A-5. Appendix Chapter 5: Physical and Environmental Analysis

Appendix A-5 supplements Chapter 5 and presents results from the analysis of impacts on the physical and environmental system components within the study area. Results for the No-Build Alternative are presented for the purpose of establishing a basis to compare Project alignment and design options. Topics covered include utilities, floodplains, wetlands, geology, hazardous materials, noise, vibration, water quality/stormwater, air quality/greenhouse gas emissions, and energy. Potential operating-phase (long-term) and construction-phase (short-term) impacts are also evaluated, and potential avoidance, minimization, and mitigation measures are presented. Project alignment and design options evaluated in this appendix are illustrated and described in Appendix A-2 of Chapter 2 of this document. The Build Alternative carried forward for the Project is presented in Chapter 2 of this Supplemental Draft EIS.

This Supplemental Draft EIS evaluates the following physical and environmental resources for impacts: utilities; floodplains; wetlands; geology, soils, and topography; hazardous materials; noise; vibration; biological environment; water quality and stormwater; air quality/GHG emissions; and energy.

A study area represents a geographic area used to identify resources and varies based on the resource being evaluated. The basis for each study area begins with the potential area of disturbance, which has been defined as the estimated area where construction would occur for the Project at this stage of design. In some cases, the study area extends beyond the potential area of disturbance to understand the potential extent of impacts on adjacent resources (for example, a wetland or waterway may extend beyond the potential area of disturbance). The study area considered for each area of analysis in this appendix is summarized in Table A5-1. Greater detail is provided in each section of this appendix.

Table A5-1 Defined Study Areas for the Physical and Environmental Analysis

Resource Evaluated	Study Area Definition	Basis for Study Area
Utilities	Within or adjacent to the LOD	Captures utilities within the LOD and adjacent utilities that could be affected
Floodplains	Within or adjacent to the LOD	Captures floodplain impacts to upstream and downstream waters directly adjacent to the LOD
Wetlands and other aquatic resources	Within or adjacent to the LOD	The distance captures the wetlands that are within and directly adjacent to the Project
Geology, soils, and topography	Within and adjacent to the LOD	Estimated area where construction would occur for the Project
Hazardous-materials contamination	500–550 feet on either side of the Project Alignment	ASTM standards (E1527-13 and 40 CFR Part 312), as modified by MnDOT for transportation corridors
Noise and vibration	Within 350 feet of the Project Alignment	Based on the screening distances provided in Chapters 4 and 9 of the FTA *Transit Noise and Vibration Impact Assessment Manual* (2018)
Biological environment (wildlife habitat and endangered species)	Within ¼ mile of the LOD	The distance captures the habitat that is directly adjacent to the footprint of the Project and the wildlife that could be affected by the Project

Resource Evaluated	Study Area Definition	Basis for Study Area
Water quality and stormwater	1 mile on either side of the Project Alignment for impaired waters; within the LOD for stormwater	NPDES requirements for identifying impaired waters within or sensitive resources within 1 mile of a project
Air quality/GHG emissions	All roadway segments adjacent to and crossing the Project including the OMF	Established in cooperation with MPCA
Energy	Anticipated changes in travel patterns and bus operations resulting from the Project	Total energy consumption of the Project measured in Btu (industry standard)

5.1 Utilities

The Council's design of the Project will include an evaluation of potential utility conflicts and a determination of which utilities could be affected by the Project.

This section includes general information about existing public and private utilities and describes the potential effects of the No-Build and Build Alternative on utilities. Major utility owners that service the study area have been contacted for existing utility information. It is expected that additional information would be needed as the Project proceeds with preliminary design. This section is not intended to identify every utility that provides service in the study area, but it does address those that could be affected by the Project.

5.1.1 Regulatory Context and Methodology

The following sections provide context and summarize the methodology used to examine potential utility impacts from the Project.

5.1.1.1 Legal and Regulatory Context

The following is a representative summary of the laws, regulations, and guidelines that are associated with utility relocation and accommodation.

Federal

The following federal laws, regulations, and guidelines are associated with utility relocation and accommodation:

- 23 USC §§ 123 and 109(l)(1)
- 23 CFR Part 645, Subparts A and B
- FTA's Project and Construction Management Guidelines (2016), Appendix F: Utility Relocation Agreements

State

The following State laws, regulations, and guidelines are associated with utility relocation and accommodation:

- MnDOT Policy OP002: Utility Accommodation on Highway Right of Way.
- MnDOT Utility Accommodation and Coordination Manual.
- Minnesota State Constitution Article 1, Section 13, addresses just compensation associated with private property that is taken, destroyed, or damaged for public use.
- Minn. Stat. 161.20, Subdivision 1, addresses the general powers of the commissioner to carry out the provisions of Article 14, Section 2, of the Minnesota State Constitution regarding the public highway system. Subdivision 2 addresses the commissioner's power regarding acquisition of property.

- Minn. Stat. 161.45 addresses utilities within highway rights-of-way that require relocation. This section describes rulemaking authority and utility owner interests when real property is conveyed.
- Minn. Stat. 161.46 addresses reimbursement of utility owners for the relocation of facilities. The section includes definitions and reimbursement requirements and describes provisions associated with a lump-sum settlement, acquisition of substitute property in which to relocate a utility, and relocation work by the State.
- Minn. Stat. ch. 216B addresses utilities that are located within right-of-way that is owned by cities. These utilities might be subject to an individual franchise agreement that provides the terms for which the utility companies may operate in the public right-of-way.
- Minn. Stat. 216D.04 addresses the Department of Public Safety's notice, plan, and locating requirements for excavation projects involving underground facilities.
- Minn. Stat. 222.37, Subdivision 2, addresses pipeline relocations.
- Minnesota Rules 8810.3100 to 8810.3600 address the utility permit process, standards for work conducted under permit, aerial lines, and underground lines.
- Minnesota Rules 4720.5100 to 4720.5590 sets standards for wellhead protection planning, which is administered by MDH's Well Management Program.

5.1.1.2 Methodology

The information provided in this Supplemental Draft EIS focuses on identifying major potential utility conflicts. The process of inventorying existing utilities in the study area using information provided by the utility owners (identified below), field investigations, and from Gopher State One Call will continue throughout design development. Additional information regarding potential utility conflicts and mitigation to address those conflicts will be disclosed in the Supplemental Final EIS as the design of the Project advances.

Major utilities include public potable water, public wastewater and public/private stormwater collection and distribution facilities, private wells and Wellhead Protection Areas, private electric transmission and distribution lines, public/private telecommunications copper and fiber-optic data (hardware and conduit) lines and facilities, and private energy (fuel) transmission and distribution lines.

Information for sanitary sewer, storm sewer, and water mains is being provided (in the form of geographic information system [GIS] database files and engineering drawings) and compared to the Project Alignment to identify conflicts for the following utility owners:

- City of Minneapolis
- City of Robbinsdale
- City of Crystal
- City of Brooklyn Park
- Hennepin County
- MCES
- MnDOT
- BNSF (formerly known as Burlington Northern Santa Fe Railway)

Limited private utility information has been obtained directly from the utility owners to date; ongoing identification of private utilities would continue through design development. Private utility owners anticipated within the study area are expected to include the following:

- Arvig
- AT&T Transmission
- CenterPoint Energy
- CenