarks

MW-2 NOT INSTALLED

Minnesota Unique Well Number

644513

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING REPORT
Minnesota Statutes Chapter 1031

Entry Date 05/29/2001
Update Date 12/05/2019
Received Date

Well Name	Township	Range	Dir	Section	Subsection
OFFICE DEPOT,	50	14	W	27	CAADBA

Elevation 642 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Contact 2200 OLD GERMANTOWN RD DEL RAY BEACH FL 33445
Well 207W SUPERIOR ST DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
CLAY/GRAVEL	0	4	RED	MEDIUM
KEWEENAWAN	4	11	BLACK	HARD

Remarks
PIT 5 FT. BELOW GRADE.

Well Depth 11 ft. **Depth Completed** 11 ft. **Date Well Completed** 04/08/2000

Drill Method Cable Tool **Drill Fluid**

Use domestic **Status** Active

Well Hydrofractured? Yes ☐ No ☐ **From** **To**

Casing Type Step down **Joint** Welded
Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
16 in. To 11 ft.	62.5 lbs./ft.	24 in. To 11 ft.
24 in. To 5 ft.	63.4 lbs./ft.	

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	16 Sacks	0 ft.	11 ft.

Nearest Known Source of Contamination
feet Direction Type
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☒ Not Installed Date Installed
Manufacturer's name
Model Number HP Volt
Length of drop pipe ft Capacity g.p. Typ

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous
First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 4 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 568577 Y 5181647
Unique Number Verification Address verification Input Date 04/06/2018

Angled Drill Hole

Well Contractor
Midwest Drilling L0004 STANGRET, J.
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

701046

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 02/21/2008
Update Date 02/26/2019
Received Date 07/05/2007

Well Name	Township	Range	Dir	Section	Subsection
MW-2	50	14	W	27	CDBBCA

Elevation 644 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 505 SUPERIOR ST W DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SANDY FILL MATEIAL	0	10	BROWN	SOFT

Remarks

SEALED 02-04-2010 BY 1381.
NO WATER ENCOUNTERED.

Well Depth	Depth Completed	Date Well Completed
10 ft.	9.31 ft.	06/28/2007

Drill Method Auger (non-specified) **Drill Fluid**

Use monitor well **Status** Sealed

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
2 in. To 4.3 ft.	0 lbs./ft.	4.2 in. To 9.3 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** plastic **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set
2 in.	10	5 ft.	4.3 ft. 9.3 ft.

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☒ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
bentonite	0.5 Sacks	0.5 ft.	3.3 ft.

Nearest Known Source of Contamination

20 feet South Direction Type

Well disinfected upon completion? ☐ Yes ☒ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock Aquifer
Last Strat man-made fill Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)
System UTM - NAD83, Zone 15, Meters X 568268 Y 5181292
Unique Number Verification Site Plan Input Date 03/17/2016

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Twin Ports Testing, Inc.	1381	DINNAN, L.

Minnesota Unique Well Number

701047

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date
Update Date 02/26/2019
Received Date 07/05/2007

Well Name	Township	Range	Dir	Section	Subsection
MW-3	50	14	W	27	CDBBCA

Elevation 644 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 505 SUPERIOR ST W DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SANDY FILL MATERIAL	0	3	BROWN	SOFT
CLAY W/SAND & SILT	3	13	RED/BRN	

Remarks

SEALED 02-04-2010 BY 1381.
NO WATER ENCOUNTERED.

Well Depth	Depth Completed	Date Well Completed
13 ft.	12.17 ft.	06/28/2007

Drill Method Auger (non-specified) **Drill Fluid**

Use monitor well **Status** Sealed

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
2 in. To 12.2 ft.	0 lbs./ft.	4.2 in. To 12.1 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** plastic **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
2 in.	10	5 ft.	7.2 ft.	12.2 ft.

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☒ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
bentonite	0.5 Sacks	0.8 ft.	5.1 ft.

Nearest Known Source of Contamination

20 feet North Direction Type

Well disinfected upon completion? ☐ Yes ☒ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock Aquifer Quat. Water

Last Strat clay/sand/silt-no peb. Depth to Bedrock ft

Located by Minnesota Geological Survey

Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)

System UTM - NAD83, Zone 15, Meters X 568284 Y 5181281

Unique Number Verification Site Plan Input Date 03/17/2016

Angled Drill Hole

Well Contractor

Twin Ports Testing, Inc.	1381	DINNAN, L.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

704170

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date
Update Date 12/05/2019
Received Date 01/17/2006

Well Name	Township	Range	Dir	Section	Subsection
A & L	50	14	W	27	ACBDCD

Elevation 655 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Contact 16W 1ST ST DULUTH MN 55802
Well 10W 1ST ST DULUTH MN 55805

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
CONCRETE	0	2	GRAY	M.HARD
ROCK	2	42	GRAY	HARD

Remarks

Well Depth 42 ft. **Depth Completed** 42 ft. **Date Well Completed** 01/05/2006

Drill Method Non-specified Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Step down **Joint** Welded
Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
16 in. To 42 ft.	62.6 lbs./ft.	19. in. To 42 ft.
2 in. To 20 ft.	52.7 lbs./ft.	

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level
6 ft. land surface Measure 01/05/2006

Pumping Level (below land surface)

Wellhead Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	2.25 Cubic yards	ft.	42 ft.

Nearest Known Source of Contamination
feet Direction Type
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed
Manufacturer's name
Model Number HP Volt
Length of drop pipe ft Capacity g.p. Typ

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous
First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 2 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 568790 Y 5181966
Unique Number Verification Address verification Input Date 04/06/2018

Angled Drill Hole

Well Contractor

United Drilling, Inc.	L0008	GRABER, K.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

739031

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING REPORT
Minnesota Statutes Chapter 1031

Entry Date
Update Date 12/05/2019
Received Date 05/08/2006

Well Name	Township	Range	Dir	Section	Subsection
SHERMAN	50	14	W	27	CAACDC

Elevation 639 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Contact 233 PARK AV S DULUTH MN
Well 301 SUPERIOR ST E DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
GRANITE	0	28	GRAY	HARD
GRANITE	28	56	RED	HARD

Remarks

Well Depth	Depth Completed	Date Well Completed
56 ft.	56 ft.	04/28/2006

Drill Method Non-specified Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Step down **Joint** Welded
Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter			Weight		Hole Diameter		
18	in. To	56 ft.	82.2	lbs./ft.	24 in. To	56	ft.
24	in. To	3 ft.	63.4	lbs./ft.			

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount		From	To
neat cement	2.5	Cubic yards	ft.	56 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 0 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 568517 Y 5181566
Unique Number Verification Address verification Input Date 04/06/2018

Angled Drill Hole

Well Contractor

United Drilling, Inc. L0008 LUTZ, D.
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

739041

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 06/29/2009
Update Date 12/05/2019
Received Date 10/29/2007

Well Name	Township	Range	Dir	Section	Subsection
A & L	50	14	W	27	ACDABB

Elevation 614 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

C/W 38 SUPERIOR ST E DULUTH MN 55807

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
GRAVEL	0	2	GRAY	MEDIUM
BROKEN ROCK	2	9	DK. GRY	MEDIUM
GRANITE	9	49	DK. GRY	HARD

Remarks

HARD ROCK.

Well Depth 49 ft. **Depth Completed** 49 ft. **Date Well Completed** 10/10/2007

Drill Method Non-specified Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Step down **Joint** Welded

Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
16 in. To 49 ft.	62.6 lbs./ft.	19. in. To 49 ft.
20 in. To 9 ft.	52.7 lbs./ft.	

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

10 ft. land surface Measure 10/10/2007

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	1.75 Cubic yards	ft.	49 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock upper southwest volc Aquifer upper southwest

Last Strat upper southwest volc Depth to Bedrock 2 ft

Located by Minnesota Geological Survey

Locate Method GPS SA Off (averaged) (15 meters)

System UTM - NAD83, Zone 15, Meters X 568951 Y 5181951

Unique Number Verification Address verification Input Date 10/11/2017

Angled Drill Hole

Well Contractor

United Drilling, Inc. 1832 SIMON, G.

Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Well Index Report | **739041** | Printed on 09/30/2025

HE-01205-15

Minnesota Unique Well Number

739042

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 06/30/2009
Update Date 12/05/2019
Received Date 10/29/2007

Well Name	Township	Range	Dir	Section	Subsection
A & L	50	14	W	27	ACDABB

Elevation 615 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

C/W 38 SUPERIOR ST E DULUTH MN 55807

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
GRAVEL	0	2	GRAY	MEDIUM
BROKEN ROCK	2	8	DK. GRY	MEDIUM
GRANITE	8	49	DK. GRY	HARD

Remarks

HARD ROCK.

Well Depth 49 ft. **Depth Completed** 49 ft. **Date Well Completed** 10/18/2007

Drill Method Non-specified Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Step down **Joint** Welded

Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
16 in. To 49 ft.	62.6 lbs./ft.	19. in. To 49 ft.
20 in. To 8 ft.	52.7 lbs./ft.	

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

10 ft. land surface Measure 10/18/2007

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	1.75 Cubic yards	ft.	49 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock upper southwest volc Aquifer upper southwest

Last Strat upper southwest volc Depth to Bedrock 2 ft

Located by Minnesota Geological Survey

Locate Method GPS SA Off (averaged) (15 meters)

System UTM - NAD83, Zone 15, Meters X 568946 Y 5181954

Unique Number Verification Address verification Input Date 10/11/2017

Angled Drill Hole

Well Contractor

United Drilling, Inc. 1832 SIMON, G.

Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

764826

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 07/28/2009
Update Date 12/05/2019
Received Date 10/23/2009

Well Name	Township	Range	Dir	Section	Subsection
HURLBUT-	50	14	W	27	ADBBBA

Elevation 628 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

C/W 222 SUPERIOR ST E DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
BROKEN GRANITE	0	5	BLACK	HARD
GRANITE	5	34	BLACK	HARD

Remarks

Well Depth	Depth Completed	Date Well Completed
34 ft.	34 ft.	03/03/2009

Drill Method Non-specified Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Step down **Joint** Welded
Drive Shoe? Yes ☐ No ☒ **Above/Below**

Casing Diameter	Weight	Hole Diameter
16 in. To 34 ft.	62.6 lbs./ft.	20 in. To 34 ft.
20 in. To 5 ft.	52.7 lbs./ft.	

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	1.5 Cubic yards	ft.	34 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 0 ft
Located by Minnesota Geological Survey
Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)
System UTM - NAD83, Zone 15, Meters X 569103 Y 5182134
Unique Number Verification Address verification Input Date 04/28/2016

Angled Drill Hole

Well Contractor

United Drilling, Inc. 1832 LANGSDORF, A.
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

703163

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING REPORT
Minnesota Statutes Chapter 1031

Entry Date 02/28/2008
Update Date 02/26/2019
Received Date 06/27/2007

Well Name	Township	Range	Dir	Section	Subsection
MW-1	50	14	W	27	CDBBCA

Elevation 643 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 505 SUPERIOR ST W DULUTH MN 55812

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SAND/GRAVEL	0	16	BROWN	SOFT

Remarks

SEALED 02-14-2010 BY 1381.

Well Depth	Depth Completed	Date Well Completed
16 ft.	16 ft.	05/04/2007

Drill Method Auger (non-specified) **Drill Fluid**

Use monitor well **Status** Sealed

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☒ **Above/Below**

Casing Diameter	Weight	Hole Diameter
3 in. To 6 ft.	0 lbs./ft.	8.2 in. To 16 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** plastic **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set
3 in.	10	10 ft.	6 ft. 16 ft.

Static Water Level

10 ft. land surface Measure 05/04/2007

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☒ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
high solids bentonite	0.5 Sacks	ft.	4 ft.

Nearest Known Source of Contamination

5 feet East Direction Tanks Type

Well disinfected upon completion? ☐ Yes ☒ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock Aquifer Quat. Water

Last Strat sand +larger-brown Depth to Bedrock ft

Located by Minnesota Geological Survey

Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)

System UTM - NAD83, Zone 15, Meters X 568281 Y 5181291

Unique Number Verification Site Plan Input Date 03/17/2016

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Environmental	1688	DANSEREAU, J.

Minnesota Unique Well No.

704151

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date
Update 12/07/2004
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
ST. MARY'S	50	14	W	27	AABADD	elevator	A	24 ft.	24 ft.	11/09/2004	L0008

Elevation 687 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 0 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Plat Book
Geological Interpretation Agency (Interpretation) Amy Block

Locate Method Digitization (Screen) - Map (1:12,000) (>15
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 569253
UTM Northing (Y) 518248
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
GRANITE	GRAY	V.HARD	0	24	24	687	663	upper southwest volc	basalt		

Minnesota Unique Well No.

704152

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date
Update 12/07/2004
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
ST. MARY'S	50	14	W	27	AABDCB	elevator	A	42 ft.	42 ft.	11/10/2004	L0008

Elevation 684 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 0 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Plat Book
Geological Interpretation Agency (Interpretation) Amy Block

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 569180
UTM Northing (Y) 518240
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
GRANITE	GRAY	V.HARD	0	42	42	684	642	upper southwest volc	basalt		

Minnesota Unique Well No.

704162

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date
Update 04/28/2005
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
VP DEVELOPMENT	50	14	W	22	DCAADA	elevator	A	50 ft.	50 ft.	04/22/2005	L0008

Elevation 821 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 5 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 569012
UTM Northing (Y) 518289
Interpretaion Method Geologic study 1:24k to 1:100k

			Depth (ft.)			Elevation (ft.)					
Geological Material	**Color**	**Hardness**	**From**	**To**	**Thickness**	**From**	**To**	**Stratigraphy**	**Primary Lithology**	**Secondary**	**Minor Lithology**
SANDY CLAY	BROWN	SOFT	0	5	5	821	816	clay+sand-brown	clay	sand	
GRANITE	GRAY	HARD	5	50	45	816	771	upper southwest volc	basalt		

Minnesota Well Index - Stratigraphy Report **704162** Printed on 09/30/2025

Minnesota Unique Well No.

739032

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date
Update 04/11/2006
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
CITY OF DULUTH	50	14	W	27	AACBCD	elevator	A	54 ft.	54 ft.	03/23/2006	L0008

Elevation 663 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 0 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Amy Block
Agency (Interpretation)

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 569073
UTM Northing (Y) 518226
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
GRANITE	RED/BLK	HARD	0	54	54	663	609	upper southwest volc	basalt	basaltic andesite	

Minnesota Unique Well No.

739033

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Entry Date 08/03/2006
Update 04/11/2006
Received Date 12/05/2019

Well Name	Township	Range	Dir	Section	Subsection	Use	Status	Well Depth	Depth Completed	Date Well Completed	Lic/Reg. No.
CITY OF DULUTH	50	14	W	27	AACBDC	elevator	A	60 ft.	60 ft.	03/23/2006	L0008

Elevation 662 ft. **Elev. Method** LiDAR 1m DEM (MNDNR) **Aquifer** **Depth to Bedrock** 0 ft **Open Hole** - ft **Static Water Level** ft

Field Located By County Planning & Zoning
Unique No. Verified Address verification
Geological Interpretation Agency (Interpretation) Amy Block

Locate Method GPS SA Off (averaged) (15 meters)
Input Source Minnesota Geological Survey
Input Date 04/06/2018

Universal Transverse Mercator (UTM) - NAD83 - Zone 15 -
UTM Easting (X) 569091
UTM Northing (Y) 518227
Interpretaion Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	Depth (ft.) From	Depth (ft.) To	Thickness	Elevation (ft.) From	Elevation (ft.) To	Stratigraphy	Primary Lithology	Secondary	Minor Lithology
GRANITE	RED/BLK	HARD	0	60	60	662	602	upper southwest volc	basalt	basaltic andesite	

Minnesota Unique Well Number

533481

County St. Louis
Quad
Quad ID

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 04/01/2013
Update Date 02/09/2018
Received Date 10/23/2008

Well Name	Township	Range	Dir	Section	Subsection
ANDA	50	14	W	22	DDD

Elevation **Elev. Method**

Address

Well 730 2ND ST E DULUTH MN

Stratigraphy Information

Remarks

ORIGINAL USE: ELEVATOR SHAFT.

ORIGINAL UNIQUE NO. FROM JULY 1994 WAS 533481. MDH SHOWS CANCELLED.

Well Depth	Depth Completed	Date Well Completed
7.5 ft.	7.5 ft.	07/00/1994

Drill Method **Drill Fluid**

Use elevator **Status** Sealed

Well Hydrofractured? **Yes** ☐ **No** ☐ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? **Yes** ☐ **No** ☐ **Above/Below**

Casing Diameter		Weight	
20	in. To 7.5	ft.	lbs./ft.

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

3 ft. land surface Measure 10/12/2006

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount		From	To
neat cement	12	Sacks	ft. 7.5	ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock Aquifer

Last Strat Depth to Bedrock ft

Located by

Locate Method

System UTM - NAD83, Zone 15, Meters X Y

Unique Number Verification Input Date

Angled Drill Hole

Well Contractor

Dennys Drilling, Inc.	1779	KOEPP, D.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

669262

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING REPORT
Minnesota Statutes Chapter 1031

Entry Date 12/13/2001
Update Date 02/26/2019
Received Date 10/16/2001

Well Name	Township	Range	Dir	Section	Subsection
MW-3	50	14	W	22	DDBCDB

Elevation 789 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 602 4TH ST E DULUTH MN 55805
Contact 4997 MILLER TRUNK HY HERMANTOWN MN 55811

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SANDY CLAY	0	8	BROWN	MEDIUM
CLAY	8	12	BROWN	HARD

Remarks
SEALED 05-19-2008 BY 1767.

Well Depth	Depth Completed	Date Well Completed
12 ft.	12 ft.	09/24/2001

Drill Method Auger (non-specified) **Drill Fluid**

Use monitor well **Status** Sealed

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
2 in. To 3 ft.	lbs./ft.	8 in. To 12 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** plastic **Make** JOHNSON (SCH 40)

Diameter	Slot/Gauze	Length	Set
2 in.	10	9 ft.	3 ft. 12 ft.

Static Water Level

Pumping Level (below land surface)

Wellhead Completion
Pitless adapter manufacturer Model
☐ Casing Protection ☐ 12 in. above grade
☒ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
high solids bentonite	1 Sacks	0 ft.	3 ft.

Nearest Known Source of Contamination
feet Direction Type
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☒ Not Installed Date Installed
Manufacturer's name
Model Number HP Volt
Length of drop pipe ft Capacity g.p. Typ

Abandoned
Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance
Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous
First Bedrock Aquifer Quat. Water
Last Strat clay-brown Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)
System UTM - NAD83, Zone 15, Meters X 569094 Y 5182808
Unique Number Verification Site Plan Input Date 03/17/2016

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Bergerson-Caswell	27058	LENZMEIER, D.

Minnesota Unique Well Number

669263

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 12/13/2001
Update Date 02/26/2019
Received Date 10/16/2001

Well Name	Township	Range	Dir	Section	Subsection
MW-1	50	14	W	22	DDBCBD

Elevation 793 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 602 4TH ST E DULUTH MN 55805
Contact 4997 MILLER TRUNK HY HERMANTOWN MN 55811

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
CLAY	0	12	BROWN	MEDIUM

Remarks

SEALED 05-19-2008 BY 1767.

Well Depth	Depth Completed	Date Well Completed
12 ft.	12 ft.	09/24/2001

Drill Method Auger (non-specified) **Drill Fluid**

Use monitor well **Status** Sealed

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☐ **Above/Below**

Casing Diameter		Weight
2	in. To 3 ft.	lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** plastic **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
2 in.	10	9 ft.	3 ft.	12 ft.

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☒ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
high solids bentonite	1 Sacks	0 ft.	3 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock Aquifer Quat. Water
Last Strat clay-brown Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)
System UTM - NAD83, Zone 15, Meters X 569076 Y 5182825
Unique Number Verification Site Plan Input Date 03/17/2016

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Bergerson-Caswell	27058	LENZMEIER, D.

Minnesota Unique Well Number

669264

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 12/13/2001
Update Date 02/26/2019
Received Date 10/16/2001

Well Name	Township	Range	Dir	Section	Subsection
MW-2	50	14	W	22	DDBCAC

Elevation 772 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 602 4TH ST E DULUTH MN 55805
Contact 4997 MILLER TRUNK HY HERMANTOWN MN 55811

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SAND	0	5	BROWN	MEDIUM
BROWN CLAY	5	12	BROWN	HARD

Remarks

SEALED 05-19-2008 BY 1767.

Well Depth	Depth Completed	Date Well Completed
12 ft.	12 ft.	09/24/2001

Drill Method Auger (non-specified) **Drill Fluid**

Use monitor well **Status** Sealed

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☐ **Above/Below**

Casing Diameter		Weight
2	in. To 3 ft.	lbs./ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** plastic **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set	
2 in.	10	9 ft.	3 ft.	12 ft.

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☒ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
high solids bentonite	1 Sacks	0 ft.	3 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock Aquifer Quat. Water
Last Strat clay-brown Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)
System UTM - NAD83, Zone 15, Meters X 569088 Y 5182825
Unique Number Verification Site Plan Input Date 03/17/2016

Angled Drill Hole

Well Contractor

Licensee Business	Lic. or Reg. No.	Name of Driller
Bergerson-Caswell	27058	LENZMEIER, D.

Minnesota Unique Well Number

698994

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH
WELL AND BORING REPORT
Minnesota Statutes Chapter 1031

Entry Date
Update Date 03/09/2017
Received Date 03/18/2004

Well Name	Township	Range	Dir	Section	Subsection
MW-5	50	14	W	22	DDBDBA

Elevation 764 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 407 3RD ST E DULUTH MN 55805

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SANDY CLAY	0	4	RED/BRN	HARD
SANDY CLAY WOOD	4	8	RED/BRN	HARD
WET SANDY CLAY	8	11	RED/BRN	HARD

Remarks

GEOLOGICAL MATERIALS: WET SANDY CLAY WOOD FROM 8 TO 10.5.
SEALED 05-19-2008 BY 1767.

Well Depth	Depth Completed	Date Well Completed
10.5 ft.	10.5 ft.	02/10/2004

Drill Method Auger (non-specified) **Drill Fluid**

Use monitor well **Status** Sealed

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint**
Drive Shoe? Yes ☐ No ☒ **Above/Below**

Casing Diameter	Weight	Hole Diameter
2 in. To 5.5 ft.	0 lbs./ft.	8 in. To 0 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** plastic **Make** JOHNSON

Diameter	Slot/Gauze	Length	Set
2 in.	10	5 ft.	5.5 ft. 10.5 ft.

Static Water Level

9 ft. land surface Measure 02/10/2004

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☒ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
bentonite	0.5 Sacks	3.5 ft.	4.5 ft.
neat cement	2 Sacks	ft.	3.5 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☒ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☒ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock Aquifer Quat. Water
Last Strat clay+sand Depth to Bedrock ft
Located by Minnesota Geological Survey
Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)
System UTM - NAD83, Zone 15, Meters X 569161 Y 5182848
Unique Number Verification Site Plan Input Date 03/17/2016

Angled Drill Hole

Well Contractor

Thein Well Co.	34625	HILBRANDS, B.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

704151

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date
Update Date 12/05/2019
Received Date 12/07/2004

Well Name	Township	Range	Dir	Section	Subsection
ST. MARY'S	50	14	W	27	AABADD

Elevation 687 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 402 1ST ST E DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
GRANITE	0	24	GRAY	V.HARD

Remarks

BROKEN ROCK FROM 19 TO 21 FT, BACK INTO SOLID.

Well Depth	Depth Completed	Date Well Completed
24 ft.	24 ft.	11/09/2004

Drill Method Non-specified Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Step down **Joint** Welded
Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter			Weight	
16	in. To	24 ft.	62.6	lbs./ft.
20	in. To	1 ft.	52.7	lbs./ft.

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	18 Sacks	ft.	24 ft.

Nearest Known Source of Contamination

0 feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 0 ft
Located by Minnesota Geological Survey
Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)
System UTM - NAD83, Zone 15, Meters X 569253 Y 5182485
Unique Number Verification Plat Book Input Date 04/06/2018

Angled Drill Hole

Well Contractor

United Drilling, Inc. L0008 SCHERER, B.
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

704152

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date
Update Date 12/05/2019
Received Date 12/07/2004

Well Name	Township	Range	Dir	Section	Subsection
ST. MARY'S	50	14	W	27	AABDCB

Elevation 684 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 402 1ST ST E DULUTH MN 55802

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
GRANITE	0	42	GRAY	V.HARD

Remarks

BROKEN ROCK FROM 19 TO 21 FT, BACK INTO SOLID.

Well Depth	Depth Completed	Date Well Completed
42 ft.	42 ft.	11/10/2004

Drill Method Air Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Step down **Joint** Welded
Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter		Weight	
16 in. To	42 ft.	62.6	lbs./ft.
20 in. To	1 ft.	52.7	lbs./ft.

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	2 Sacks	ft. 42	ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☐ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 0 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 569180 Y 5182404
Unique Number Verification Plat Book Input Date 04/06/2018

Angled Drill Hole

Well Contractor

United Drilling, Inc.	L0008	SCHERER, B.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

704162

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date
Update Date 12/05/2019
Received Date 04/28/2005

Well Name	Township	Range	Dir	Section	Subsection
VP	50	14	W	22	DCAADA

Elevation 821 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 602 5TH ST E DULUTH MN 55805

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
SANDY CLAY	0	5	BROWN	SOFT
GRANITE	5	50	GRAY	HARD

Remarks

DRY HOLE.

Well Depth	Depth Completed	Date Well Completed
50 ft.	50 ft.	04/22/2005

Drill Method Non-specified Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Step down **Joint** Welded
Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter			Weight	
16	in. To	50 ft.	62.6	lbs./ft.
20	in. To	5 ft.	52.7	lbs./ft.

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount		From	To
neat cement	4	Cubic yards	ft.	50 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 5 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 569012 Y 5182896
Unique Number Verification Address verification Input Date 04/06/2018

Angled Drill Hole

Well Contractor

United Drilling, Inc. L0008 GRABER, K.
Licensee Business Lic. or Reg. No. Name of Driller

Minnesota Unique Well Number

739032

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date
Update Date 12/05/2019
Received Date 04/11/2006

Well Name	Township	Range	Dir	Section	Subsection
CITY OF	50	14	W	27	AACBCD

Elevation 663 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 302 1ST ST E DULUTH MN 55805

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
GRANITE	0	54	RED/BLK	HARD

Remarks

NO DRILL CASING.

Well Depth	Depth Completed	Date Well Completed
54 ft.	54 ft.	03/23/2006

Drill Method Non-specified Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint** Welded
Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
18 in. To 54 ft.	70.6 lbs./ft.	24 in. To 54 ft.

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	3 Cubic yards	ft.	54 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 0 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 569073 Y 5182268
Unique Number Verification Address verification Input Date 04/06/2018

Angled Drill Hole

Well Contractor

United Drilling, Inc.	L0008	LANGSDORF, A.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

739033

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 08/03/2006
Update Date 12/05/2019
Received Date 04/11/2006

Well Name	Township	Range	Dir	Section	Subsection
CITY OF	50	14	W	27	AACBDC

Elevation 662 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 302 1ST ST E DULUTH MN 55805

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
GRANITE	0	60	RED/BLK	HARD

Remarks

NO DRILL CASING.

Well Depth	Depth Completed	Date Well Completed
60 ft.	60 ft.	03/23/2006

Drill Method Non-specified Rotary **Drill Fluid**

Use elevator **Status** Active

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint** Welded
Drive Shoe? Yes ☒ No ☐ **Above/Below**

Casing Diameter	Weight	Hole Diameter
18 in. To 60 ft.	70.6 lbs./ft.	24 in. To 60 ft.

Open Hole From ft. To ft.

Screen? ☐ **Type** **Make**

Static Water Level

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade
☐ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☒ Yes ☐ No ☐ Not Specified

Material	Amount	From	To
neat cement	3.25 Cubic yards	ft.	60 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock upper southwest volc Aquifer
Last Strat upper southwest volc Depth to Bedrock 0 ft
Located by Minnesota Geological Survey
Locate Method GPS SA Off (averaged) (15 meters)
System UTM - NAD83, Zone 15, Meters X 569091 Y 5182277
Unique Number Verification Address verification Input Date 04/06/2018

Angled Drill Hole

Well Contractor

United Drilling, Inc.	L0008	LANGSDORF, A.
Licensee Business	Lic. or Reg. No.	Name of Driller

Minnesota Unique Well Number

758411

County St. Louis
Quad Duluth
Quad ID 244D

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING REPORT

Minnesota Statutes Chapter 1031

Entry Date 02/26/2013
Update Date 02/26/2019
Received Date 10/17/2008

Well Name	Township	Range	Dir	Section	Subsection
MW	50	14	W	22	DDBCBA

Elevation 794 ft. **Elev. Method** LiDAR 1m DEM (MNDNR)

Address

Well 601 4TH ST E DULUTH MN 55805

Stratigraphy Information

Geological Material	From	To (ft.)	Color	Hardness
FILL	0	1	BLACK	SOFT
CLAY	1	2	BROWN	SOFT
NO DATA	2	3		
SAND	3	9	BROWN	SOFT

Remarks

SEALED 9-26-2008 BY 1635.

Well Depth 9 ft. **Depth Completed** 9 ft. **Date Well Completed** 11/21/2007

Drill Method Auger (non-specified) **Drill Fluid**

Use monitor well **Status** Sealed

Well Hydrofractured? Yes ☐ No ☒ **From** **To**

Casing Type Single casing **Joint**

Drive Shoe? Yes ☐ No ☒ **Above/Below**

Casing Diameter	Weight	Hole Diameter
2 in. To 4 ft.	lbs./ft.	8.5 in. To 9 ft.

Open Hole From ft. To ft.

Screen? ☒ **Type** plastic **Make** ECT

Diameter	Slot/Gauze	Length	Set
2 in.	10	5 ft.	4 ft. 9 ft.

Static Water Level

6 ft. land surface Measure 11/21/2007

Pumping Level (below land surface)

Wellhead Completion

Pitless adapter manufacturer Model

☐ Casing Protection ☐ 12 in. above grade

☒ At-grade (Environmental Wells and Borings ONLY)

Grouting Information Well Grouted? ☐ Yes ☐ No ☒ Not Specified

Material	Amount	From	To
bentonite		1 ft.	3 ft.

Nearest Known Source of Contamination

feet Direction Type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☒ Not Installed Date Installed

Manufacturer's name

Model Number HP Volt

Length of drop pipe ft Capacity g.p. Typ

Abandoned

Does property have any not in use and not sealed well(s)? ☐ Yes ☐ No

Variance

Was a variance granted from the MDH for this well? ☐ Yes ☒ No

Miscellaneous

First Bedrock Aquifer Quat. Water

Last Strat sand-brown Depth to Bedrock ft

Located by Minnesota Geological Survey

Locate Method Digitization (Screen) - Map (1:12,000) (>15 meters)

System UTM - NAD83, Zone 15, Meters X 569074 Y 5182857

Unique Number Verification Site Plan Input Date 03/17/2016

Angled Drill Hole

Well Contractor

Northeast Technical 1635 SECABA, S.

Licensee Business Lic. or Reg. No. Name of Driller

Appendix F

List of MPCA WIMN Sites within the AUAR area

MPCA Potentially Contaminated Sites within One-Quarter Mile of the AUAR area

Site ID	Site Name	MPCA Program	Status
Lot D Subarea			
205357	Bayfront Lot D	• Brownfields (5)	Active
192538	SLIP 3	• Environmental Review	Active
Essentia Subarea			
215131	Hacienda Del Sol	• Brownfields	Inactive
146463	E 1st St Medical Parking Facility	• Petroleum Remediation • Underground Tanks	Inactive
16441	Northland Chiropractic Center	• Hazardous Waste	Inactive
23329	Lake Superior Cust Photolab Inc	• Hazardous Waste	Inactive
109460	Voyageur Motel/lakewalk Inn	• Brownfields • Petroleum Remediation • Underground Tanks	Inactive
26385	State Farm Mutual Insurance	• Hazardous Waste	Inactive
56856	Northern Access Transportation	• Hazardous Waste	Inactive
112895	Grandview Manor	• Underground Tanks	Inactive
14444	Harbor Centers Inc	• Hazardous Waste	Inactive
23708	A Quality Lube Center	• Aboveground Tanks • Hazardous Waste	Inactive
27688	Dunbar's Auto Body	• Hazardous Waste	Inactive
1998	Rainbow Auto Body Inc	• Air Quality • Hazardous Waste	Inactive
191217	SMDC Campus Addition	• Brownfields • Site Assessment	Inactive
24501	Saint Anns Home & Residence	• Hazardous Waste	Inactive
256441	Essentia Health-Duluth	• Hazardous Waste	Inactive
109580	Miller Dwan Medical Center	• Aboveground Tanks • Underground Tanks	Inactive
213953	Essentia Health Duluth 1st Street Pharmacy	• Hazardous Waste	Inactive
27262	Kaarbo's Auto Repair Inc	• Aboveground Tanks • Hazardous Waste	Inactive
23379	Joes Peerless Auto Body	• Hazardous Waste • Underground Tanks	Inactive
23078	Essentia Health Duluth 3rd Street Pharmacy	• Hazardous Waste	Inactive
24220	Miller Dwan Medical Center	• Hazardous Waste	Inactive
1668	Saint Mary's Medical Center	• Air Quality • Hazardous Waste • Site Assessment • Solid Waste	Inactive
231339	Life Link III-Duluth Base	• Hazardous Waste	Inactive
256068	Essentia Health Duluth 2nd Street Pharmacy	• Hazardous Waste	Inactive
11766	Twice But Nice	• Hazardous Waste	Inactive

Site ID	Site Name	MPCA Program	Status
130013	Former American Linen Building	• Underground Tanks	Inactive
25057	Downtown Service Skafte Ent	• Hazardous Waste	Inactive
28557	Chart & Mohs Dentistry PA	• Hazardous Waste	Inactive
23552	Expert Tire - Duluth	• Hazardous Waste	Inactive
16411	Polinsky Medical Rehabilitation Center	• Hazardous Waste	Inactive
138625	Support Services Building	• Aboveground Tanks • Petroleum Remediation • Underground Tanks	Inactive
27239	Johnson-Crawford Funeral Home	• Hazardous Waste	Inactive
108459	Saint Mary's Medical Center	• Aboveground Tanks	Inactive
103482	Saint Mary's Medical Center	• Petroleum Remediation • Underground Tanks	Inactive
255572	Essentia Health	• Aboveground Tanks	Inactive
26883	Fifield Portrait Design	• Hazardous Waste	Inactive
12974	Midtown Auto Service	• Hazardous Waste	Inactive
28971	Daugherty Hardware & Appliances	• Hazardous Waste	Inactive
195306	Na Auto Electric	• Petroleum Remediation	Inactive
262656	Lead Water Service Replacement	• Construction Stormwater	Active
250020	Aspirus St. Luke's Behavioral Health Clinic - Duluth	• Hazardous Waste	Inactive
185387	Bell Building	• Petroleum Remediation	Inactive
28347	Auto Medics	• Hazardous Waste	Inactive
112719	Speedway #4896	• Petroleum Remediation • Underground Tanks	Inactive
116710	Spur Station #4885	• Petroleum Remediation • Underground Tanks	Inactive
139137	Whole Foods Coop	• Hazardous Waste	Inactive
151403	Involta Duluth 6th Ave	• Aboveground Tanks	Inactive
28346	Brewery Creek Apartments LLLP	• Aboveground Tanks • Brownfields • Hazardous Waste • Petroleum Remediation • Solid Waste • Underground Tanks	Inactive
25670	Holiday Stationstore 089	• Hazardous Waste	Inactive
113616	Holiday Stationstore #89	• Petroleum Remediation • Underground Tanks	Inactive
252811	Portland Land Co LLC	• Solid Waste	Inactive
188473	Sixth & Sixth Ico	• Petroleum Remediation	Active
107411	Central Hillside ICO	• Petroleum Remediation • Underground Tanks	Active
1st Street Subarea			
262165	Mesaba Ave Bridge/Filling Station	• Petroleum Remediation	Active
27709	Lenox Place	Brownfields (2) • Hazardous Waste	Inactive

Site ID	Site Name	MPCA Program	Status
27338	Gateway Tower	• Brownfields (2) • Hazardous Waste	Inactive
29931	The Depot	• Hazardous Waste	Inactive
36708	Northshore Scenic Railroad	• Hazardous Waste	Inactive
48746	Duluth Art Institute	• Hazardous Waste	Active
36709	Saint Louis County Heritage & Arts Center	• Hazardous Waste • Wastewater	Inactive
126787	Radisson Hotel	• Aboveground Tanks • Petroleum Remediation • Underground Tanks	Active
23087	Duluth Fire Department	• Aboveground Tanks • Hazardous Waste • Petroleum Remediation • Underground Tanks	Active
24350	Wahl & Wahl Inc	• Hazardous Waste	Inactive
15229	Otis Elevator	• Hazardous Waste	Inactive
24173	USDA NRCS	• Hazardous Waste	Active
130106	Atlas Abatement & Contracting LLC - Duluth	• Hazardous Waste	Active
138143	Gerald W Heaney Federal Building	• Hazardous Waste	Active
29460	425 Development	• Hazardous Waste	Active
213324	Lake Superior Consulting - Landsmenn Building	• Hazardous Waste	Active
24968	Lutheran Social Service	• Hazardous Waste	Inactive
146341	Maurices Headquarters	• Brownfields	Active
48153	ISD 709 DNT Building	• Hazardous Waste • Industrial Stormwater • Site Assessment	Active
41391	Saint Louis County Safety & Risk	• Hazardous Waste	Inactive
192083	Medical Arts Annex	• Petroleum Remediation	Active
214476	Genoa Healthcare	• Hazardous Waste	Active
27119	Stewart Taylor Company	• Hazardous Waste	Inactive
27365	Midwest Podiatry Centers - Duluth	• Hazardous Waste	Active
36878	Aspirus St. Luke's Eye Care - Duluth	• Hazardous Waste	Inactive
15189	Bluestone OMS	• Hazardous Waste	Active
112404	Medical Arts Garage	• Aboveground Tanks • Petroleum Remediation • Underground Tanks	Active
48154	Ray Bob & Associates Inc	• Hazardous Waste	Inactive
130015	Duluth Budgeteer	• Industrial Stormwater	Active
30253	Michael Bussa DDS	• Hazardous Waste	Active
127531	Downtown Dental Care of Duluth	• Hazardous Waste	Active
14420	PS Rudie Medical Clinic - Suite 302	• Hazardous Waste	Inactive
26984	Robert D Le Vasseur DDS	• Hazardous Waste	Inactive
34050	Steven D Johnson DDS	• Hazardous Waste	Active

Site ID	Site Name	MPCA Program	Status
23092	The Dental Specialists Duluth	• Hazardous Waste	Active
15790	William J Schuldt DDS PA	• Hazardous Waste	Active
36877	Wolf Frank MD	• Hazardous Waste	Inactive
63890	Duluth News Tribune	• Industrial Stormwater • Petroleum Remediation • Underground Tanks	Active
15797	Secretarial Services	• Hazardous Waste	Inactive
23071	Duluth Camera Exchange 1	• Hazardous Waste	Inactive
23070	Duluth Camera Exchange	• Hazardous Waste	Inactive
92737	Duluth City of	• Hazardous Waste	Active
90804	Duluth city of	• MS4 • Wastewater	Active
11923	Oneida Realty Co	• Hazardous Waste	Active
77278	Sandelin Rodney E DDS	• Hazardous Waste	Inactive
36876	Sarvela Leonard A DDS	• Hazardous Waste	Inactive
14527	First Properties	• Hazardous Waste	Inactive
227684	Oneida Realty	• Hazardous Waste	Active
25112	Madison Nelson Family Dental	• Hazardous Waste	Active
84132	Douglas M Erickson DDS MS Inc	• Hazardous Waste	Active
120009	Saint Luke's Medical Arts Clinic	• Hazardous Waste	Active
15799	Security Jewelers	• Hazardous Waste	Active
26929	Patterson Family Dental	• Hazardous Waste	Active
26798	Young Allen A DDS	• Hazardous Waste	Inactive
16430	Northern Oral & Maxillofacial Surgeons	• Hazardous Waste	Inactive
23641	Eugene T Altiere DDS MS	• Hazardous Waste	Active
26982	Layon Roger E DDS	• Hazardous Waste	Inactive
27242	Johnson William O DDS	• Hazardous Waste	Inactive
26081	J Marco Hearing Service	• Hazardous Waste	Inactive
12093	Medical Arts Orthodontic Lab	• Hazardous Waste	Inactive
13489	Northern Prosthodontics	• Hazardous Waste	Inactive
15699	Northern Endodontics Associates Ltd	• Hazardous Waste	Inactive
26973	Park Dental Downtown Duluth	• Hazardous Waste	Active
27339	Wayne C Gatlin DDS	• Hazardous Waste	Active
195971	City Hall And Police Garage	• Petroleum Remediation	Active
15920	Jewelers Bench	• Hazardous Waste	Active
1411	Qwest Corp dba CenturyLink QC - Duluth	• Aboveground Tanks • Air Quality • Hazardous Waste	Active
193953	DTA Multimodal Transportation Center	• Brownfields (2)	Active
25324	Toys For Keeps	• Hazardous Waste	Inactive
115683	At&t Building	• Underground Tanks	Active

Site ID	Site Name	MPCA Program	Status
11750	Shoreline Dental Associates Downtown	• Hazardous Waste	Inactive
12598	Reporters Diversified Service	• Hazardous Waste	Inactive
24355	Third Avenue Dental Clinic	• Hazardous Waste	Inactive
263989	The Herald Building	• Brownfields (2)	Active
27331	Garrett Hr	• Hazardous Waste	Inactive
136434	Saint Louis County Public Health	• Hazardous Waste	Active
50279	Lake Superior Painting	• Hazardous Waste	Inactive
28062	Telespectrum Communications	• Hazardous Waste	Inactive
126881	Nalco Co - Duluth	• Hazardous Waste	Inactive
137356	Innovative Living Inc	• Hazardous Waste	Active
141335	Duluth Area Family YMCA	• Hazardous Waste	Active
23372	Jiran D H Design Inc	• Hazardous Waste	Inactive
28985	Decora Painting & Wallcovering	• Hazardous Waste	Inactive
14421	Psycholgist	• Hazardous Waste	Inactive
41360	MSA Professional Services	• Hazardous Waste	Inactive
22949	Hawley Music Inc	• Brownfields • Hazardous Waste	Inactive
121266	Duluth Budgeteer News	• Hazardous Waste	Inactive
236319	Duluth Board of Trade Lofts	• Hazardous Waste	Active
31092	D T A Transit Center	• Hazardous Waste	Inactive
16130	Former Peter Pan Cleaners	• Brownfields • Emergency Response • Hazardous Waste • Site Assessment	Active
104687	Ace Hardware Downtown	• Hazardous Waste	Active
38999	Arrowhead Printing	• Hazardous Waste	Inactive
26387	State Labor & Industry Dept	• Hazardous Waste	Inactive
43753	Oneida Realty Co - Duluth	• Aboveground Tanks • Hazardous Waste • Underground Tanks	Active
41035	St. Louis County GSC	• Hazardous Waste	Inactive
196201	NorShor Theatre	• Brownfields • Hazardous Waste	Active
222711	Board of Trade Building	• Brownfields	Active
217457	Saint Louis County GSC	• Hazardous Waste	Active
26574	Advantage Hearing Center	• Hazardous Waste	Inactive
25872	Whitefish Mfg Co	• Hazardous Waste	Inactive
122248	Twi Port Mailing	• Hazardous Waste	Inactive
2298	Great Lakes Gas Transmission LP	• Wastewater	Active
27240	Johnson Supply Co	• Hazardous Waste	Active
148087	Saint Louis County Public Works Garage	• Aboveground Tanks	Active

Site ID	Site Name	MPCA Program	Status
27712	Leones Tailors Cleaners Shop	• Brownfields • Hazardous Waste	Inactive
28079	Skywalk Chiropractic	• Hazardous Waste	Inactive
15028	Sawmill Unpainted Furniture	• Hazardous Waste	Inactive
112830	Us Bank	• Underground Tanks	Inactive
27118	Stewart Taylor Co	• Hazardous Waste	Active
23377	JNT Printery Co Inc	• Hazardous Waste	Inactive
217678	Duluth Board of Trade Building Parking Lot	• Brownfields	Active
131776	Sheldon Group Inc Pressroom	• Hazardous Waste	Active
22932	Duluth Auto Repair & Quick Lube	• Aboveground Tanks • Hazardous Waste • Petroleum Remediation • Underground Tanks	Inactive
28086	US Bank - Duluth	• Hazardous Waste	Active
195708	Parking Lot	• Petroleum Remediation	Active
116075	Como Quick Lube - City Center	• Underground Tanks	Inactive
126181	Cooper Enterprises	• Hazardous Waste	Inactive
194992	Superior Street Reconstruction Corridor	• Brownfields (2)	Inactive
13497	Planned Parenthood - Duluth	• Hazardous Waste	Inactive
30167	Etcetera Studio & Gallery	• Hazardous Waste	Inactive
22985	Gopher Shoe Repair Co Inc	• Hazardous Waste	Inactive
15936	Wilson Environmental Laboratories Inc	• Hazardous Waste	Inactive
22619	Arrowhead Security Systems Inc	• Hazardous Waste	Inactive
27932	Courage Center	• Hazardous Waste	Inactive
14275	Printing Express The	• Hazardous Waste	Inactive
136470	American Indian Community Housing Organization	• Hazardous Waste • Petroleum Remediation • Underground Tanks	Inactive
16106	Paper Hog Inc	• Hazardous Waste	Active
86818	New Garrick Building	• Hazardous Waste	Active
138141	Advanstar	• Hazardous Waste	Active
262206	Children's Dental Services	• Hazardous Waste	Active
15935	Insty Prints Litho Printing	• Hazardous Waste	Inactive
26967	Us Dea	• Hazardous Waste	Inactive
42462	Earth Burners Inc	• Hazardous Waste	Inactive
15918	Jersey City	• Hazardous Waste	Inactive
2419	Minnesota Power Inc- General Office	• Hazardous Waste • Site Assessment • Wastewater	Active
256891	Human Development Center	• Petroleum Remediation • Site Assessment	Active
220769	PETSMART 2735	• Hazardous Waste	Active

Site ID	Site Name	MPCA Program	Status
136443	Aspirus St. Luke's Clinic - Duluth - 26 E Superior St	• Hazardous Waste	Active
30166	Eslabon Designer Jewelry	• Hazardous Waste	Inactive
106090	Women In Construction Co LLC	• Hazardous Waste • Petroleum Remediation • Site Assessment	Inactive
29950	Commercial Electric Company	• Hazardous Waste	Inactive
190601	Lakehead Pipe Line Company	• Petroleum Remediation	Active
26068	Southwest Windpower	• Hazardous Waste	Inactive
26029	Masters Piano Shop The	• Hazardous Waste	Inactive
25652	Carters Spring	• Hazardous Waste	Inactive
14524	Music Center	• Hazardous Waste	Inactive
27097	Johns Used Furniture	• Hazardous Waste	Inactive
133844	EMR Inc	• Hazardous Waste	Active
215167	Lewis Lake Avenue Building	• Brownfields	Active
27961	Carlton & Co	• Hazardous Waste	Inactive
206926	The Scottish Rite Foundation	• Petroleum Remediation	Active
150005	Former Service Station	• Underground Tanks	Active
156532	Scottish Rite Clinic	• Hazardous Waste	Active
220319	Enbridge Energy Line 3 Replacement Project	• Integrated Remediation • Wastewater	Inactive
128234	Jes Durfee Glass Art	• Hazardous Waste	Active
236478	Enbridge Energy LP - Former Brunos Truck Stop	• Wastewater	Active
27183	Fuhr Printing Co Inc	• Hazardous Waste	Inactive
27954	Carlson & Kirwan Inc	• Hazardous Waste	Inactive
39377	Duluth Soft Center	• Hazardous Waste • Underground Tanks	Inactive
59305	WE Health Clinic	• Hazardous Waste	Active
235179	Cove Apartments	• Hazardous Waste	Active
253737	North Creek Investors II LLC	• Solid Waste	Active
27138	Superior Computer Prod Inc	• Hazardous Waste	Inactive
232599	Proposed 1st Aveue Lofts	• Brownfields	Active
15697	Northern Electric Supply C	• Hazardous Waste	Inactive
196011	Duluth Technology Village - City Block	• Petroleum Remediation	Active
215451	Former Muffler Clinic	• Brownfields • Petroleum Remediation	Active
116012	Teachers Credit Union	• Petroleum Remediation • Underground Tanks	Inactive
26558	Johnson's Auto Repair of Duluth	• Hazardous Waste	Inactive
26393	Den's AutoBody	• Hazardous Waste	Active
39981	Automotive Maintenance & Repair	• Hazardous Waste	Inactive
28366	Balcum Appliance Inc	• Hazardous Waste	Inactive
22931	Duluth Auto Body	• Hazardous Waste	Inactive

Site ID	Site Name	MPCA Program	Status
24198	Viking Micrographics	• Hazardous Waste	Inactive
23341	Tv Spotlight Inc	• Hazardous Waste	Inactive
25868	Whirlwind Power Co	• Hazardous Waste	Inactive
228788	Former Carter Hotel	• Underground Tanks	Active
22626	Winslow's Inc	• Hazardous Waste	Inactive
222216	Temple Opera Block	• Brownfields	Active
232507	Zeitgiest Building - Superior St Utlty Reconstruction Proj	• Underground Tanks	Active
197506	Former Ncr	• Brownfields • Site Assessment	Active
2509	Gene's Auto Body	• Air Quality • Hazardous Waste	Active
23711	A1 Auto Body	• Hazardous Waste	Inactive
1318	202 E 1st LLC	• Air Quality • Hazardous Waste	Active
64827	SMDC	• Hazardous Waste	Inactive
29292	Clean As New Auto Cleaning	• Hazardous Waste	Inactive
24721	Greysolon Plaza Property	• Brownfields (2) • Hazardous Waste • Petroleum Remediation • Underground Tanks	Active
16117	Paul Bunyan Press	• Hazardous Waste	Inactive
24529	Arrowhead Hearing Aid Cente	• Hazardous Waste	Inactive
186951	Sheraton Hotel/Condominiums	• Brownfields	Active
193848	Greysolon Plaza Parking Lot	• Brownfields • Site Assessment	Active
26455	HealthEast Transportation	• Aboveground Tanks • Hazardous Waste	Active
26400	Housing & Redevelopment Authority Duluth	• Hazardous Waste	Active
112193	King Manor	• Underground Tanks	Inactive
Secondary Subarea			
194260	Duluth Gas Mfg Site	• CERCLIS Site	Active
196404	JAS Duluth LLC Property	• Petroleum Remediation • Underground Tanks	Active
193704	Apartment Complex	• Petroleum Remediation	Active
127456	Sir Benedicts Tavern On The Lake	• Underground Tanks	Inactive
114321	Formerly Service Station	• Underground Tanks	Inactive
34697	Wick Marvin G Dental Office	• Hazardous Waste	Inactive
108514	Pat Schelhom Property-apt Comp	• Underground Tanks	Inactive
195630	Shehon Property	• Petroleum Remediation	Active
24518	C & H Automotive Service	• Hazardous Waste	Inactive
108525	Louis Pichetti Est (henlock Gar)	• Petroleum Remediation • Site Assessment • Underground Tanks	Inactive

Site ID	Site Name	MPCA Program	Status
27341	General Cleaning Specialists	• Hazardous Waste	Inactive
27651	Fochs & Associates Inc Adve	• Hazardous Waste	Inactive
201505	Northland Medical Center South Lmtd	• Petroleum Remediation	Active
252046	Saint Lukes Hospital of Duluth	• Solid Waste	Active
24483	Sorcerer Lures	• Hazardous Waste	Inactive
27657	Foreign Affairs Of Duluth Inc	• Hazardous Waste	Inactive
24728	Guardian Pest Solutions Inc	• Hazardous Waste	Active
30159	Pavilion Surgery Center LLC	• Hazardous Waste	Active
12976	Midwest Engine Rebuilders	• Hazardous Waste	Active
26797	Yorkleigh Apartments	• Brownfields • Hazardous Waste	Inactive
112188	Gaidas Amoco Gas Station	• Underground Tanks	Inactive
38439	Haighs Electric Service	• Hazardous Waste	Inactive
47261	Waynes Radiator	• Hazardous Waste	Inactive
23085	Duluth Family Practice Center	• Hazardous Waste	Active
24503	Saint Germain Co	• Hazardous Waste	Inactive
47262	Litmans Garage	• Brownfields • Hazardous Waste • Petroleum Remediation • Underground Tanks	Inactive
194636	Pavillion 2	• Petroleum Remediation	Active
195695	Saint Lukes Hospital Parking Lot	• Petroleum Remediation	Active
14860	Aspirus St. Lukes Hospital	• Aboveground Tanks • Brownfields • Hazardous Waste • Underground Tanks	Active
12100	Somers James M DDS MS PA	• Hazardous Waste	Inactive
16443	Northland Ear Nose & Throat	• Hazardous Waste	Active
11924	Oral & Maxillofacial Surgical	• Hazardous Waste	Inactive
27684	Duluth Urology Group Ltd	• Hazardous Waste	Inactive
13348	Saint Luke's Obstetrics & Gynecology Associates	• Hazardous Waste	Inactive
125021	Saint Lukes Center for Diagnostic Imaging	• Hazardous Waste	Inactive
16431	Northern Photo	• Hazardous Waste • Underground Tanks	Inactive
139590	Orthopedic Associates	• Hazardous Waste	Active
16446	Oral & Maxillofacial Surgical Associates	• Hazardous Waste	Active
225637	Northland Pharmacy	• Hazardous Waste	Active
191429	Saint Lukes Hospital	• Petroleum Remediation	Active
134035	Jefferson Square	• Underground Tanks	Inactive
41034	Duluth Detoxifcation Center	• Hazardous Waste	Inactive
109975	Duluth Family Practice Center	• Petroleum Remediation	Inactive
214703	First Lutheran Church	• Petroleum Remediation	Active

Site ID	Site Name	MPCA Program	Status
253861	Genoa Healthcare	• Hazardous Waste	Active
28988	Dee Independent Cleaners	• Brownfields • Hazardous Waste • Petroleum Remediation • Site Assessment • Underground Tanks	Active
13511	Plaza Dental Center	• Hazardous Waste	Inactive
28092	Basgen Photography Inc	• Hazardous Waste	Inactive
26456	Hearing Associates	• Hazardous Waste	Inactive
130083	Walgreen's Store 13877	• Hazardous Waste	Active
133110	Saint Lukes Hospital Apartments	• Hazardous Waste	Active
193024	Heikkila Property	• Petroleum Remediation	Active
23561	Family Chiropractic	• Hazardous Waste	Inactive
113851	Plaza Shopping Center	• Underground Tanks	Inactive
29937	Cm Business Equipment	• Hazardous Waste	Inactive
27134	Sunset Antiques	• Hazardous Waste	Inactive
143913	O'Reilly Auto Parts - 1543	• Hazardous Waste	Active
42459	Duluth Public Works Dept Central Tool	• Hazardous Waste	Inactive
105532	City Of Duluth-street Maintenance-dist 3	• Aboveground Tanks • Petroleum Remediation • Underground Tanks	Active
190579	Proposed CVS Pharmacy Store 6691	• Brownfields (2) • Petroleum Remediation	Active
111124	Former SuperAmerica 4895	• Hazardous Waste • Petroleum Remediation • Underground Tanks	Active
250996	Alaskef Coffee Building	• Hazardous Waste	Active
148125	Former Car Dealership	• Underground Tanks	Inactive
49089	Center for Alcohol & Drug Treatment	• Aboveground Tanks • Hazardous Waste • Petroleum Remediation • Underground Tanks	Inactive

Appendix G

USFWS IPaC Unofficial Species List and DNR NHIS Review Letter

IPaC **U.S. Fish & Wildlife Service**

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.

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Location

St. Louis 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.

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

Mammals

NAME	STATUS
Canada Lynx Lynx canadensis There is **final** critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf Canis lupus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/4488	Threatened

Birds

NAME	STATUS
Piping Plover Charadrius melodus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/6039	Endangered
Rufa Red Knot Calidris canutus rufa Wherever found There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/1864	Threatened

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
Suckley's Cuckoo Bumble Bee Bombus suckleyi No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10885	Proposed Endangered

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Critical habitats

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

This location overlaps the critical habitat for the following species:

NAME	TYPE
Canada Lynx Lynx canadensis https://ecos.fws.gov/ecp/species/3652#crithab	Final

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 habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

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

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

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The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete

If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

Review the FAQs

The FAQs below provide important additional information and resources.

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

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Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental

Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

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 year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. 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.
2. 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.
3. 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.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

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.

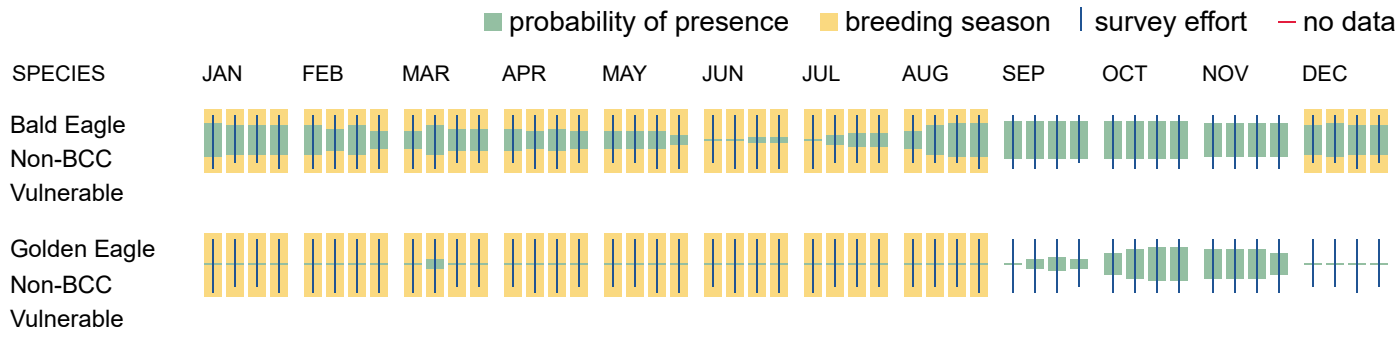
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

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.

NOT FOR CONSULTATION



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:

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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.

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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 (Service).

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

Measures for Proactively Minimizing Migratory Bird Impacts

Your IPaC Migratory Bird list showcases birds of concern, including Birds of Conservation Concern (BCC), in your project location. This is not a comprehensive list of all birds found in your project area. However, you can help proactively minimize significant impacts to all birds at your project location by implementing the measures in the Nationwide avoidance and minimization measures for birds document, and any other project-specific avoidance and minimization measures suggested at the link Measures for avoiding and minimizing impacts to birds for the birds of concern on your list below.

Ensure Your Migratory Bird List is Accurate and Complete

If your project area is in a poorly surveyed area, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles document, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

Review the FAQs

The FAQs below provide important additional information and resources.

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

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Bobolink Dolichonyx oryzivorus — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Canada Warbler Cardellina canadensis — Breeds May 20 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Chimney Swift Chaetura pelagica — Breeds Mar 15 to Aug 25
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Common Tern Sterna hirundo — Breeds May 1 to Aug 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/4963

Connecticut Warbler Oporornis agilis — Breeds Jun 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Eastern Whip-poor-will Antrostomus vociferus — Breeds May 1 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Evening Grosbeak Coccothraustes vespertinus — Breeds May 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

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

Golden-winged Warbler Vermivora chrysoptera — Breeds May 1 to Jul 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8745

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Le Conte's Sparrow Ammospiza leconteii — Breeds Jun 1 to Aug 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Long-eared Owl asio otus — Breeds Mar 1 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3631

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Pectoral Sandpiper Calidris melanotos — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Ruddy Turnstone Arenaria interpres morinella — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Veery Catharus fuscescens fuscescens — Breeds May 15 to Jul 15
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Whimbrel Numenius phaeopus hudsonicus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Wood Thrush Hylocichla mustelina — Breeds May 10 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

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Probability of Presence Summary

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

Probability of Presence (■)

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 year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. 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.
2. 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.
3. 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.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

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. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

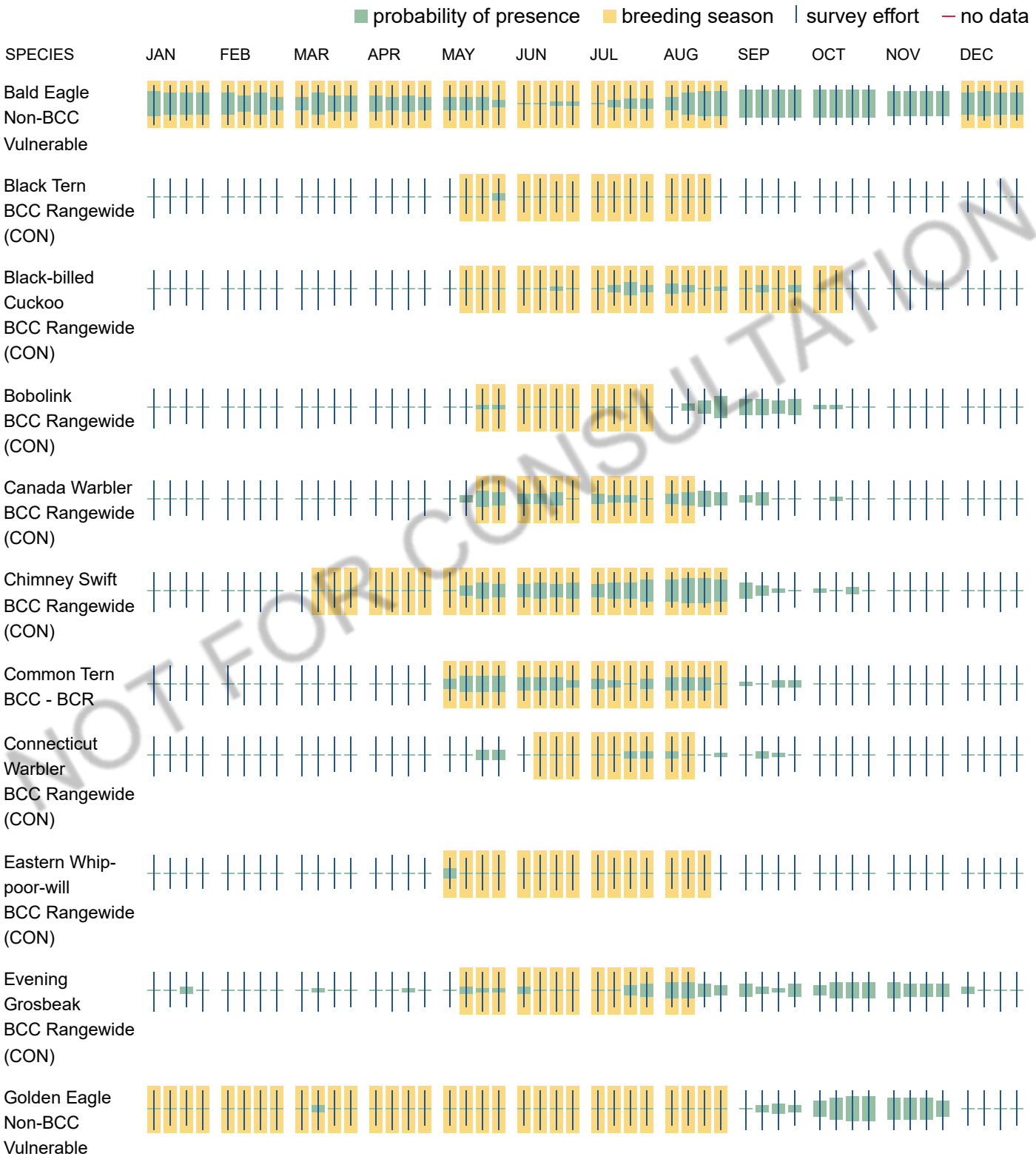
No Data (–)

NOT FOR CONSULTATION

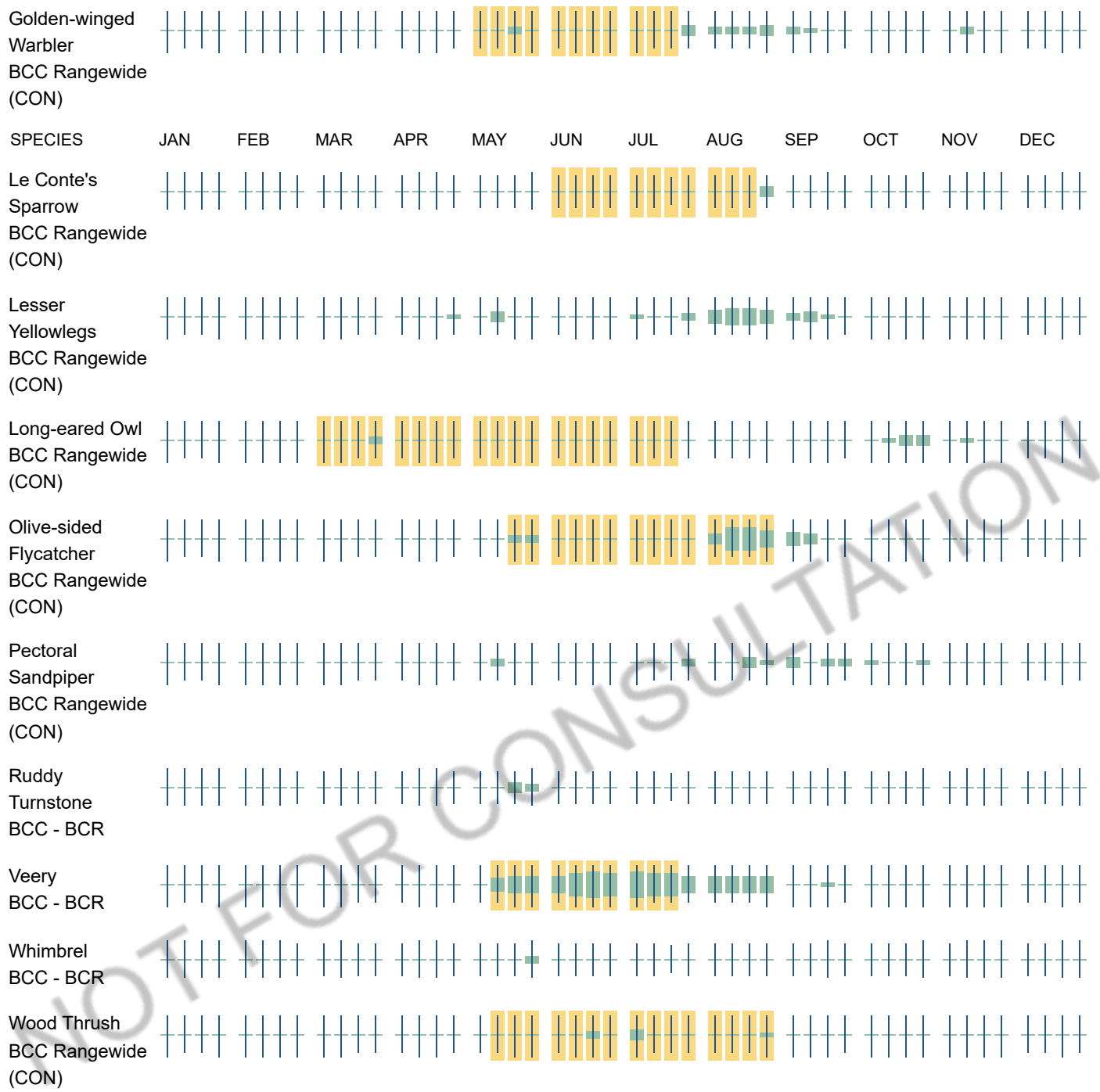
A week is marked as having no data if there were no survey events for that week.

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.



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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?

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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:

NOT FOR CONSULTATION

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.

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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.

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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.

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DEPARTMENT OF NATURAL RESOURCES

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

December 12, 2025

Erin Sejkora
Stantec

RE: Natural Heritage Review of the proposed **Downtown Duluth AUAR**,
T50N R14W Sections 22, 23, 27, and 34; St. Louis County

Dear Erin Sejkora,

For all correspondence regarding the Natural Heritage Review of this project please include the project ID **MCE-2025-00850** in the email subject line.

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

Ecologically Significant Areas

- Lake Superior has been identified as a Lake of *Outstanding* Biological Significance. Lakes of Biological Significance were ranked as *Outstanding, High, or Moderate* based on unique plant and animal presence. Many state-listed species are found within Lake Superior, including rare fish and mussels.

  There are other natural resource related issues associated with lakeshore developments besides the potential impacts to rare features. These issues include increased nutrients, pollutants, erosion, and sedimentation resulting in decreased water quality and decreased habitat quality for fish and wildlife. Maintaining native vegetation along lakeshores is one way to reduce these negative impacts. The combination of upland, lakeshore, and aquatic plants creates a buffer zone that provides numerous ecological benefits. Lakeshore and upland plants help stabilize banks and protect the shoreline from erosion by absorbing the forces of wind, waves, and boat traffic. They also filter pollutants that would otherwise drain from the watershed into the lake, thereby protecting water quality. Most noticeably, lakeshore and upland plants provide a variety of vital habitat components for fish and wildlife including food, protection from weather and predators, denning sites and nursery areas for young, perching and sunning sites for birds and turtles, and flyways and travel corridors. Aquatic plants produce oxygen, purify lake water by stabilizing bottom sediments and reducing nutrient cycling, and provide underwater cover for fish. As such, if a native vegetation buffer zone is present within the project boundary, we recommend that it be maintained and enhanced. If not, we recommend that one be established.

For additional information on aquatic plants and lakeshore management, please refer to Natural Shores and Natural Buffers & Lakescaping. The DNR book *Lakescaping for Wildlife and Water Quality* also covers a wide array of topics associated with managing lakeshore property and includes techniques to prevent shoreline erosion and to restore wildlife habitat, wildflowers, and water quality. Another reference is *Restore Your Shore*, an online interactive multimedia program that guides users through the process of protecting a natural shoreline or restoring a degraded shore with a natural buffer zone.

- Ecologically Significant Areas can be viewed using the Explore page in Minnesota Conservation Explorer (MCE) or their GIS shapefiles can be downloaded from the MN Geospatial Commons. To receive a list of Ecologically Significant Areas in the vicinity of your project, create a Conservation Planning Report using the Explore page in MCE.

State-listed Species

- Peregrine falcons (*Falco peregrinus*), a state-listed species of special concern, have been documented nesting on Greysolon Plaza. In urban areas, peregrine falcons nest on tall buildings, bridges, and smokestacks. Peregrine falcons do not make stick nests, instead their nests are scraped flat areas of rock or on a flat building surface. **Provided this structure will not be impacted by the proposed improvements, it is unlikely that the construction activities will affect these birds**. If the birds exhibit unusual behaviors or other signs of potential distress during construction, especially during the breeding season (April through July), please contact the DNR Regional Nongame Specialist, Gaea Crozier (gaea.crozier@state.mn.us).

- The Natural Heritage Information System (NHIS) tracks bat roost trees and hibernacula plus some acoustic data, but this information is not exhaustive. Even if there are no bat records listed nearby, all of Minnesota's bats, including the federally endangered northern long-eared bat (*Myotis septentrionalis*), can be found throughout Minnesota. During the active season (approximately April-November) bats roost underneath bark, in cavities, or in crevices of both live and dead trees. Tree removal can negatively impact bats by destroying roosting habitat, especially during the pup rearing season when females are forming maternity roosting colonies and the pups cannot yet fly. To minimize these impacts, **the DNR recommends that tree removal be avoided from June 1 through August 15.**

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

- Please report incidental sightings of state-listed species via the DNR Plant and Animal Observation Form.

Federally Protected Species

- To ensure compliance with federal law, conduct a federal regulatory review using the U.S. Fish and Wildlife Service's (USFWS) online Information for Planning and Consultation (IPaC) tool.

Environmental Review and Permitting

- Given the potential presence of state protected species, we encourage submission of Natural Heritage Review requests to ensure avoidance of take for these species and to determine survey needs as individual projects are planned.

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

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

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location and project description provided with the request. **If project details change or the project has not occurred within one year, please resubmit the project for review within one year of initiating project activities.** Resubmit by selecting *Clone Project as Draft* on the project page in MCE.

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

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

Sincerely,
Molly Barrett

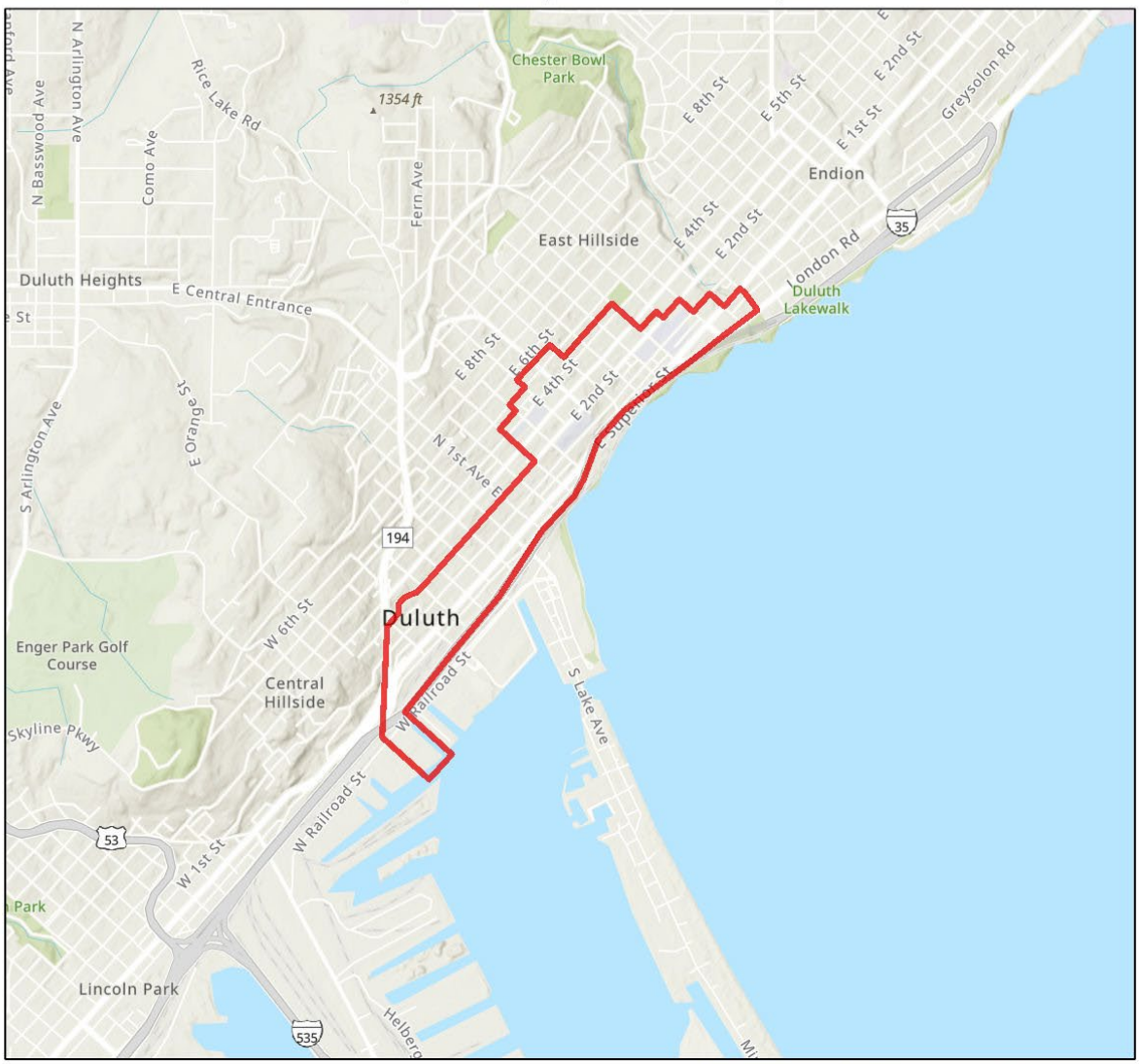
Natural Heritage Review Specialist
molly.barrett@state.mn.us

Cc: Jessica Parson, Regional Environmental Assessment Ecologist, Northeast (Region 2)
Cc: Sophia Musiak, Assistant Regional Environmental Assessment Ecologist, Northeast (Region 2)

For more project details, see the MCE-generated Final Project Report, available on the MCE project page.

Downtown Duluth AUAR

USA Topo Basemap With Locator Map



N
W E
S

0 0.23 0.45 0.9 1.35 1.8 Miles

Project Boundary



Project Type: Development, Mixed Use

Project Size (acres): 334.05

County(s): St. Louis

TRS: T50 R14 S22, T50 R14 S23, T50 R14 S27, T50 R14 S34

Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
St. Louis County (MN), MN Dept Natural Resources, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA,

Appendix H

MnSHIP Sites within the AUAR area

MnSHIP Sites within the AUAR area

Resource No.	Name	Address/Location	NRHP Status
Lot D Subarea (2 Resources)			
SL-DUL-02441	US Coast Guard Cutter Sundew	7th Avenue SW	Individually Listed
SL-DUL-00329	Slips 1, 2, and 3 Historic District	7th Ave. SW.	Listed
Essentia Subarea (13 Resources)			
SL-DUL-00181	Carlson Bakery	319 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00182	Paul Bunyan Printing	321 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00183	Parker Millinery	323 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00212	Mutual Auto Company	302 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00213	Burrell and Harmon Metal Work	308 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00214	Hotel Florham	310-312 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00215	Northwest Cadillac Company	314 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00216	McNamara Automobiles	318 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00217	Buffalo Saloon	320 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-01429	Kohagen Flats	632 E 3rd St	Eligible
SL-DUL-03942	Bridge 69821 (Brewery Historic District Tunnel/ Superior West Tunnel)	I-35 between 4th and 6th Avenues East	Eligible
SL-DUL-03592 (also in the 1st Street and Secondary Subareas)	Duluth Commercial Historic District	Superior Street, 1st Street, East 1st Ave., East 2nd Ave., East 3rd Ave., West 1st Ave., West 2nd Ave., and West 3rd Ave.	Listed
SL-DUL-04120	Bridge 69817	Michigan Street and I-35 Interchange	Eligible
1st Street Subarea (136 Resources)			
SL-DUL-00066	Merrit and Hector Printers	108-114 North 1st Ave. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00070	Leone's Cleaners and Tailors	115 North 2nd Ave. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00071	Natchios Greek Restaurant	109 North 2nd Ave. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00078	Duluth Masonic Temple	4 2nd St. W.	Individually Listed
SL-DUL-00093	Bayha and Company Furniture	131 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00094	Gershgol Grocery	123 1st St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00095	Columbia Block-Norman's Bar Bldg	113-115 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00096	Frederick Hotel	105 W 1st St.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00097	East End Ice and Coal- Life House Youth Center	31 1st St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00098	Commercial Building-Life House Youth Center	29 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00099	Arthurs Formal Wear	25 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00100	HBJ Publications Inc	1-7 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00101	European Bakery-New England Hotel	109-111 W 1st St.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00102	Beckley-Cardy Builders Exchange Building	1-3 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00103	Interstate Auto	5-7 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00104	Salo Building-Dunlap Building	15-17 1st St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00105	Parking Lot	19-23 1st St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00106	Sher Brothers and Company	25 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00108	Northwest Radio	123 1st St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00109	Surplus Electronics-Commercial Building	125 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00110	Pastoret Terrace	127-129 1st St. E.	Listed – Contributing to Duluth Commercial Historic District)
SL-DUL-00111	Shrine Temple	201-207 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00112	Peterson Building-Scarlett Feed Store	213-215 1st St. E.	Listed – Contributing to Duluth Commercial Historic District

MnSHIP Sites within the AUAR area

Resource No.	Name	Address/Location	NRHP Status
SL-DUL-00113	Union Gospel Mission-Martin Hotel	217-219 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00124	Commercial Building	118-138 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00125	Deluxe Coney Island-Rowley Building	112 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00126	Pasek Pharmacy	114-116 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00127	Ideal Market & Bakery	102 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00128	Pearson Block-Duluth Liquor	26-32 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00129	Cantonese House-commercial building	24 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00130	Young at Heart	22 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00131	E.F. Berg Hotel Supplies	20 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00132	Sanitary Plumbing-Glenwood trophy	18 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00134	Bridgeman-Russell Block	10-16 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00135	Spina Building	2-8 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00140	Yale Laundry-H & J	30-32 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00141	Toverilla Hotel-First Street Exchange	102-108 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00142	Union Fur Company	110-112 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00143	Moose 505 Lodge-International Harvester Company	114-116 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00144	Gray Brothers Bakery	118-120 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00145	Model Laundry	126 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00147	Jenswold Motor Company	202-206 1st St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00148	Parisian Dry Cleaners	208 1st St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00149	Motor Mart	210 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00150	Duluth Ford Exchange	214-216 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00151	Turner Automobiles	218-222 1st St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00158	Hunter Building	31 Superior St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00159	Commercial Building	29 Superior St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00160	Commercial Building	25 Superior St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00162	Sportsman's Headquarters	17-23 Superior St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00163	Commercial Building	15 Superior St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00164	Wirth Building	13 Superior St. W.	Individually Listed and Contributing to Duluth Commercial Historic District
SL-DUL-00165	Silberstein and Bondy Dry Goods Company	9-11 Superior St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00166	Norris-MacDougal Block	5-7 Superior St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00167	Bell and Eyster	3 Superior St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00168	Poirier's Boots and Shoes	1 Superior St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00169	Commercial Building	13 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00174	Grand Hotel	101-105 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00175	Parking Ramp, Fond-du-Luth Casino	107-123 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00176	Roebuck and Company	125-131 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00177	Masonic Temple Opera House	201-205 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District

MnSHIP Sites within the AUAR area

Resource No.	Name	Address/Location	NRHP Status
SL-DUL-00178	NorShor Theatre-Orpheum Service Garage	207-213 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00179	Hotel Duluth	219-231 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00191	Great Northern Power Company	30 W Superior St	Eligible
SL-DUL-00193	Vacant Lot	16 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00194	J. J. Costello Hardware and Stoves	22-24 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00196	Wieland Block	26 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00197	Hayes Block	30-38 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00198	Astoria Hotel-Northern lights	102-108 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00199	Vacant Lot	110-116 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00200	Peterson Buffet-chamber of commerce	118 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00201	Delray Hotel	120 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00202	Service Motor Company, Drivers' Union Hall	124 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00203	Duluth City Jail	126 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00204	Duluth City Hall	132 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00205	Knudsen Automobile Company Building	202 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00206	Interstate Auto Company	206-214 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00208	Gannon Auto Supplies	216-218 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00209	Albert Salter Saloon	220 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00210	Rockhill Buick Company-St, Louis Cty health Dept.	222 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00211	Jacob Kohn Autos	228-230 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00233	Action Pawn and Gopher Shoe Repair	16-18 North 1st Ave. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00234	Printing Express	22-26 North 1st Ave. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00235	Tremont Hotel	12 Lake Ave. N.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00237	Bayly building	17-19 Lake Ave. N.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00238	Nortun Lodge #126 Sons of Norway	21-23 Lake Ave. N.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00239	Apartments	114 N. 1st Ave. E	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00240	Duluth Steam Bath	18-20 North 1st Ave. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00241	Orpheum Theatre	8-12 North 2nd Ave. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00243	Duluth Cleaners and Dyers	16-18 North 2nd Ave. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-00658	Duluth Union Depot	506 Michigan St.	Individually Listed
SL-DUL-00804	Apartments	111 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00805	China Night Restaurant	113 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-00812	Sunnyside Cafe	214 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01208	Hockin Furniture Co.	5 1st St. W. (formerly 1 - 7 W 1st St)	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01211	Commercial Building	106-110 1st St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-01214	Coney Island	110 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01219	Altman Clothing	201-207 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01220	Gilbert Building	209-211 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01221	Central Club Café	213-215 1st St. W.	Listed – Contributing to Duluth Commercial Historic District

MnSHIP Sites within the AUAR area

Resource No.	Name	Address/Location	NRHP Status
SL-DUL-01223	Armstead Building	217 1st St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-01224	LeTourneau Printing Company	219-221 1st St. W.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-01226	Wolvin Building	225-231 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01227	Duluth Board of Trade	301-307 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01229	Elk's Club-Court house bldg.	309-311 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01231	Central Garage	315 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01232	Commercial Building	321-323 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01237	Duluth City Hall	411 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01240	Gerald W. Heaney Federal Building & US Courthouse/US Custom House/ US Post Office/Civic Center Station	515 1st St. W.	Listed – Contributing to Duluth Civic Center Historic District
SL-DUL-01858	Carter Hotel	17-25 North 2nd Ave. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-02004	Gulleson Shoe Store	21 North 1st Ave. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-02353	Granada Theatre	109 Superior St. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-02354	Jimmy's Used Cars	27 North 2nd Ave. E.	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-02372	St. Louis County Courthouse	unknown	Listed – Contributing to Duluth Civic Center Historic District
SL-DUL-02373	Soldiers and Sailors Monument	unknown	Listed – Contributing to Duluth Civic Center Historic District
SL-DUL-02390	Young Women's Christian Association of Duluth (YWCA)	202 2nd St. W.	Individually Listed
SL-DUL-02644	Parking Lot	9-23 1st St. W.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-02645	Granite Retaining Wall	9 1st St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-02646	US Bank Parking Garage	2-28 1st St. E	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-02647	Parking lot	101-121 1st St. E	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-02648	Hobart Manufacturing Company	31 1st St. E	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-02649	Clayton Jackson McGhie Memorial	130 1st St. E	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-02650	Parking Lot	226-232 1st St. E	Listed – Non-Contributing to Duluth Commercial Historic District
SL-DUL-02651	Winthrop Building	325-333 1st St. W	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-03874	Pastoret Terrace	101-107-109-111-113 N 2nd Ave E	Listed – Contributing to Duluth Commercial Historic District)
SL-DUL-03922	Bridge 69857	Connecting Superior Street to Gichi-Ode' Akiing Park	Eligible
SL-DUL-03923	Bridge 69858	Connecting Superior Street to Gichi-Ode' Akiing Park	Eligible
SL-DUL-04073	I-35 Mesaba Avenue to 26th Avenue East (Duluth)	I-35: Mesaba Avenue to 26th Avenue East	Eligible
SL-DUL-04107	Bridge 69818B	5th Avenue West and I-35 Interchange	Eligible
SL-DUL-04109	Bridge 69818S	I-35 between Mesaba Avenue and 5th Avenue West	Eligible
SL-DUL-04110	Bridge 69870A	5th Avenue West and I-35 Interchange	Eligible
SL-DUL-04111	Bridge 69870B	5th Avenue West and I-35 Interchange	Eligible
SL-DUL-04116	Bridge 69816E	Lake Avenue and I-35 Interchange	Eligible
SL-DUL-04117	Bridge 69816F	Lake Avenue and I-35 Interchange	Eligible
SL-DUL-04128	Gichi-ode' Akiing	North 2nd Ave. E. and E. Michigan St.	Eligible
SL-DUL-03592 (also within the Essentia and Secondary Subareas)	Duluth Commercial Historic District	Superior Street, 1st Street, East 1st Ave., East 2nd Ave., East 3rd Ave., West 1st Ave., West 2nd Ave., and West 3rd Ave.	Listed
Secondary Subarea (12 Resources)			
SL-DUL-00192	Bijou Theater	12-14 Superior St. E.	Listed – Contributing to Duluth Commercial Historic District
SL-DUL-01095	Double House	709-711 E 1st St	Eligible
SL-DUL-00583	Duluth Armory	1301-1305 London Rd	Individually Listed
SL-DUL-00832	Kitchi Gammi Club	831 E Superior St	Individually Listed
SL-DUL-01114	Chester Terrace Apartments	1210-1232 E 1st St	Individually Listed

MnSHIP Sites within the AUAR area

Resource No.	Name	Address/Location	NRHP Status
SL-DUL-01883	Row Flats	119-125 N 9th Ave E	Eligible
SL-DUL-03030	Rowhouse	121 North 9th Ave. E.	Eligible
SL-DUL-03031	Rowhouse	123 North 9th Ave. E.	Eligible
SL-DUL-03032	Rowhouse	125 North 9th Ave. E.	Eligible
SL-DUL-03941	Bridge 69820 (Jay Cooke Plaza Tunnel/Superior East Tunnel)	I-35 between 8th and 9th Avenues East	Eligible
SL-DUL-03592 (also within the Essentia and 1st Street Subareas)	Duluth Commercial Historic District	Superior Street, 1st Street, East 1st Ave., East 2nd Ave., East 3rd Ave., West 1st Ave., West 2nd Ave., and West 3rd Ave.	Listed
SL-DUL-04123	Mechanical Building	1121 London Road	Eligible
Study Area (34 Resources)			
SL-DUL-00081	Engine House No. 1	101 East Third St.	Individually Listed
SL-DUL-00656	Munger Terrace	405 Mesaba Ave.	Individually Listed
SL-DUL-00703	Minnesota Slip	301-346 Harbor Dr.	Eligible
SL-DUL-00799	Endion Passenger Depot	1504 South St.	Individually Listed
SL-DUL-00824	Fitger Brewing Company	600 Superior St. E.	Individually Listed
SL-DUL-00826	Bengetta Moe Bakery	716 Superior St. E.	Individually Listed
SL-DUL-00830	Hartley Building	740 Superior St. E.	Individually Listed
SL-DUL-00841	Oliver Traphagen House	1509-1511 Superior St. E.	Individually Listed
SL-DUL-00956	Duluth Public Library	520 Superior St. W.	Individually Listed
SL-DUL-01530	Luke A. Marvin House	123 3rd St. W.	Eligible
SL-DUL-01534	San Marcos Apartments	222-224 3rd Street West	Eligible
SL-DUL-01680	Sacred Heart Cathedral	201 4th St. W.	Individually Listed
SL-DUL-01869	St. Mark's African Methodist Episcopal C	530 North 5th Ave. E.	Individually Listed
SL-DUL-02351	Sacred Heart Cathedral Grade School	206 4th St. W.	Individually Listed
SL-DUL-02365	Sacred Heart Cathedral Convent/Christia	North 2nd Ave. W.	Listed
SL-DUL-02370	Carnegie Building/Duluth Public Library	101 2nd St. W.	Individually Listed
SL-DUL-02374	St. Louis County Jail	521 W. 2nd St	Listed – Contributing to Duluth Civic Center Historic District
SL-DUL-02395	Duluth Central High School	215 North 1st Avenue East	Individually Listed
SL-DUL-03912	Elevator Row Historic District	Rice's Point Piers	Eligible
SL-DUL-03937	Bridge 69804	Connecting London Road and Leif Erikson Park	Eligible
SL-DUL-03938	Bridge 69805	Connecting London Road and Leif Erikson Park	Eligible
SL-DUL-03943	Bridge 69838	Connecting South Street to the Duluth Lake Walk	Eligible
SL-DUL-04106	Bridge 69818A	5th Avenue West and I-35 Interchange	Eligible
SL-DUL-04108	Bridge 69818N	I-35 between Mesaba Avenue and 5th Avenue West	Eligible
SL-DUL-04112	Bridge 69870C	5th Avenue West and I-35 Interchange	Eligible
SL-DUL-04113	Bridge 69870D	5th Avenue West and I-35 Interchange	Eligible
SL-DUL-04114	Bridge 95795	I-35 over Unnamed Stream	Eligible
SL-DUL-04115	Bridge 69816	Lake Avenue over I-35	Eligible
SL-DUL-04118	Bridge 69816G	Lake Avenue and I-35 Interchange	Eligible
SL-DUL-04119	Bridge 69816H	Lake Avenue and I-35 Interchange	Eligible
SL-DUL-04121	Bridge 69819 (Gichi-Ode' Akiing Tunnel)	I-35 between 1st and 3rd Avenues East	Eligible
SL-DUL-04122	Bridge 69836 (Leif Erikson Tunnel)	Between 10th and 13th Avenues East	Eligible
SL-DUL-04124	Bridge 96911	I-35 over Unnamed Stream	Eligible
SL-DUL-00329	Slips 1, 2, and 3 Historic District	7th Ave. SW.	Listed

Appendix I

GHG Analysis Calculations

Downtown Duluth Redevelopment Project
GHG Emissions Summary

		Scenario A - Existing				Scenario B - Maximum Development				Change			
Scope	**Source**	**CO_2 (ton/yr)**	**CH_4 (ton/yr)**	**N_2O (ton/yr)**	**CO_2e (ton/yr)**	**CO_2 (ton/yr)**	**CH_4 (ton/yr)**	**N_2O (ton/yr)**	**CO_2e (ton/yr)**	**CO_2 (ton/yr)**	**CH_4 (ton/yr)**	**N_2O (ton/yr)**	**CO_2e (ton/yr)**
Direct Emissions													
Scope 1	Construction - Mobile Sources Onroad - Gasoline and Diesel	See Net Change for Project Emissions								434	0.003	0.0117	437
Scope 1	Construction - Mobile Sources Non-road - Diesel									2,364	0.22	0.20	2,423
Scope 1	Operations - Stationary Combustion - Natural Gas	26,426	0.50	0.049	26,453	34,316	0.65	0.063	34,351	7,890	0.149	0.014	7,898
Scope 1	Operations - Mobile Sources - Gasoline and Diesel	See Net Change for Project Emissions								115,439	1.9	1.3	115,836
Indirect Emissions													
Scope 2	Purchased Electricity	74,703	8.03	1.125	75,226	96,143	10.3	1.45	96,816	21,440	2.30	0.32	21,591
Scope 2	Waste - Operations	See Net Change for Project Emissions											3,229
Total										**147,567**	**4.6**	**1.85**	**151,415**

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Scope 1 Emissions from Stationary Combustion Sources

Guidance

(A) Enter annual data for each combustion unit, facility, or site (by fuel type) in ORANGE cells on **Table 1**. Example entry is shown in first row (*GREEN Italics*).

- Select "Fuel Combusted" from drop down box.

- Enter "Quantity Combusted" and choose the appropriate units from the drop down box in the unit column. If it's necessary to convert units, common heat contents can be found on the "Heat Content" sheet and unit conversions on the "Unit Conversion" sheet.

(B) If fuel is consumed in a facility but stationary fuel consumption data are not available, an estimate should be made for completeness. See the "Items to Note" section of the Help sheet for suggested estimation approaches.

(C) Biomass CO_2 emissions are not reported in the total emissions, but are reported separately at the bottom of the sheet.

Table 1. Stationary Source Fuel Combustion

Source ID	Source Description	Source Area (sq ft)	Fuel Combusted	Fuel State (solid, liquid, gas)	Quantity Combusted	Units
BLR-012	*East Power Plant*	*12,517*	*Natural Gas*	*Gas*	*10,000*	*MMBtu*
Industrial	Warehouse and Storage	67,000	Natural Gas	Gas	2,566,100	SCF
Retail/Commercial	Retail	6,003,000	Natural Gas	Gas	158,479,200	SCF
Insitutional	Education	4,160,000	Natural Gas	Gas	160,992,000	SCF
Other - Tourism (assume Hotel)	Lodging	540,000	Natural Gas	Gas	23,814,000	SCF
Residential - Townhomes	Lodging	2,146,000	Natural Gas	Gas	94,638,600	SCF
Residential - Apartments	Lodging	0	Natural Gas	Gas	0	SCF

GHG Emissions

Total Organization-Wide Stationary Source Combustion by Fuel Type

Fuel Type		Quantity Combusted	Units
Coal and Coke - Solid			
Anthracite Coal		0	short ton
Bituminous Coal		0	short ton
Sub-bituminous Coal		0	short ton
Lignite Coal		0	short ton
Mixed (Commercial Sector)		0	short ton
Mixed (Electric Power Sector)		0	short ton
Mixed (Industrial Coking)		0	short ton
Mixed (Industrial Sector)		0	short ton
Coal Coke		0	short ton
Other Fuels - Solid			
Municipal Solid Waste		0	short ton
Petroleum Coke (Solid)		0	short ton
Plastics		0	short ton
Tires		0	short ton
Biomass Fuels - Solid			
Agricultural Byproducts		0	short ton
Peat		0	short ton
Solid Byproducts		0	short ton
Wood and Wood Residuals		0	short ton
Gaseous Fuels			
Natural Gas		440,489,900	scf
Propane Gas		0	scf
Landfill Gas		0	scf
Petroleum Products			
Distillate Fuel Oil No. 2		0	gallons
Residual Fuel Oil No. 6		0	gallons
Kerosene		0	gallons
Liquefied Petroleum Gases (LPG)		0	gallons
Biomass Fuels - Liquid			
Biodiesel (100%)		0	gallons
Ethanol (100%)		0	gallons
Rendered Animal Fat		0	gallons
Vegetable Oil		0	gallons

Total Organization-Wide CO_2, CH_4 and N_2O Emissions from Stationary Source Fuel Combustion

Fuel Type		CO_2 (kg)	CH_4 (g)	N_2O (g)
Coal and Coke - Solid				
Anthracite Coal		0.0	0.0	0.0
Bituminous Coal		0.0	0.0	0.0
Sub-bituminous Coal		0.0	0.0	0.0
Lignite Coal		0.0	0.0	0.0
Mixed (Commercial Sector)		0.0	0.0	0.0
Mixed (Electric Power Sector)		0.0	0.0	0.0
Mixed (Industrial Coking)		0.0	0.0	0.0
Mixed (Industrial Sector)		0.0	0.0	0.0
Coal Coke		0.0	0.0	0.0
Other Fuels - Solid				
Municipal Solid Waste		0.0	0.0	0.0
Petroleum Coke (Solid)		0.0	0.0	0.0
Plastics		0.0	0.0	0.0
Tires		0.0	0.0	0.0
Gaseous Fuels				
Natural Gas		23,980,270.2	453,704.6	44,049.0
Propane Gas		0.0	0.0	0.0
Landfill Gas		0.0	0.0	0.0
Petroleum Products				
Distillate Fuel Oil No. 2		0.0	0.0	0.0
Residual Fuel Oil No. 6		0.0	0.0	0.0
Kerosene		0.0	0.0	0.0
Liquefied Petroleum Gases (LPG)		0.0	0.0	0.0
Total Fossil Fuel Emissions		**23,980,270.2**	**453,704.6**	**44,049.0**
Biomass Fuels - Solid				
Agricultural Byproducts		0.0	0.0	0.0
Peat		0.0	0.0	0.0
Solid Byproducts		0.0	0.0	0.0
Wood and Wood Residuals		0.0	0.0	0.0
Biomass Fuels - Liquid				
Biodiesel (100%)		0.0	0.0	0.0
Ethanol (100%)		0.0	0.0	0.0
Rendered Animal Fat		0.0	0.0	0.0
Vegetable Oil		0.0	0.0	0.0
Total Non-Fossil Fuel Emissions		**0.0**	**0.0**	**0.0**
Total Emissions for all Fuels		**23,980,270.2**	**453,704.6**	**44,049.0**

Total CO_2 Equivalent Emissions (metric tons) - Stationary Combustion	**24,004.7**
Total Biomass CO_2 Equivalent Emissions (metric tons) - Stationary Combustion	**0.0**

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Scope 1 Emissions from Stationary Combustion Sources

Guidance

(A) Enter annual data for each combustion unit, facility, or site (by fuel type) in ORANGE cells on **Table 1**. Example entry is shown in first row (*GREEN Italics*).

- Select "Fuel Combusted" from drop down box.
- Enter "Quantity Combusted" and choose the appropriate units from the drop down box in the unit column. If it's necessary to convert units, common heat contents can be found on the "Heat Content" sheet and unit conversions on the "Unit Conversion" sheet.

(B) If fuel is consumed in a facility but stationary fuel consumption data are not available, an estimate should be made for completeness. See the "Items to Note" section of the Help sheet for suggested estimation approaches.

(C) Biomass CO_2 emissions are not reported in the total emissions, but are reported separately at the bottom of the sheet.

Table 1. Stationary Source Fuel Combustion

Source ID	Source Description	Source Area (sq ft)	Fuel Combusted	Fuel State (solid, liquid, gas)	Quantity Combusted	Units
BLR-012	*East Power Plant*	*12,517*	*Natural Gas*	*Gas*	*10,000*	*MMBtu*
Industrial	Warehouse and Storage	67,000	Natural Gas	Gas	2,566,100	SCF
Retail/Com	Retail	6,073,000	Natural Gas	Gas	160,327,200	SCF
Insitutional	Education	4,435,000	Natural Gas	Gas	171,634,500	SCF
Other - Tou	Lodging	869,000	Natural Gas	Gas	38,322,900	SCF
Residential	Lodging	4,516,000	Natural Gas	Gas	199,155,600	SCF
Residential	Lodging	0	Natural Gas	Gas	0	SCF

GHG Emissions

Total Organization-Wide Stationary Source Combustion by Fuel Type

Fuel Type	Quantity Combusted	Units
Coal and Coke - Solid		
Anthracite Coal	0	short ton
Bituminous Coal	0	short ton
Sub-bituminous Coal	0	short ton
Lignite Coal	0	short ton
Mixed (Commercial Sector)	0	short ton
Mixed (Electric Power Sector)	0	short ton
Mixed (Industrial Coking)	0	short ton
Mixed (Industrial Sector)	0	short ton
Coal Coke	0	short ton
Other Fuels - Solid		
Municipal Solid Waste	0	short ton
Petroleum Coke (Solid)	0	short ton
Plastics	0	short ton
Tires	0	short ton
Biomass Fuels - Solid		
Agricultural Byproducts	0	short ton
Peat	0	short ton
Solid Byproducts	0	short ton
Wood and Wood Residuals	0	short ton
Gaseous Fuels		
Natural Gas	572,006,300	scf
Propane Gas	0	scf
Landfill Gas	0	scf
Petroleum Products		
Distillate Fuel Oil No. 2	0	gallons
Residual Fuel Oil No. 6	0	gallons
Kerosene	0	gallons
Liquefied Petroleum Gases (LPG)	0	gallons
Biomass Fuels - Liquid		
Biodiesel (100%)	0	gallons
Ethanol (100%)	0	gallons
Rendered Animal Fat	0	gallons
Vegetable Oil	0	gallons

Total Organization-Wide CO_2, CH_4 and N_2O Emissions from Stationary Source Fuel Combustion

Fuel Type	CO_2 (kg)	CH_4 (g)	N_2O (g)
Coal and Coke - Solid			
Anthracite Coal	0.0	0.0	0.0
Bituminous Coal	0.0	0.0	0.0
Sub-bituminous Coal	0.0	0.0	0.0
Lignite Coal	0.0	0.0	0.0
Mixed (Commercial Sector)	0.0	0.0	0.0
Mixed (Electric Power Sector)	0.0	0.0	0.0
Mixed (Industrial Coking)	0.0	0.0	0.0
Mixed (Industrial Sector)	0.0	0.0	0.0
Coal Coke	0.0	0.0	0.0
Other Fuels - Solid			
Municipal Solid Waste	0.0	0.0	0.0
Petroleum Coke (Solid)	0.0	0.0	0.0
Plastics	0.0	0.0	0.0
Tires	0.0	0.0	0.0
Gaseous Fuels			
Natural Gas	31,140,023.0	589,166.5	57,200.6
Propane Gas	0.0	0.0	0.0
Landfill Gas	0.0	0.0	0.0
Petroleum Products			
Distillate Fuel Oil No. 2	0.0	0.0	0.0
Residual Fuel Oil No. 6	0.0	0.0	0.0
Kerosene	0.0	0.0	0.0
Liquefied Petroleum Gases (LPG)	0.0	0.0	0.0
Total Fossil Fuel Emissions	**31,140,023.0**	**589,166.5**	**57,200.6**
Biomass Fuels - Solid			
Agricultural Byproducts	0.0	0.0	0.0
Peat	0.0	0.0	0.0
Solid Byproducts	0.0	0.0	0.0
Wood and Wood Residuals	0.0	0.0	0.0
Biomass Fuels - Liquid			
Biodiesel (100%)	0.0	0.0	0.0
Ethanol (100%)	0.0	0.0	0.0
Rendered Animal Fat	0.0	0.0	0.0
Vegetable Oil	0.0	0.0	0.0
Total Non-Fossil Fuel Emissions	**0.0**	**0.0**	**0.0**
Total Emissions for all Fuels	**31,140,023.0**	**589,166.5**	**57,200.6**

Total CO_2 Equivalent Emissions (metric tons) - Stationary Combustion	**31,171.8**
Total Biomass CO_2 Equivalent Emissions (metric tons) - Stationary Combustion	**0.0**

Scope 2 Emissions from Purchase of Electricity

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Guidance

The Indirect Emissions from Purchased Electricity Guidance document provides guidance for quantifying two scope 2 emissions totals, using a **location-based method** and a **market-based method**. The organization should quantify and report both totals in its GHG inventory. The location-based method considers average emission factors for the electricity grids that provide electricity. The market-based method considers contractual arrangements under which the organization procures electricity from specific sources, such as renewable energy.

(A) Enter total annual electricity purchased in kWh and each eGRID subregion for each facility or site in ORANGE cells of **Table 1**.
(B) If electricity consumption data are not available for a facility, an estimate should be made for completeness.
See the "Items to Note" section of the Help sheet for suggested estimation approaches.
(C) Select "eGRID subregion" from drop box and enter "Electricity Purchased."
- Use map (Figure 1) at bottom of sheet to determine appropriate eGRID subregion. If subregion cannot be determined from the map, find the correct subregion by entering the location's zip code into EPA's Power Profiler:
https://www.epa.gov/egrid/power-profiler#/
(D) See the market-based emission factor hierarchy on the market-based method Help sheet. If any of the first four types of emission factors are applicable, enter the factors in the yellow cells marked as "<enter factor>". If not, leave the yellow cells as is, and eGRID subregion factors will be used for market-based emissions.
Example entry is shown in first row (*GREEN Italics*) for a facility that purchases RECs for 100% of its consumption, and therefore has a market-based emission factor of 0.

Help - Market-Based Method

Tips: Enter electricity usage by location and then look up the eGRID subregion for each location.
If you purchase renewable energy that is less than 100% of your site's electricity, see the example in the market-based method Help sheet.

Table 1. Total Amount of Electricity Purchased by eGRID Subregion

					Market-Based *Use these cells to enter applicable market-based emission factors*						**Location-Based**		
					Emission Factors			**Emissions**			**Emissions**		
Source ID	**Source Description**	**Source Area (sq ft)**	**eGRID Subregion** *where electricity is consumed*	**Electricity Purchased (kWh)**	**CO_2 Emissions (lb/MWh)**	**CH_4 Emissions (lb/MWh)**	**N_2O Emissions (lb/MWh)**	**CO_2 Emissions (lb)**	**CH_4 Emissions (lb)**	**N_2O Emissions (lb)**	**CO_2 Emissions (lb)**	**CH_4 Emissions (lb)**	**N_2O Emissions (lb)**
Bldg-012	*East Power Plant*	*12,517*	*HIMS (HICC Miscellaneous)*	*200,000*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*226,880.0*	*27.0*	*4.2*
Industrial	Warehouse and Sto	67000	MROW (MRO West)	348,400	<enter factor>	<enter factor>	<enter factor>	346,936.7	37.3	5.2	346,936.7	37.3	5.2
Retail/Com	Retail	6003000	MROW (MRO West)	76,238,100	<enter factor>	<enter factor>	<enter factor>	75,917,900.0	8,157.5	1,143.6	75,917,900.0	8,157.5	1,143.6
Insitutional	Education	4160000	MROW (MRO West)	33,696,000	<enter factor>	<enter factor>	<enter factor>	33,554,476.8	3,605.5	505.4	33,554,476.8	3,605.5	505.4
Other - Tou	Lodging	540000	MROW (MRO West)	7,992,000	<enter factor>	<enter factor>	<enter factor>	7,958,433.6	855.1	119.9	7,958,433.6	855.1	119.9
Residential	Lodging	2146000	MROW (MRO West)	31,760,800	<enter factor>	<enter factor>	<enter factor>	31,627,404.6	3,398.4	476.4	31,627,404.6	3,398.4	476.4
Residential	Lodging	0	MROW (MRO West)	0	<enter factor>	<enter factor>	<enter factor>	0.0	0.0	0.0	0.0	0.0	0.0
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					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
Total Emissions for All Sources				150,035,300				149,405,151.7	16,053.8	2,250.5	149,405,151.7	16,053.8	2,250.5

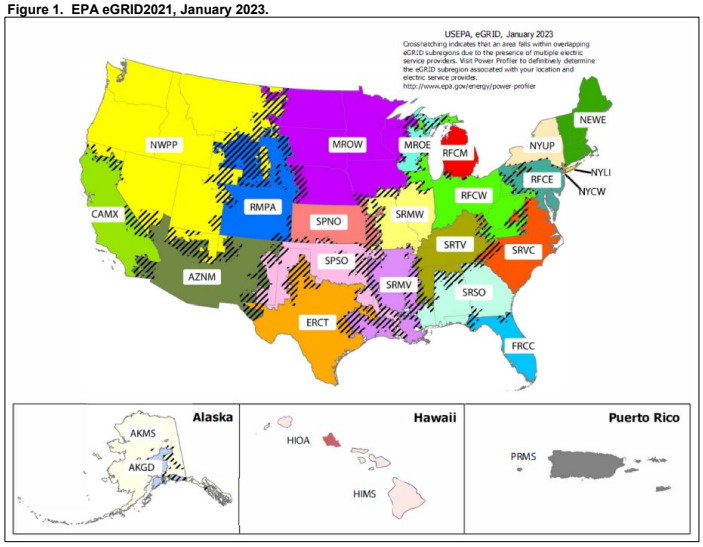
GHG Emissions

CO_2 Equivalent Emissions (metric tons)	
Location-Based Electricity Emissions	68,256.4
Market-Based Electricity Emissions	68,256.4

Notes:

1. CO_2, CH_4 and N_2O emissions are estimated using methodology provided in EPA's Center for Corporate Climate Leadership Greenhouse Gas Inventory Guidance - Indirect Emissions from Purchased Electricity (January 2016).

Figure 1. EPA eGRID2021, January 2023.



Back to Intro | Back to Summary | Help | Help - Market-Based Method

Scope 2 Emissions from Purchase of Electricity

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Guidance

The Indirect Emissions from Purchased Electricity Guidance document provides guidance for quantifying two scope 2 emissions totals, using a **location-based method** and a **market-based method**. The organization should quantify and report both totals in its GHG inventory. The location-based method considers average emission factors for the electricity grids that provide electricity. The market-based method considers contractual arrangements under which the organization procures electricity from specific sources, such as renewable energy.

(A) Enter total annual electricity purchased in kWh and each eGRID subregion for each facility or site in ORANGE cells of **Table 1**.
(B) If electricity consumption data are not available for a facility, an estimate should be made for completeness.
See the "Items to Note" section of the Help sheet for suggested estimation approaches.
(C) Select "eGRID subregion" from drop box and enter "Electricity Purchased."
- Use map (Figure 1) at bottom of sheet to determine appropriate eGRID subregion. If subregion cannot be determined from the map, find the correct subregion by entering the location's zip code into EPA's Power Profiler:
https://www.epa.gov/egrid/power-profiler#/
(D) See the market-based emission factor hierarchy on the market-based method Help sheet. If any of the first four types of emission factors are applicable, enter the factors in the yellow cells marked as "<enter factor>". If not, leave the yellow cells as is, and eGRID subregion factors will be used for market-based emissions.
Example entry is shown in first row (*GREEN Italics*) for a facility that purchases RECs for 100% of its consumption, and therefore has a market-based emission factor of 0.

Help - Market-Based Method

Tips: Enter electricity usage by location and then look up the eGRID subregion for each location.
If you purchase renewable energy that is less than 100% of your site's electricity, see the example in the market-based method Help sheet.

Table 1. Total Amount of Electricity Purchased by eGRID Subregion

					Market-Based *Use these cells to enter applicable market-based emission factors*						Location-Based		
					Emission Factors			Emissions			Emissions		
Source ID	Source Description	Source Area (sq ft)	eGRID Subregion *where electricity is consumed*	Electricity Purchased (kWh)	CO_2 Emissions (lb/MWh)	CH_4 Emissions (lb/MWh)	N_2O Emissions (lb/MWh)	CO_2 Emissions (lb)	CH_4 Emissions (lb)	N_2O Emissions (lb)	CO_2 Emissions (lb)	CH_4 Emissions (lb)	N_2O Emissions (lb)
Bldg-012	*East Power Plant*	*12,517*	*HIMS (HICC Miscellaneous)*	*200,000*	*0*	*0*	*0*	*0.0*	*0.0*	*0.0*	*226,880.0*	*27.0*	*4.2*
Industrial	Warehouse and Sto	67,000	MROW (MRO West)	348,400	<enter factor>	<enter factor>	<enter factor>	346,936.7	37.3	5.2	346,936.7	37.3	5.2
Retail/Com	Retail	6,073,000	MROW (MRO West)	77,127,100	<enter factor>	<enter factor>	<enter factor>	76,803,166.2	8,252.6	1,156.9	76,803,166.2	8,252.6	1,156.9
Insitutional	Education	4,435,000	MROW (MRO West)	35,923,500	<enter factor>	<enter factor>	<enter factor>	35,772,621.3	3,843.8	538.9	35,772,621.3	3,843.8	538.9
Other - Tou	Lodging	869,000	MROW (MRO West)	12,861,200	<enter factor>	<enter factor>	<enter factor>	12,807,183.0	1,376.1	192.9	12,807,183.0	1,376.1	192.9
Residential	Lodging	4,516,000	MROW (MRO West)	66,836,800	<enter factor>	<enter factor>	<enter factor>	66,556,085.4	7,151.5	1,002.6	66,556,085.4	7,151.5	1,002.6
Residential	Lodging	0	MROW (MRO West)	0	<enter factor>	<enter factor>	<enter factor>	0.0	0.0	0.0	0.0	0.0	0.0
					<enter factor>	<enter factor>	<enter factor>						
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					<enter factor>	<enter factor>	<enter factor>						
					<enter factor>	<enter factor>	<enter factor>						
Total Emissions for All Sources				193,097,000				192,285,992.6	20,661.4	2,896.5	192,285,992.6	20,661.4	2,896.5

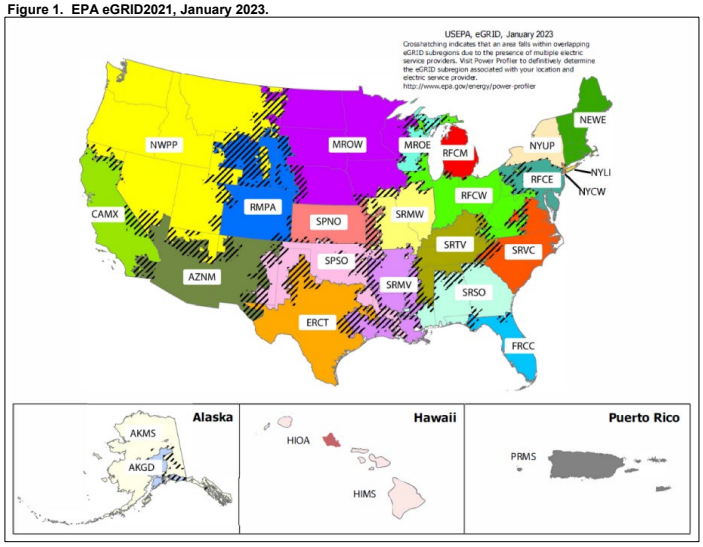
GHG Emissions

CO_2 Equivalent Emissions (metric tons)	
Location-Based Electricity Emissions	87,846.7
Market-Based Electricity Emissions	87,846.7

Notes:

1. CO_2, CH_4 and N_2O emissions are estimated using methodology provided in EPA's Center for Corporate Climate Leadership Greenhouse Gas Inventory Guidance - Indirect Emissions from Purchased Electricity (January 2016).

Figure 1. EPA eGRID2021, January 2023.



Construction Emissions - Scenario B
Mobile Source Information

Construction 10 Years (estimate)
Project Lifetime 50 Years (estimate)

									Annual		Total for Project		Emission Factors[5]			Total Emissions (ton)				Emissions Annualized over Project Lifetime (50 yrs)			
Onroad/Off-Road	Vehicle Type[1]	Number of Vehicles per Day[2]	Fuel Type	Vehicle Year[3]	VMT (miles per day, per vehicle)[2]	Miles per Gallon[4]	Fuel Usage (gal/day, all vehicles)	Days Per Year[2]	Miles Traveled (mi/yr, all vehicles)	Fuel Usage (gal/yr, all vehicles)	Miles Traveled (mi)	Fuel Usage (gal)	CO2 (kg/gal)	CH4 (g/mile)	N2O (g/mile)	CO2 (short ton)	CH4 (short ton)	N2O (short ton)	CO2e (short ton)	CO2 (short ton/yr)	CH4 (short ton/yr)	N2O (short ton/yr)	CO2e (short ton/yr)
Onroad	Light Duty Vehicles - Laborers (commute)	95	Gas	2015	20	22.0	86.44	260	494,000	22,476	4,940,000	224,757	8.78	0.0068	0.0042	2,174.65	0.0370	0.02286	2,182	43.5	0.00074	0.00046	43.635
	Heavy Duty Trucks - Dump Trucks (onsite and offsite)	38	Diesel	2015	60	7.6	300.00	260	592,800	78,000	5,928,000	780,000	10.21	0.0095	0.0431	8,776.11	0.0621	0.2816	8,852	175.5	0.00124	0.0056	177.049
	Heavy Duty Trucks - Semis (onsite and offsite)	38	Diesel	2015	60	6.2	367.74	260	592,800	95,613	5,928,000	956,129	10.21	0.0095	0.0431	10,757.81	0.0621	0.2816	10,834	215.2	0.00124	0.0056	216.683
															Total	**21,709**	**0.161**	**0.586**	**21,868**	**434.2**	**0.00322**	**0.0117**	**437.4**

1. Vehicle types are defined by the Federal Highway Administration (FHWA). Light duty vehicle, short wheel base replaces the old category passenger car and includes passenger cars, light trucks, vans and sport utility vehicles with a wheelbase (WB) equal to or less than 121 inches. Light duty, long wheel base replaces "Other 2-axle, 4-tire vehicle and includes large passenger cars, vans, pickup trucks, and sport/utility vehicles with wheelbases larger than 121 inches. Light Duty Vehicles includes all vehicles in the short and long wheel base category.

2. Estimates based on similar development projects.

3. Assumed.

4. For light duty vehicles, based on 1995-2020: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics (Washington, DC: Annual Issues), table VM-1, available at http://www.fhwa.dot.gov/policyinformation/statistics.cfm as of Dec. 29, 2021. For heavy duty vehicles, average miles per gallon values from the U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2020 (November 2022), Table VM-1.

5. Emission factors based on the U.S. EPA's Emission Factors Hub (https://www.epa.gov/system/files/other-files/2025-01/ghg-emission-factors-hub-2025.xlsx).

									Emission Factors[4]			Total Project Emissions				Emissions Annualized over Project Lifetime (50 yrs)			
Onroad/Offroad	Vehicle Type	Number of Vehicles[1]	Fuel type	Engine Size (hp)[1]	Consumption Rate (gal per hp-hr)[2]	Hours per Year[3]	Total Gallons per Year	Total Gallons for Project	CO2 (kg/gal)	CH4 (g/gal)	N2O (g/gal)	CO2 (short ton)	CH4 (short ton)	N2O (short ton)	CO2e (short ton)	CO2 (short ton/yr)	CH4 (short ton/yr)	N2O (short ton/yr)	CO2e (short ton/yr)
Off-road	Crane	8	Diesel	250	0.05	2,080	208,000	2,080,000	10.21	0.94	0.87	23402.95	2.155	1.994	23,992	468.1	0.0431	0.0399	479.8
	Backhoe	12	Diesel	125	0.05	2,080	156,000	1,560,000	10.21	0.94	0.87	17552.22	1.616	1.496	17,994	351.0	0.0323	0.0299	359.9
	Loader	16	Diesel	250	0.05	2,080	416,000	4,160,000	10.21	0.94	0.87	46805.91	4.309	3.988	47,983	936.1	0.0862	0.0798	959.7
	Excavator	8	Diesel	250	0.05	2,080	208,000	2,080,000	10.21	0.94	0.87	23402.95	2.155	1.994	23,992	468.1	0.0431	0.0399	479.8
	Skid Steer	12	Diesel	50	0.05	2,080	62,400	624,000	10.21	0.94	0.87	7020.89	0.646	0.598	7,198	140.4	0.0129	0.0120	144.0
	Total	56					1,050,400	10,504,000			**Total**	**118,185**	**10.881**	**10.071**	**121,158**	**2,363.7**	**0.21762**	**0.2014**	**2,423.2**

1. Estimates based on similar development projects.

2. Off-road mobile source fuel usage based on South Coast Air Quality Management District CEQA Air Quality Handbook, Table A9-3E.

3. Based on 8 hr/day, 5 day/wk, 52 wk/yr.

4. Emission factors based on the U.S. EPA's Emission Factors Hub (https://www.epa.gov/system/files/other-files/2025-01/ghg-emission-factors-hub-2025.xlsx).

Operational Emissions - Net Increase
Mobile Source - Operations

															Emission Factors[7]			Emissions			
Area	**Development**	**Square Feet**	**Vehicle Type[1]**	**Vehicle Driver**	**Daily Trips[2]**	**Fuel Type**	**Vehicle Year[3]**	**VMT (miles per trip)[4]**	**Miles per Gallon[5]**	**Fuel Usage (gal/day, all vehicles)**	**Days Per Year[6]**	**Miles per Year (per Vehicle)**	**Miles per Year All Vehicles**	**Fuel Usage (gal/yr, all vehicles)**	**CO2 (kg/gal)**	**CH4 (g/mile)**	**N2O (g/mile)**	**CO2 (short ton/yr)**	**CH4 (short ton/yr)**	**N2O (short ton/yr)**	**CO2e (short ton/yr)**
Lot D	Residential	802,000	Light Duty Vehicle, (Passenger Cars, small trucks and SUVs)	Resident	2311	Gas	2015	10	22.0	1051.44	365	3,650	8,435,150	383,777	8.78	0.0068	0.0042	3,713	0.06	0.039	3,725
	Other - Tourism	93000	Light Duty Vehicle, (Passenger Cars, small trucks and SUVs)	Tourist	1119	Gas	2015	100	22.0	5091.15	365	36,500	40,843,500	1,858,270	8.78	0.0068	0.0042	17,980	0.30606	0.1890	18,038
Essentia	Residential	950,000	Light Duty Vehicle, (Passenger Cars, small trucks and SUVs)	Resident	2676	Gas	2015	10	22.0	1217.51	365	3,650	9,767,400	444,391	8.78	0.0068	0.0042	4,300	0.07	0.045	4,314
	Commercial (assume grocery store)	50,000	Light Duty Vehicle, (Passenger Cars, small trucks and SUVs)	Customer	2723	Gas	2015	10	22.0	1238.89	365	3,650	9,938,950	452,196	8.78	0.0068	0.0042	4,375	0.07	0.046	4,390
			Heavy Duty Trucks (Deliveries)	Deliveries	50	Diesel	2015	100	7.6	657.89	365	36,500	1,825,000	240,132	10.21	0.0095	0.0431	2,702	0.02	0.087	2,725
	Institutional/Medical Office	275,000	Light Duty Vehicle, (Passenger Cars, small trucks and SUVs)	Students, Staff, Parents	9358	Gas	2015	20	22.0	8515.28	365	7,300	68,313,400	3,108,077	8.78	0.0068	0.0042	30,072	0.5119	0.31618	30,171
	Other - Tourism	236,000	Light Duty Vehicle, (Passenger Cars, small trucks and SUVs)	Tourist	2803	Diesel	2015	100	22.0	12752.90	365	36,500	102,309,500	4,654,809	8.78	0.0068	0.0042	45,038	0.76667	0.4735	45,185
1st Street	Residential	492,000	Light Duty Vehicle, (Passenger Cars, small trucks and SUVs)	Resident	2194	Gas	2015	10	22.0	998.21	365	3,650	8,008,100	364,347	8.78	0.0068	0.0042	3,525	0.060	0.037	3,537
	Commercial (assume grocery store)	20,000	Light Duty Vehicle, (Passenger Cars, small trucks and SUVs)	Customer	1089	Gas	2015	10	22.0	495.47	365	3,650	3,974,850	180,845	8.78	0.0068	0.0042	1,750	0.030	0.018	1,755
			Heavy Duty Trucks (Deliveries)	Deliveries	20	Diesel	2015	100	7.6	263.16	365	36,500	730,000	96,053	10.21	0.0095	0.04	1,081	0.008	0.035	1,090
Secondary	Residential	126,000	Light Duty Vehicle, (Passenger Cars, small trucks and SUVs)	Resident	562	Gas	2015	10	22.0	255.69	365	3,650	2,051,300	93,329	8.78	0.0068	0.0042	903	0.02	0.009	906
																	Total	**115,439**	**1.93**	**1.30**	**115,836**

1. Assumes residents and employees drive gasoline powered light duty vehicles and deliveries are made by heavy duty diesel vehicles.

2. Trip generation estimates represent peak weekday trips and are based on the Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers. It is conservatively assumed for this analysis that the daily trips occur 365 days per year.

3. Assume vehicles are 2015 model year.

4. Assumed distance per trip.

5. For light duty vehicles, based on 1995-2020: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics (Washington, DC: Annual Issues), table VM-1, available at http://www.fhwa.dot.gov/policyinformation/statistics.cfm as of Dec. 29, 2021. For heavy duty vehicles, average miles per gallon values from the U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2020 (November 2022), Table VM-1.

6. Assume daily trips take place 365 days per year.

7. Emission factors based on the U.S. EPA's Emission Factors Hub (https://www.epa.gov/climateleadership/ghg-emission-factors-hub, updated January 2025).

Waste Generation and Disposal Estimates

	lb/person/day					
	Total	Recycled	Composted	Landfilled	Combusted	Other Food Management
Waste Generation per Person per Day	4.9	1.2	0.4	2.4	0.6	0.3

** Source: USEPA Fact Sheet 2018 - Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2018.*

Area	Development	Square Feet	Number of Units/Rooms	Employees per Room or Residents per Unit	Number of Employees or Residents	Total Waste Generaration Rate (lb/day)	Recycled	Composted	Landfilled	Combusted	Other Food Management
Lot D	Residential	802,000	509	4	2036	9976.4	2443.2	814.4	4886.4	1221.6	610.8
	Other - Tourism	93,000	140	2	280	1372	336	112	672	168	84
Essentia	Residential	950,000	600	4	2400	11760	2880	960	5760	1440	720
	Commercial (assume grocery store)	50,000			100	490	120	40	240	60	30
	Institutional	275,000			1000	4900	1200	400	2400	600	300
	Other - Tourism	236,000	480	2	960	4704	1152	384	2304	576	288
1st Street	Residential	492,000	492	4	1968	9643.2	2361.6	787.2	4723.2	1180.8	590.4
	Commercial (assume grocery store)	20,000			50	245	60	20	120	30	15
Secondary	Residential	126,000	126	4	504	2469.6	604.8	201.6	1209.6	302.4	151.2
					Total (lb/day)	45560.2	11157.6	3719.2	22315.2	5578.8	2789.4
					Total (ton/day)	22.8	5.6	1.9	11.2	2.8	1.4
					Total (ton/yr)	8314.7	2036.3	678.8	4072.5	1018.1	509.1

EPA CENTER FOR CORPORATE CLIMATE LEADERSHIP
U.S. Environmental Protection Agency

Scope 3 Emissions from Waste

Guidance

(A) Enter annual waste data in ORANGE cells. Example entry is shown in first row (*GREEN Italics*).

(B) First, choose the appropriate material then the disposal method from the drop down options. For the average-data method, use one of the mixed material types, such as mixed MSW. If the exact waste material is not available, consider an appropriate proxy. For example, dimensional lumber can be used as a proxy for wood furniture.

a new material type or appropriate disposal method.

Table 1. Waste Disposal Weight by Waste Material and Disposal Method (CO_2, CH_4 and N_2O)

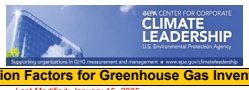
Source ID	Source Description	Waste Material	Disposal Method	Weight	Unit	CO_2e Emissions (kg)
Bldg-012	*East Power Plant Finished Goods*	*Copper Wire*	*Landfilled*	*1,000*	*metric ton*	*22,040*
Total Landfilled	Total Landfilled	Mixed MSW municipal solid waste	Landfilled	4,073	short ton	*2,117,712*
Total Recycled	Total Recycled	Mixed Recyclables	Recycled	2,036	short ton	*183,264*
Total Composted	Total Composted	Mixed Organics	Composted	679	short ton	*115,388*
Total Combusted	Total Combusted	Mixed MSW municipal solid waste	Combusted	1,018	short ton	*437,796*
Total Other	Total Other	Fruits and Vegetables	Composted	509	short ton	*76,360*

GHG Emissions

Total Emissions by Disposal Method

Waste Material	CO_2e (kg)
Recycled	183,264
Landfilled	2,117,712
Combusted	437,796
Composted	191,748
Anaerobically Digested (Dry	-
Anaerobically Digested (Wet	-

Total CO_2 Equivalent Emissions (metric tons) - Waste	**2,930.5**



Emission Factors for Greenhouse Gas Inventories

Last Modified: January 15, 2025

Blue text indicates an update from the 2024 version of this document.

Typically, greenhouse gas emissions are reported in units of carbon dioxide equivalent (CO_2e). Gases are converted to CO_2e by multiplying by their global warming potential (GWP). In most cases, the emission factors listed in this document generally have not been converted to CO_2e. To do so, multiply the emissions by the corresponding GWP listed in the table below.

Gas	100-Year GWP
CH_4	28
N_2O	265

Source: Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment Report (AR5), 2013.
See the source note to Table 11 for further explanation.

Table 1 Stationary Combustion

Fuel Type	Heat Content (HHV)	CO_2 Factor	CH_4 Factor	N_2O Factor	CO_2 Factor	CH_4 Factor	N_2O Factor
	mmBtu per short ton	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per short ton	g CH_4 per short ton	g N_2O per short
Coal and Coke							
Anthracite	25.09	103.69	11	1.6	2,602	276	40
Bituminous	24.93	93.28	11	1.6	2,325	274	40
Sub-bituminous	17.25	97.17	11	1.6	1,676	190	28
Lignite	14.21	97.72	11	1.6	1,389	156	23
Mixed (Commercial Sector)	21.39	94.27	11	1.6	2,016	235	34
Mixed (Electric Power Sector)	19.73	95.52	11	1.6	1,885	217	32
Mixed (Industrial Coking)	26.28	93.90	11	1.6	2,468	289	42
Mixed (Industrial Sector)	22.35	94.67	11	1.6	2,116	246	36
Coal Coke	24.80	113.67	11	1.6	2,819	273	40
Other Fuels - Solid							
Municipal Solid Waste	9.95	90.70	32	4.2	902	318	42
Petroleum Coke (Solid)	30.00	102.41	32	4.2	3,072	960	126
Plastics	38.00	75.00	32	4.2	2,850	1,216	160
Tires	28.00	85.97	32	4.2	2,407	896	118
Biomass Fuels - Solid							
Agricultural Byproducts	8.25	118.17	32	4.2	975	264	35
Peat	8.00	111.84	32	4.2	895	256	34
Solid Byproducts	10.39	105.51	32	4.2	1,096	332	44
Wood and Wood Residuals	17.48	93.80	7.2	3.6	1,640	126	63
	mmBtu per scf	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per scf	g CH_4 per scf	g N_2O per scf
Natural Gas							
Natural Gas	0.001026	53.06	1.0	0.10	0.05444	0.00103	0.00010
Other Fuels - Gaseous							
Blast Furnace Gas	0.000092	274.32	0.022	0.10	0.02524	0.000002	0.000009
Coke Oven Gas	0.000599	46.85	0.48	0.10	0.02806	0.000288	0.000060
Fuel Gas	0.001388	59.00	3.0	0.60	0.08189	0.004164	0.000833
Propane Gas	0.002516	61.46	3.0	0.60	0.15463	0.007548	0.001510
Biomass Fuels - Gaseous							
Landfill Gas	0.000485	52.07	3.2	0.63	0.025254	0.001552	0.000306
Other Biomass Gases	0.000655	52.07	3.2	0.63	0.034106	0.002096	0.000413
	mmBtu per gallon	kg CO_2 per mmBtu	g CH_4 per mmBtu	g N_2O per mmBtu	kg CO_2 per gallon	g CH_4 per gallon	g N_2O per gallon
Petroleum Products							
Asphalt and Road Oil	0.158	75.36	3.0	0.60	11.91	0.47	0.09
Aviation Gasoline	0.120	69.25	3.0	0.60	8.31	0.36	0.07
Butane	0.103	64.77	3.0	0.60	6.67	0.31	0.06
Butylene	0.105	68.72	3.0	0.60	7.22	0.32	0.06
Crude Oil	0.138	74.54	3.0	0.60	10.29	0.41	0.08
Distillate Fuel Oil No. 1	0.139	73.25	3.0	0.60	10.18	0.42	0.08
Distillate Fuel Oil No. 2	0.138	73.96	3.0	0.60	10.21	0.41	0.08
Distillate Fuel Oil No. 4	0.146	75.04	3.0	0.60	10.96	0.44	0.09
Ethane	0.068	59.60	3.0	0.60	4.05	0.20	0.04
Ethylene	0.058	65.96	3.0	0.60	3.83	0.17	0.03
Heavy Gas Oils	0.148	74.92	3.0	0.60	11.09	0.44	0.09
Isobutane	0.099	64.94	3.0	0.60	6.43	0.30	0.06
Isobutylene	0.103	68.86	3.0	0.60	7.09	0.31	0.06
Kerosene	0.135	75.20	3.0	0.60	10.15	0.41	0.08
Kerosene-Type Jet Fuel	0.135	72.22	3.0	0.60	9.75	0.41	0.08
Liquefied Petroleum Gases (LPG)	0.092	61.71	3.0	0.60	5.68	0.28	0.06
Lubricants	0.144	74.27	3.0	0.60	10.69	0.43	0.09
Motor Gasoline	0.125	70.22	3.0	0.60	8.78	0.38	0.08
Naphtha (<401 deg F)	0.125	68.02	3.0	0.60	8.50	0.38	0.08
Natural Gasoline	0.110	66.88	3.0	0.60	7.36	0.33	0.07
Other Oil (>401 deg F)	0.139	76.22	3.0	0.60	10.59	0.42	0.08
Pentanes Plus	0.110	70.02	3.0	0.60	7.70	0.33	0.07
Petrochemical Feedstocks	0.125	71.02	3.0	0.60	8.88	0.38	0.08
Propane	0.091	62.87	3.0	0.60	5.72	0.27	0.05
Propylene	0.091	67.77	3.0	0.60	6.17	0.27	0.05
Residual Fuel Oil No. 5	0.140	72.93	3.0	0.60	10.21	0.42	0.08
Residual Fuel Oil No. 6	0.150	75.10	3.0	0.60	11.27	0.45	0.09
Special Naphtha	0.125	72.34	3.0	0.60	9.04	0.38	0.08
Unfinished Oils	0.139	74.54	3.0	0.60	10.36	0.42	0.08
Used Oil	0.138	74.00	3.0	0.60	10.21	0.41	0.08
Biomass Fuels - Liquid							
Biodiesel (100%)	0.128	73.84	1.1	0.11	9.45	0.14	0.01
Ethanol (100%)	0.084	68.44	1.1	0.11	5.75	0.09	0.01
Rendered Animal Fat	0.125	71.06	1.1	0.11	8.88	0.14	0.01
Vegetable Oil	0.120	81.55	1.1	0.11	9.79	0.13	0.01
Biomass Fuels - Kraft Pulping Liquor, by Wood Furnish							
North American Softwood		94.4	1.9	0.42			
North American Hardwood		93.7	1.9	0.42			
Bagasse		95.5	1.9	0.42			
Bamboo		93.7	1.9	0.42			
Straw		95.1	1.9	0.42			

Source:
Federal Register EPA; 40 CFR Part 98; e-CFR, (see link below). Table C-1 and Table C-2 (78 FR 71950, Nov. 29, 2013, as amended at 81 FR 89252, Dec. 9, 2016), Table AA-1 (78 FR 71965, Nov. 29, 2013).
https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98

Notes:
Emission factors are per unit of heat content using higher heating values (HHV). If heat content is available from the fuel supplier, it is preferable to use that value. If not, default heat contents are provided.
All CO_2 emission factors assume that 100 percent of the carbon content of the fuel is oxidized to CO_2, as is recommended by the Intergovernmental Panel on Climate Change (IPCC).
The CH_4 and N_2O emission factors provided represent emissions in terms of fuel type and by end-use sector (i.e., residential, commercial, industrial, electricity generation).
Please see the Center for Corporate Climate Leadership's guidance document on Direct Emissions from Stationary Combustion Sources for guidance on how to include biomass fuels in an organization's greenhouse gas inventory.
https://www.epa.gov/sites/default/files/2020-12/documents/stationaryemissions.pdf
The factors represented in the table above represent combustion emissions only and do not represent upstream emissions.

Table 2 Mobile Combustion CO_2

Fuel Type	kg CO_2 per unit	Unit
Aviation Gasoline	8.31	gallon
Biodiesel (100%)	9.45	gallon
Compressed Natural Gas (CNG)	0.05444	scf
Diesel Fuel	10.21	gallon
Ethanol (100%)	5.75	gallon
Kerosene-Type Jet Fuel	9.75	gallon
Liquefied Natural Gas (LNG)	4.50	gallon
Liquefied Petroleum Gases (LPG)	5.68	gallon
Motor Gasoline	8.78	gallon
Residual Fuel Oil	11.27	gallon

Source:
Federal Register EPA; 40 CFR Part 98; e-CFR, (see link below). Table C-1 (78 FR 71950, Nov. 29, 2013, as amended at 81 FR 89252, Dec. 9, 2016)
https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98
Notes:
LNG: The factor was developed based on the CO_2 factor (kg CO2 per mmBtu) for Natural Gas from Table 1 and the higher heating value (HHV) LNG fuel density factor (btu/gallon) from the R&D GREET1 2024 Model, Argonne National Laboratory published January 10, 2025 (Fuel_Specs worksheet).
More information on GREET can be found here: https://greet.anl.gov/
Please see the Center for Corporate Climate Leadership's guidance document on Direct Emissions from Stationary Combustion Sources for guidance on how to include biomass fuels in an organization's greenhouse gas inventory.
https://www.epa.gov/sites/default/files/2020-12/documents/stationaryemissions.pdf
The factors represented in the table above represent combustion emissions only (tank-to-wheel) and do not represent upstream emissions or well-to-wheel emissions.

Table 3 Mobile Combustion CH_4 and N_2O for On-Road Gasoline Vehicles

Vehicle Type	Model Year	CH_4 Factor (g CH_4 / vehicle-mile)	N_2O Factor (g N_2O / vehicle-mile)
Gasoline Passenger Cars	1973-1974	0.1696	0.0197
	1975	0.1423	0.0443
	1976-1977	0.1406	0.0458
	1978-1979	0.1389	0.0473
	1980	0.1326	0.0499
	1981	0.0802	0.0626
	1982	0.0795	0.0627
	1983	0.0782	0.0630
	1984-1993	0.0704	0.0647
	1994	0.0617	0.0603
	1995	0.0531	0.0560
	1996	0.0434	0.0503
	1997	0.0337	0.0446
	1998	0.0240	0.0389
	1999	0.0215	0.0355
	2000	0.0175	0.0304
	2001	0.0105	0.0212
	2002	0.0102	0.0207
	2003	0.0095	0.0181
	2004	0.0078	0.0085
	2005	0.0075	0.0067
	2006	0.0076	0.0075
	2007	0.0072	0.0052
	2008	0.0072	0.0049
	2009	0.0071	0.0046
	2010	0.0071	0.0046
	2011	0.0071	0.0046
	2012	0.0071	0.0046
	2013	0.0071	0.0046
	2014	0.0071	0.0046
	2015	0.0068	0.0042
	2016	0.0065	0.0038
	2017	0.0054	0.0018
	2018	0.0052	0.0016
	2019	0.0051	0.0015
	2020	0.0050	0.0014
	2021	0.0051	0.0014
	2022	0.0050	0.0014
Gasoline Light-Duty Trucks (Vans, Pickup Trucks, SUVs)	1973-1974	0.1908	0.0218
	1975	0.1634	0.0513
	1976	0.1594	0.0555
	1977-1978	0.1614	0.0534
	1979-1980	0.1594	0.0555
	1981	0.1479	0.0660
	1982	0.1442	0.0681
	1983	0.1368	0.0722
	1984	0.1294	0.0764
	1985	0.1220	0.0806
	1986	0.1146	0.0848
	1987-1993	0.0813	0.1035
	1994	0.0646	0.0982
	1995	0.0517	0.0908
	1996	0.0452	0.0871
	1997	0.0452	0.0871
	1998	0.0412	0.0787
	1999	0.0333	0.0618
	2000	0.0340	0.0631
	2001	0.0221	0.0379
	2002	0.0242	0.0424
	2003	0.0221	0.0373
	2004	0.0115	0.0088
	2005	0.0105	0.0064
	2006	0.0108	0.0080
	2007	0.0103	0.0061
	2008	0.0095	0.0036
	2009	0.0095	0.0036
	2010	0.0095	0.0035
	2011	0.0096	0.0034
	2012	0.0096	0.0033
	2013	0.0095	0.0035
	2014	0.0095	0.0033
	2015	0.0094	0.0031
	2016	0.0091	0.0029
	2017	0.0084	0.0018
	2018	0.0081	0.0015
	2019	0.0080	0.0013
	2020	0.0079	0.0012
	2021	0.0079	0.0012
	2022	0.0079	0.0012
Gasoline Heavy-Duty Vehicles	≤1980	0.4604	0.0497
	1981-1984	0.4492	0.0538
	1985-1986	0.4090	0.0515
	1987	0.3675	0.0849
	1988-1989	0.3492	0.0933
	1990-1995	0.3246	0.1142
	1996	0.1278	0.1680
	1997	0.0924	0.1726
	1998	0.0655	0.1750
	1999	0.0648	0.1724
	2000	0.0630	0.1660
	2001	0.0577	0.1468
	2002	0.0634	0.1673
	2003	0.0602	0.1553
	2004	0.0298	0.0164
	2005	0.0297	0.0083
	2006	0.0299	0.0241
	2007	0.0322	0.0015
	2008	0.0340	0.0015
	2009	0.0339	0.0015
	2010	0.0320	0.0015
	2011	0.0304	0.0015
	2012	0.0313	0.0015
	2013	0.0313	0.0015
	2014	0.0315	0.0015
	2015	0.0332	0.0021
	2016	0.0321	0.0061
	2017	0.0329	0.0084
	2018	0.0326	0.0082
	2019	0.0330	0.0091
	2020	0.0332	0.0100
	2021	0.0332	0.0100
	2022	0.0332	0.0100
Gasoline Motorcycles	1960-1995	0.0090	0.0900
	1996-2005	0.0070	0.0670
	2006-2022	0.0180	0.0660

Source: EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022 (Annexes). All values are calculated from Tables A-79 through A-83.
https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks
Notes:
The factors represented in the table above represent combustion emissions only (tank-to-wheel) and do not represent upstream emissions or well-to-wheel emissions.

Table 4 Mobile Combustion CH_4 and N_2O for On-Road Diesel and Alternative Fuel Vehicles

Vehicle Type	Fuel Type	Model Year	CH_4 Factor (g CH_4 / vehicle-mile)	N_2O Factor (g N_2O / vehicle-mile)
Passenger Cars	Diesel	1960-1982	0.0006	0.0012
		1983-2006	0.0005	0.0010
		2007-2022	0.0302	0.0192
Light-Duty Trucks	Diesel	1960-1982	0.0011	0.0017
		1983-2006	0.0009	0.0014
		2007-2022	0.0290	0.0214
Medium- and Heavy-Duty Vehicles	Diesel	1960-2006	0.0051	0.0048
		2007-2022	0.0095	0.0431
Light-Duty Cars	Methanol		0.0120	0.0040
	Ethanol		0.0120	0.0040
	CNG		0.1200	0.0040
	LPG		0.0120	0.0040
	Biodiesel		0.0300	0.0010
Light-Duty Trucks	Ethanol		0.0130	0.0050
	CNG		0.1300	0.0050
	LPG		0.0130	0.0050
	LNG		0.1300	0.0050
	Biodiesel		0.0540	0.0010
Medium-Duty Trucks	CNG		1.7860	0.0330
	LPG		0.1790	0.0330
	LNG		1.7860	0.0330
	Biodiesel		0.0090	0.0050
Heavy-Duty Trucks	Methanol		0.0720	0.0260
	Ethanol		0.0720	0.0260
	CNG		0.9210	0.0170
	LPG		0.0920	0.0170
	LNG		0.9210	0.0170
	Biodiesel		0.0090	0.0020
Buses	Methanol		0.1900	0.0290
	Ethanol		0.1900	0.0290
	CNG		2.7190	0.0170
	LPG		0.2720	0.0170
	LNG		2.7190	0.0170
	Biodiesel		0.0090	0.0030

Source: EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022 (Annexes). All values are calculated from Tables A-84 through A-85.
https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

Notes:
The factors represented in the table above represent combustion emissions only (tank-to-wheel) and do not represent upstream emissions or well-to-wheel emissions.

Table 5 Mobile Combustion CH_4 and N_2O for Non-Road Vehicles

Vehicle Type	Fuel Type	CH_4 Factor (g CH_4 / gallon)	N_2O Factor (g N_2O / gallon)
Ships and Boats	Residual Fuel Oil	1.10	0.31
	Gasoline (2 stroke)	4.67	0.08
	Gasoline (4 stroke)	2.27	0.01
	Diesel	6.51	0.17
Locomotives	Diesel	0.80	0.26
Aircraft	Jet Fuel	0	0.30
	Aviation Gasoline	7.06	0.11
Agricultural Equipment[A]	Gasoline (2 stroke)	6.90	0.47
	Gasoline (4 stroke)	1.93	1.20
	Gasoline Off-Road Trucks	1.93	1.20
	Diesel Equipment	1.26	1.07
	Diesel Off-Road Trucks	0.92	0.56
	LPG	0.33	0.94
Construction/Mining Equipment[B]	Gasoline (2 stroke)	8.00	0.12
	Gasoline (4 stroke)	2.86	1.48
	Gasoline Off-Road Trucks	2.86	1.48
	Diesel Equipment	1.01	0.94
	Diesel Off-Road Trucks	0.92	0.56
	LPG	0.59	0.50
Lawn and Garden Equipment	Gasoline (2 stroke)	7.34	0.31
	Gasoline (4 stroke)	3.02	1.50
	Diesel	0.67	0.49
	LPG	0.37	0.63
Airport Equipment	Gasoline	1.07	1.12
	Diesel	1.98	1.21
	LPG	0.37	0.93
Industrial/Commercial Equipment	Gasoline (2 stroke)	7.30	0.51
	Gasoline (4 stroke)	2.81	1.57
	Diesel	0.43	0.62
	LPG	0.46	0.66
Logging Equipment	Gasoline (2 stroke)	9.82	0
	Gasoline (4 stroke)	3.22	2.05
	Diesel	0.49	1.26
Railroad Equipment	Gasoline	3.32	1.86
	Diesel	0.41	0.97
	LPG	2.05	0.01
Recreational Equipment	Gasoline (2 stroke)	9.86	0.11
	Gasoline (4 stroke)	2.74	1.49
	Diesel	0.73	0.66
	LPG	0.44	0.61

Source: EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022 (Annexes). All values are calculated from Tables A-86 and A-87.
https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

Notes:
The factors represented in the table above represent combustion emissions only (tank-to-wheel) and do not represent upstream emissions or well-to-wheel emissions.
[A] Includes equipment, such as tractors and combines, as well as fuel consumption from trucks that are used off-road in agriculture.
[B] Includes equipment, such as cranes, dumpers, and excavators, as well as fuel consumption from trucks that are used off-road in construction.

Table 6 Electricity

eGRID Subregion Acronym	eGRID Subregion Name	Total Output Emission Factors			Non-Baseload Emission Factors			Grid Gross Loss (%)
		CO_2 Factor (lb CO_2 / MWh)	CH_4 Factor (lb CH_4 / MWh)	N_2O Factor (lb N_2O / MWh)	CO_2 Factor (lb CO_2 / MWh)	CH_4 Factor (lb CH_4 / MWh)	N_2O Factor (lb N_2O / MWh)	
AKGD	ASCC Alaska Grid	899.0	0.086	0.012	1,077.1	0.116	0.016	4.1%
AKMS	ASCC Miscellaneous	519.4	0.026	0.004	1,548.6	0.067	0.012	4.1%
AZNM	WECC Southwest	740.8	0.041	0.006	1,260.4	0.067	0.009	4.1%
CAMX	WECC California	436.7	0.025	0.003	1,034.0	0.051	0.007	4.1%
ERCT	ERCOT All	738.0	0.043	0.006	1,264.9	0.076	0.010	4.2%
FRCC	FRCC All	801.9	0.042	0.005	1,034.0	0.045	0.006	4.2%
HIMS	HICC Miscellaneous	1,122.1	0.146	0.022	1,596.4	0.170	0.027	4.4%
HIOA	HICC Oahu	1,489.4	0.134	0.021	1,753.4	0.159	0.025	4.4%
MROE	MRO East	1,402.0	0.116	0.017	1,713.8	0.161	0.023	4.2%
MROW	MRO West	920.0	0.097	0.014	1,776.6	0.180	0.026	4.2%
NEWE	NPCC New England	537.2	0.063	0.008	885.2	0.067	0.009	4.2%
NWPP	WECC Northwest	631.7	0.054	0.008	1,613.4	0.146	0.021	4.1%
NYCW	NPCC NYC/Westchester	974.7	0.025	0.003	1,008.9	0.020	0.002	4.2%
NYLI	NPCC Long Island	1,180.7	0.140	0.018	1,316.6	0.050	0.006	4.2%
NYUP	NPCC Upstate NY	241.0	0.011	0.001	909.1	0.041	0.005	4.2%
PRMS	Puerto Rico Miscellaneous	1,543.0	0.077	0.012	1,636.7	0.072	0.012	
RFCE	RFC East	594.7	0.036	0.005	1,175.5	0.077	0.010	4.2%
RFCM	RFC Michigan	962.1	0.082	0.011	1,508.1	0.144	0.020	4.2%
RFCW	RFC West	911.3	0.071	0.010	1,757.3	0.161	0.023	4.2%
RMPA	WECC Rockies	1,036.0	0.090	0.013	1,620.6	0.124	0.018	4.1%
SPNO	SPP North	861.9	0.087	0.012	1,892.1	0.188	0.027	4.2%
SPSO	SPP South	891.1	0.055	0.008	1,508.4	0.095	0.013	4.2%
SRMV	SERC Mississippi Valley	739.4	0.032	0.004	1,145.5	0.061	0.008	4.2%
SRMW	SERC Midwest	1,238.3	0.132	0.019	1,818.6	0.190	0.027	4.2%
SRSO	SERC South	840.9	0.055	0.008	1,386.0	0.098	0.014	4.2%
SRTV	SERC Tennessee Valley	895.7	0.079	0.011	1,865.8	0.154	0.022	4.2%
SRVC	SERC Virginia/Carolina	590.2	0.045	0.006	1,286.8	0.100	0.014	4.2%
US Average	US Average	771.5	0.057	0.008	1,393.7	0.104	0.015	4.2%

Source: EPA eGRID2023, January 2025 (Summary Tables - Table 1. Subregion Output Emission Rates)
https://www.epa.gov/system/files/documents/2025-01/egrid2023_summary_tables.xlsx

Notes:
Total output emission factors can be used as default factors for estimating GHG emissions from electricity use when developing a carbon footprint or emissions inventory.
Annual non-baseload output emission factors should not be used when developing a carbon footprint or emissions inventory, but can be used to estimate GHG emissions reductions on the grid from changes in electricity use.
Grid gross loss % factors provide the Transmission & Distribution loss rates for electricity only, and should not be applied to scope 2 emissions for an end-user. They can assist in calculating one component of Scope 3 Category 3 Fuel- and Energy-Related Activities emissions, Activity C.
For technical information, reference the EPA's eGRID Technical Guide
https://www.epa.gov/system/files/documents/2025-01/egrid2023_technical_guide.pdf
The factors represented in the table above represent combustion emissions only (tank-to-wheel) and do not represent upstream emissions or well-to-wheel emissions.

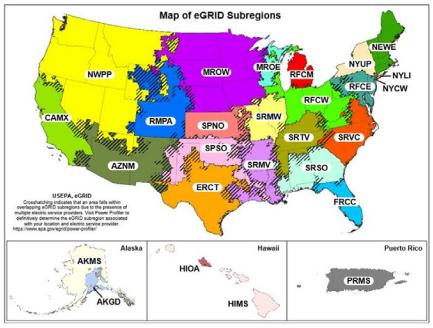


Table 7 **Steam and Heat**

	CO_2 Factor (kg CO_2 / mmBtu)	CH_4 Factor (g CH_4 / mmBtu)	N_2O Factor (g N_2O / mmBtu)
Steam and Heat	66.33	1.250	0.125

Notes:
Emission factors are per mmBtu of steam or heat purchased. These factors assume natural gas fuel is used to generate steam or heat at 80 percent thermal efficiency.
The factors represented in the table above represent combustion emissions only (tank-to-wheel) and do not represent upstream emissions or well-to-wheel emissions.

Scope 3 Emission Factors

Scope 3 emission factors provided below are aligned with the Greenhouse Gas Protocol Technical Guidance for Calculating Scope 3 Emissions, version 1.0 (Scope 3 Calculation Guidance). Where applicable, the specific calculation method is referenced. Refer to the Scope 3 Calculation Guidance for more information.
http://www.ghgprotocol.org/scope-3-technical-calculation-guidance

Table 8 **Scope 3 Category 4: Upstream Transportation and Distribution and Category 9: Downstream Transportation and Distribution**

These factors are intended for use in the distance-based method defined in the Scope 3 Calculation Guidance. If fuel data are available, then the fuel-based method should be used, with factors from Tables 2 through 5.

Vehicle Type	CO_2 Factor (kg CO_2 / unit)	CH_4 Factor (g CH_4 / unit)	N_2O Factor (g N_2O / unit)	Units
Medium- and Heavy-Duty Truck	1.298	0.0115	0.0376	vehicle-mile
Passenger Car [A]	0.297	0.0059	0.0053	vehicle-mile
Light-Duty Truck [B]	0.394	0.0109	0.0088	vehicle-mile
Medium- and Heavy-Duty Truck[C]	0.186	0.0016	0.0054	short ton-mile
Rail	0.021	0.0018	0.0005	short ton-mile
Waterborne Craft	0.077	0.0310	0.0020	short ton-mile
Aircraft	1.086	0	0.0334	short ton-mile

Source:
CO_2, CH_4, and N_2O emissions data for on-road vehicles are from Table 2-13 of the EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022.
Vehicle-miles data for on-road vehicles are from Tables A-71 - A-73 of the EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022 (Annexes).
CO_2e emissions data for non-road vehicles are based on Table A-93 of the EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022 (Annexes), which are distributed into CO_2, CH_4, and N_2O emissions based on fuel/vehicle emission factors.
Freight ton-mile data are from Table 1-50 of the Bureau of Transportation Statistics, National Transportation Statistics (2024): 2022 data.

Notes:
Vehicle-mile factors are appropriate to use when the entire vehicle is dedicated to transporting the reporting company's product. Ton-mile factors are appropriate when the vehicle is shared with products from other companies.
The factors represented in the table above represent combustion emissions only (tank-to-wheel) and do not represent upstream emissions or well-to-wheel emissions.
[A] Passenger cars are automobiles used primarily to transport 12 people or less for personal travel, and are less than 8,500 lbs in gross vehicle weight.
[B] Light-duty trucks are vehicles that primarily transport passengers such as sport utility vehicles (SUVs) and minivans. This category also includes vehicles used for transporting light-weight cargo which are equipped with special features such as four-wheel drive for off-road operation. The gross vehicle weight normally ranges around 8,500 pounds or less.
[C] Medium- and heavy-duty trucks are vehicles with a gross vehicle weight of more than around 8,500 pounds, such as single unit trucks, combination trucks, tractor-trailers, and box trucks used for freight transportation. In addition, this category includes some vehicles that are not typically used for freight movement such as service and utility trucks.

Table 9 **Scope 3 Category 5: Waste Generated in Operations and Category 12: End-of-Life Treatment of Sold Products**

These factors are intended for use in the waste-type-specific method or the average-data method defined in the Scope 3 Calculation Guidance for category 5 and category 12. Choose the appropriate material and disposal method from the table below. For the average-data method, use one of the mixed material types, such as mixed MSW.

	Metric Tons CO_2e / Short Ton Material					
Material	Recycled[A]	Landfilled[B]	Combusted[C]	Composted[D]	Anaerobically Digested (Dry Digestate with Curing)	Anaerobically Digested (Wet Digestate with Curing)
Aluminum Cans	0.06	0.02	0.01	NA	NA	NA
Aluminum Ingot	0.04	0.02	0.01	NA	NA	NA
Steel Cans	0.32	0.02	0.01	NA	NA	NA
Copper Wire	0.18	0.02	0.01	NA	NA	NA
Glass	0.05	0.02	0.01	NA	NA	NA
HDPE	0.21	0.02	2.80	NA	NA	NA
LDPE	NA	0.02	2.80	NA	NA	NA
PET	0.23	0.02	2.05	NA	NA	NA
LLDPE	NA	0.02	2.80	NA	NA	NA
PP	0.20	0.02	2.80	NA	NA	NA
PS	NA	0.02	3.02	NA	NA	NA
PVC	NA	0.02	1.26	NA	NA	NA
PLA	NA	0.02	0.01	0.13	NA	NA
Corrugated Containers	0.11	1.00	0.05	NA	NA	NA
Magazines/Third-class mail	0.02	0.46	0.05	NA	NA	NA
Newspaper	0.02	0.39	0.05	NA	NA	NA
Office Paper	0.02	1.41	0.05	NA	NA	NA
Phonebooks	0.04	0.39	0.05	NA	NA	NA
Textbooks	0.04	1.41	0.05	NA	NA	NA
Dimensional Lumber	NA	0.17	0.05	NA	NA	NA
Medium-density Fiberboard	NA	0.07	0.05	NA	NA	NA
Food Waste (non-meat)	NA	0.67	0.05	0.11	0.14	0.11
Food Waste (meat only)	NA	0.69	0.05	0.11	0.14	0.11
Beef	NA	0.64	0.05	0.11	0.14	0.11
Poultry	NA	0.73	0.05	0.11	0.14	0.11
Grains	NA	2.06	0.05	0.11	0.14	0.11
Bread	NA	1.49	0.05	0.11	0.14	0.11
Fruits and Vegetables	NA	0.28	0.05	0.11	0.14	0.11
Dairy Products	NA	0.72	0.05	0.11	0.14	0.11
Yard Trimmings	NA	0.36	0.05	0.14	0.11	NA
Grass	NA	0.28	0.05	0.14	0.09	NA
Leaves	NA	0.28	0.05	0.14	0.12	NA
Branches	NA	0.58	0.05	0.14	0.15	NA
Mixed Paper (general)	0.07	0.89	0.05	NA	NA	NA
Mixed Paper (primarily residential)	0.07	0.86	0.05	NA	NA	NA
Mixed Paper (primarily from offices)	0.03	0.84	0.05	NA	NA	NA
Mixed Metals	0.23	0.02	0.01	NA	NA	NA
Mixed Plastics	0.22	0.02	2.34	NA	NA	NA
Mixed Recyclables	0.09	0.75	0.11	NA	NA	NA
Food Waste	NA	0.68	0.05	0.11	NA	NA
Mixed Organics	NA	0.54	0.05	0.13	NA	NA
Mixed MSW	NA	0.58	0.43	NA	NA	NA
Carpet	NA	0.02	1.68	NA	NA	NA
Desktop CPUs	0.01	0.02	0.40	NA	NA	NA
Portable Electronic Devices	0.02	0.02	0.89	NA	NA	NA
Flat-panel Displays	0.02	0.02	0.74	NA	NA	NA
CRT Displays	NA	0.02	0.64	NA	NA	NA
Electronic Peripherals	0.05	0.02	2.23	NA	NA	NA
Hard-copy Devices	0.01	0.02	1.92	NA	NA	NA
Mixed Electronics	0.02	0.02	0.96	NA	NA	NA
Clay Bricks	NA	0.02	NA	NA	NA	NA
Concrete	0.01	0.02	NA	NA	NA	NA
Fly Ash	0.01	0.02	NA	NA	NA	NA
Tires	0.10	0.02	2.21	NA	NA	NA
Asphalt Concrete	0.004	0.02	NA	NA	NA	NA
Asphalt Shingles	0.03	0.02	0.70	NA	NA	NA
Drywall	NA	0.02	NA	NA	NA	NA
Fiberglass Insulation	0.05	0.02	NA	NA	NA	NA
Structural Steel	0.04	0.02	NA	NA	NA	NA
Vinyl Flooring	NA	0.02	0.29	NA	NA	NA
Wood Flooring	NA	0.18	0.08	NA	NA	NA

Source:
U.S. Environmental Protection Agency, Office of Resource Conservation and Recovery (December 2023) Documentation for Greenhouse Gas Emission and Energy Factors used in the Waste Reduction Model (WARM). Factors from tables provided in the Management Practices Chapters and Background Chapters.

Notes:
These factors do not include avoided emissions impact from any of the disposal methods. This exclusion is an adjustment to the life-cycle factors in the WARM tool. Thus the waste factors presented above will not directly match the factors published in the WARM tool. All the factors presented above include transportation emissions, which are optional in the Scope 3 Calculation Guidance, with an assumed average distance traveled to the processing facility.
AR4 GWP values are used to convert all waste emission factors into CO2e.
Short ton = 2000 lbs.
[A] Recycling emissions do not include avoided emissions associated with process energy, transportation energy, process non-energy, or forest carbon storage. Recycling emissions include transport to recycling facility and sorting of recycled materials at material recovery facility.
[B] Landfilling emissions do not include avoided emissions associated with energy recovery or landfill carbon sequestration. Landfilling emissions include transport to landfill, equipment use at landfill, and landfill CH4 emissions from anaerobic decomposition of biogenic carbon compounds. Landfill CH_4 is based on typical landfill gas collection practices, average landfill moisture conditions, and U.S.-average non-baseload electricity grid mix.
[C] Combustion emissions do not include avoided emissions associated with displaced electric utility generation or decreased energy requirements for production processes using recycled inputs. Combustion emissions include transport to waste-to-energy facility and combustion-related non-biogenic CO_2 and N_2O.
[D] Composting emissions do not include avoided emissions associated with fertilizer offset or soil carbon storage. Composting emissions include transport to compost facility, equipment use at compost facility, and CH_4 and N_2O emissions during composting.
[E] Anaerobically Digested (Dry and Wet Digestate with Curing) emissions do not include avoided emissions associated with displaced electric utility generation, soil carbon storage, or avoided fertilizer application. Anaerobically Digested (Dry and Wet Digestate with Curing) emissions include transport to the anaerobic digester facility, equipment use at the anaerobic digester facility, biogas leakage at the digester, emissions released during the curing and land application process, and fugitive emissions during the curing and after land application.

Table 10 Scope 3 Category 6: Business Travel and Category 7: Employee Commuting

These factors are intended for use in the distance-based method defined in the Scope 3 Calculation Guidance. If fuel data are available, then the fuel-based method should be used, with factors from Tables 2 through 5.

Vehicle Type	CO_2 Factor (kg CO_2 / unit)	CH_4 Factor (g CH_4 / unit)	N_2O Factor (g N_2O / unit)	Units
Passenger Car [A]	0.297	0.0059	0.0053	vehicle-mile
Light-Duty Truck [B]	0.394	0.0109	0.0088	vehicle-mile
Motorcycle	0.368	0.0888	0.0188	vehicle-mile
Intercity Rail - Northeast Corridor [C]	0.023	0.0010	0.0001	passenger-mile
Intercity Rail - Other Routes [C]	0.149	0.0120	0.0040	passenger-mile
Intercity Rail - National Average [C]	0.096	0.0080	0.0020	passenger-mile
Commuter Rail [D]	0.133	0.0105	0.0026	passenger-mile
Transit Rail (i.e. Subway, Tram) [E]	0.093	0.0075	0.0010	passenger-mile
Bus	0.066	0.0045	0.0019	passenger-mile
Air Travel - Short Haul (< 300 miles)	0.207	0.0064	0.0066	passenger-mile
Air Travel - Medium Haul (>= 300 miles, < 2300 miles)	0.129	0.0006	0.0041	passenger-mile
Air Travel - Long Haul (>= 2300 miles)	0.163	0.0006	0.0052	passenger-mile

Source:
CO_2, CH_4, and N_2O emissions data for highway vehicles are from Table 2-13 of the EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2022.
Vehicle-miles data for on-road vehicles are from Tables A-71 - A-73 of the EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2022 (Annexes).
Passenger-miles data for buses are from Table VM-1 of the Federal Highway Administration Highway Statistics (2024): 2022 data.
Fuel consumption data and passenger-miles data for rail are from Tables A.14 - A.16, 10-10, and 7.3 - 7.4 of the Transportation Energy Data Book: Edition 40 (2022): 2019 data. Fuel consumption was converted to emissions by using fuel and electricity emission factors presented in the tables above.
Intercity Rail factors from communication with Amtrak, December 2024, based on 2023 data.
Air Travel factors from 2022 Guidelines to Defra / DECC's GHG Conversion Factors for Company Reporting. Version 2.0 June 2022. Defra air travel emission factors held constant from 2022 release (2018 activity data) to more accurately reflect the current state of business travel as the 2023 and 2024 Defra release reflects significantly reduced load factors during COVID-19.

Notes:
The factors represented in the table above represent combustion emissions only (tank-to-wheel) and do not represent upstream emissions or well-to-wheel emissions.
[A] Passenger cars are automobiles used primarily to transport 12 people or less for personal travel, and are less than 8,500 lbs in gross vehicle weight.
[B] Light-duty trucks are vehicles that primarily transport passengers such as sport utility vehicles (SUVs) and minivans. This category also includes vehicles used for transporting light-weight cargo which are equipped with special features such as four-wheel drive for off-road operation. The gross vehicle weight normally ranges around 8,500 pounds or less.
[C] Intercity rail: Amtrak long-distance rail between major cities. Northeast Corridor extends from Boston to Washington D.C. Other Routes are all routes outside the Northeast Corridor.
[D] Commuter rail: rail service between a central city and adjacent suburbs (also called regional rail or suburban rail).
[E] Transit rail: rail typically within an urban center, such as subways, elevated railways, metropolitan railways (metro), streetcars, trolley cars, and tramways.

Global Warming Potential

Table 11 Global Warming Potential (GWP)

Industrial Designation or Common Name	Chemical Formula	100-Year GWP
Carbon dioxide	CO_2	1
Methane	CH_4	28
Nitrous oxide	N_2O	265
HFC-23	CHF_3	12,400
HFC-32	CH_2F_2	677
HFC-41	CH_3F	116
HFC-125	CHF_2CF_3	3,170
HFC-134	CHF_2CHF_2	1,120
HFC-134a	CH_2FCF_3	1,300
HFC-143	CH_2FCHF_2	328
HFC-143a	CH_3CF_3	4,800
HFC-152	CH_2FCH_2F	16
HFC-152a	CH_3CHF_2	138
HFC-161	CH_3CH_2F	4
HFC-227ea	CF_3CHFCF_3	3,350
HFC-236cb	$CH_2FCF_2CF_3$	1,210
HFC-236ea	CHF_2CHFCF_3	1,330
HFC-236fa	$CF_3CH_2CF_3$	8,060
HFC-245ca	$CH_2FCF_2CHF_2$	716
HFC-245fa	$CHF_2CH_2CF_3$	858
HFC-365mfc	$CH_3CF_2CH_2CF_3$	804
HFC-43-10mee	$CF_3CHFCHFCF_2CF_3$	1,650
Sulfur hexafluoride	SF_6	23,500
Nitrogen trifluoride	NF_3	16,100
PFC-14	CF_4	6,630
PFC-116	C_2F_6	11,100
PFC-218	C_3F_8	8,900
PFC-318	c-C_4F_8	9,540
PFC-31-10	C_4F_{10}	9,200
PFC-41-12	C_5F_{12}	8,550
PFC-51-14	C_6F_{14}	7,910
PFC-91-18	$C_{10}F_{18}$	7,190

Source:
100-year GWP values from IPCC Fifth Assessment Report (AR5), 2013. Chapter 8, Table 8.A.1, Lifetimes, Radiative Efficiencies and Metric Values.
IPCC AR5 was published in 2013 and is among the most current and comprehensive peer-reviewed assessments of climate change. AR5 provides revised GWP values of several GHGs relative to the values provided in previous assessment reports, following advances in scientific knowledge on the radiative efficiencies and atmospheric lifetimes of these GHGs.

Table 12 Global Warming Potential (GWP) for Blended Refrigerants

ASHRAE #	100-year GWP	Blend Composition
R-401A	18	53% HCFC-22 , 34% HCFC-124 , 13% HFC-152a
R-401B	15	61% HCFC-22 , 28% HCFC-124 , 11% HFC-152a
R-401C	21	33% HCFC-22 , 52% HCFC-124 , 15% HFC-152a
R-402A	1,902	38% HCFC-22 , 60% HFC-125 , 2% propane
R-402B	1,205	60% HCFC-22 , 38% HFC-125 , 2% propane
R-403B	3,471	56% HCFC-22 , 39% PFC-218 , 5% propane
R-404A	3,943	44% HFC-125 , 4% HFC-134a , 52% HFC-143a
R-406A	0	55% HCFC-22 , 41% HCFC-142b , 4% isobutane
R-407A	1,923	20% HFC-32 , 40% HFC-125 , 40% HFC-134a
R-407B	2,547	10% HFC-32 , 70% HFC-125 , 20% HFC-134a
R-407C	1,624	23% HFC-32 , 25% HFC-125 , 52% HFC-134a
R-407D	1,487	15% HFC-32 , 15% HFC-125 , 70% HFC-134a
R-408A	2,430	47% HCFC-22 , 7% HFC-125 , 46% HFC-143a
R-409A	0	60% HCFC-22 , 25% HCFC-124 , 15% HCFC-142b
R-410A	1,924	50% HFC-32 , 50% HFC-125
R-410B	2,048	45% HFC-32 , 55% HFC-125
R-411A	15	87.5% HCFC-22 , 11% HFC-152a , 1.5% propylene
R-411B	4	94% HCFC-22 , 3% HFC-152a , 3% propylene
R-414A	0	51% HCFC-22 , 28.5% HCFC-124 , 16.5% HCFC-142b , 4% isobutane
R-414B	0	50% HCFC-22 , 39% HCFC-124 , 9.5% HCFC-142b , 1.5% isobutane
R-417A	2,127	46.6% HFC-125 , 50% HFC-134a , 3.4% butane
R-422A	2,847	85.1% HFC-125 , 11.5% HFC-134a , 3.4% isobutane
R-422D	2,473	65.1% HFC-125 , 31.5% HFC-134a , 3.4% isobutane
R-424A	3,104	50.5% HFC-125 , 47% HFC-134a , 1% butane , 0.9% isobutane , 0.6% isopentane
R-426A	1,371	5.1% HFC-125 , 93% HFC-134a , 1.3% butane , 0.6% isobutane
R-428A	3,417	77.5% HFC-125 , 20% HFC-143a , 1.9% isobutane , 0.6% propane
R-434A	3,075	63.2% HFC-125 , 16% HFC-134a , 18% HFC-143a , 2.8% isobutane
R-507A	3,985	50% HFC-125 , 50% HFC-143a
R-508A	11,607	39% HFC-23 , 61% PFC-116
R-508B	11,698	46% HFC-23 , 54% PFC-116

Source:
100-year GWP values from IPCC Fifth Assessment Report (AR5), 2013. Chapter 8, Table 8.A.1, Lifetimes, Radiative Efficiencies and Metric Values.
GWP values of blended refrigerants are based only on their HFC and PFC constituents, which are based on data from https://www.epa.gov/snap/compositions-refrigerant-blends.

Table 4-23: Average Fuel Efficiency of U.S. Light Duty Vehicles

	1980	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Average U.S. light duty vehicle fuel efficiency (mpg) (calendar year)	14.9	16.5	18.8	19.5	19.5	19.2	19.3	19.6	19.7	19.7	19.8	19.6	20.0	20.2	20.1	19.5	19.6	20.2	20.4	21.3	21.8	21.7	21.5	21.4	21.6	21.6	21.4	22.0	22.0	22.3	22.5	22.2	22.9
Light duty vehicle, short wheel base[a,b]	16.0	17.5	20.3	21.2	21.0	20.6	20.8	21.1	21.3	21.5	21.6	21.4	21.9	22.1	22.0	22.2	22.5	22.1	22.5	22.9	23.7	23.5	23.3	23.1	23.3	23.4	23.2	23.9	24.0	24.2	24.4	24.1	25.3
Light duty vehicle, long wheel base[a]	12.2	14.3	16.1	17.0	17.3	17.4	17.3	17.3	17.3	17.2	17.2	17.1	17.4	17.6	17.5	16.2	16.2	17.7	17.8	17.1	17.3	17.3	17.2	17.1	17.1	17.2	17.1	17.3	17.4	17.5	17.9	17.6	18.2
New vehicle fuel efficiency (mpg)[c] (model year)																																	
Light-duty vehicle																																	
Passenger car	24.3	27.6	28.0	28.4	27.9	28.4	28.3	28.6	28.5	28.7	28.8	28.3	28.5	28.8	29.0	29.5	29.5	30.3	30.1	31.2	31.5	32.9	33.9	33.1	35.3	36.4	36.5	37.2	37.7	39.4	U	U	U
Domestic	22.6	26.3	26.9	27.3	27.0	27.8	27.5	27.7	28.1	27.8	28.6	28.0	28.7	28.7	29.1	29.1	29.9	30.5	30.3	30.6	31.2	32.1	33.1	32.7	34.8	36.1	36.3	37.2	37.3	39.2	U	U	U
Imported	29.6	31.5	29.9	30.1	29.2	29.6	29.7	30.3	29.6	30.1	29.2	29.0	28.3	29.0	28.8	29.9	28.7	29.9	29.7	32.2	31.8	33.8	35.2	33.7	36.0	36.8	36.9	37.3	38.1	39.7	U	U	U
Light truck (<8,500 lbs GVWR)[d]	18.5	20.7	20.8	21.3	20.8	21.0	20.8	20.5	20.8	20.6	21.0	20.9	21.3	20.9	21.4	21.8	21.5	22.1	22.5	23.1	23.6	24.8	25.2	24.7	25.0	25.7	26.5	27.3	27.4	28.6	U	U	U
CAFE standards (mpg)[c] (model year)																																	
Passenger car	20.0	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	30.2	33.0	33.5	34.2	35.5	36.9	39.0	U	U	U
Light truck[e]	U	19.5	20.0	20.2	20.2	20.4	20.5	20.6	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	21.0	21.6	22.2	22.4	23.0	23.4	24.3	25.3	25.9	26.3	27.6	28.8	29.4	U	U	U

KEY: CAFE = Corporate Average Fuel Economy; GVWR = gross vehicle weight rating; mpg = miles per gallon; U = data are not available.

[a] Data from 2007 were calculated using a new methodology developed by FHWA. Data for these years are based on new categories and are not comparable to previous years. The new category *Light duty vehicle, short wheel base* replaces the old category Passenger car and includes passenger cars, light trucks, vans and sport utility vehicles with a wheelbase (WB) equal to or less than 121 inches. The new category *Light duty vehicle, long wheel base* replaces Other 2-axle, 4-tire vehicle and includes large passenger cars, vans, pickup trucks, and sport/utility vehicles with wheelbases (WB) larger than 121 inches.

[b] From 1980 to 1993, *Light duty vehicle, short wheel base* (previously *Passenger car*) fuel efficiency includes motorcycles.

[c] Assumes 55% city and 45% highway-miles. The source calculated average miles per gallon for light-duty vehicles by taking the reciprocal of the sales-weighted average of gallons per mile. This is called the harmonic average.

[d] Beginning with FY 1999, the total *Light truck* fleet ceased to be categorized by either domestic or import fleets.

[e] No combined figure is available for 1980. In 1980, CAFE standard for 2 wheel drive, and 4 wheel drive light trucks were 16.0, and 14.0 mpg respectively.

NOTE

The fuel efficiency figures for *Light duty vehicles* represent the sales-weighted harmonic average of the combined *Passenger car* and *Light truck* fuel economies.

SOURCES

Average U.S. light duty vehicle fuel efficiency:

1980-94: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995,* table VM-201A, available at http://www.fhwa.dot.gov/policyinformation/statistics.cfm as of Oct. 6, 2011.

1995-2020: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics (Washington, DC: Annual Issues), table VM-1, available at http://www.fhwa.dot.gov/policyinformation/statistics.cfm as of Dec. 29, 2021.

New vehicle fuel efficiency (based on model year production) and CAFE standards:

1960-2003: U.S. Department of Transportation, National Highway Traffic Safety Administration, *Summary of Fuel Economy Performance* (Washington, DC: Annual Issues), available at http://www.nhtsa.gov/fuel-economy as of Mar. 3, 2016.

2004-17: U.S. Department of Transportation, National Highway Traffic Safety Administration, Fleet Fuel Economy Performance Report, available at https://one.nhtsa.gov/cafe_pic/CAFE_PIC_fleet_LIVE.html as of Oct. 16, 2019.

Appendix J

Lot D Traffic Impact Study

File #227708309
February 27, 2026

Traffic Impact Study for Lot D Development in Duluth, MN

Prepared for:
City of Duluth

411 W. 1st Street
Duluth, MN 55802

Prepared by:

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



_____ DATE: February 27, 2026

Edward F. Terhaar
License No. 24441

1.0 Executive Summary

The purpose of this Traffic Impact Study is to evaluate the impacts of a mixed use development in Duluth, MN. The project site is known as Lot D and is located on the east side of Railroad Street south of Harbor Drive.

This study examined weekday a.m. and p.m. peak hour traffic impacts of the proposed project at the following intersections:

- Garfield Avenue/Railroad Street
- Railroad Street/5th Avenue W
- Harbor Drive/5th Avenue W
- I-35 northbound ramps/Harbor Drive
- I-35 southbound ramps/Harbor Drive
- Railroad Street/Harbor Drive
- Railroad Street/proposed access

The proposed project will involve construction of three buildings totaling 894,750 square feet in size. Two of the buildings will contain a total of 509 apartment dwelling units and the third building will contain 140 hotel rooms. A full access will be provided on Railroad Street. The project is expected to be completed in 2031.

The conclusions drawn from the information and analyses presented in this report are as follows:

- The proposed development is expected to generate 252 trips during the a.m. peak hour, 282 trips during the p.m. peak hour, and 3,430 trips daily.

- Traffic generated by the proposed development has minimal impact on traffic operations at the intersections included in this study. All intersections and movements operate at acceptable levels of service.

- Based on the traffic forecasts and operations analysis for each intersection, the following mitigation measures are recommended:

    - Railroad Street/proposed development access
        - Construct dedicated left turn lane for entering traffic.

    - No mitigation is needed at the other intersections to accommodate the proposed development.

2.0 Purpose and Background

The purpose of this Traffic Impact Study is to evaluate the impacts of a mixed use development in Duluth, MN. The project site is known as Lot D and is located on the east side of Railroad Street south of Harbor Drive. The project location is shown in **Figure 1**.

This study examined weekday a.m. and p.m. peak hour traffic impacts of the proposed project at the following intersections:

- Garfield Avenue/Railroad Street
- Railroad Street/5th Avenue W
- Harbor Drive/5th Avenue W
- I-35 northbound ramps/Harbor Drive
- I-35 southbound ramps/Harbor Drive
- Railroad Street/Harbor Drive
- Railroad Street/proposed access

Proposed Development Characteristics

The proposed project will involve construction of three buildings totaling 894,750 square feet in size. Two of the buildings will contain a total of 509 apartment dwelling units and the third building will contain 140 hotel rooms. A full access will be provided on Railroad Street.

The project is expected to be completed in 2031. The current site plan is shown in **Figure 2**.

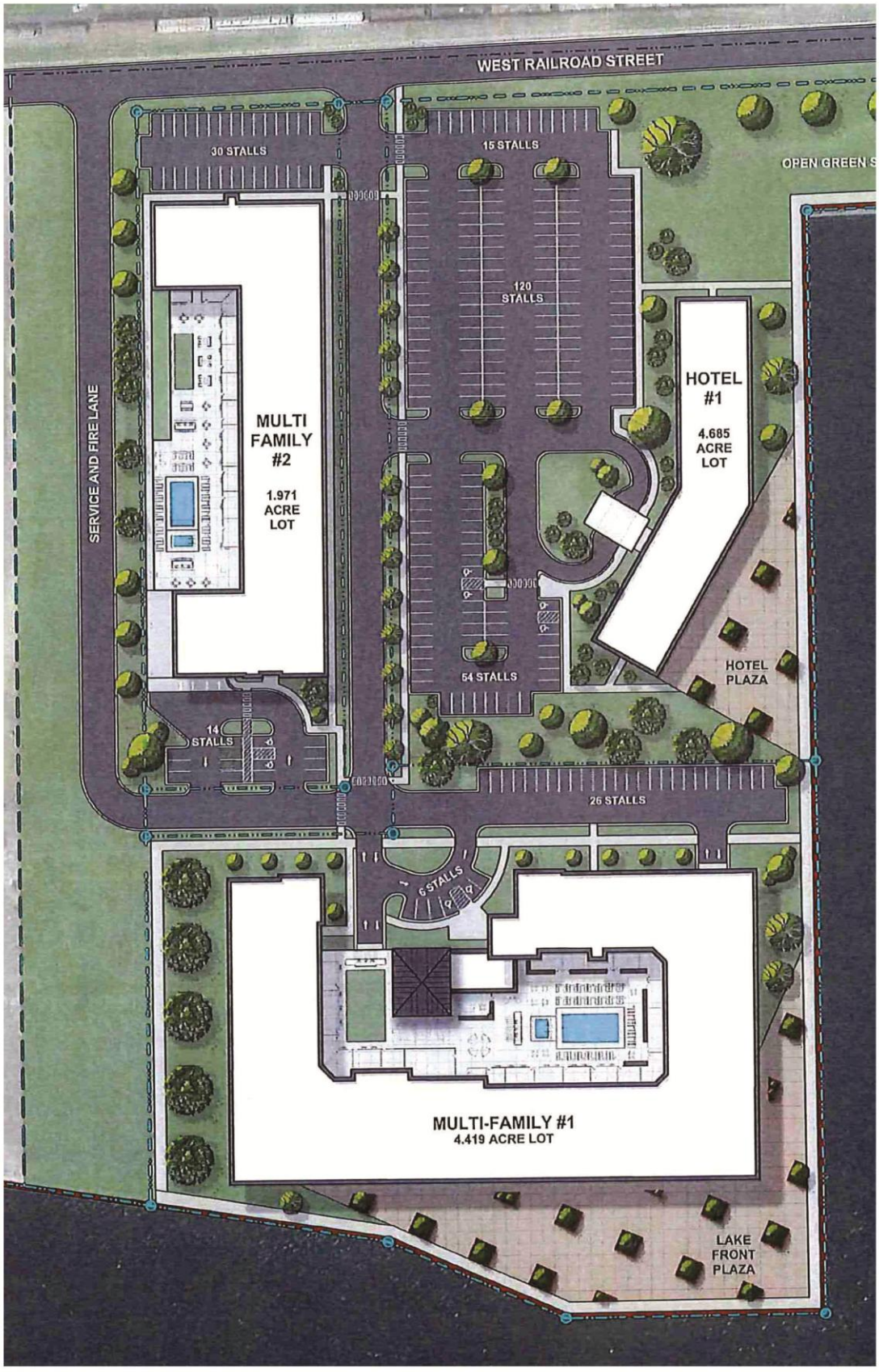


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TRAFFIC IMPACT STUDY
FOR LOT D DEVELOPMENT
IN DULUTH, MN

FIGURE 1

PROJECT LOCATION



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FOR LOT D DEVELOPMENT
IN DULUTH, MN

FIGURE 2

SITE PLAN

3.0 Existing Conditions

The proposed project site is currently vacant property. The site is bounded by Railroad Street on the west, Lake Superior on the east and north, and an industrial use on the south.

Near the site location, Railroad Street is a two lane local street that extends north from Garfield Street to Canal Park. Harbor Drive is a four lane undivided roadway with traffic signal control at major intersections that extends west over I-35.

Existing conditions near the proposed project location are shown in **Figure 3** and described below.

Railroad Street/Harbor Drive

This four legged intersection is controlled with stop signs on the eastbound and westbound approaches.. The eastbound approach provides one left turn/through/right turn lane. The westbound approach provides one left turn lane and one right turn lane. The northbound approach provides one through lane and one through/right turn lane. The southbound approach provides one left turn lane and two through lanes.

Railroad Street/5th Avenue W

This three-way intersection is controlled with a stop sign on the westbound approach. The westbound approach provides one left turn lane and one right turn lane. The northbound approach provides one through lane and one right turn lane. The southbound approach provides one left turn lane and one through lane.

Garfield Avenue/Railroad Street

This three-way intersection is controlled with a stop sign on the westbound approach. The westbound approach provides one left turn/right turn lane. The northbound approach provides two through lanes and one right turn lane. The southbound approach provides one left turn lane and one through lane.

Harbor Drive/5th Avenue W

This three-way intersection is controlled with a stop sign on the northbound approach. The northbound approach provides one left turn lane and one right turn lane. The eastbound approach provides one through lane and one through/right turn lane. The westbound approach provides one left turn/through lane and one through lane.

I-35 northbound ramps/Harbor Drive

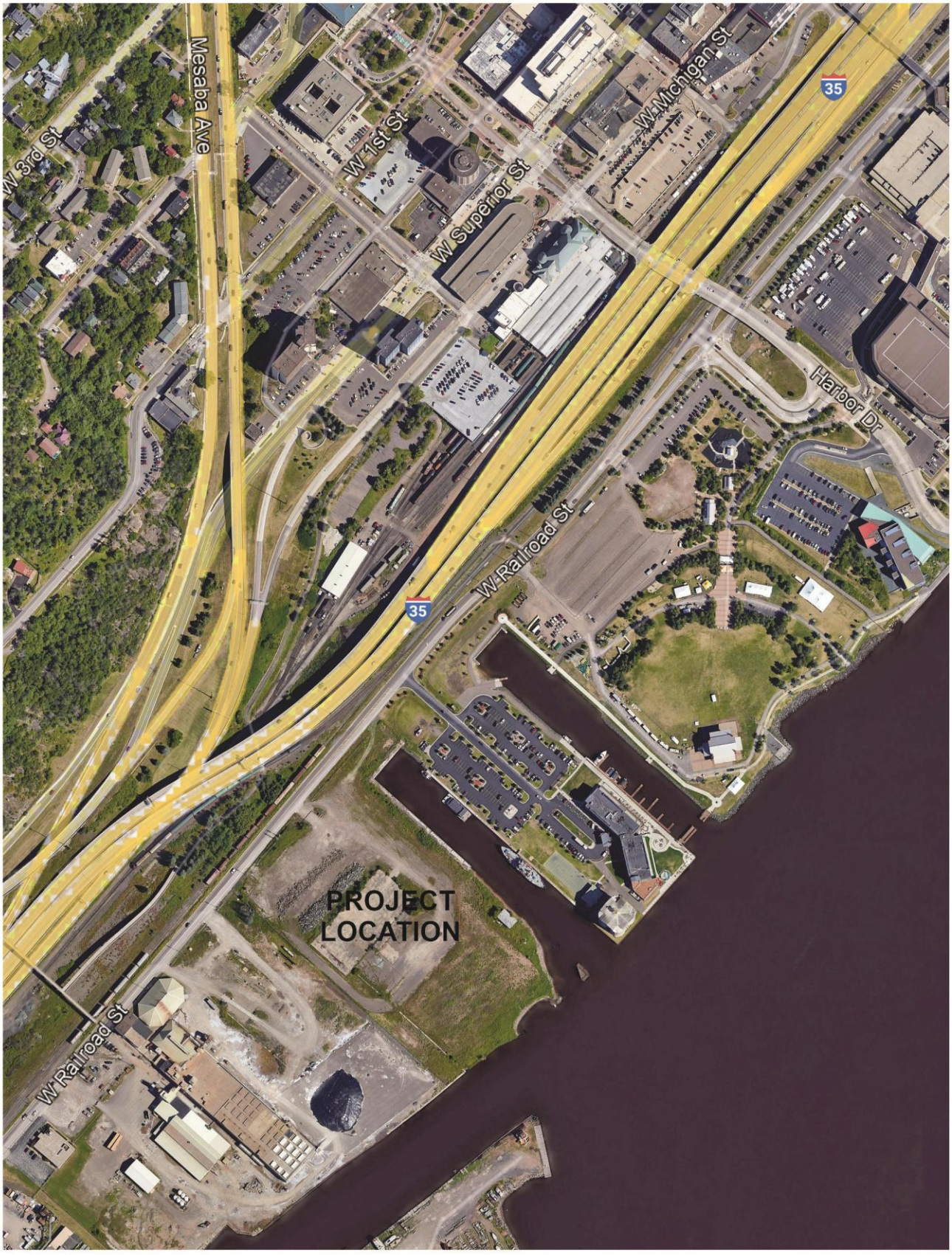
This four-legged intersection is controlled with a traffic signal. The northbound approach provides one left turn/through lane and one through/right turn lane. The westbound approach provides one through lane and one through/right turn lane. The eastbound approach provides one left turn/through lane and one through lane.

I-35 southbound ramps/Harbor Drive

This four-legged intersection is controlled with a traffic signal. The southbound approach provides one left turn/through lane and one through/right turn lane. The eastbound approach provides one through lane and one through/right turn lane. The westbound approach provides one left turn/through lane and one through lane.

Traffic Volume Data

Weekday traffic volume data was recorded at the existing intersections in November, 2025. Existing traffic volume data is presented later in this report.



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FOR LOT D DEVELOPMENT
IN DULUTH, MN

FIGURE 3

EXISTING CONDITIONS

4.0 Traffic Forecasts

Traffic Forecast Scenarios

To adequately address the impacts of the proposed project and other development in the area, forecasts and analyses were completed for the year 2031. Specifically, weekday a.m. and p.m. peak hour traffic forecasts were completed for the following scenarios:

- *2025 Existing*. Existing volumes were determined through traffic counts at the subject intersections. The existing volume information includes trips generated by existing uses near the project site.

- *2031 No-Build*. Existing volumes were increased by 1.0 percent per year to account for background growth in the surrounding area. The growth rate was based on historic growth in the area.

- *2031 Build*. Trips generated by the proposed development were added to the 2031 No-Build volumes to determine 2031 Build volumes.

Trip Generation for Proposed Project

The expected new development trips were calculated based on data presented in Trip Generation, Eleventh Edition, published by the Institute of Transportation Engineers. These calculations represent total trips that will be generated by the proposed development. The resultant trip generation estimates are shown in **Table 4-1**.

Table 4-1
Weekday Trip Generation for Proposed Project

Land Use	Size	Weekday AM Peak Hour 8:30 to 9:30 a.m.			Weekday PM Peak Hour 3:30 to 4:30 p.m.			Weekday Daily
		In	Out	Total	In	Out	Total	Total
Apartments (ITE 221)	509 DU	43	145	188	121	78	199	2,311
Hotel (ITE 310)	140 rooms	36	28	64	42	41	83	1,119
Totals		**79**	**173**	**252**	**163**	**119**	**282**	**3,430**

Note: DU=dwelling units

Trip Distribution Percentages

Trip distribution percentages for the subject development trips were established based on the nearby roadway network, existing and expected future traffic patterns, and location of the subject development in relation to major attractions and population concentrations.

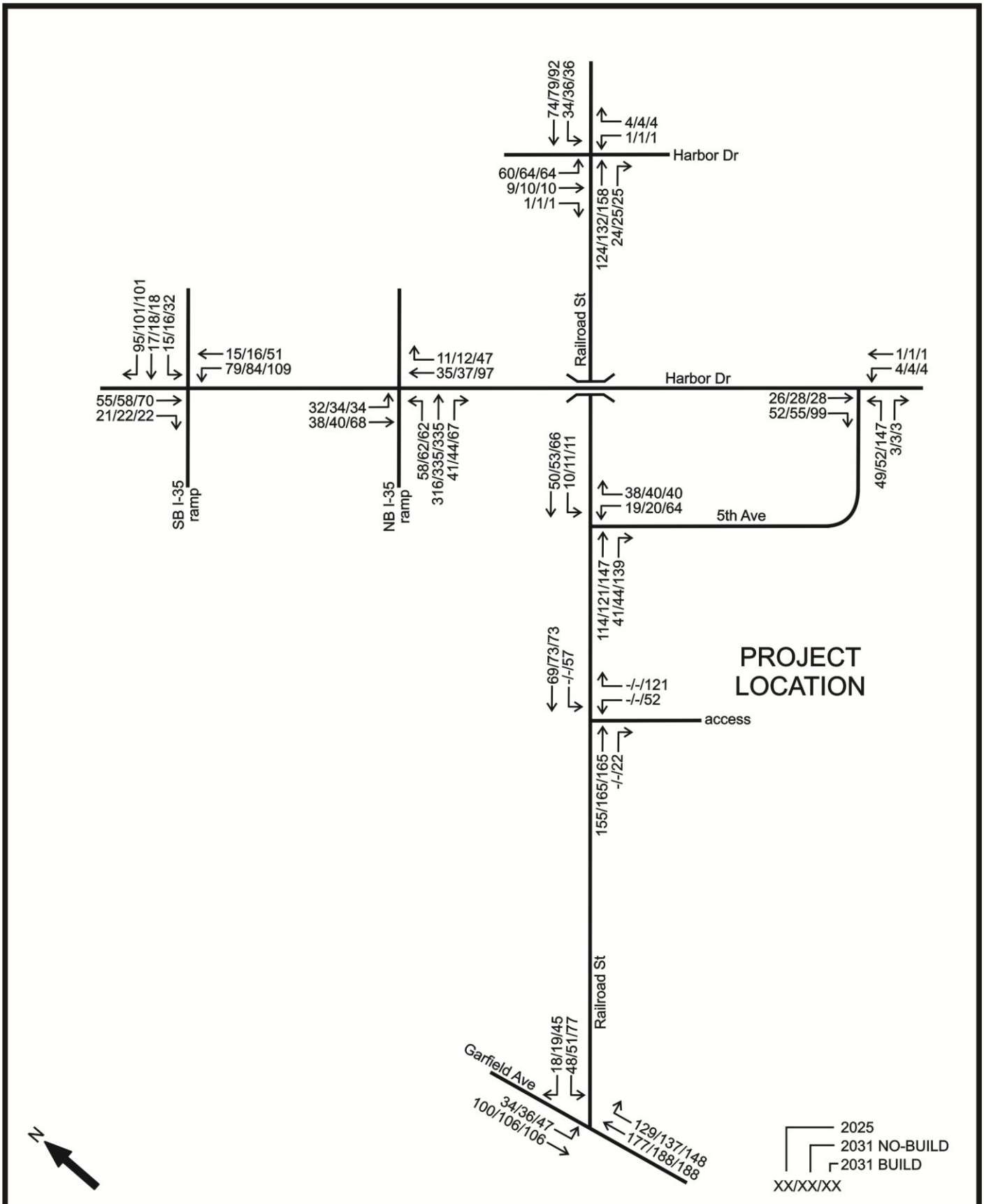
The distribution percentages for trips generated by the proposed development are as follows:

- 15 percent to/from the north on Railroad Street
- 15 percent to/from the west on Harbor Drive
- 20 percent to/from the north on I-35
- 20 percent to/from the south on I-35

- 15 percent to/from the south on Garfield Street
- 15 percent to/from the north on Garfield Street

Traffic Volumes

Development trips from Table 4-1 were assigned to the surrounding roadway network using the preceding trip distribution percentages. Traffic volumes were established for all the forecasting scenarios described earlier during the weekday a.m. and p.m. peak hours. The resultant peak hour volumes are shown in **Figures 4 and 5**.

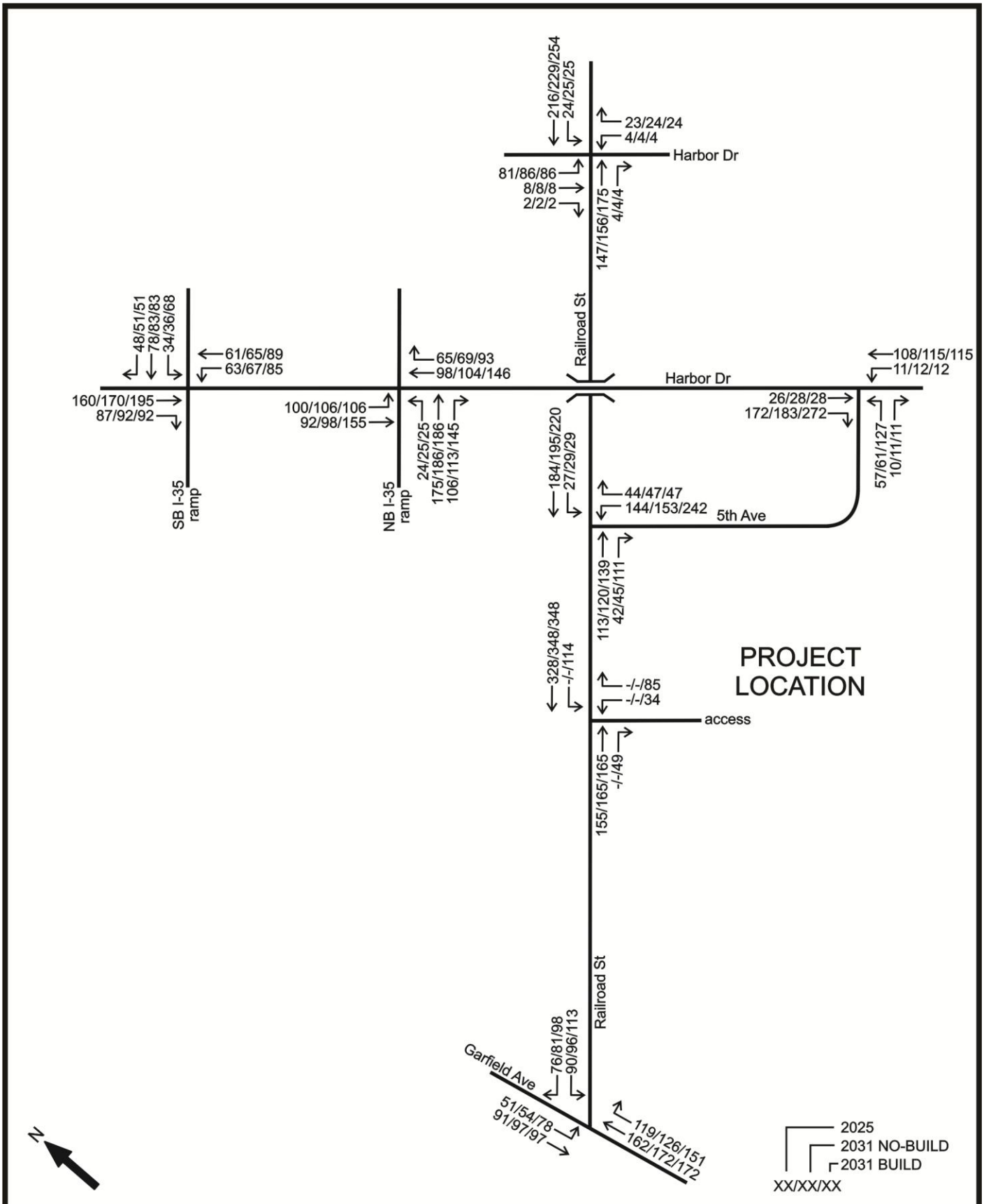


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TRAFFIC IMPACT STUDY
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IN DULUTH, MN

FIGURE 4

WEEKDAY A.M. PEAK HOUR VOLUMES



Stantec

TRAFFIC IMPACT STUDY
FOR LOT D DEVELOPMENT
IN DULUTH, MN

FIGURE 5

WEEKDAY P.M. PEAK HOUR VOLUMES

5.0 Traffic Analysis

Intersection Level of Service Analysis

Traffic analyses were completed for the subject intersections for all scenarios described earlier during the weekday a.m. and p.m. peak hours using Synchro software. Initial analysis was completed using existing geometrics and intersection control.

Capacity analysis results are presented in terms of level of service (LOS), which is defined in terms of traffic delay at the intersection. LOS ranges from A to F. LOS A represents the best intersection operation, with little delay for each vehicle using the intersection. LOS F represents the worst intersection operation with excessive delay. In accordance with MnDOT traffic study guidelines, this analysis used the LOS D/E boundary as an indicator of acceptable traffic operations. The following is a detailed description of the conditions described by each LOS designation:

- Level of service A corresponds to a free flow condition with motorists virtually unaffected by the intersection control mechanism. For a signalized or an unsignalized intersection, the average delay per vehicle would be approximately 10 seconds or less.

- Level of service B represents stable flow with a high degree of freedom, but with some influence from the intersection control device and the traffic volumes. For a signalized intersection, the average delay ranges from 10 to 20 seconds. An unsignalized intersection would have delays ranging from 10 to 15 seconds for this level.

- Level of service C depicts a restricted flow which remains stable, but with significant influence from the intersection control device and the traffic volumes. The general level of comfort and convenience changes noticeably at this level. The delay ranges from 20 to 35 seconds for a signalized intersection and from 15 to 25 seconds for an unsignalized intersection at this level.

- Level of service D corresponds to high-density flow in which speed and freedom are significantly restricted. Though traffic flow remains stable, reductions in comfort and convenience are experienced. The control delay for this level is 35 to 55 seconds for a signalized intersection and 25 to 35 seconds for an unsignalized intersection.

- Level of service E represents unstable flow of traffic at or near the capacity of the intersection with poor levels of comfort and convenience. The delay ranges from 55 to 80 seconds for a signalized intersection and from 35 to 50 seconds for an unsignalized intersection at this level.

- Level of service F represents forced flow in which the volume of traffic approaching the intersection exceeds the volume that can be served. Characteristics often experienced include long queues, stop-and-go waves, poor travel times, low comfort and convenience, and increased accident exposure. Delays over 80 seconds for a signalized intersection and over 50 seconds for an unsignalized intersection correspond to this level of service.

The LOS results are described below. All LOS worksheets are included in the Appendix for further detail.

2025 Existing

Weekday Peak Hour LOS Results

Intersection	Traffic Control	AM Peak Hour LOS	PM Peak Hour LOS
Railroad Street/Harbor Drive	EB/WB stop	A/B	A/B
Harbor Drive/5th Avenue W	NB stop	A/A	A/B
Railroad Street/5th Avenue W	WB stop	A/B	A/B
I-35 northbound ramps/Harbor Dr	Signal	B/B	B/C
I-35 southbound ramps/Harbor Dr	Signal	A/B	B/C
Garfield Avenue/Railroad Street	WB stop	A/B	A/B

Note: Level of service results presented with overall intersection LOS followed by worst movement LOS.

All intersections operate at LOS B or better and all movements operate at LOS C or better during the a.m. and p.m. peak hours.

2031 No-Build

Weekday Peak Hour LOS Results

Intersection	Traffic Control	AM Peak Hour LOS	PM Peak Hour LOS
Railroad Street/Harbor Drive	EB/WB stop	A/B	A/B
Harbor Drive/5th Avenue W	NB stop	A/A	A/B
Railroad Street/5th Avenue W	WB stop	A/B	A/B
I-35 northbound ramps/Harbor Dr	Signal	B/B	B/C
I-35 southbound ramps/Harbor Dr	Signal	A/B	B/C
Garfield Avenue/Railroad Street	WB stop	A/B	A/B

Note: Level of service results presented with overall intersection LOS followed by worst movement LOS.

All intersections operate at LOS B or better and all movements operate at LOS C or better during the a.m. and p.m. peak hours.

2031 Build

Weekday Peak Hour LOS Results

Intersection	Traffic Control	AM Peak Hour LOS	PM Peak Hour LOS
Railroad Street/Harbor Drive	EB/WB stop	A/B	A/B
Harbor Drive/5th Avenue W	NB stop	A/B	A/B
Railroad Street/5th Avenue W	WB stop	A/B	A/C
I-35 northbound ramps/Harbor Dr	Signal	B/C	B/C
I-35 southbound ramps/Harbor Dr	Signal	A/B	B/C
Garfield Avenue/Railroad Street	WB stop	A/B	A/B
Railroad Street/proposed access	WB stop	A/B	A/B

Note: Level of service results presented with overall intersection LOS followed by worst movement LOS.

All intersections operate at LOS B or better and all movements operate at LOS C or better during the a.m. and p.m. peak hours.

Overall Traffic Impacts

Traffic generated by the proposed development has minimal impact on traffic operations at the intersections included in this study. All intersections and movements operate at acceptable levels of service.

Recommended Mitigation

Based on the traffic forecasts and operations analysis for each intersection, the following mitigation measures are recommended:

- Railroad Street/proposed development access
    - Construct dedicated left turn lane for entering traffic.

- No mitigation is needed at the other intersections to accommodate the proposed development.

6.0 Conclusions and Recommendations

The conclusions drawn from the information and analyses presented in this report are as follows:

- The proposed development is expected to generate 252 trips during the a.m. peak hour, 282 trips during the p.m. peak hour, and 3,430 trips daily.
- Traffic generated by the proposed development has minimal impact on traffic operations at the intersections included in this study. All intersections and movements operate at acceptable levels of service.
- Based on the traffic forecasts and operations analysis for each intersection, the following mitigation measures are recommended:
    - Railroad Street/proposed development access
        - Construct dedicated left turn lane for entering traffic.
    - No mitigation is needed at the other intersections to accommodate the proposed development.

7.0 Appendix

- Level of Service worksheets
- Turn movement volumes

Intersection	
Int Delay, s/veh	3.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	26	52	4	1	49	3
Future Vol, veh/h	26	52	4	1	49	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	71	5	1	67	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	107	0	83	53
Stage 1	-	-	-	-	71	-
Stage 2	-	-	-	-	12	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1482	-	910	1003
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	1009	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1482	-	906	1003
Mov Cap-2 Maneuver	-	-	-	-	906	-
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	1006	-

Approach	SE	NW	NE
HCM Ctrl Dly, s/v	0	5.95	9.25
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	906	1003	1481	-	-	-
HCM Lane V/C Ratio	0.074	0.004	0.004	-	-	-
HCM Ctrl Dly (s/v)	9.3	8.6	7.4	0	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0.2	0	0	-	-	-

Intersection	
Int Delay, s/veh	1.1

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	19	38	114	41	10	50
Future Vol, veh/h	19	38	114	41	10	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	175	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	52	156	56	14	68

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	252	-	0	0	212	0
Stage 1	156	-	-	-	-	-
Stage 2	96	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	2.218	-
Pot Cap-1 Maneuver	737	0	-	-	1358	-
Stage 1	872	0	-	-	-	-
Stage 2	928	0	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	729	-	-	-	1358	-
Mov Cap-2 Maneuver	729	-	-	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	919	-	-	-	-	-

Approach	NW	NE	SW
HCM Ctrl Dly, s/v	10.12	0	1.28
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	729	-	1358	-
HCM Lane V/C Ratio	-	-	0.036	-	0.01	-
HCM Ctrl Dly (s/v)	-	-	10.1	0	7.7	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	-	0	-

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	32	38	0	0	35	11	58	316	41	0	0	0
Future Volume (veh/h)	32	38	0	0	35	11	58	316	41	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	40	48	0	0	44	14	72	395	51			
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	648	842	0	0	1173	356	88	480	62			
Arrive On Green	0.44	0.44	0.00	0.00	0.44	0.44	0.34	0.34	0.34			
Sat Flow, veh/h	1121	2014	0	0	2779	815	254	1392	180			
Grp Volume(v), veh/h	49	39	0	0	28	30	518	0	0			
Grp Sat Flow(s),veh/h/ln	1433	1617	0	0	1777	1724	1825	0	0			
Q Serve(g_s), s	0.2	0.6	0.0	0.0	0.4	0.4	10.7	0.0	0.0			
Cycle Q Clear(g_c), s	0.7	0.6	0.0	0.0	0.4	0.4	10.7	0.0	0.0			
Prop In Lane	0.81		0.00	0.00		0.47	0.14		0.10			
Lane Grp Cap(c), veh/h	784	706	0	0	776	753	630	0	0			
V/C Ratio(X)	0.06	0.05	0.00	0.00	0.04	0.04	0.82	0.00	0.00			
Avail Cap(c_a), veh/h	784	706	0	0	776	753	797	0	0			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	6.7	6.7	0.0	0.0	6.6	6.7	12.3	0.0	0.0			
Incr Delay (d2), s/veh	0.2	0.1	0.0	0.0	0.1	0.1	5.6	0.0	0.0			
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.2	0.2	0.0	0.0	0.1	0.1	4.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.9	6.8	0.0	0.0	6.7	6.8	17.9	0.0	0.0			
LnGrp LOS	A	A			A	A	B					
Approach Vol, veh/h		88			58			518				
Approach Delay, s/veh		6.9			6.7			17.9				
Approach LOS		A			A			B				

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		22.5		18.7		22.5						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		18.0		18.0		18.0						
Max Q Clear Time (g_c+I1), s		2.4		12.7		2.7						
Green Ext Time (p_c), s		0.2		1.6		0.3						

Intersection Summary												
HCM 7th Control Delay, s/veh			15.5									
HCM 7th LOS			B									

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	55	21	15	79	0	0	0	0	15	17	95
Future Volume (veh/h)	0	55	21	15	79	0	0	0	0	15	17	95
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	71	27	19	101	0				19	22	122
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1470	531	356	1707	0				26	30	169
Arrive On Green	0.00	0.58	0.58	0.58	0.58	0.00				0.14	0.14	0.14
Sat Flow, veh/h	0	2651	924	360	3053	0				191	221	1227
Grp Volume(v), veh/h	0	48	50	65	55	0				163	0	0
Grp Sat Flow(s),veh/h/ln	0	1777	1704	1711	1617	0				1640	0	0
Q Serve(g_s), s	0.0	0.4	0.4	0.0	0.5	0.0				3.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.4	0.4	0.5	0.5	0.0				3.0	0.0	0.0
Prop In Lane	0.00		0.54	0.29		0.00				0.12		0.75
Lane Grp Cap(c), veh/h	0	1022	980	1133	930	0				225	0	0
V/C Ratio(X)	0.00	0.05	0.05	0.06	0.06	0.00				0.72	0.00	0.00
Avail Cap(c_a), veh/h	0	1022	980	1133	930	0				943	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	2.9	2.9	2.9	2.9	0.0				12.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.1	0.1	0.1	0.0				4.4	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.1	0.1	0.1	0.0				1.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	0.0	3.0	3.0	3.0	3.0	0.0				17.3	0.0	0.0
LnGrp LOS		A	A	A	A					B		
Approach Vol, veh/h		98			120						163	
Approach Delay, s/veh		3.0			3.0						17.3	
Approach LOS		A			A						B	

Timer - Assigned Phs	2				6		8					
Phs Duration (G+Y+Rc), s	22.5				22.5		8.8					
Change Period (Y+Rc), s	4.5				4.5		4.5					
Max Green Setting (Gmax), s	18.0				18.0		18.0					
Max Q Clear Time (g_c+I1), s	2.5				2.4		5.0					
Green Ext Time (p_c), s	0.5				0.4		0.7					

Intersection Summary												
HCM 7th Control Delay, s/veh		9.1										
HCM 7th LOS		A										

Intersection	
Int Delay, s/veh	2.1

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	34	100	177	129	48	18
Future Vol, veh/h	34	100	177	129	48	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	200	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	44	128	227	165	62	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	392	0	-	0	378	227
Stage 1	-	-	-	-	227	-
Stage 2	-	-	-	-	151	-
Critical Hdwy	4.13	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1164	-	-	-	610	812
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	861	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1164	-	-	-	586	812
Mov Cap-2 Maneuver	-	-	-	-	586	-
Stage 1	-	-	-	-	779	-
Stage 2	-	-	-	-	861	-

Approach	SE	NW	SW
HCM Ctrl Dly, s/v	2.23	0	11.55
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	913	-	634
HCM Lane V/C Ratio	-	-	0.037	-	0.133
HCM Ctrl Dly (s/v)	-	-	8.2	0.2	11.5
HCM Lane LOS	-	-	A	A	B
HCM 95th %tile Q(veh)	-	-	0.1	-	0.5

Intersection	
Int Delay, s/veh	3.3

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	64	10	1	1	0	4	0	132	25	36	79	0
Future Vol, veh/h	64	10	1	1	0	4	0	132	25	36	79	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	11	1	1	0	5	0	152	29	41	91	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	249	354	45	300	-	90	-	0	0	180	0	0
Stage 1	174	174	-	166	-	-	-	-	-	-	-	-
Stage 2	76	180	-	134	-	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	684	570	1014	630	0	950	0	-	-	1392	-	0
Stage 1	811	754	-	819	0	-	0	-	-	-	-	0
Stage 2	925	749	-	856	0	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	660	553	1014	598	-	950	-	-	-	1392	-	-
Mov Cap-2 Maneuver	660	553	-	598	-	-	-	-	-	-	-	-
Stage 1	787	732	-	819	-	-	-	-	-	-	-	-
Stage 2	920	749	-	816	-	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Ctrl Dly, s/v	11.43	9.25	0	2.4
HCM LOS	B	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SELn1	SWL	SWT
Capacity (veh/h)	-	-	598	950	646	1392	-
HCM Lane V/C Ratio	-	-	0.002	0.005	0.133	0.03	-
HCM Ctrl Dly (s/v)	-	-	11	8.8	11.4	7.7	-
HCM Lane LOS	-	-	B	A	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0.5	0.1	-

Intersection	
Int Delay, s/veh	3.8

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	28	55	4	1	52	3
Future Vol, veh/h	28	55	4	1	52	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	75	5	1	71	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	114	0	88	57
Stage 1	-	-	-	-	76	-
Stage 2	-	-	-	-	12	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1473	-	903	997
Stage 1	-	-	-	-	938	-
Stage 2	-	-	-	-	1009	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1473	-	900	997
Mov Cap-2 Maneuver	-	-	-	-	900	-
Stage 1	-	-	-	-	938	-
Stage 2	-	-	-	-	1006	-

Approach	SE	NW	NE
HCM Ctrl Dly, s/v	0	5.96	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	900	997	1473	-	-	-
HCM Lane V/C Ratio	0.079	0.004	0.004	-	-	-
HCM Ctrl Dly (s/v)	9.3	8.6	7.5	0	-	-
HCM Lane LOS	A	A	A	A	-	-
HCM 95th %tile Q(veh)	0.3	0	0	-	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	20	40	121	44	11	53
Future Vol, veh/h	20	40	121	44	11	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	175	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	55	166	60	15	73

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	268	-	0	0	226	0
Stage 1	166	-	-	-	-	-
Stage 2	103	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	2.218	-
Pot Cap-1 Maneuver	721	0	-	-	1342	-
Stage 1	864	0	-	-	-	-
Stage 2	921	0	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	713	-	-	-	1342	-
Mov Cap-2 Maneuver	713	-	-	-	-	-
Stage 1	864	-	-	-	-	-
Stage 2	911	-	-	-	-	-

Approach	NW	NE	SW
HCM Ctrl Dly, s/v	10.25	0	1.33
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	713	-	1342	-
HCM Lane V/C Ratio	-	-	0.038	-	0.011	-
HCM Ctrl Dly (s/v)	-	-	10.3	0	7.7	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.1	-	0	-

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	34	40	0	0	37	12	62	335	44	0	0	0
Future Volume (veh/h)	34	40	0	0	37	12	62	335	44	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	42	50	0	0	46	15	78	419	55			
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	635	821	0	0	1141	355	92	497	65			
Arrive On Green	0.43	0.43	0.00	0.00	0.43	0.43	0.36	0.36	0.36			
Sat Flow, veh/h	1123	2007	0	0	2762	830	258	1385	182			
Grp Volume(v), veh/h	52	40	0	0	30	31	552	0	0			
Grp Sat Flow(s),veh/h/ln	1428	1617	0	0	1777	1721	1825	0	0			
Q Serve(g_s), s	0.3	0.6	0.0	0.0	0.4	0.4	11.7	0.0	0.0			
Cycle Q Clear(g_c), s	0.8	0.6	0.0	0.0	0.4	0.4	11.7	0.0	0.0			
Prop In Lane	0.81		0.00	0.00		0.48	0.14		0.10			
Lane Grp Cap(c), veh/h	765	691	0	0	760	736	655	0	0			
V/C Ratio(X)	0.07	0.06	0.00	0.00	0.04	0.04	0.84	0.00	0.00			
Avail Cap(c_a), veh/h	765	691	0	0	760	736	780	0	0			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	7.1	7.1	0.0	0.0	7.0	7.0	12.4	0.0	0.0			
Incr Delay (d2), s/veh	0.2	0.2	0.0	0.0	0.1	0.1	7.3	0.0	0.0			
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.2	0.2	0.0	0.0	0.1	0.1	5.0	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	7.3	7.2	0.0	0.0	7.1	7.1	19.7	0.0	0.0			
LnGrp LOS	A	A			A	A	B					
Approach Vol, veh/h		92			61			552				
Approach Delay, s/veh		7.3			7.1			19.7				
Approach LOS		A			A			B				

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		22.5		19.6		22.5						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		18.0		18.0		18.0						
Max Q Clear Time (g_c+I1), s		2.4		13.7		2.8						
Green Ext Time (p_c), s		0.2		1.4		0.3						

Intersection Summary												
HCM 7th Control Delay, s/veh			17.0									
HCM 7th LOS			B									

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	58	22	16	84	0	0	0	0	16	18	101
Future Volume (veh/h)	0	58	22	16	84	0	0	0	0	16	18	101
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	74	28	21	108	0				21	23	129
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1457	524	361	1677	0				29	32	179
Arrive On Green	0.00	0.57	0.57	0.57	0.57	0.00				0.15	0.15	0.15
Sat Flow, veh/h	0	2654	921	373	3032	0				199	218	1223
Grp Volume(v), veh/h	0	50	52	70	59	0				173	0	0
Grp Sat Flow(s),veh/h/ln	0	1777	1705	1703	1617	0				1640	0	0
Q Serve(g_s), s	0.0	0.4	0.4	0.0	0.5	0.0				3.2	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.4	0.4	0.5	0.5	0.0				3.2	0.0	0.0
Prop In Lane	0.00		0.54	0.30		0.00				0.12		0.75
Lane Grp Cap(c), veh/h	0	1011	970	1117	920	0				240	0	0
V/C Ratio(X)	0.00	0.05	0.05	0.06	0.06	0.00				0.72	0.00	0.00
Avail Cap(c_a), veh/h	0	1011	970	1117	920	0				933	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	3.0	3.0	3.1	3.1	0.0				12.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.1	0.1	0.1	0.0				4.0	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.1	0.1	0.1	0.0				1.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	0.0	3.1	3.1	3.2	3.2	0.0				16.9	0.0	0.0
LnGrp LOS		A	A	A	A					B		
Approach Vol, veh/h		102			129						173	
Approach Delay, s/veh		3.1			3.2						16.9	
Approach LOS		A			A						B	

Timer - Assigned Phs	2				6		8					
Phs Duration (G+Y+Rc), s	22.5				22.5		9.1					
Change Period (Y+Rc), s	4.5				4.5		4.5					
Max Green Setting (Gmax), s	18.0				18.0		18.0					
Max Q Clear Time (g_c+I1), s	2.5				2.4		5.2					
Green Ext Time (p_c), s	0.5				0.4		0.7					

Intersection Summary												
HCM 7th Control Delay, s/veh		9.0										
HCM 7th LOS		A										

Intersection	
Int Delay, s/veh	2.1

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	36	106	188	137	51	19
Future Vol, veh/h	36	106	188	137	51	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	200	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	136	241	176	65	24

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	417	0	-	0	401	241
Stage 1	-	-	-	-	241	-
Stage 2	-	-	-	-	160	-
Critical Hdwy	4.13	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1141	-	-	-	591	797
Stage 1	-	-	-	-	798	-
Stage 2	-	-	-	-	853	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1141	-	-	-	566	797
Mov Cap-2 Maneuver	-	-	-	-	566	-
Stage 1	-	-	-	-	765	-
Stage 2	-	-	-	-	853	-

Approach	SE	NW	SW
HCM Ctrl Dly, s/v	2.26	0	11.86
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	913	-	614
HCM Lane V/C Ratio	-	-	0.04	-	0.146
HCM Ctrl Dly (s/v)	-	-	8.3	0.2	11.9
HCM Lane LOS	-	-	A	A	B
HCM 95th %tile Q(veh)	-	-	0.1	-	0.5

Intersection	
Int Delay, s/veh	3.1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	64	10	1	1	0	4	0	158	25	36	92	0
Future Vol, veh/h	64	10	1	1	0	4	0	158	25	36	92	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	74	11	1	1	0	5	0	182	29	41	106	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	279	399	53	337	-	105	-	0	0	210	0	0
Stage 1	189	189	-	196	-	-	-	-	-	-	-	-
Stage 2	91	210	-	141	-	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	651	538	1003	592	0	929	0	-	-	1358	-	0
Stage 1	795	743	-	787	0	-	0	-	-	-	-	0
Stage 2	906	727	-	847	0	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	628	521	1003	561	-	929	-	-	-	1358	-	-
Mov Cap-2 Maneuver	628	521	-	561	-	-	-	-	-	-	-	-
Stage 1	771	720	-	787	-	-	-	-	-	-	-	-
Stage 2	902	727	-	807	-	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Ctrl Dly, s/v	11.81	9.4	0	2.18
HCM LOS	B	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SELn1	SWL	SWT
Capacity (veh/h)	-	-	561	929	614	1358	-
HCM Lane V/C Ratio	-	-	0.002	0.005	0.14	0.03	-
HCM Ctrl Dly (s/v)	-	-	11.4	8.9	11.8	7.7	-
HCM Lane LOS	-	-	B	A	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0.5	0.1	-

Intersection	
Int Delay, s/veh	5.6

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	28	99	4	1	147	3
Future Vol, veh/h	28	99	4	1	147	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	136	5	1	201	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	174	0	118	87
Stage 1	-	-	-	-	106	-
Stage 2	-	-	-	-	12	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1400	-	866	954
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	1009	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1400	-	862	954
Mov Cap-2 Maneuver	-	-	-	-	862	-
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	1005	-

Approach	SE	NW	NE
HCM Ctrl Dly, s/v	0	6.07	10.41
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	862	954	1400	-	-	-
HCM Lane V/C Ratio	0.234	0.004	0.004	-	-	-
HCM Ctrl Dly (s/v)	10.4	8.8	7.6	0	-	-
HCM Lane LOS	B	A	A	A	-	-
HCM 95th %tile Q(veh)	0.9	0	0	-	-	-

Intersection	
Int Delay, s/veh	1.9

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	64	40	147	139	11	66
Future Vol, veh/h	64	40	147	139	11	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	175	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	73	73	73	73	73	73
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	88	55	201	190	15	90

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	322	-	0	0	392	0
Stage 1	201	-	-	-	-	-
Stage 2	121	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	2.218	-
Pot Cap-1 Maneuver	672	0	-	-	1167	-
Stage 1	832	0	-	-	-	-
Stage 2	905	0	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	663	-	-	-	1167	-
Mov Cap-2 Maneuver	663	-	-	-	-	-
Stage 1	832	-	-	-	-	-
Stage 2	893	-	-	-	-	-

Approach	NW	NE	SW
HCM Ctrl Dly, s/v	11.25	0	1.16
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	663	-	1167	-
HCM Lane V/C Ratio	-	-	0.132	-	0.013	-
HCM Ctrl Dly (s/v)	-	-	11.3	0	8.1	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	0.5	-	0	-

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	34	68	0	0	97	47	62	335	67	0	0	0
Future Volume (veh/h)	34	68	0	0	97	47	62	335	67	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	42	85	0	0	121	59	78	419	84			
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	464	945	0	0	990	457	90	485	97			
Arrive On Green	0.42	0.42	0.00	0.00	0.42	0.42	0.37	0.37	0.37			
Sat Flow, veh/h	784	2340	0	0	2454	1091	243	1306	262			
Grp Volume(v), veh/h	69	58	0	0	89	91	581	0	0			
Grp Sat Flow(s),veh/h/ln	1422	1617	0	0	1777	1674	1811	0	0			
Q Serve(g_s), s	0.0	0.9	0.0	0.0	1.3	1.4	12.8	0.0	0.0			
Cycle Q Clear(g_c), s	1.4	0.9	0.0	0.0	1.3	1.4	12.8	0.0	0.0			
Prop In Lane	0.61		0.00	0.00		0.65	0.13		0.14			
Lane Grp Cap(c), veh/h	731	678	0	0	745	702	672	0	0			
V/C Ratio(X)	0.09	0.09	0.00	0.00	0.12	0.13	0.86	0.00	0.00			
Avail Cap(c_a), veh/h	731	678	0	0	745	702	759	0	0			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	7.5	7.5	0.0	0.0	7.6	7.7	12.5	0.0	0.0			
Incr Delay (d2), s/veh	0.3	0.2	0.0	0.0	0.3	0.4	9.4	0.0	0.0			
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.3	0.3	0.0	0.0	0.4	0.5	5.7	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	7.8	7.8	0.0	0.0	8.0	8.0	21.9	0.0	0.0			
LnGrp LOS	A	A			A	A	C					
Approach Vol, veh/h		127			180			581				
Approach Delay, s/veh		7.8			8.0			21.9				
Approach LOS		A			A			C				

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		22.5		20.4		22.5						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		18.0		18.0		18.0						
Max Q Clear Time (g_c+I1), s		3.4		14.8		3.4						
Green Ext Time (p_c), s		0.8		1.2		0.5						

Intersection Summary												
HCM 7th Control Delay, s/veh			17.0									
HCM 7th LOS			B									

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	70	22	51	109	0	0	0	0	32	18	101
Future Volume (veh/h)	0	70	22	51	109	0	0	0	0	32	18	101
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	90	28	65	140	0				41	23	129
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78				0.78	0.78	0.78
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1504	449	620	1294	0				57	32	181
Arrive On Green	0.00	0.56	0.56	0.56	0.56	0.00				0.16	0.16	0.16
Sat Flow, veh/h	0	2790	806	795	2406	0				351	197	1105
Grp Volume(v), veh/h	0	58	60	111	94	0				193	0	0
Grp Sat Flow(s),veh/h/ln	0	1777	1725	1498	1617	0				1654	0	0
Q Serve(g_s), s	0.0	0.5	0.5	0.0	0.9	0.0				3.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.5	0.5	0.9	0.9	0.0				3.6	0.0	0.0
Prop In Lane	0.00		0.47	0.59		0.00				0.21		0.67
Lane Grp Cap(c), veh/h	0	991	962	1013	902	0				270	0	0
V/C Ratio(X)	0.00	0.06	0.06	0.11	0.10	0.00				0.71	0.00	0.00
Avail Cap(c_a), veh/h	0	991	962	1013	902	0				922	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	3.3	3.3	3.4	3.4	0.0				12.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.1	0.2	0.2	0.0				3.5	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.1	0.1	0.2	0.2	0.0				1.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	0.0	3.4	3.4	3.6	3.6	0.0				16.3	0.0	0.0
LnGrp LOS		A	A	A	A					B		
Approach Vol, veh/h		118			205						193	
Approach Delay, s/veh		3.4			3.6						16.3	
Approach LOS		A			A						B	

Timer - Assigned Phs	2				6		8					
Phs Duration (G+Y+Rc), s	22.5				22.5		9.8					
Change Period (Y+Rc), s	4.5				4.5		4.5					
Max Green Setting (Gmax), s	18.0				18.0		18.0					
Max Q Clear Time (g_c+I1), s	2.9				2.5		5.6					
Green Ext Time (p_c), s	0.9				0.5		0.8					

Intersection Summary												
HCM 7th Control Delay, s/veh		8.3										
HCM 7th LOS		A										

Intersection	
Int Delay, s/veh	3.3

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	47	106	188	148	77	45
Future Vol, veh/h	47	106	188	148	77	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	200	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	60	136	241	190	99	58

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	431	0	-	0	429	241
Stage 1	-	-	-	-	241	-
Stage 2	-	-	-	-	188	-
Critical Hdwy	4.13	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1127	-	-	-	568	797
Stage 1	-	-	-	-	798	-
Stage 2	-	-	-	-	826	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1127	-	-	-	536	797
Mov Cap-2 Maneuver	-	-	-	-	536	-
Stage 1	-	-	-	-	754	-
Stage 2	-	-	-	-	826	-

Approach	SE	NW	SW
HCM Ctrl Dly, s/v	2.74	0	12.92
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	1084	-	610
HCM Lane V/C Ratio	-	-	0.053	-	0.256
HCM Ctrl Dly (s/v)	-	-	8.4	0.2	12.9
HCM Lane LOS	-	-	A	A	B
HCM 95th %tile Q(veh)	-	-	0.2	-	1

Intersection	
Int Delay, s/veh	4.9

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	52	121	165	22	57	73
Future Vol, veh/h	52	121	165	22	57	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	57	132	179	24	62	79

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	395	191	0	0	203	0
Stage 1	191	-	-	-	-	-
Stage 2	203	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	610	850	-	-	1368	-
Stage 1	841	-	-	-	-	-
Stage 2	831	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	581	850	-	-	1368	-
Mov Cap-2 Maneuver	581	-	-	-	-	-
Stage 1	841	-	-	-	-	-
Stage 2	791	-	-	-	-	-

Approach	NW	NE	SW
HCM Ctrl Dly, s/v	11.44	0	3.4
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	746	789	-
HCM Lane V/C Ratio	-	-	0.252	0.045	-
HCM Ctrl Dly (s/v)	-	-	11.4	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	1	0.1	-

Intersection	
Int Delay, s/veh	3.3

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	60	9	1	1	0	4	0	124	24	34	74	0
Future Vol, veh/h	60	9	1	1	0	4	0	124	24	34	74	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	69	10	1	1	0	5	0	143	28	39	85	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	234	333	43	282	-	85	-	0	0	170	0	0
Stage 1	163	163	-	156	-	-	-	-	-	-	-	-
Stage 2	71	170	-	126	-	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	700	585	1019	648	0	957	0	-	-	1405	-	0
Stage 1	823	762	-	830	0	-	0	-	-	-	-	0
Stage 2	930	757	-	865	0	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	678	569	1019	618	-	957	-	-	-	1405	-	-
Mov Cap-2 Maneuver	678	569	-	618	-	-	-	-	-	-	-	-
Stage 1	800	741	-	830	-	-	-	-	-	-	-	-
Stage 2	926	757	-	828	-	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Ctrl Dly, s/v	11.16	9.19	0	2.4
HCM LOS	B	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SELn1	SWL	SWT
Capacity (veh/h)	-	-	618	957	664	1405	-
HCM Lane V/C Ratio	-	-	0.002	0.005	0.121	0.028	-
HCM Ctrl Dly (s/v)	-	-	10.8	8.8	11.2	7.6	-
HCM Lane LOS	-	-	B	A	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0	0.4	0.1	-

Intersection	
Int Delay, s/veh	2

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	26	172	11	108	57	10
Future Vol, veh/h	26	172	11	108	57	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	31	205	13	129	68	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	236	0	224	118
Stage 1	-	-	-	-	133	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1329	-	744	912
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	923	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1329	-	737	912
Mov Cap-2 Maneuver	-	-	-	-	737	-
Stage 1	-	-	-	-	879	-
Stage 2	-	-	-	-	913	-

Approach	SE	NW	NE
HCM Ctrl Dly, s/v	0	0.77	10.18
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	737	912	333	-	-	-
HCM Lane V/C Ratio	0.092	0.013	0.01	-	-	-
HCM Ctrl Dly (s/v)	10.4	9	7.7	0.1	-	-
HCM Lane LOS	B	A	A	A	-	-
HCM 95th %tile Q(veh)	0.3	0	0	-	-	-

Intersection	
Int Delay, s/veh	4.1

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	144	44	113	42	27	184
Future Vol, veh/h	144	44	113	42	27	184
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	175	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	157	48	123	46	29	200

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	382	-	0	0	168	0
Stage 1	123	-	-	-	-	-
Stage 2	259	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	2.218	-
Pot Cap-1 Maneuver	621	0	-	-	1409	-
Stage 1	903	0	-	-	-	-
Stage 2	785	0	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	608	-	-	-	1409	-
Mov Cap-2 Maneuver	608	-	-	-	-	-
Stage 1	903	-	-	-	-	-
Stage 2	768	-	-	-	-	-

Approach	NW	NE	SW
HCM Ctrl Dly, s/v	12.96	0	0.97
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	608	-	1409	-
HCM Lane V/C Ratio	-	-	0.257	-	0.021	-
HCM Ctrl Dly (s/v)	-	-	13	0	7.6	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	1	-	0.1	-

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	100	92	0	0	98	65	24	175	106	0	0	0
Future Volume (veh/h)	100	92	0	0	98	65	24	175	106	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	108	99	0	0	105	70	26	188	114			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	826	980	0	0	1277	791	34	246	149			
Arrive On Green	0.61	0.61	0.00	0.00	0.61	0.61	0.24	0.24	0.24			
Sat Flow, veh/h	1165	1702	0	0	2201	1305	139	1005	610			
Grp Volume(v), veh/h	108	99	0	0	87	88	328	0	0			
Grp Sat Flow(s),veh/h/ln	1165	1617	0	0	1777	1635	1754	0	0			
Q Serve(g_s), s	2.5	1.5	0.0	0.0	1.2	1.3	10.5	0.0	0.0			
Cycle Q Clear(g_c), s	3.8	1.5	0.0	0.0	1.2	1.3	10.5	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		0.80	0.08		0.35			
Lane Grp Cap(c), veh/h	826	980	0	0	1077	991	429	0	0			
V/C Ratio(X)	0.13	0.10	0.00	0.00	0.08	0.09	0.77	0.00	0.00			
Avail Cap(c_a), veh/h	826	980	0	0	1077	991	1762	0	0			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	5.7	5.0	0.0	0.0	4.9	4.9	21.1	0.0	0.0			
Incr Delay (d2), s/veh	0.3	0.2	0.0	0.0	0.1	0.2	2.9	0.0	0.0			
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.6	0.4	0.0	0.0	0.4	0.4	4.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.1	5.2	0.0	0.0	5.1	5.1	24.0	0.0	0.0			
LnGrp LOS	A	A			A	A	C					
Approach Vol, veh/h		207			175			328				
Approach Delay, s/veh		5.6			5.1			24.0				
Approach LOS		A			A			C				

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		41.0		19.2		41.0						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		36.5		60.5		36.5						
Max Q Clear Time (g_c+I1), s		3.3		12.5		5.8						
Green Ext Time (p_c), s		1.1		2.3		1.3						

Intersection Summary		
HCM 7th Control Delay, s/veh		14.0
HCM 7th LOS		B

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	160	87	61	63	0	0	0	0	34	78	48
Future Volume (veh/h)	0	160	87	61	63	0	0	0	0	34	78	48
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	193	105	73	76	0				41	94	58
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83				0.83	0.83	0.83
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1595	831	829	1170	0				56	129	80
Arrive On Green	0.00	0.71	0.71	0.71	0.71	0.00				0.15	0.15	0.15
Sat Flow, veh/h	0	2353	1176	1015	1743	0				373	856	528
Grp Volume(v), veh/h	0	150	148	76	73	0				193	0	0
Grp Sat Flow(s),veh/h/ln	0	1777	1659	1056	1617	0				1757	0	0
Q Serve(g_s), s	0.0	1.7	1.8	1.4	0.9	0.0				6.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	1.7	1.8	3.2	0.9	0.0				6.6	0.0	0.0
Prop In Lane	0.00		0.71	0.96		0.00				0.21		0.30
Lane Grp Cap(c), veh/h	0	1255	1171	858	1142	0				265	0	0
V/C Ratio(X)	0.00	0.12	0.13	0.09	0.06	0.00				0.73	0.00	0.00
Avail Cap(c_a), veh/h	0	1255	1171	858	1142	0				1463	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	3.0	3.0	3.4	2.9	0.0				25.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.2	0.1	0.0				3.8	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.4	0.4	0.3	0.2	0.0				2.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	0.0	3.2	3.2	3.6	3.0	0.0				29.3	0.0	0.0
LnGrp LOS		A	A	A	A					C		
Approach Vol, veh/h		298			149						193	
Approach Delay, s/veh		3.2			3.3						29.3	
Approach LOS		A			A						C	

Timer - Assigned Phs	2				6		8					
Phs Duration (G+Y+Rc), s	49.0				49.0		14.0					
Change Period (Y+Rc), s	4.5				4.5		4.5					
Max Green Setting (Gmax), s	44.5				44.5		52.5					
Max Q Clear Time (g_c+I1), s	5.2				3.8		8.6					
Green Ext Time (p_c), s	1.0				1.9		1.3					

Intersection Summary												
HCM 7th Control Delay, s/veh		11.1										
HCM 7th LOS		B										

Intersection	
Int Delay, s/veh	4.1

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	51	91	162	119	90	76
Future Vol, veh/h	51	91	162	119	90	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	200	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	57	101	180	132	100	84

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	312	0	-	0	344	180
Stage 1	-	-	-	-	180	-
Stage 2	-	-	-	-	164	-
Critical Hdwy	4.13	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1247	-	-	-	639	862
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	849	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1247	-	-	-	610	862
Mov Cap-2 Maneuver	-	-	-	-	610	-
Stage 1	-	-	-	-	811	-
Stage 2	-	-	-	-	849	-

Approach	SE	NW	SW
HCM Ctrl Dly, s/v	3	0	11.92
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	1212	-	704
HCM Lane V/C Ratio	-	-	0.045	-	0.262
HCM Ctrl Dly (s/v)	-	-	8	0.2	11.9
HCM Lane LOS	-	-	A	A	B
HCM 95th %tile Q(veh)	-	-	0.1	-	1

Intersection	
Int Delay, s/veh	3.2

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	86	8	2	4	0	24	0	156	4	25	229	0
Future Vol, veh/h	86	8	2	4	0	24	0	156	4	25	229	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	99	99	99	99	99	99	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	87	8	2	4	0	24	0	158	4	25	231	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	361	443	116	330	-	81	-	0	0	162	0	0
Stage 1	282	282	-	160	-	-	-	-	-	-	-	-
Stage 2	79	162	-	170	-	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	570	507	915	600	0	963	0	-	-	1415	-	0
Stage 1	701	677	-	827	0	-	0	-	-	-	-	0
Stage 2	921	763	-	815	0	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	546	498	915	578	-	963	-	-	-	1415	-	-
Mov Cap-2 Maneuver	546	498	-	578	-	-	-	-	-	-	-	-
Stage 1	689	664	-	827	-	-	-	-	-	-	-	-
Stage 2	898	763	-	789	-	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Ctrl Dly, s/v	13.01	9.18	0	0.75
HCM LOS	B	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SELn1	SWL	SWT
Capacity (veh/h)	-	-	578	963	546	1415	-
HCM Lane V/C Ratio	-	-	0.007	0.025	0.178	0.018	-
HCM Ctrl Dly (s/v)	-	-	11.3	8.8	13	7.6	-
HCM Lane LOS	-	-	B	A	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0.1	0.6	0.1	-

Intersection	
Int Delay, s/veh	2.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	28	183	12	115	61	11
Future Vol, veh/h	28	183	12	115	61	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	218	14	137	73	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	251	0	239	126
Stage 1	-	-	-	-	142	-
Stage 2	-	-	-	-	97	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1311	-	728	901
Stage 1	-	-	-	-	870	-
Stage 2	-	-	-	-	916	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1311	-	720	901
Mov Cap-2 Maneuver	-	-	-	-	720	-
Stage 1	-	-	-	-	870	-
Stage 2	-	-	-	-	906	-

Approach	SE	NW	NE
HCM Ctrl Dly, s/v	0	0.8	10.33
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	720	901	340	-	-	-
HCM Lane V/C Ratio	0.101	0.015	0.011	-	-	-
HCM Ctrl Dly (s/v)	10.6	9.1	7.8	0.1	-	-
HCM Lane LOS	B	A	A	A	-	-
HCM 95th %tile Q(veh)	0.3	0	0	-	-	-

Intersection	
Int Delay, s/veh	4.2

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	153	47	120	45	29	195
Future Vol, veh/h	153	47	120	45	29	195
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	175	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	166	51	130	49	32	212

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	405	-	0	0	179	0
Stage 1	130	-	-	-	-	-
Stage 2	275	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	2.218	-
Pot Cap-1 Maneuver	601	0	-	-	1396	-
Stage 1	896	0	-	-	-	-
Stage 2	771	0	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	588	-	-	-	1396	-
Mov Cap-2 Maneuver	588	-	-	-	-	-
Stage 1	896	-	-	-	-	-
Stage 2	754	-	-	-	-	-

Approach	NW	NE	SW
HCM Ctrl Dly, s/v	13.52	0	0.99
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	588	-	1396	-
HCM Lane V/C Ratio	-	-	0.283	-	0.023	-
HCM Ctrl Dly (s/v)	-	-	13.5	0	7.6	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	1.2	-	0.1	-

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	106	98	0	0	104	69	25	186	113	0	0	0
Future Volume (veh/h)	106	98	0	0	104	69	25	186	113	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	114	105	0	0	112	74	27	200	122			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	799	957	0	0	1250	769	35	260	158			
Arrive On Green	0.59	0.59	0.00	0.00	0.59	0.59	0.26	0.26	0.26			
Sat Flow, veh/h	1148	1702	0	0	2207	1300	136	1005	613			
Grp Volume(v), veh/h	114	105	0	0	93	93	349	0	0			
Grp Sat Flow(s),veh/h/ln	1148	1617	0	0	1777	1636	1753	0	0			
Q Serve(g_s), s	2.7	1.7	0.0	0.0	1.4	1.5	11.1	0.0	0.0			
Cycle Q Clear(g_c), s	4.2	1.7	0.0	0.0	1.4	1.5	11.1	0.0	0.0			
Prop In Lane	1.00		0.00	0.00		0.79	0.08		0.35			
Lane Grp Cap(c), veh/h	799	957	0	0	1051	968	453	0	0			
V/C Ratio(X)	0.14	0.11	0.00	0.00	0.09	0.10	0.77	0.00	0.00			
Avail Cap(c_a), veh/h	799	957	0	0	1051	968	1797	0	0			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	6.2	5.4	0.0	0.0	5.3	5.3	20.6	0.0	0.0			
Incr Delay (d2), s/veh	0.4	0.2	0.0	0.0	0.2	0.2	2.8	0.0	0.0			
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.6	0.5	0.0	0.0	0.4	0.4	4.5	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	6.6	5.6	0.0	0.0	5.4	5.5	23.4	0.0	0.0			
LnGrp LOS	A	A			A	A	C					
Approach Vol, veh/h		219			186			349				
Approach Delay, s/veh		6.1			5.5			23.4				
Approach LOS		A			A			C				

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		40.0		20.0		40.0						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		35.5		61.5		35.5						
Max Q Clear Time (g_c+I1), s		3.5		13.1		6.2						
Green Ext Time (p_c), s		1.1		2.5		1.4						

Intersection Summary		
HCM 7th Control Delay, s/veh		14.0
HCM 7th LOS		B

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	170	92	65	67	0	0	0	0	36	83	51
Future Volume (veh/h)	0	170	92	65	67	0	0	0	0	36	83	51
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	205	111	78	81	0				43	100	61
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83				0.83	0.83	0.83
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1583	822	812	1152	0				59	137	83
Arrive On Green	0.00	0.70	0.70	0.70	0.70	0.00				0.16	0.16	0.16
Sat Flow, veh/h	0	2355	1175	1001	1731	0				370	861	525
Grp Volume(v), veh/h	0	159	157	80	79	0				204	0	0
Grp Sat Flow(s),veh/h/ln	0	1777	1659	1030	1617	0				1757	0	0
Q Serve(g_s), s	0.0	1.9	2.0	1.6	1.0	0.0				7.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	1.9	2.0	3.6	1.0	0.0				7.0	0.0	0.0
Prop In Lane	0.00		0.71	0.97		0.00				0.21		0.30
Lane Grp Cap(c), veh/h	0	1244	1161	832	1132	0				279	0	0
V/C Ratio(X)	0.00	0.13	0.14	0.10	0.07	0.00				0.73	0.00	0.00
Avail Cap(c_a), veh/h	0	1244	1161	832	1132	0				1451	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	3.1	3.2	3.7	3.0	0.0				25.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.2	0.2	0.1	0.0				3.7	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.5	0.5	0.3	0.2	0.0				3.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	0.0	3.4	3.4	3.9	3.1	0.0				29.2	0.0	0.0
LnGrp LOS		A	A	A	A					C		
Approach Vol, veh/h		316			159						204	
Approach Delay, s/veh		3.4			3.5						29.2	
Approach LOS		A			A						C	

Timer - Assigned Phs	2				6		8					
Phs Duration (G+Y+Rc), s	49.0				49.0		14.6					
Change Period (Y+Rc), s	4.5				4.5		4.5					
Max Green Setting (Gmax), s	44.5				44.5		52.5					
Max Q Clear Time (g_c+I1), s	5.6				4.0		9.0					
Green Ext Time (p_c), s	1.1				2.1		1.3					

Intersection Summary												
HCM 7th Control Delay, s/veh		11.2										
HCM 7th LOS		B										

Intersection	
Int Delay, s/veh	4.2

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	54	97	172	126	96	81
Future Vol, veh/h	54	97	172	126	96	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	200	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	60	108	191	140	107	90

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	331	0	-	0	365	191
Stage 1	-	-	-	-	191	-
Stage 2	-	-	-	-	174	-
Critical Hdwy	4.13	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1227	-	-	-	621	850
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	839	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1227	-	-	-	590	850
Mov Cap-2 Maneuver	-	-	-	-	590	-
Stage 1	-	-	-	-	798	-
Stage 2	-	-	-	-	839	-

Approach	SE	NW	SW
HCM Ctrl Dly, s/v	3.02	0	12.35
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	1190	-	686
HCM Lane V/C Ratio	-	-	0.049	-	0.287
HCM Ctrl Dly (s/v)	-	-	8.1	0.2	12.3
HCM Lane LOS	-	-	A	A	B
HCM 95th %tile Q(veh)	-	-	0.2	-	1.2

Intersection	
Int Delay, s/veh	3

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	86	8	2	4	0	24	0	175	4	25	254	0
Future Vol, veh/h	86	8	2	4	0	24	0	175	4	25	254	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	99	99	99	99	99	99	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	87	8	2	4	0	24	0	177	4	25	257	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	395	488	128	362	-	90	-	0	0	181	0	0
Stage 1	307	307	-	179	-	-	-	-	-	-	-	-
Stage 2	88	181	-	183	-	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	539	479	898	569	0	949	0	-	-	1392	-	0
Stage 1	678	659	-	806	0	-	0	-	-	-	-	0
Stage 2	909	749	-	801	0	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	515	470	898	548	-	949	-	-	-	1392	-	-
Mov Cap-2 Maneuver	515	470	-	548	-	-	-	-	-	-	-	-
Stage 1	665	647	-	806	-	-	-	-	-	-	-	-
Stage 2	886	749	-	775	-	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Ctrl Dly, s/v	13.59	9.28	0	0.68
HCM LOS	B	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SELn1	SWL	SWT
Capacity (veh/h)	-	-	548	949	516	1392	-
HCM Lane V/C Ratio	-	-	0.007	0.026	0.188	0.018	-
HCM Ctrl Dly (s/v)	-	-	11.6	8.9	13.6	7.6	-
HCM Lane LOS	-	-	B	A	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0.1	0.7	0.1	-

Intersection	
Int Delay, s/veh	3.1

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	28	272	12	115	127	11
Future Vol, veh/h	28	272	12	115	127	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	150	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	324	14	137	151	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	357	0	292	179
Stage 1	-	-	-	-	195	-
Stage 2	-	-	-	-	97	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	1198	-	675	834
Stage 1	-	-	-	-	818	-
Stage 2	-	-	-	-	916	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1198	-	666	834
Mov Cap-2 Maneuver	-	-	-	-	666	-
Stage 1	-	-	-	-	818	-
Stage 2	-	-	-	-	905	-

Approach	SE	NW	NE
HCM Ctrl Dly, s/v	0	0.83	11.77
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	666	834	340	-	-	-
HCM Lane V/C Ratio	0.227	0.016	0.012	-	-	-
HCM Ctrl Dly (s/v)	12	9.4	8	0.1	-	-
HCM Lane LOS	B	A	A	A	-	-
HCM 95th %tile Q(veh)	0.9	0	0	-	-	-

Intersection	
Int Delay, s/veh	6

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	242	47	139	111	29	220
Future Vol, veh/h	242	47	139	111	29	220
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	175	0	-	200	200	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	263	51	151	121	32	239

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	453	-	0	0	272	0
Stage 1	151	-	-	-	-	-
Stage 2	302	-	-	-	-	-
Critical Hdwy	6.42	-	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	-	-	-	2.218	-
Pot Cap-1 Maneuver	564	0	-	-	1292	-
Stage 1	877	0	-	-	-	-
Stage 2	750	0	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	551	-	-	-	1292	-
Mov Cap-2 Maneuver	551	-	-	-	-	-
Stage 1	877	-	-	-	-	-
Stage 2	732	-	-	-	-	-

Approach	NW	NE	SW
HCM Ctrl Dly, s/v	17.37	0	0.92
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	551	-	1292	-
HCM Lane V/C Ratio	-	-	0.478	-	0.024	-
HCM Ctrl Dly (s/v)	-	-	17.4	0	7.9	-
HCM Lane LOS	-	-	C	A	A	-
HCM 95th %tile Q(veh)	-	-	2.6	-	0.1	-

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	106	155	0	0	146	93	25	186	145	0	0	0
Future Volume (veh/h)	106	155	0	0	146	93	25	186	145	0	0	0
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach		No			No			No				
Adj Sat Flow, veh/h/ln	1870	1870	0	0	1870	1870	1870	1870	1870			
Adj Flow Rate, veh/h	114	167	0	0	157	100	27	200	156			
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93			
Percent Heavy Veh, %	2	2	0	0	2	2	2	2	2			
Cap, veh/h	644	1073	0	0	1242	747	34	252	197			
Arrive On Green	0.58	0.58	0.00	0.00	0.58	0.58	0.28	0.28	0.28			
Sat Flow, veh/h	931	1929	0	0	2227	1283	122	907	707			
Grp Volume(v), veh/h	139	142	0	0	129	128	383	0	0			
Grp Sat Flow(s),veh/h/ln	1158	1617	0	0	1777	1639	1737	0	0			
Q Serve(g_s), s	3.0	2.6	0.0	0.0	2.1	2.3	13.2	0.0	0.0			
Cycle Q Clear(g_c), s	5.3	2.6	0.0	0.0	2.1	2.3	13.2	0.0	0.0			
Prop In Lane	0.82		0.00	0.00		0.78	0.07		0.41			
Lane Grp Cap(c), veh/h	776	941	0	0	1034	954	483	0	0			
V/C Ratio(X)	0.18	0.15	0.00	0.00	0.12	0.13	0.79	0.00	0.00			
Avail Cap(c_a), veh/h	776	941	0	0	1034	954	1604	0	0			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh	7.0	6.2	0.0	0.0	6.1	6.1	21.5	0.0	0.0			
Incr Delay (d2), s/veh	0.5	0.3	0.0	0.0	0.2	0.3	3.0	0.0	0.0			
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	0.9	0.8	0.0	0.0	0.7	0.7	5.3	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	7.5	6.5	0.0	0.0	6.3	6.4	24.5	0.0	0.0			
LnGrp LOS	A	A			A	A	C					
Approach Vol, veh/h		281			257			383				
Approach Delay, s/veh		7.0			6.4			24.5				
Approach LOS		A			A			C				

Timer - Assigned Phs		2		4		6						
Phs Duration (G+Y+Rc), s		42.0		22.4		42.0						
Change Period (Y+Rc), s		4.5		4.5		4.5						
Max Green Setting (Gmax), s		37.5		59.5		37.5						
Max Q Clear Time (g_c+I1), s		4.3		15.2		7.3						
Green Ext Time (p_c), s		1.6		2.8		1.8						

Intersection Summary												
HCM 7th Control Delay, s/veh			14.1									
HCM 7th LOS			B									

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	195	92	89	85	0	0	0	0	68	83	51
Future Volume (veh/h)	0	195	92	89	85	0	0	0	0	68	83	51
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Lane Width Adj.	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Work Zone On Approach		No			No						No	
Adj Sat Flow, veh/h/ln	0	1870	1870	1870	1870	0				1870	1870	1870
Adj Flow Rate, veh/h	0	235	111	107	102	0				82	100	61
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83				0.83	0.83	0.83
Percent Heavy Veh, %	0	2	2	2	2	0				2	2	2
Cap, veh/h	0	1601	732	773	1093	0				110	134	82
Arrive On Green	0.00	0.68	0.68	0.68	0.68	0.00				0.18	0.18	0.18
Sat Flow, veh/h	0	2463	1083	978	1702	0				594	725	442
Grp Volume(v), veh/h	0	174	172	107	102	0				243	0	0
Grp Sat Flow(s),veh/h/ln	0	1777	1675	978	1617	0				1761	0	0
Q Serve(g_s), s	0.0	2.3	2.4	2.7	1.4	0.0				8.4	0.0	0.0
Cycle Q Clear(g_c), s	0.0	2.3	2.4	5.1	1.4	0.0				8.4	0.0	0.0
Prop In Lane	0.00		0.65	1.00		0.00				0.34		0.25
Lane Grp Cap(c), veh/h	0	1201	1132	773	1093	0				325	0	0
V/C Ratio(X)	0.00	0.15	0.15	0.14	0.09	0.00				0.75	0.00	0.00
Avail Cap(c_a), veh/h	0	1201	1132	773	1093	0				1464	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	1.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	3.8	3.8	4.7	3.6	0.0				24.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.3	0.4	0.2	0.0				3.5	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.6	0.6	0.5	0.4	0.0				3.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	0.0	4.0	4.1	5.1	3.8	0.0				28.3	0.0	0.0
LnGrp LOS		A	A	A	A					C		
Approach Vol, veh/h		346			209						243	
Approach Delay, s/veh		4.0			4.4						28.3	
Approach LOS		A			A						C	

Timer - Assigned Phs	2				6		8					
Phs Duration (G+Y+Rc), s	48.0				48.0		16.4					
Change Period (Y+Rc), s	4.5				4.5		4.5					
Max Green Setting (Gmax), s	43.5				43.5		53.5					
Max Q Clear Time (g_c+I1), s	7.1				4.4		10.4					
Green Ext Time (p_c), s	1.5				2.3		1.6					

Intersection Summary												
HCM 7th Control Delay, s/veh		11.5										
HCM 7th LOS		B										

Intersection	
Int Delay, s/veh	5

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	78	97	172	151	113	98
Future Vol, veh/h	78	97	172	151	113	98
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	200	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	87	108	191	168	126	109

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	359	0	-	0	418	191
Stage 1	-	-	-	-	191	-
Stage 2	-	-	-	-	227	-
Critical Hdwy	4.13	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1198	-	-	-	577	850
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	790	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1198	-	-	-	534	850
Mov Cap-2 Maneuver	-	-	-	-	534	-
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	790	-

Approach	SE	NW	SW
HCM Ctrl Dly, s/v	3.8	0	13.73
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	1162	-	645
HCM Lane V/C Ratio	-	-	0.072	-	0.363
HCM Ctrl Dly (s/v)	-	-	8.2	0.2	13.7
HCM Lane LOS	-	-	A	A	B
HCM 95th %tile Q(veh)	-	-	0.2	-	1.7

Intersection	
Int Delay, s/veh	3.2

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	34	85	165	49	114	348
Future Vol, veh/h	34	85	165	49	114	348
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	37	92	179	53	124	378

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	832	206	0	0	233	0
Stage 1	206	-	-	-	-	-
Stage 2	626	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	339	835	-	-	1335	-
Stage 1	829	-	-	-	-	-
Stage 2	533	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	299	835	-	-	1335	-
Mov Cap-2 Maneuver	299	-	-	-	-	-
Stage 1	829	-	-	-	-	-
Stage 2	470	-	-	-	-	-

Approach	NW	NE	SW
HCM Ctrl Dly, s/v	13.5	0	1.97
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	552	444	-
HCM Lane V/C Ratio	-	-	0.234	0.093	-
HCM Ctrl Dly (s/v)	-	-	13.5	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.9	0.3	-

Intersection	
Int Delay, s/veh	3.1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	81	8	2	4	0	23	0	147	4	24	216	0
Future Vol, veh/h	81	8	2	4	0	23	0	147	4	24	216	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	99	99	99	99	99	99	99	99	99	99	99	99
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	82	8	2	4	0	23	0	148	4	24	218	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	341	419	109	312	-	76	-	0	0	153	0	0
Stage 1	267	267	-	151	-	-	-	-	-	-	-	-
Stage 2	74	153	-	162	-	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	-	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	589	524	924	617	0	969	0	-	-	1426	-	0
Stage 1	716	687	-	837	0	-	0	-	-	-	-	0
Stage 2	927	770	-	824	0	-	0	-	-	-	-	0
Platoon blocked, %								-	-		-	
Mov Cap-1 Maneuver	565	515	924	596	-	969	-	-	-	1426	-	-
Mov Cap-2 Maneuver	565	515	-	596	-	-	-	-	-	-	-	-
Stage 1	704	675	-	837	-	-	-	-	-	-	-	-
Stage 2	904	770	-	799	-	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Ctrl Dly, s/v	12.61	9.14	0	0.76
HCM LOS	B	A		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SELn1	SWL	SWT
Capacity (veh/h)	-	-	596	969	565	1426	-
HCM Lane V/C Ratio	-	-	0.007	0.024	0.163	0.017	-
HCM Ctrl Dly (s/v)	-	-	11.1	8.8	12.6	7.6	-
HCM Lane LOS	-	-	B	A	B	A	-
HCM 95th %tile Q(veh)	-	-	0	0.1	0.6	0.1	-

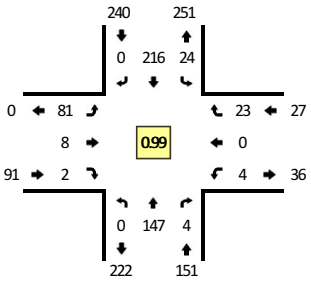
Type of peak hour being reported: Intersection Peak

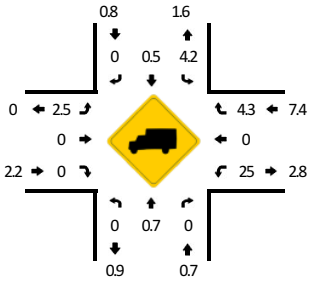
Method for determining peak hour: Total Entering Volume

LOCATION: Railroad St -- Harbor Dr
CITY/STATE: Duluth, MN

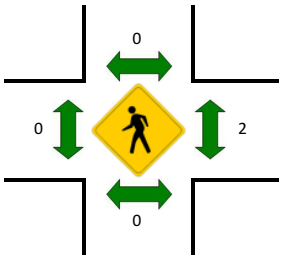
QC JOB #: 17239206
DATE: Wed, Nov 5 2025

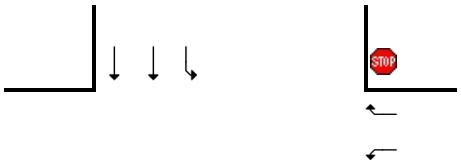
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

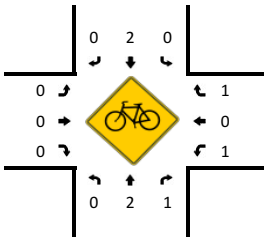


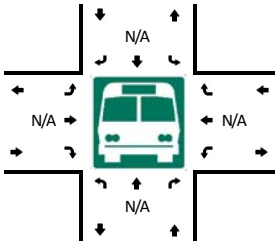


TRUE DATA TO IMPROVE MOBILITY

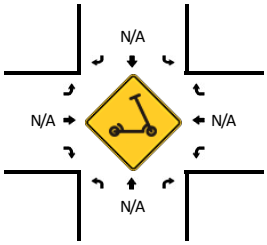












15-Min Count Period Beginning At	Railroad St (Northbound)				Railroad St (Southbound)				Harbor Dr (Eastbound)				Harbor Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	10	1	0	1	7	0	0	5	0	0	0	0	0	0	0	24	
6:15 AM	0	12	0	0	0	6	0	0	8	0	0	0	0	0	2	0	28	
6:30 AM	0	22	0	0	0	7	0	0	6	0	0	0	0	0	0	0	35	
6:45 AM	0	18	0	0	3	27	0	0	17	0	0	0	0	0	1	0	66	153
7:00 AM	0	27	0	0	4	15	0	0	13	0	0	0	0	0	0	0	59	188
7:15 AM	0	27	0	0	5	20	0	0	9	1	0	0	0	0	0	0	62	222
7:30 AM	0	29	1	0	5	18	0	0	14	2	0	0	1	0	2	0	72	259
7:45 AM	0	41	0	0	13	25	0	0	15	0	0	0	0	0	1	0	95	288
8:00 AM	0	21	7	0	12	13	0	1	14	3	0	0	0	0	0	0	71	300
8:15 AM	0	33	16	0	4	18	0	0	17	4	1	0	0	0	1	0	94	332
8:30 AM	0	27	1	0	11	13	0	0	6	2	0	0	1	0	3	0	64	324
8:45 AM	0	26	1	0	4	16	0	0	19	0	0	0	0	0	0	0	66	295
9:00 AM	0	26	0	0	5	20	0	0	13	2	0	0	0	0	0	0	66	290
9:15 AM	0	23	0	0	3	20	0	1	16	1	0	0	0	0	1	0	65	261
9:30 AM	0	20	0	0	3	31	0	0	13	1	0	0	2	0	3	0	73	270
9:45 AM	0	21	10	0	3	27	0	0	20	1	0	0	0	0	2	0	84	288
10:00 AM	0	17	0	0	2	20	0	0	17	1	2	0	1	0	6	0	66	288
10:15 AM	0	19	0	0	1	16	0	0	11	1	0	0	1	0	3	0	52	275
10:30 AM	0	20	2	0	10	16	0	0	12	0	0	0	1	0	2	0	63	265
10:45 AM	0	24	1	0	4	21	0	0	17	2	0	0	1	0	4	0	74	255
11:00 AM	0	27	2	0	3	25	0	0	15	1	1	0	1	0	0	0	75	264
11:15 AM	0	22	0	0	2	22	0	0	13	1	1	0	0	0	5	0	66	278
11:30 AM	0	24	0	0	3	23	0	0	18	0	1	0	0	0	2	0	71	286
11:45 AM	0	26	0	0	4	18	0	0	16	3	0	0	2	0	3	0	72	284
12:00 PM	0	24	0	0	1	18	0	0	15	2	0	0	1	0	6	0	67	276
12:15 PM	0	25	0	0	2	31	0	0	14	1	0	0	0	0	2	0	75	285
12:30 PM	0	18	0	0	2	15	0	0	17	0	0	0	0	0	3	0	55	269
12:45 PM	0	23	0	0	5	23	0	1	13	1	0	0	0	0	1	0	67	264
1:00 PM	0	29	0	0	5	27	0	0	20	0	0	0	0	0	5	0	86	283
1:15 PM	0	27	0	0	2	18	0	0	10	0	0	0	0	0	2	0	59	267
1:30 PM	0	16	0	0	2	23	0	0	18	0	0	0	0	0	2	0	61	273
1:45 PM	0	31	0	0	1	27	0	0	14	3	0	0	0	0	3	0	79	285
2:00 PM	0	16	0	0	3	27	0	0	14	2	0	0	3	0	5	0	70	269
2:15 PM	0	17	0	0	3	25	0	0	13	0	0	0	0	0	2	0	60	270
2:30 PM	0	23	0	0	5	26	0	0	17	1	1	0	1	0	1	0	75	284
2:45 PM	0	29	0	0	6	25	0	0	15	2	0	0	0	0	1	0	78	283
3:00 PM	0	31	0	0	5	33	0	0	28	1	0	0	1	0	3	0	102	315
3:15 PM	0	25	0	0	13	43	0	0	18	1	1	0	0	0	2	0	103	358

15-Min Count Period Beginning At	Railroad St (Northbound)				Railroad St (Southbound)				Harbor Dr (Eastbound)				Harbor Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	0	37	1	0	15	31	0	0	23	1	1	0	1	0	2	0	112	395
3:45 PM	0	37	1	0	14	33	0	0	17	3	0	0	0	0	0	0	105	422
4:00 PM	0	34	3	0	7	39	0	1	25	5	1	0	2	0	5	0	122	442
4:15 PM	0	40	1	1	7	30	0	0	18	2	0	0	2	0	6	0	107	446
4:30 PM	0	38	3	0	7	55	0	0	16	4	0	0	0	0	2	0	125	459
4:45 PM	0	40	1	0	5	55	0	0	21	0	2	0	0	0	5	0	129	483
5:00 PM	0	36	0	0	3	56	0	0	22	3	0	0	0	0	8	0	128	489
5:15 PM	0	33	0	0	9	50	0	0	22	1	0	0	4	0	8	0	127	509
5:30 PM	0	47	1	0	19	37	0	0	17	1	0	0	0	0	2	0	124	508
5:45 PM	0	34	0	0	10	33	0	1	21	0	0	0	0	0	1	0	100	479
6:00 PM	0	29	0	0	0	30	0	0	12	0	0	0	0	0	2	0	73	424
6:15 PM	0	32	2	0	5	32	0	0	16	0	2	0	8	0	18	0	115	412
6:30 PM	0	36	0	0	8	25	0	0	9	0	2	0	3	0	15	0	98	386
6:45 PM	0	26	5	0	21	36	0	0	10	3	0	0	1	0	9	0	111	397

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	160	4	0	20	220	0	0	84	0	8	0	0	0	20	0	516
Heavy Trucks	0	0	0		0	0	0		4	0	0		0	0	0		4
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	4		4
Scooters																	

Comments:

Report generated on 11/12/2025 7:26 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

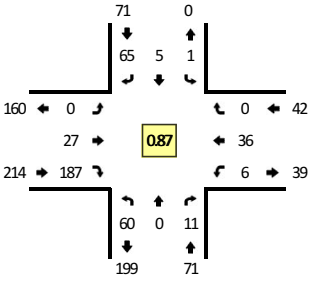
Type of peak hour being reported: Intersection Peak

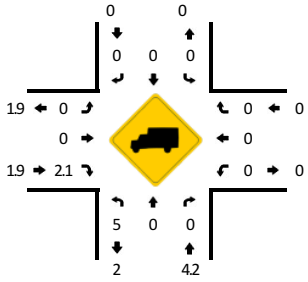
Method for determining peak hour: Total Entering Volume

LOCATION: S 5th Ave W -- Harbor Dr
CITY/STATE: Duluth, MN

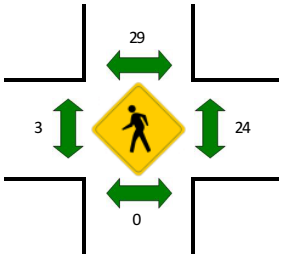
QC JOB #: 17239205
DATE: Wed, Nov 5 2025

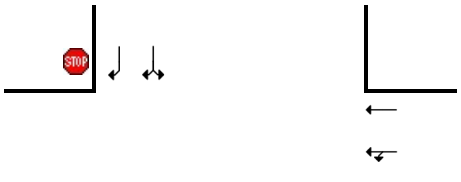
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

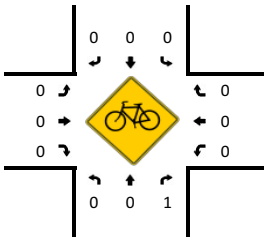


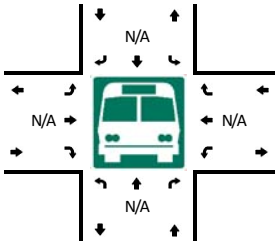


TRUE DATA TO IMPROVE MOBILITY

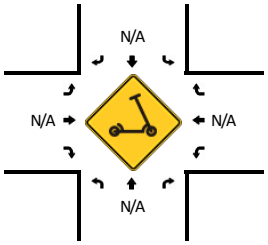












15-Min Count Period Beginning At	S 5th Ave W (Northbound)				S 5th Ave W (Southbound)				Harbor Dr (Eastbound)				Harbor Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	5	0	0	0	0	1	0	0	0	2	7	0	1	0	0	0	16	
6:15 AM	1	0	0	0	0	0	0	0	0	1	7	0	1	1	0	0	11	
6:30 AM	3	0	0	0	0	0	1	0	0	6	12	0	0	0	0	0	22	
6:45 AM	9	0	0	0	0	0	0	0	0	2	24	0	0	2	0	0	37	86
7:00 AM	5	0	1	0	0	0	0	0	0	3	10	0	1	0	0	0	20	90
7:15 AM	4	0	2	0	0	0	0	0	0	5	15	0	0	2	0	0	28	107
7:30 AM	11	0	0	0	0	1	0	0	0	8	11	0	1	0	0	0	32	117
7:45 AM	17	0	2	0	0	0	0	0	0	10	16	0	1	0	0	0	46	126
8:00 AM	10	0	0	0	0	0	0	0	0	3	11	0	0	0	0	0	24	130
8:15 AM	11	0	1	0	0	0	1	0	0	5	14	0	1	0	0	0	33	135
8:30 AM	11	0	1	0	0	0	2	0	0	3	10	0	0	0	0	0	27	130
8:45 AM	6	0	1	0	0	0	0	0	0	2	14	0	0	0	0	0	23	107
9:00 AM	3	0	1	0	0	0	0	0	0	9	12	0	0	0	0	0	25	108
9:15 AM	10	0	1	0	0	0	1	0	0	2	15	0	2	2	0	0	33	108
9:30 AM	6	0	5	0	0	0	1	0	0	4	6	0	4	1	0	0	27	108
9:45 AM	8	0	8	0	0	0	1	0	0	9	12	0	0	2	0	0	40	125
10:00 AM	6	0	4	0	0	1	2	0	0	8	12	0	0	2	0	0	35	135
10:15 AM	8	0	2	0	1	1	1	0	0	5	10	0	0	4	0	0	32	134
10:30 AM	8	0	3	0	0	0	0	0	0	7	13	0	4	4	0	0	39	146
10:45 AM	11	0	1	0	0	0	3	0	0	3	7	0	2	3	0	0	30	136
11:00 AM	8	0	3	0	0	0	4	0	0	3	9	0	1	7	0	0	35	136
11:15 AM	5	0	2	0	0	1	7	0	0	3	9	0	2	12	0	0	41	145
11:30 AM	3	0	3	0	0	0	9	0	0	5	7	0	2	9	0	0	38	144
11:45 AM	13	0	0	0	0	0	6	0	0	6	13	0	2	7	0	0	47	161
12:00 PM	8	0	1	1	0	0	7	0	0	2	7	0	0	8	0	0	34	160
12:15 PM	6	0	5	0	0	1	4	0	0	7	4	0	0	3	0	0	30	149
12:30 PM	7	0	3	0	0	1	7	0	0	6	13	0	4	7	0	0	48	159
12:45 PM	6	0	2	0	0	0	5	0	0	2	7	0	2	10	0	0	34	146
1:00 PM	11	0	3	0	0	0	4	0	0	5	12	0	1	5	0	0	41	153
1:15 PM	17	0	3	0	0	0	1	0	0	3	12	0	5	6	0	0	47	170
1:30 PM	10	0	4	0	0	0	4	0	0	4	5	0	2	3	0	0	32	154
1:45 PM	10	0	4	0	0	1	3	0	0	10	13	0	2	3	0	0	46	166
2:00 PM	16	0	5	0	1	2	5	0	0	9	16	0	0	8	0	0	62	187
2:15 PM	10	0	5	0	1	0	5	0	0	6	10	0	0	9	0	0	46	186
2:30 PM	15	0	2	0	0	1	3	0	0	3	20	0	5	12	0	0	61	215
2:45 PM	14	0	5	0	0	1	3	0	0	4	14	1	4	5	0	0	51	220
3:00 PM	23	0	0	0	0	0	3	0	0	9	15	0	2	9	0	0	61	219
3:15 PM	17	0	0	0	0	1	15	0	0	2	18	0	1	10	0	0	64	237

15-Min Count Period Beginning At	S 5th Ave W (Northbound)				S 5th Ave W (Southbound)				Harbor Dr (Eastbound)				Harbor Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	15	0	1	0	0	1	12	0	0	4	29	0	3	13	0	0	78	254
3:45 PM	16	0	0	0	0	1	10	0	0	3	27	0	2	2	0	0	61	264
4:00 PM	28	0	2	0	1	0	16	0	0	8	15	0	5	8	0	0	83	286
4:15 PM	21	0	3	0	0	1	17	0	0	4	31	0	6	11	0	0	94	316
4:30 PM	24	0	0	0	0	0	14	0	0	6	24	0	1	9	0	0	78	316
4:45 PM	13	0	3	0	0	0	11	0	0	6	49	0	3	14	0	0	99	354
5:00 PM	11	0	6	0	1	4	20	0	0	6	51	0	2	14	0	0	115	386
5:15 PM	9	0	1	1	0	1	23	0	0	8	48	0	0	3	0	0	94	386
5:30 PM	26	0	1	0	0	0	11	0	0	7	39	0	1	5	0	0	90	398
5:45 PM	23	0	3	0	0	0	8	0	0	2	37	0	2	11	0	0	86	385
6:00 PM	23	0	2	0	0	0	3	0	0	5	24	0	1	2	0	0	60	330
6:15 PM	23	0	6	1	0	0	3	0	0	3	17	0	4	7	0	0	64	300
6:30 PM	29	0	4	0	0	1	11	0	0	2	19	0	1	11	0	0	78	288
6:45 PM	28	0	6	0	0	0	10	0	0	10	24	0	2	7	0	0	87	289

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	44	0	24	0	4	16	80	0	0	24	204	0	8	56	0	0	460
Heavy Trucks	4	0	0		0	0	0		0	0	0		0	0	0		4
Buses																	
Pedestrians		0				28				0				12			40
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/12/2025 7:26 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

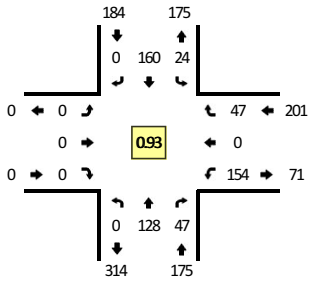
Type of peak hour being reported: Intersection Peak

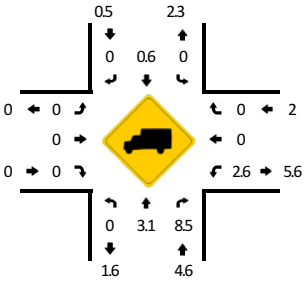
Method for determining peak hour: Total Entering Volume

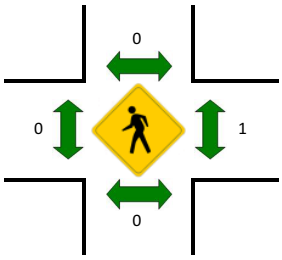
LOCATION: Railroad St -- S 5th Ave W
CITY/STATE: Duluth, MN

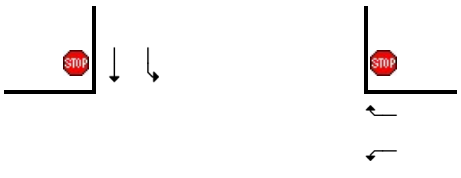
QC JOB #: 17239204
DATE: Wed, Nov 5 2025

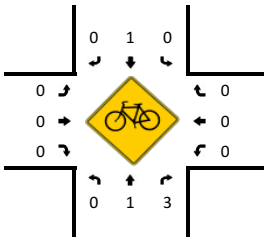
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

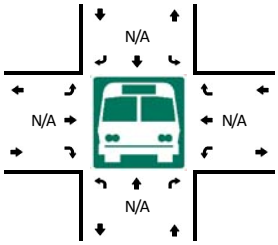




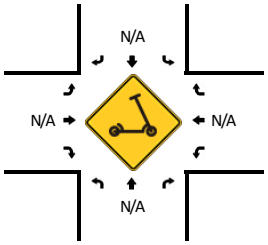












15-Min Count Period Beginning At	Railroad St (Northbound)				Railroad St (Southbound)				S 5th Ave W (Eastbound)				S 5th Ave W (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	9	3	0	2	4	0	0	0	0	0	0	9	0	0	0	27	
6:15 AM	0	10	1	0	1	3	0	0	0	0	0	0	7	0	0	0	22	
6:30 AM	0	22	3	0	0	7	0	0	0	0	0	0	11	0	1	0	44	
6:45 AM	0	15	7	0	2	11	0	0	0	0	0	0	14	0	11	0	60	153
7:00 AM	0	29	5	0	1	12	0	0	0	0	0	0	6	0	4	0	57	183
7:15 AM	0	27	6	0	0	20	0	0	0	0	0	0	10	0	6	0	69	230
7:30 AM	0	28	11	0	0	12	0	0	0	0	0	0	6	0	5	0	62	248
7:45 AM	0	36	15	0	4	18	0	0	0	0	0	0	6	0	14	0	93	281
8:00 AM	0	22	7	0	2	9	0	0	0	0	0	0	4	0	7	0	51	275
8:15 AM	0	28	8	0	4	11	0	0	0	0	0	0	3	0	12	0	66	272
8:30 AM	0	25	8	0	4	9	0	0	0	0	0	0	6	0	4	0	56	266
8:45 AM	0	24	4	0	3	12	0	0	0	0	0	0	8	0	6	0	57	230
9:00 AM	0	27	4	0	0	12	0	0	0	0	0	0	5	0	6	0	54	233
9:15 AM	0	14	6	0	6	16	0	0	0	0	0	0	8	0	8	0	58	225
9:30 AM	0	21	6	0	7	21	0	0	0	0	0	0	5	0	7	0	67	236
9:45 AM	0	17	11	0	6	16	0	0	0	0	0	0	1	0	12	0	63	242
10:00 AM	0	12	6	0	5	10	0	0	0	0	0	0	6	0	6	0	45	233
10:15 AM	0	16	8	0	2	9	0	0	0	0	0	0	7	0	5	0	47	222
10:30 AM	0	21	7	0	5	9	0	0	0	0	0	0	8	0	9	0	59	214
10:45 AM	0	18	9	0	3	15	0	0	0	0	0	0	3	0	5	0	53	204
11:00 AM	0	24	8	0	3	18	0	0	0	0	0	0	6	0	5	0	64	223
11:15 AM	0	17	5	0	2	17	0	0	0	0	0	0	6	0	6	0	53	229
11:30 AM	0	22	4	0	2	21	0	0	0	0	0	0	4	0	3	0	56	226
11:45 AM	0	19	9	0	6	15	0	0	0	0	0	0	6	0	10	0	65	238
12:00 PM	0	22	9	0	1	16	0	0	0	0	0	0	3	0	6	0	57	231
12:15 PM	0	24	6	0	5	23	0	0	0	0	0	0	3	0	1	0	62	240
12:30 PM	0	11	9	0	0	18	0	0	0	0	0	0	12	0	7	0	57	241
12:45 PM	0	19	6	0	3	19	0	0	0	0	0	0	4	0	5	0	56	232
1:00 PM	0	19	9	0	5	17	0	0	0	0	0	0	6	0	7	0	63	238
1:15 PM	0	19	13	0	7	17	0	0	0	0	0	0	9	0	8	0	73	249
1:30 PM	0	20	9	0	5	16	0	0	0	0	0	0	4	0	2	0	56	248
1:45 PM	0	22	10	0	5	22	0	0	0	0	0	0	7	0	10	0	76	268
2:00 PM	0	14	12	0	10	20	0	0	0	0	0	0	13	0	5	0	74	279
2:15 PM	0	13	11	0	2	18	0	0	0	0	0	0	4	0	5	0	53	259
2:30 PM	0	17	11	0	6	22	0	0	0	0	0	0	20	0	10	0	86	289
2:45 PM	0	24	11	0	9	15	0	0	0	0	0	0	19	0	6	0	84	297
3:00 PM	0	23	17	0	5	26	0	0	0	0	0	0	7	0	8	0	86	309
3:15 PM	0	17	8	0	10	23	0	0	0	0	0	0	12	0	12	0	82	338

15-Min Count Period Beginning At	Railroad St (Northbound)				Railroad St (Southbound)				S 5th Ave W (Eastbound)				S 5th Ave W (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	0	26	12	0	3	26	0	0	0	0	0	0	19	0	21	0	107	359
3:45 PM	0	28	9	0	7	27	0	0	0	0	0	0	17	0	15	0	103	378
4:00 PM	0	27	20	0	10	31	0	0	0	0	0	0	12	0	10	0	110	402
4:15 PM	0	24	16	0	8	25	0	0	0	0	0	0	22	0	15	0	110	430
4:30 PM	0	30	14	0	10	47	0	0	0	0	0	0	19	0	8	0	128	451
4:45 PM	0	32	10	0	6	49	0	0	0	0	0	0	41	0	12	0	150	498
5:00 PM	0	24	10	0	7	45	0	0	0	0	0	0	44	0	11	0	141	529
5:15 PM	0	27	8	0	4	43	0	0	0	0	0	0	40	0	13	0	135	554
5:30 PM	0	45	19	0	7	23	0	0	0	0	0	0	29	0	11	0	134	560
5:45 PM	0	32	19	0	7	22	0	0	0	0	0	0	30	0	8	0	118	528
6:00 PM	0	20	18	0	7	22	0	0	0	0	0	0	22	0	4	0	93	480
6:15 PM	0	31	25	0	6	23	0	0	0	0	0	0	16	0	5	0	106	451
6:30 PM	0	27	26	0	8	21	0	0	0	0	0	0	17	0	5	0	104	421
6:45 PM	0	27	30	0	5	17	0	0	0	0	0	0	12	0	12	0	103	406

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	128	40	0	24	196	0	0	0	0	0	0	164	0	48	0	600
Heavy Trucks	0	4	0		0	0	0		0	0	0		16	0	0		20
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	8		0	0	0		0	0	0		0	0	0		8
Scooters																	

Comments:

Report generated on 11/12/2025 7:26 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

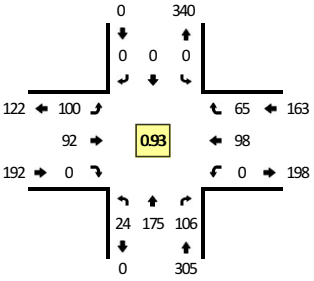
Type of peak hour being reported: Intersection Peak

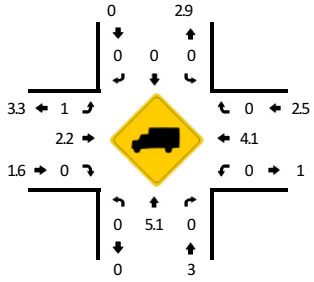
Method for determining peak hour: Total Entering Volume

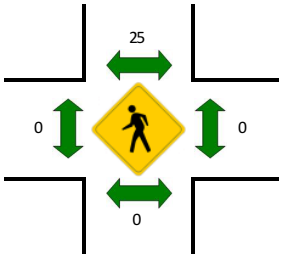
LOCATION: I-35 NB Ramps -- Harbor Dr
CITY/STATE: Duluth, MN

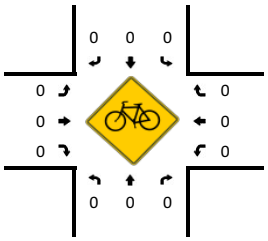
QC JOB #: 17239203
DATE: Wed, Nov 5 2025

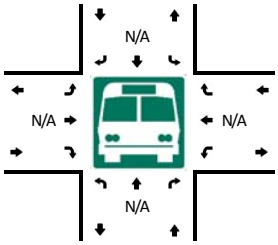
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

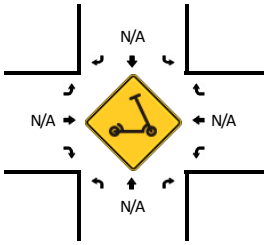












15-Min Count Period Beginning At	I-35 NB Ramps (Northbound)				I-35 NB Ramps (Southbound)				Harbor Dr (Eastbound)				Harbor Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	1	22	5	0	0	0	0	0	5	4	0	0	0	4	1	0	42	
6:15 AM	3	38	5	0	0	0	0	0	5	3	0	0	0	3	0	0	57	
6:30 AM	4	46	9	0	0	0	0	0	4	9	0	0	0	2	2	0	76	
6:45 AM	8	67	16	0	0	0	0	0	7	10	0	0	0	7	4	0	119	294
7:00 AM	2	54	7	0	0	0	0	0	7	6	0	0	0	5	0	0	81	333
7:15 AM	11	56	16	0	0	0	0	0	8	4	0	0	0	3	3	0	101	377
7:30 AM	17	97	7	0	0	0	0	0	8	12	0	0	0	7	3	0	151	452
7:45 AM	29	89	12	0	0	0	0	0	5	14	0	0	0	14	2	0	165	498
8:00 AM	6	70	10	0	0	0	0	0	9	4	0	0	0	7	3	0	109	526
8:15 AM	6	60	12	0	0	0	0	0	10	8	0	0	0	7	3	0	106	531
8:30 AM	6	56	6	0	0	0	0	0	7	6	0	0	0	12	1	0	94	474
8:45 AM	3	56	4	0	0	0	0	0	8	12	0	0	0	6	2	0	91	400
9:00 AM	4	39	10	0	0	0	0	0	6	11	0	0	0	3	0	0	73	364
9:15 AM	7	39	10	0	0	0	0	0	11	7	0	0	0	8	4	0	86	344
9:30 AM	2	43	4	0	0	0	0	0	2	6	0	0	0	6	3	0	66	316
9:45 AM	1	48	14	0	0	0	0	0	12	7	0	0	0	9	1	0	92	317
10:00 AM	3	40	9	0	0	0	0	0	7	11	0	0	0	6	5	0	81	325
10:15 AM	3	43	9	0	0	0	0	0	12	6	0	0	0	6	4	0	83	322
10:30 AM	5	53	11	0	0	0	0	0	11	10	0	0	0	9	5	0	104	360
10:45 AM	5	54	5	0	0	0	0	0	5	5	0	0	0	12	6	0	92	360
11:00 AM	6	28	5	0	0	0	0	0	13	7	0	0	0	12	6	0	77	356
11:15 AM	1	40	5	0	0	0	0	0	12	7	0	0	0	14	10	0	89	362
11:30 AM	4	44	7	0	0	0	0	0	10	5	0	0	0	10	11	0	91	349
11:45 AM	3	39	13	0	0	0	0	0	12	7	0	0	0	18	7	0	99	356
12:00 PM	2	37	7	0	0	0	0	0	11	1	0	0	0	9	14	0	81	360
12:15 PM	5	38	7	0	0	0	0	0	16	8	0	0	0	10	4	0	88	359
12:30 PM	13	51	8	0	0	0	0	0	12	7	0	0	0	16	5	0	112	380
12:45 PM	3	49	4	0	0	0	0	0	11	5	0	0	0	14	6	0	92	373
1:00 PM	4	42	7	0	0	0	0	0	16	10	0	0	0	14	5	0	98	390
1:15 PM	7	29	4	0	0	0	0	0	5	10	0	0	0	16	8	0	79	381
1:30 PM	3	46	4	0	0	0	0	0	13	5	0	0	0	9	6	0	86	355
1:45 PM	5	36	13	0	0	0	0	0	9	10	0	0	0	12	6	0	91	354
2:00 PM	9	31	14	0	0	0	0	0	13	12	0	0	0	21	8	0	108	364
2:15 PM	3	39	7	0	0	0	0	0	12	8	0	0	0	18	4	0	91	376
2:30 PM	4	35	12	0	0	0	0	0	9	11	0	0	0	16	11	0	98	388
2:45 PM	6	46	6	0	0	0	0	0	10	13	0	0	0	21	6	0	108	405
3:00 PM	6	50	11	0	0	0	0	0	13	13	0	0	0	21	14	0	128	425
3:15 PM	4	34	10	0	0	0	0	0	15	10	0	0	0	28	12	0	113	447

15-Min Count Period Beginning At	I-35 NB Ramps (Northbound)				I-35 NB Ramps (Southbound)				Harbor Dr (Eastbound)				Harbor Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	3	43	18	0	0	0	0	0	15	12	0	0	0	31	12	0	134	483
3:45 PM	3	41	15	0	0	0	0	0	13	16	0	0	0	18	11	0	117	492
4:00 PM	5	66	11	0	0	0	0	0	26	12	0	0	0	33	20	0	173	537
4:15 PM	5	43	18	0	0	0	0	0	21	17	0	0	0	30	19	0	153	577
4:30 PM	11	45	14	0	0	0	0	0	33	15	0	0	0	29	17	0	164	607
4:45 PM	3	40	31	0	0	0	0	0	19	24	0	0	0	22	15	0	154	644
5:00 PM	3	47	29	0	0	0	0	0	27	29	0	0	0	27	16	0	178	649
5:15 PM	7	43	32	0	0	0	0	0	21	24	0	0	0	20	17	0	164	660
5:30 PM	4	35	23	0	0	0	0	0	20	22	0	0	0	29	14	0	147	643
5:45 PM	2	37	27	0	0	0	0	0	22	12	0	0	0	28	12	0	140	629
6:00 PM	5	21	10	0	0	0	0	0	25	18	0	0	0	22	7	0	108	559
6:15 PM	3	33	12	0	0	0	0	0	18	9	0	0	0	21	12	0	108	503
6:30 PM	2	24	9	0	0	0	0	0	14	11	0	0	0	38	13	0	111	467
6:45 PM	3	25	16	0	0	0	0	0	22	19	0	0	0	32	11	0	128	455

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	12	188	116	0	0	0	0	0	108	116	0	0	0	108	64	0	712
Heavy Trucks	0	12	0		0	0	0		0	0	0		0	4	0		16
Buses																	
Pedestrians		0				28				0				0			28
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/12/2025 7:26 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

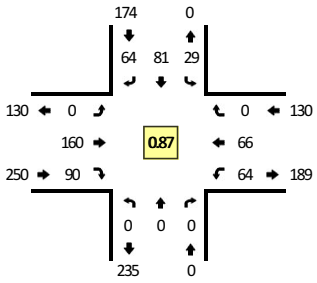
Type of peak hour being reported: Intersection Peak

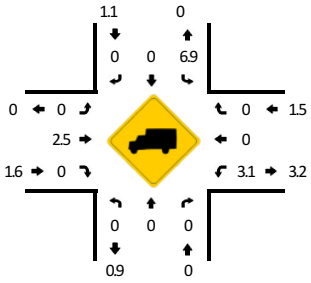
Method for determining peak hour: Total Entering Volume

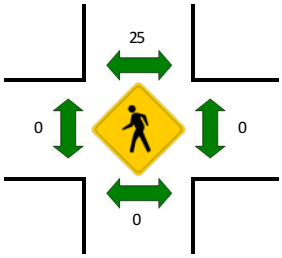
LOCATION: I-35 SB Ramps -- S 5th Ave W/Harbor Dr
CITY/STATE: Duluth, MN

QC JOB #: 17239202
DATE: Wed, Nov 5 2025

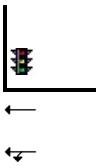
Peak-Hour: 4:15 PM -- 5:15 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

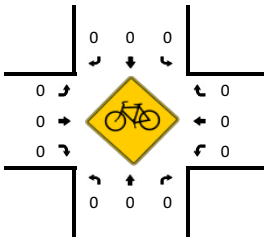


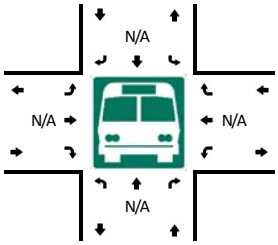


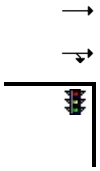




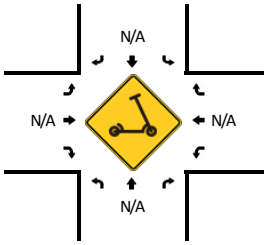












15-Min Count Period Beginning At	I-35 SB Ramps (Northbound)				I-35 SB Ramps (Southbound)				S 5th Ave W/Harbor Dr (Eastbound)				S 5th Ave W/Harbor Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	0	0	0	1	1	4	0	0	6	3	0	1	4	0	0	20	
6:15 AM	0	0	0	0	2	0	7	0	0	6	0	0	1	5	0	0	21	
6:30 AM	0	0	0	0	6	0	11	0	0	7	5	0	0	6	0	0	35	
6:45 AM	0	0	0	0	5	2	11	0	0	12	1	0	4	11	0	0	46	122
7:00 AM	0	0	0	0	3	2	12	0	0	10	3	0	3	4	0	0	37	139
7:15 AM	0	0	0	0	2	2	14	0	0	10	4	0	2	12	0	0	46	164
7:30 AM	0	0	0	0	5	5	24	0	0	15	5	0	3	22	0	0	79	208
7:45 AM	0	0	0	0	5	2	29	0	0	14	2	0	5	38	0	0	95	257
8:00 AM	0	0	0	0	0	4	20	0	0	13	8	0	3	10	0	0	58	278
8:15 AM	0	0	0	0	5	6	22	0	0	13	6	0	4	9	0	0	65	297
8:30 AM	0	0	0	0	3	9	17	0	0	10	3	0	5	13	0	0	60	278
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9:30 AM	0	0	0	0	2	3	13	0	0	6	5	0	4	4	0	0	37	180
9:45 AM	0	0	0	0	5	6	12	0	0	14	9	0	8	2	0	0	56	192
10:00 AM	0	0	0	0	5	5	9	0	0	13	5	0	5	4	0	0	46	191
10:15 AM	0	0	0	0	1	4	8	0	0	17	7	0	5	4	0	0	46	185
10:30 AM	0	0	0	0	1	0	8	0	0	20	7	0	3	10	0	0	49	197
10:45 AM	0	0	0	0	0	2	3	0	0	11	3	0	6	11	0	0	36	177
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2:45 PM	0	0	0	0	3	6	3	0	0	19	10	0	11	15	0	0	67	281
3:00 PM	0	0	0	0	6	7	12	0	0	20	8	0	11	16	0	0	80	280
3:15 PM	0	0	0	0	4	6	14	0	0	21	11	0	13	19	0	0	88	306

15-Min Count Period Beginning At	I-35 SB Ramps (Northbound)				I-35 SB Ramps (Southbound)				S 5th Ave W/Harbor Dr (Eastbound)				S 5th Ave W/Harbor Dr (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	0	0	0	0	6	16	13	0	0	21	7	0	24	10	0	0	97	332
3:45 PM	0	0	0	0	8	17	14	0	0	21	17	0	6	15	0	0	98	363
4:00 PM	0	0	0	0	2	18	9	0	0	36	17	0	24	14	0	0	120	403
4:15 PM	0	0	0	0	4	17	21	0	0	35	21	0	16	18	0	0	132	447
4:30 PM	0	0	0	0	6	30	18	0	0	43	22	0	23	18	0	0	160	510
4:45 PM	0	0	0	0	11	17	14	0	0	33	27	0	7	18	0	0	127	539
5:00 PM	0	0	0	0	8	17	11	0	0	49	20	0	18	12	0	0	135	554
5:15 PM	0	0	0	0	9	14	5	0	0	35	18	0	13	15	0	0	109	531
5:30 PM	0	0	0	0	6	12	14	0	0	36	4	0	17	16	0	0	105	476
5:45 PM	0	0	0	0	6	5	12	0	0	29	9	0	13	17	0	0	91	440
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6:15 PM	0	0	0	0	3	9	10	0	0	24	9	0	16	7	0	0	78	374
6:30 PM	0	0	0	0	2	4	8	0	0	23	5	0	32	9	0	0	83	352
6:45 PM	0	0	0	0	3	6	4	0	0	38	6	0	21	14	0	0	92	353

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	24	120	72	0	0	172	88	0	92	72	0	0	640
Heavy Trucks	0	0	0		4	0	0		0	0	0		8	0	0		12
Buses																	
Pedestrians		0				16				0				0			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/12/2025 7:26 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

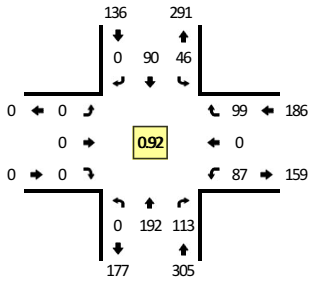
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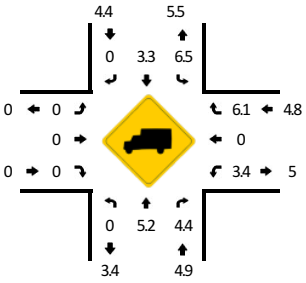
Method for determining peak hour: Total Entering Volume

LOCATION: Garfield Ave -- Railroad St
CITY/STATE: Duluth, MN

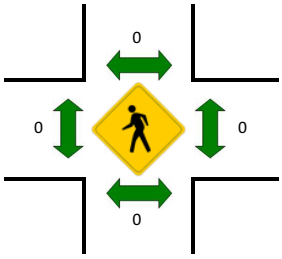
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DATE: Wed, Nov 5 2025

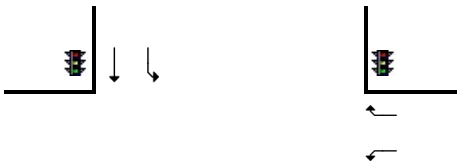
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Peak 15-Min: 4:00 PM -- 4:15 PM

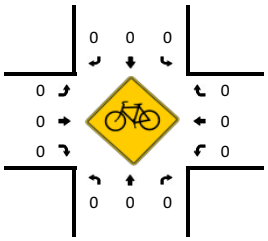


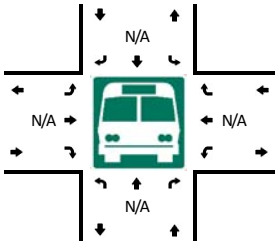


TRUE DATA TO IMPROVE MOBILITY

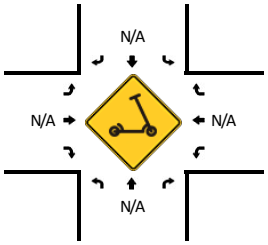












15-Min Count Period Beginning At	Garfield Ave (Northbound)				Garfield Ave (Southbound)				Railroad St (Eastbound)				Railroad St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
6:00 AM	0	12	14	0	4	12	0	0	0	0	0	0	7	0	0	0	49	
6:15 AM	0	12	9	0	5	17	0	0	0	0	0	0	7	0	1	0	51	
6:30 AM	0	24	24	0	11	17	0	0	0	0	0	0	9	0	3	0	88	
6:45 AM	0	25	24	0	19	23	0	0	0	0	0	0	7	0	5	0	103	291
7:00 AM	0	32	38	0	10	21	0	0	0	0	0	0	10	0	6	0	117	359
7:15 AM	0	24	36	0	17	28	0	0	0	0	0	0	15	0	7	0	127	435
7:30 AM	0	35	38	0	10	30	0	0	0	0	0	0	18	0	3	0	134	481
7:45 AM	0	59	35	0	10	36	0	0	0	0	0	0	15	0	7	0	162	540
8:00 AM	0	48	25	0	10	16	0	0	0	0	0	0	9	0	4	0	112	535
8:15 AM	0	35	31	0	4	18	0	0	0	0	0	0	6	0	4	0	98	506
8:30 AM	0	43	26	0	8	16	0	0	0	0	0	0	11	0	5	0	109	481
8:45 AM	0	38	27	0	10	16	0	0	0	0	0	0	15	0	10	0	116	435
9:00 AM	0	30	18	0	8	18	0	0	0	0	0	0	10	0	8	0	92	415
9:15 AM	0	36	15	0	6	16	0	0	0	0	0	0	9	0	2	0	84	401
9:30 AM	0	38	18	0	4	19	0	0	0	0	0	0	25	0	8	0	112	404
9:45 AM	0	35	11	0	10	19	0	0	0	0	0	0	14	0	11	0	100	388
10:00 AM	0	33	13	0	6	21	0	0	0	0	0	0	7	0	7	0	87	383
10:15 AM	0	37	20	0	6	23	0	0	0	0	0	0	12	0	9	0	107	406
10:30 AM	0	51	23	0	3	17	0	0	0	0	0	0	5	0	6	0	105	399
10:45 AM	0	33	17	0	9	20	0	0	0	0	0	0	12	0	9	0	100	399
11:00 AM	0	39	29	0	6	31	0	0	0	0	0	0	9	0	9	0	123	435
11:15 AM	0	43	20	0	6	21	0	0	0	0	0	0	19	0	17	0	126	454
11:30 AM	0	39	14	0	9	29	0	0	0	0	0	0	9	0	21	0	121	470
11:45 AM	0	45	24	0	8	31	0	0	0	0	0	0	15	0	15	0	138	508
12:00 PM	0	58	25	0	8	19	0	0	0	0	0	0	16	0	13	0	139	524
12:15 PM	0	39	18	0	10	32	0	0	0	0	0	0	16	0	10	0	125	523
12:30 PM	0	40	15	0	11	22	0	0	0	0	0	0	14	0	9	0	111	513
12:45 PM	0	31	22	0	14	22	0	0	0	0	0	0	18	0	6	0	113	488
1:00 PM	0	45	23	0	9	30	0	0	0	0	0	0	13	0	12	0	132	481
1:15 PM	0	45	31	0	8	21	0	0	0	0	0	0	19	0	6	0	130	486
1:30 PM	0	43	22	0	7	24	0	0	0	0	0	0	14	0	8	0	118	493
1:45 PM	0	40	20	0	8	26	0	0	0	0	0	0	16	0	15	0	125	505
2:00 PM	0	37	22	0	4	24	0	0	0	0	0	0	13	0	11	0	111	484
2:15 PM	0	30	19	0	4	25	0	0	0	0	0	0	23	0	11	0	112	466
2:30 PM	0	55	27	0	6	21	0	0	0	0	0	0	19	0	15	0	143	491
2:45 PM	0	36	20	0	9	24	0	0	0	0	0	0	13	0	15	0	117	483
3:00 PM	0	54	27	0	12	33	0	0	0	0	0	0	18	0	15	0	159	531
3:15 PM	0	51	30	0	4	20	0	0	0	0	0	0	14	0	15	0	134	553

15-Min Count Period Beginning At	Garfield Ave (Northbound)				Garfield Ave (Southbound)				Railroad St (Eastbound)				Railroad St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
3:30 PM	0	59	24	0	13	17	0	0	0	0	0	0	22	0	18	0	153	563
3:45 PM	0	51	29	0	16	20	0	0	0	0	0	0	19	0	19	0	154	600
4:00 PM	0	52	26	0	9	21	0	0	0	0	0	0	25	0	38	0	171	612
4:15 PM	0	40	28	0	11	25	0	0	0	0	0	0	17	0	18	0	139	617
4:30 PM	0	49	30	0	10	24	0	0	0	0	0	0	26	0	24	0	163	627
4:45 PM	0	43	31	0	16	23	0	0	0	0	0	0	19	0	22	0	154	627
5:00 PM	0	30	35	0	12	24	0	0	0	0	0	0	25	0	21	0	147	603
5:15 PM	0	40	23	0	13	20	0	0	0	0	0	0	20	0	9	0	125	589
5:30 PM	0	31	29	0	4	11	0	0	0	0	0	0	15	0	20	0	110	536
5:45 PM	0	25	24	0	12	10	0	0	0	0	0	0	5	0	19	0	95	477
6:00 PM	0	33	13	0	8	13	0	0	0	0	0	0	8	0	9	0	84	414
6:15 PM	0	35	22	0	6	9	0	0	0	0	0	0	13	0	18	0	103	392
6:30 PM	0	21	15	0	5	5	0	0	0	0	0	0	10	0	19	0	75	357
6:45 PM	0	11	10	0	6	6	0	0	0	0	0	0	8	0	16	0	57	319

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	208	104	0	36	84	0	0	0	0	0	0	100	0	152	0	684
Heavy Trucks	0	16	12		0	4	0		0	0	0		0	0	12		44
Buses																	
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Scooters																	

Comments:

Report generated on 11/12/2025 7:26 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Appendix K

Responses to Draft AUAR Comments

Downtown Duluth Project

DRAFT AUAR (Alternative Urban Areawide Review)

Public Comments and RGU Responses to Comments

AUAR Guidelines: The final AUAR document must include a section specifically responding to each timely and substantive comment on the draft that indicates the way in which the comment has been addressed. Similar comments may be combined for purposes of responding. Minnesota Environmental Quality Board (EQB) Guidance (A Citizen's Guide: Commenting on Environmental Review Projects) provides that: Substantive comments address the content or issue raised in the AUAR. Furthermore, the guidance states that public comments are particularly valuable and helpful to the Responsible Governmental Unit (RGU), the City of Duluth in this instance, when they: list inaccuracies in the AUAR; speak to potential environmental impacts that have not been identified; speak to environmental impacts that have been identified but have not been adequately addressed or suggest possible mitigation measures that should be added.

The Downtown Duluth Project Draft Alternative Urban Areawide Review (Draft AUAR) was prepared for the City of Duluth and distributed to the Environmental Quality Board (EQB) and persons and agencies on the official EQB mailing list in accordance with EQB rules on March 24, 2026.

Notices concerning the availability of the document and comment period were posted in the Duluth News Tribune on April 4, April 11, and April 18. The document was made available at the Duluth City Hall and on the City of Duluth website at https://duluthmn.gov/planning-development/land-use-zoning-and-applications/environmental-reviews/. The Duluth City Planning Commission held a public hearing on April 14, 2026. Responses to one oral comment were provided during the meeting are included in the meeting minutes available at https://duluthmn.gov/boards-commissions/planning-commission/. The Commentator also provided written comments that summarize the oral comments provided during the meeting and are addressed in this document.

The 30-day comment period expired on April 23, 2026. One agency and two citizen comment letters were received on the Draft AUAR.

Agency/Organization/Citizen	Letter Dated	Signatory
Minnesota Pollution Control Agency (MPCA)	April 15, 2026	Chris Green, Project Manager Environmental Review Unit
Commentor #1	April 19, 2026	David Schimpf
Commentor #2	April 22, 2026	Karen Evens

Comments received by these agencies and the public are summarized below by commenter and subject matter. Copies of all comments submitted are included in Appendix A.

Item 6. Project Description

1. **Comment:** The project description section seems a bit shy on an accurate description of the current facilities. The areas included for review also include a government services campus including downtown anchor services like courthouse, fire and police, elements of critical infrastructure. The area also includes businesses that support local residential needs, grocery stores, bakeries, drug stores, hardware stores, small scale shopping hubs which describes more than the short descriptor that reads more toward tourism support. It also hosts a gambling venue, a tribal casino and unique commercial venture. Also servicing the area are needed support systems for Duluth citizens in need of social comforts; there are support systems for citizens in need of food and shelter or other social support, job counseling, health delivery systems, etc. These are scattered throughout the downtown area.

   Commenting Party: Commentor #2 – Karen Evens

   Response: Comment noted. Additional details about the existing conditions within the AUAR area, including the information summarized in this comment have been added to the Project Description (Item 6b). Details about the existing conditions in each subarea of the AUAR can be found in the description of Development Scenario A – Existing Conditions (Item 6b).

2. **Comment:** The project description describes the bounded areas and notes growth scenarios are using the Imagine Duluth 2035 as a base for projected scenarios. Some detail would have been helpful re the primary recommendations of Imagine Duluth, as it is unclear what may have been defined as a key target area for redevelopment/ development from the Imagine document.

   Commenting Party: Commentor #2 – Karen Evens

   Response: Scenario B – Maximum Development is based on the Future Land Use map and associated assumptions in Imagine Duluth 2035. This is described in the project description and shown in Exhibit 2 (Development Scenario B – Maximum Development). Additional details on future land use guidance per subarea is included in the Land Use section (Item 10ii). A clarifying sentence has been added to the project description.

3. **Comment:** It is also unclear how maximum density numbers were arrived at, or what key constraints are required. For example, currently Duluth downtown buildings are height limited for the most part. A few buildings exceed 5 stories and some reach 10 stories but they are few. Most apartments scattered around the downtown are 2-4 story buildings. This may be a factor of fire protection or some engineering issue associated with the massive bedrock base or other. As I reviewed the AUAR I kept trying to imagine what or how the density would appear in the future. The Bayfront image provided suggests limited height development along the waterfront for both the proposed hotel and apartment complex. However, the new Essentia building is a gleaming tower and of course, it is easy to assume an associated residential complex could match that

gleaming tower. Depending on the actual building, density could vary dramatically which would then skew other assumptions for traffic or water treatment etc.

Commenting Party: Commentor #2 – Karen Evens

Response: Development Scenario B – Maximum Development is based on the Imagine Duluth 2035 Future Land Use Map. Density assumptions were generally derived from the comprehensive plan assumptions and proposed development or plans for each subarea. This is described in the project description (Item 6b). Maximum density assumptions for the Lot D subarea are generally based on the concept plan prepared by Inland for the site. Maximum density assumptions for the Essentia subarea are based on the comprehensive plan and the plans that Essentia Health and the Benedictine Sisters of the St. Scholastica Monastery have for redevelopment of excess properties made available by the consolidation of the campus and parking lots. Maximum density assumptions for the 1st Street subarea are based on the comprehensive plan and assume an approximately 60 percent increase in residential development and a small increase in commercial development from existing conditions over the next ten years. Maximum density assumptions for the Secondary subarea are based on the comprehensive plan and assume that the area could see a 20 percent increase in residential development over the next ten years. As noted, these assumptions will be revisited in 5 years when the AUAR is updated. Mitigation items have been included identifying the types of evaluation needed as specific developments occur.

Height assumptions are shown in Table 1- Project Magnitude. Heights vary by subarea and are based on the city's adopted zoning code. The table shows existing heights and proposed height (Development Scenario B).

Item 7. Climate Adaptation and Resilience

1. **Comment:** Although there is a widespread belief that climatic change is reducing snowfall nationally, the opposite may be true in this case. A warming of Lake Superior can boost the snow total from storms that are fed by air from over the lake. Snow records at the Duluth International Airport site began 85 years ago. Eight of the 12 snowiest winters there came in the past 40 years. Maximum snow accumulation is probably smaller downtown than it is at the airport, and snow tends to disappear downtown earlier in the spring. It can be acknowledged that the climatic data for St. Louis County *(pages 10-15),* which are measured at the airport, are probably not correct for the AUAR area. Knowing whether the time trend for temperature or precipitation within the AUAR area would be equivalent to those in the draft document would require having the same sequence of recorded observations be made downtown.

   Commenting Party: Commentor #1 – David Schimpf

Response: The Draft AUAR follows EQB guidance (June 2024)[1] for development of Item 7 Climate Adaptation and Resilience. The Minnesota Climate Trends Tool, developed by the Minnesota Department of Natural Resource (DNR), served as the primary resource to identifying climate trends, which is a recommended resource identified in the EQB's guidance. The DNR's climate tool utilizes data from the National Oceanic and Atmospheric Administration (NOAA) National Center for Environmental Information. The data is available for a number of geographic units, such as counties and major watersheds, however, it is not possible to refine the data at smaller geographic units using the DNR's climate trends tool. While there may be slight differences between the localized climate conditions in downtown Duluth and the data used from St. Louis County, generally the trends and associated planning for climate change adaptation are still relevant to this analysis.

Item 10. Land Use

1. **Comment:** The area also provides support services for various social needs; the area provides housing/shelter for Duluth citizens who are challenged in securing safe and affordable housing. Discussion or acknowledgement of the importance of that concern would be useful. And how the development scenario benefits or detracts in that regard.

   Commenting Party: Commentor #2 – Karen Evens

   Response: Comment noted. Acknowledgement of these support services has been added to the existing conditions description in the AUAR. It is not anticipated that these support services would be directly impacted by potential redevelopment within the downtown area.

2. **Comment:** I also noted that areas targeted for the more intense residential increase, have almost no park, trail, or other outdoor amenity for community use/experience. To add more people to a targeted location, without providing access to something more than a strip of trees with a small lawn seems counter to the whole park program and natural resource planning of recent efforts. Re-development should consider these greenways/park amenities as critical infrastructures for enhancing livability with increased development.

   Commenting Party: Commentor #2 – Karen Evens

   Response: Thank you for this comment. A mitigation strategy has been added to the Final AUAR which identifies the need for the city to proactively identify and pursue green space and greenway opportunities downtown to increase the livability of this heavily impervious area.

[1] EQB. Environmental Assessment Worksheet Guidance: Developing a carbon footprint and incorporating climate adaptation and resilience. June 2024. Available at https://www.eqb.state.mn.us/sites/eqb/files/2024_eaw_climate_guidance_2.pdf

Item 12. Water Resources

1. **Comment:** Section 12. b. Wastewater, should include estimates of anticipated increases in wastewater quantity generated by the projects. Proposed flows should be compared to existing flows from the area.

   Commenting Party: MPCA

   Response: Thank you for your comment. Please see page 37 of the Draft AUAR where wastewater estimates are compared for Scenario A (existing conditions) and Scenario B (proposed redevelopment). Total average annual day flow was estimated to be 1,740,224 gallons per day (GPD) for Scenario A, and 2,359,134 GPD for Scenario B. The additional wastewater flow for Scenario B will contribute an additional 982 lbs. per day of biochemical oxygen demand (BOD) and 1085 lbs. per day of total suspended solids (TSS).

   These estimates are based on a high-level redevelopment scenario, which do not identify specific projects at this time. The mitigation plan includes a commitment that future developers will need to coordinate with the City of Duluth Public Works and Utilities Department as specific development projects are proposed to confirm the need for improvements to the City's sewer collection infrastructure system.

2. **Comment:** The MPCA uses a watershed approach to restoring and protecting Minnesota's rivers, lakes, and wetlands. We accomplish this important work through partnerships, collaboration, and building local capacity. Through this work, water quality restoration and protection strategies are identified that will lead to restored and maintained water quality. Water quality data on Minnesota's waters in and near the AUAR area (e.g., water quality condition, impairments, stressors to water quality) can be found in a series of reports completed as part of MPCA's Watershed Restoration and Protection Strategies program housed on several web pages, including St. Louis River Watershed: https://www.pca.state.mn.us/watershed-information/st-louis-river, Duluth Urban Area Watershed: https://www.pca.state.mn.us/watershed-information/duluth-urban-area-watershed, and Lake Superior South Watershed: https://www.pca.state.mn.us/watershed-information/lake-superior-south.

   Please note that class 2A waters (coldwater, or trout waters) within or near the AUAR area include Buckingham Creek (04010201-B02, headwaters to Twin Ponds only), Chester Creek (04010102-545), Miller Creek (04010201-512), Lake Superior (16-0001-00), Lower Twin Pond (69-0967-02), and Upper Twin Pond (69-0967-01).

   Minnesota's impaired waters list and Table 10, document pages 32-34. Regarding the Secondary Subarea information on impaired waters and TMDLs, an *E. coli* TMDL was approved in 2020 for Chester Creek (545). Leif Erickson Beach (04010102-C21) wasn't included in Table 10 but is impaired for Aquatic Recreation due to *E. coli*. A TMDL was approved in 2022. Also, while not yet approved but as a means of information sharing, chloride TMDLs to address the aquatic life impairments for Miller Creek (04010201-512) and Chester Creek (04010102-545) are underway, with anticipated approval in 2026.

TMDLs are also under development to address the aquatic consumption impairments due to mercury in fish tissue and mercury in water column, including those in Duluth Superior Harbor (69-1291-01) and St. Louis Bay (69-1291-02) with approval anticipated in 2027.

Commenting Party: MPCA

Response: Thank you for providing additional context regarding the MPCA watershed-based approach to water quality protection and for identifying relevant Watershed Restoration and Protection Strategy resources for waters near the AUAR area. The Draft AUAR acknowledges that the AUAR area is located within multiple watersheds that drain to Lake Superior and includes waters with established impairments and TMDLs. The Draft AUAR identifies surface waters, including impaired waters, within a one-mile radius of the AUAR area. The Final AUAR has been revised to include the additional Class 2A waters and impaired waters as noted in MPCA's comment letter. . The additional information on the anticipated chloride TMDL for Miller Creek and Chester Creek is appreciated. This has been noted in the Final AUAR. It is acknowledged that class 2A waters include Buckingham Creek, Chester Creek, Miller Creek, Lake Superior, Upper Twin Pond, and Lower Twin Pond. Language has been added to the Final AUAR to clarify these designations and recognize that these sensitive receiving waters that are subject to specific state water quality standards.

3. **Comment:** Water resources were described with some confusion. Impaired streams and near shore beach areas within, or adjacent to the AUAR locations have been studied. There are two completed TMDL reports addressing the impaired areas and an investigative report to determine sources of impairments associated with bacteria and suspended solids. A third report addressing chloride was recently finalized and will in a few short months receive final approvals. Pollutant loads have been quantified for Chester Creek and these reduced loads must be managed by various methods, one of which will be the MS4 stormwater permit program. The AUAR does not acknowledge the approved TMDLs, does not acknowledge the pollutant load reductions and the mitigation strategies discussed in the reports and required for future permitting.

   Commenting Party: Commentor #2 – Karen Evens

   Response: Comment noted. Clarity has been provided by MPCA and included in the AUAR document (see response to comment No. 2 above).

4. **Comment:** Stormwater mgmt is discussed but as many years of investigations have concluded, stormwater is an especially challenging issue for the city. The AUAR needs a better acknowledgement beyond listing some hopeful BMPs like green infrastructure. For example, if large areas are targeted for re-development, one mitigation is elimination of public streets and alleys. The new development may have a public street connection but no lengthy road as a border of public street. In effect, this reduces surface runoff and may also allow for on-site runoff water treatment. At minimum, one of the mitigation strategies should mention old infrastructure may be retired/replaced with more effective

strategies. MPCA Duluth staff in the Watershed and Stormwater Divisions can provide informational support.

Commenting Party: Commentor #2 – Karen Evens

Response: Comment noted. Under existing conditions, the majority of the AUAR area consists of developed, impervious surfaces without stormwater treatment systems that adhere to current regulations. Redevelopment of the downtown area will require improvements to the existing stormwater infrastructure as future projects will be required to comply with current stormwater requirements for volume control, rate control, and water quality treatment in accordance with State and local standards. Given the impervious nature of the AUAR area, it is not anticipated that redevelopment would result in a substantial increase in impervious surface area compared to existing conditions and, therefore, higher loading would not be expected. Further, proposed stormwater system improvements associated with redevelopment projects would provide water quality benefits

5. **Comment:** Despite the stormwater mitigation efforts that are proposed *(page 88* of print document), vulnerability to damaging runoff may worsen if the economic value of the built environment increases under Scenario B. The AUAR was supposed to address issues at a broad-area scale, but the mitigation actions that the draft describes are no different from what would be expected for any individual parcel if it were developed in isolation. Broader-scale mitigation plans need to be considered. The City should take measures to diminish runoff from the large amount of land that sits steeply uphill from the AUAR area. If the upstream teaches of streams and pipes receive less of the water that falls on their land, their lower reaches will have greater capacity to absorb peak runoff originating within the AUAR area, peaks that might increase as a result of buildout.

   One way to accomplish this is by making pervious land surfaces up the hill more pervious. Not all surfaces mapped "pervious" are equally pervious. Innumerable tiny, closely spaced, short, vertical infiltration channels can be added by using plug aerators or spike aerators on lawns, streetside boulevard strips (aka parkways), and ornamental plantings. That would enhance water retention rates during downpours, slowing runoff. The City can do this on its own lands and street verges, and ask school, County, and State landowners up the slope to do the same. These governmental bodies have their own structures in the AUAR area, which they would help protect from overflows. Include tax-forfeited properties. Private property owners can be encouraged to give civic help by making non-motorized aerator devices available to them via community tool-lending facilities. Downspout outflows are the places to begin. Such infiltration channels eventually close up, so the process needs to be repeated annually to be effective long-term. This would represent enhancement of dispersed infiltration, as opposed to the constructed infiltration approaches mentioned in the AUAR. Like any other feasible watershed improvement effort, the resulting differences will be marginal and would not prevent damage like that which happened in the June 2012 event.

   Commenting Party: Commentor #1 – David Schimpf

Response: Comment noted. See response to Comment #4 above.

6. **Comment:** The stormwater section makes no mention of meltwater management. Duluth receives much more snow than the dense downtowns of other largish Minnesota cities do. After winters with heavy snowfall, Duluth drainages can carry high volumes and rates in the spring at the points where they have descended to downtown elevations, even if no major rains happen before all of the snow has melted. Although there could turn out to be minimal increase in the total extent of hardscape in the AUAR area, the addition of buildings and people will boost the mass of snow that needs to be relocated promptly. Some new buildings may occupy ground where snow has been dumped in recent years. Where is the snow to be taken? If it can be kept clean enough, snow piles in the right places can yield cold groundwater that supplements one or more trout streams but does not leak into sewers.

   Commenting Party: Commentor #1 – David Schimpf

   Response: The AUAR plans for a minor increase in impervious surface, mainly due to the redevelopment of Lot D. Overall, the impervious surface in downtown could be significantly reduced with careful planning for redevelopment. A mitigation strategy has been added to the AUAR to address the coordination of snow removal efforts.

Item 14. Fish. Wildlife, Plant Communities, and Sensitive Ecological Resources (Rare Features)

1. **Comment:** Mitigation of problems with invasive plants *(page* 60) needs to pay extra attention to Bohemian and Japanese knotweeds. The longstanding national reporting site EDDMapS, used heavily by professionals, shows that these large perennials are established in the AUAR area (www.eddrnaps.org/distribution/viewmap.cfm?sub=.59459 and www.eddmaps.org/distribution/viewmap.drn?sub=19655). Note that EDDMapS uses different Latin/scientific names for knotweeds than Minnesota state government agencies do (mda.state.mn.us/rninnesota-noxious-\Need-list). Knotweeds are notoriously difficult to kill, growing back from even small fragments that are easily overlooked. The regrowths are known to sometimes damage pavement or masonry walls, which could put contractors of new construction at risk of liability. Within Minnesota law, knotweeds have a "Prohibited - Control" classification. Experienced professionals are needed for reliable knotweed control, which may require multiple years of treatment for final success.

   Commenting Party: Commentor #1 – David Schimpf

   Response: Noted. While the AUAR does not call out specific invasive species, a mitigation measure has been added to consider creating a coordinated mitigation effort between public and private land.

Item 18. Greenhouse Gas (GHG) Emissions/Carbon Footprint

1. **Comment:** I am surprised that the draft AUAR apparently makes no reference to Duluth Energy Systems (DES), which already serves numerous buildings in the AUAR area. If new construction tapped into that system, its greenhouse gas emissions from stationary operations would presumably be less than the modeled values in *Table* 20, *page* 72. What amount of further building space could DES serve, and where? This is another instance in which the draft document looked at the situation at the isolated parcel level rather than at the broad-area scale.

   Commenting Party: Commentor #1 – David Schimpf

   Response: While examining the capacity of DES is outside the scope of the AUAR analysis, it is possible that this could be considered in the future. A mitigation measure has been added to consider whether new construction can take advantage of the DES system, where applicable.

Item 20. Transportation

1. **Comment:** In Transportation, beginning on *page* 76, transit gets relatively superficial attention in each of the several places where it appears in this report section. This may be a product of consultants who are not transit riders. The AUAR area is the nexus for Duluth Transit Authority (DTA) routes. Although the DTA' s Green Line is mentioned, the Blue Line, its other high-frequency route, is not. The Blue Line runs between downtown and the University of Minnesota Duluth via the Plaza and Mount Royal commercial districts. Other routes connect downtown to the College of St. Scholastica, Lake Superior College, the University of Wisconsin Superior, and Northwood Technical College - Superior. The spatial relationship of the various routes to grocers, public library, government offices and courtrooms, and health care facilities should be described.

   Commenting Party: Commentor #1 – David Schimpf

   Response: Noted. The AUAR already states that the Duluth Transit Center is located within the 1st Street subarea. The details about the blue line and other lines connecting downtown have been added to the AUAR. A mitigation strategy has been added to the AUAR to identify that the city will work with DTA as development occurs downtown to identify and implement transit improvements that increase access to everyday goods and services.

2. **Comment:** How much transit ridership would Scenario B be expected to add? What is the capacity of the DTA to serve this? Could the projected developments be a basis for changing DTA' s routes, stops, or sites for shelters? The existence and location of the terminal for inter-city bus service gets no mention.

   Commenting Party: Commentor #1 – David Schimpf

Response: This type of analysis is outside the scope of the AUAR effort. As noted above, a mitigation strategy has been added to the AUAR to identify that the city will work with DTA as development occurs downtown to identify and implement transit improvements that increase access to everyday goods and services.

3. **Comment:** Sidewalks and trails within the AUAR area are addressed, but not the skywalk system. The latter is currently being evaluated for downsizing. How might the utilization of, or desire to utilize, skywalks change as a result of implementing Scenario B?

   Commenting Agency: Commentor #1 – David Schimpf

   Response: Noted. A description of the existing skywalk network has now been added to the AUAR. While the future of the entire skywalk system is outside the scope of this AUAR (and currently being evaluated through a separate study), a mitigation measure has been added to prompt city staff to evaluate skyway connection as applicable to specific developments as they occur.

General Comments

1. **Comment:** We appreciate the opportunity to review this Project. Please be aware that this letter does not constitute approval by the MPCA of any or all elements of the Project for the purpose of pending or future permit actions by the MPCA. Ultimately, it is the responsibility of the Project proposer to secure any required permits and to comply with any requisite permit conditions.

   Commenting Agency: MPCA

   Response: Thank you for commenting on this AUAR. We recognize that the comment letter from MPCA does not constitute approval by MPCA of any or all elements of the Project for the purpose of pending or future permit actions by MPCA.

2. **Comment:** The fully developed scenario places a heavy emphasis on residential, increasing by a substantial amount in a corridor of already intense urbanization in "downtown" Duluth. It's difficult to imagine the change, fewer single family home or duplex home structures and many more apartment/townhome structures. Conceptually and socially that changes the character of "neighborhoods" and these components are not well discussed in the report. What will the new neighborhood character evolve into? How does that alter, for positive or negative, the society of the target development areas. Fire, police and school response was not described for the expanded residential footprint envisioned and who is likely to live in that future residence. Apartments/townhomes of professional folks servicing the hospitals or seasonal retirees are a much different neighborhood than starter family home units in a clustered pattern. It would be nice to believe all of this housing diversity could be accommodated by the Duluth Imagine plan but the AUAR does not give comment on that diversity.

   Commenting Party: Commentor #2 – Karen Evens

Response: Noted. The AUAR complies with EQB guidance and addresses the key environmental components. Other planning efforts for downtown are more appropriate for evaluating downtown character and housing diversity.

3. **Comment:** Lastly, I am not certain the Bayfront Lot D review is best served in a "downtown Duluth AUAR". The location and separation from the downtown to my thinking would place it more in a Canal Park/DECC arena/Lincoln Park corridor of re-development/future visioning. That corridor is both interesting re the future land/water use for potential tourism/recreation and problematic by virtue of significant and industrial current infrastructure.

   Commenting Party: Commentor #2 – Karen Evens

   Response: Comment noted. Given the timing and opportunity of redevelopment on the Lot D site, the city elected to take a holistic approach to the downtown AUAR. Lot D is one of the last redevelopment sites along the harbor and poses a unique opportunity to spur additional connections between the downtown and the lakefront. Capturing Lot D as part of the downtown through this AUAR effort memorializes the desire for additional connections between downtown and the lakefront and fosters this long-term reconnection vision.

4. **Comment:** In general, The AUAR seems a good introductory report, but to be most useful, needs improvement or inclusion of details to help shape it into a more effective guide for interested citizens and developers. It is likely the maximum density scenario will need adjustment to accommodate a scenario that supports the complex social diversity of the downtown Duluth population and also re-configure the urban landscape to allow for small community parks or connected greenway corridors. While I was a resident of the city, I was so thankful that my apartment complex was adjacent to a small parcel of wooded property, identified as protected property. The downtown community should be more than a maximum density exercise.

   Commenting Party: Commentor #2 – Karen Evens

   Response: Comment noted. The AUAR complies with EQB guidance and addresses the key environmental components. Other planning efforts for downtown are more appropriate for evaluating downtown character and housing diversity.

5. **Comment:** On page 87, the impending reconstruction of 40th Avenue West is described as taking place less than ½ mile northwest of the Lot D subarea. Actually it is located southwest of Lot D, and by my measurement it is about 3 miles away at its closest point, well beyond the approximately 1-mile radius threshold (page 86).

   Commenting Party: Commentor #1 – David Schimpf

   Response: Noted, this has been corrected in the Final AUAR document.

6. **Comment:** On page 12, projected temperature changes are reported as percentage increases, which is nonsensical unless one uses the degrees-above-absolute-zero-scale (which was not used).

   Commenting Party: Commentor #1 – David Schimpf

   Response: Comment noted.

Appendix L

Draft AUAR Comment Letters

MINNESOTA POLLUTION CONTROL AGENCY

Marshall Office | 504 Fairgrounds Road | Suite 200 | Marshall, MN 56258-1688 | 507-537-7146

800-657-3864 | Use your preferred relay service | info.pca@state.mn.us | Equal Opportunity Employer

April 15, 2026

VIA EMAIL

Jenn Moses
City of Duluth
411 West 1st Street, Room 160
Duluth, MN 55802

RE: Downtown Duluth- Alternative Urban Areawide Review

Dear Jenn Moses:

Thank you for the opportunity to review and comment on the Alternative Urban Areawide Review (AUAR) for the Downtown Duluth project (Project) located in Saint Louis County, Minnesota. The Project consists of approximately 354 acres, encompassing the traditional downtown, the Essentia Health Medical Campus, the surrounding Hillside neighborhood, and the proposed "Lot D" development in the Bayfront area. The purpose of this AUAR is to prepare for infill or redevelopment of key sites within this broader area. Two development scenarios will be evaluated as part of the AUAR: an existing conditions scenario and a maximum mixed-use (commercial and residential) redevelopment scenario consistent with the City's adopted Comprehensive Plan. Regarding matters for which the Minnesota Pollution Control Agency (MPCA) has regulatory responsibility and other interests, the MPCA staff has the following comments for your consideration.

Wastewater:

- Section 12. b. Wastewater, should include estimates of anticipated increases in wastewater quantity generated by the projects. Proposed flows should be compared to existing flows from the area.

Watershed:

The MPCA uses a watershed approach to restoring and protecting Minnesota's rivers, lakes, and wetlands. We accomplish this important work through partnerships, collaboration, and building local capacity. Through this work, water quality restoration and protection strategies are identified that will lead to restored and maintained water quality. Water quality data on Minnesota's waters in and near the AUAR area (e.g., water quality condition, impairments, stressors to water quality) can be found in a series of reports completed as part of MPCA's Watershed Restoration and Protection Strategies program housed on several web pages, including St. Louis River Watershed: https://www.pca.state.mn.us/watershed-information/st-louis-river , Duluth Urban Area Watershed: https://www.pca.state.mn.us/watershed-information/duluth-urban-area-watershed , and Lake Superior South Watershed: https://www.pca.state.mn.us/watershed-information/lake-superior-south .

Please note that class 2A waters (coldwater, or trout waters) within or near the AUAR area include Buckingham Creek (04010201-B02, headwaters to Twin Ponds only), Chester Creek (04010102-545), Miller Creek (04010201-512), Lake Superior (16-0001-00), Lower Twin Pond (69-0967-02), and Upper Twin Pond (69-0967-01).

Minnesota's impaired waters list and Table 10, document pages 32-34. Regarding the Secondary Subarea information on impaired waters and TMDLs, an *E. coli* TMDL was approved in 2020 for Chester Creek (545). Leif Erickson Beach (04010102-C21) wasn't included in Table 10 but is impaired for Aquatic Recreation due to *E. coli*. A TMDL was approved in 2022. Also, while not yet approved but as a means of information sharing, chloride TMDLs to address the aquatic life impairments for Miller Creek (04010201-512) and Chester Creek (04010102-545) are underway, with anticipated approval in 2026. TMDLs are also under development to address the aquatic consumption impairments due to mercury in fish tissue and mercury in water column, including those in Duluth Superior Harbor (69-1291-01) and St. Louis Bay (69-1291-02) with approval anticipated in 2027.

We appreciate the opportunity to review this Project. Please be aware that this letter does not constitute approval by the MPCA of any or all elements of the Project for the purpose of pending or future permit actions by the MPCA. Ultimately, it is the responsibility of the Project proposer to secure any required permits and to comply with any requisite permit conditions. If you have any questions concerning our review of this AUAR, please contact me by email at chris.green@state.mn.us or by telephone at 507-476-4258.

Sincerely,

Chris Green

This document has been electronically signed.

Chris Green
Project Manager
Environmental Review Unit
Resource Management and Assistance Division

CG:kj

cc: David Sahli, MPCA
Tom Estabrooks, MPCA
Nicole Peterson, MPCA
Matthew Moon, MPCA
Lauren Dickerson, MPCA
Deepa deAlwis, MPCA
Julie Henderson, MPCA
Amy Adrihan, MPCA
Ryan Anderson, MPCA

Comments on **Draft Downtown Duluth AUAR** 19 April 2026

By David Schimpf, [redacted]

Despite the stormwater mitigation efforts that are proposed (*page 88* of print document), vulnerability to damaging runoff may worsen if the economic value of the built environment increases under Scenario B. The AUAR was supposed to address issues at a broad-area scale, but the mitigation actions that the draft describes are no different from what would be expected for any individual parcel if it were developed in isolation. Broader-scale mitigation plans need to be considered. The City should take measures to diminish runoff from the large amount of land that sits steeply uphill from the AUAR area. If the upstream reaches of streams and pipes receive less of the water that falls on their land, their lower reaches will have greater capacity to absorb peak runoff originating within the AUAR area, peaks that might increase as a result of buildout.

One way to accomplish this is by making pervious land surfaces up the hill more pervious. Not all surfaces mapped "pervious" are equally pervious. Innumerable tiny, closely spaced, short, vertical infiltration channels can be added by using plug aerators or spike aerators on lawns, streetside boulevard strips (aka parkways), and ornamental plantings. That would enhance water retention rates during downpours, slowing runoff. The City can do this on its own lands and street verges, and ask school, County, and State landowners up the slope to do the same. These governmental bodies have their own structures in the AUAR area, which they would help protect from overflows. Include tax-forfeited properties. Private property owners can be encouraged to give civic help by making non-motorized aerator devices available to them via community tool-lending facilities. Downspout outflows are the places to begin. Such infiltration channels eventually close up, so the process needs to be repeated annually to be effective long-term. This would represent enhancement of dispersed infiltration, as opposed to the constructed infiltration approaches mentioned in the AUAR. Like any other feasible watershed improvement effort, the resulting differences will be marginal and would not prevent damage like that which happened in the June 2012 event.

The stormwater section makes no mention of meltwater management. Duluth receives much more snow than the dense downtowns of other largish Minnesota cities do. After winters with heavy snowfall, Duluth drainages can carry high volumes and rates in the spring at the points where they have descended to downtown elevations, even if no major rains happen before all of the snow has melted. Although there could turn out to be minimal increase in the total extent of hardscape in the AUAR area, the addition of buildings and people will boost the mass of snow that needs to be relocated

promptly. Some new buildings may occupy ground where snow has been dumped in recent years. Where is the snow to be taken? If it can be kept clean enough, snow piled in the right places can yield cold groundwater that supplements one or more trout streams but does not leak into sewers.

❄ Although there is a widespread belief that climatic change is reducing snowfall nationally, the opposite may be true in this case. A warming of Lake Superior can boost the snow total from storms that are fed by air from over the lake. Snow records at the Duluth International Airport site began 85 years ago. Eight of the 12 snowiest winters there came in the past 40 years. Maximum snow accumulation is probably smaller downtown than it is at the airport, and snow tends to disappear downtown earlier in the spring. It can be acknowledged that the climatic data for St. Louis County (*pages 10—15*), which are measured at the airport, are probably not correct for the AUAR area. Knowing whether the time trend for temperature or precipitation within the AUAR area would be equivalent to those in the draft document would require having the same sequence of recorded observations be made downtown.

⚠ Mitigation of problems with invasive plants (*page 60*) needs to pay extra attention to Bohemian and Japanese knotweeds. The longstanding national reporting site EDDMapS, used heavily by professionals, shows that these large perennials are established in the AUAR area (www.eddmaps.org/distribution/viewmap.cfm?sub=59459 and www.eddmaps.org/distribution/viewmap.cfm?sub=19655). Note that EDDMapS uses different Latin/scientific names for knotweeds than Minnesota state government agencies do (mda.state.mn.us/minnesota-noxious-weed-list). Knotweeds are notoriously difficult to kill, growing back from even small fragments that are easily overlooked. The regrowths are known to sometimes damage pavement or masonry walls, which could put contractors of new construction at risk of liability. Within Minnesota law, knotweeds have a "Prohibited – Control" classification. Experienced professionals are needed for reliable knotweed control, which may require multiple years of treatment for final success.

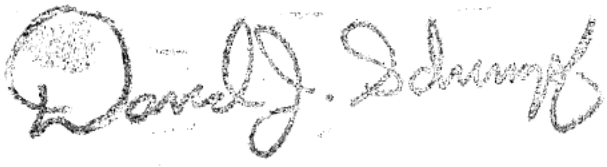
🔃 I am surprised that the draft AUAR apparently makes no reference to Duluth Energy Systems (DES), which already serves numerous buildings in the AUAR area. If new construction tapped into that system, its greenhouse gas emissions from stationary operations would presumably be less than the modeled values in *Table 20, page 72*. What amount of further building space could DES serve, and where? This is another instance in which the draft document looked at the situation at the isolated parcel level rather than at the broad-area scale.

🚌 In Transportation, beginning on *page 76*, transit gets relatively superficial attention in each of the several places where it appears in this report section. This may be a product of consultants who are not transit riders. The AUAR area is the nexus for Duluth Transit Authority (DTA) routes. Although the DTA's Green Line is mentioned, the Blue Line, its other high-frequency route, is not. The Blue Line runs between downtown and the University of Minnesota Duluth via the Plaza and Mount Royal commercial districts. Other routes connect downtown to the College of St. Scholastica, Lake Superior College, the University of Wisconsin Superior, and Northwood Technical College - Superior. The spatial relationship of the various routes to grocers, public library, government offices and courtrooms, and health care facilities should be described. How much transit ridership would Scenario B be expected to add? What is the capacity of the DTA to serve this? Could the projected developments be a basis for changing DTA's routes, stops, or sites for shelters? The existence and location of the terminal for inter-city bus service gets no mention. Sidewalks and trails within the AUAR area are addressed, but not the skywalk system. The latter is currently being evaluated for downsizing. How might the utilization of, or desire to utilize, skywalks change as a result of implementing Scenario B?

😄 BLOOPERS: On *page 87*, the impending reconstruction of 40th Avenue West is described as taking place less than ½ mile northwest of the Lot D subarea. Actually it is located southwest of Lot D, and by my measurement it is about 3 miles away at its closest point, well beyond the approximately 1-mile radius threshold (*page 86*). On *page 12*, projected temperature changes are reported as percentage increases, which is nonsensical unless one uses the degrees-above-absolute-zero-scale (which was not used). Is this Artificial Intelligence slop? It seems like the consulting company that produced the draft did not do a sufficiently critical review before submitting it. The City needs to expect better product quality for its contract money.

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$0 Non-self-dealing statement: I declare that I have no financial conflict of interest, i.e., that I don't think that I or anyone close to me would get money as a result if any of my suggestions in this document were to be implemented.



Outlook

Comments for the Duluth downtown AUAR currently on public notice

From Wayne and Karen [redacted]
Date Wed 4/22/2026 1:39 PM
To Jason Mozol <jmozol@DuluthMN.gov>

The City of Duluth has accomplished many substantial projects over recent years. Efforts to improve water quality and better management of both stormwater and wastewater have been impressive. Undertaking resource reviews and future forward planning exercises to improve city life are also commendable. This AUAR review attempt is another positive example in an attempt to understand potential developmental changes and impacts. I lived in the city for nearly 20 years while working in a job that, on occasion, interacted with city staff. In my attempted review, I tried to envision how this AUAR was a useful descriptive exercise for me to better understand possible impacts.

Project Description
The project description section seems a bit shy on an accurate description of the current facilities. The areas included for review also include a government services campus including downtown anchor services like courthouse, fire and police, elements of critical infrastructure. The area also includes businesses that support local residential needs, grocery stores, bakeries, drug stores, hardware stores, small scale shopping hubs which describes more than the short descriptor that reads more toward tourism support. It also hosts a gambling venue, a tribal casino and unique commercial venture. Also servicing the area are needed support systems for Duluth citizens in need of social comforts; there are support systems for citizens in need of food and shelter or other social support, job counseling, health delivery systems, etc. These are scattered throughout the downtown area.

The project description describes the bounded areas and notes growth scenarios are using the Imagine Duluth 2035 as a base for projected scenarios. Some detail would have been helpful re the primary recommendations of Imagine Duluth, as it is unclear what may have been defined as a key target area for re-development/development from the Imagine document. It is also unclear how maximum density numbers were arrived at, or what key constraints are required. For example, currently Duluth downtown buildings are height limited for the most part. A few buildings exceed 5 stories and some reach 10 stories but they are few. Most apartments scattered around the downtown are 2-4 story buildings. This may be a factor of fire protection or some engineering issue associated with the massive bedrock base or other. As I reviewed the AUAR I kept trying to imagine what or how the density would appear in the future. The Bayfront image provided suggests limited height development along the waterfront for both the proposed hotel and apartment complex. However, the new Essentia building is a gleaming tower and of course, it is easy to assume an associated residential complex could match that gleaming tower. Depending on the actual building, density could vary dramatically which would then skew other assumptions for traffic or water treatment etc.

Residential Footprint and General Characterization
The fully developed scenario places a heavy emphasis on residential, increasing by a substantial amount in a corridor of already intense urbanization in "downtown" Duluth. It's difficult to imagine the change, fewer single family home or duplex home structures and many more

apartment/townhome structures. Conceptually and socially that changes the character of "neighborhoods" and these components are not well discussed in the report. What will the new neighborhood character evolve into? How does that alter, for positive or negative, the society of the target development areas. Fire, police and school response was not described for the expanded residential footprint envisioned and who is likely to live in that future residence.
Apartments/townhomes of professional folks servicing the hospitals or seasonal retirees are a much different neighborhood than starter family home units in a clustered pattern.
It would be nice to believe all of this housing diversity could be accommodated by the Duluth Imagine plan but the AUAR does not give comment on that diversity.
The area also provides support services for various social needs; the area provides housing/shelter for Duluth citizens who are challenged in securing safe and affordable housing. Discussion or acknowledgement of the importance of that concern would be useful. And how the development scenario benefits or detracts in that regard.

Park/Trail Green Corridor Infrastructure

I also noted that areas targeted for the more intense residential increase, have almost no park, trail, or other outdoor amenity for community use/experience. To add more people to a targeted location, without providing access to something more than a strip of trees with a small lawn seems counter to the whole park program and natural resource planning of recent efforts. Re-development should consider these greenways/park amenities as critical infrastructures for enhancing livability with increased development.

Water Resources

Water resources were described with some confusion. Impaired streams and near shore beach areas within, or adjacent to the AUAR locations have been studied. There are two completed TMDL reports addressing the impaired areas and an investigative report to determine sources of impairments associated with bacteria and suspended solids. A third report addressing chloride was recently finalized and will in a few short months receive final approvals. Pollutant loads have been quantified for Chester Creek and these reduced loads must be managed by various methods, one of which will be the MS4 stormwater permit program. The AUAR does not acknowledge the approved TMDLs, does not acknowledge the pollutant load reductions and the mitigation strategies discussed in the reports and required for future permitting. Stormwater mgmt is discussed but as many years of investigations have concluded, stormwater is an especially challenging issue for the city. The AUAR needs a better acknowledgement beyond listing some hopeful BMPs like green infrastructure. For example, if large areas are targeted for re-development, one mitigation is elimination of public streets and alleys. The new development may have a public street connection but no lengthy road as a border of public street. In effect, this reduces surface runoff and may also allow for on-site runoff water treatment. At minimum, one of the mitigation strategies should mention old infrastructure may be retired/replaced with more effective strategies. MPCA Duluth staff in the Watershed and Stormwater Divisions can provide informational support.

Bayfront Lot D

Lastly, I am not certain the Bayfront Lot D review is best served in a "downtown Duluth AUAR". The location and separation from the downtown to my thinking would place it more in a Canal Park/DECC arena/Lincoln Park corridor of re-development/future visioning. That corridor is both interesting re the future land/water use for potential tourism/recreation and problematic by virtue of significant and industrial current infrastructure.

General comment

In general, The AUAR seems a good introductory report, but to be most useful, needs improvement or inclusion of details to help shape it into a more effective guide for interested citizens and developers. It is likely the maximum density scenario will need adjustment to accommodate a scenario that supports the complex social diversity of the downtown Duluth population and also re-confiure the urban landscape to allow for small community parks or connected greenway corridors. While I was a resident of the city, I was so thankful that my apartment complex was adjacent to a small parcel of wooded property, identified as protected property. The downtown community should be more than a maximum density exercise.

Karen Evens
Cook County MN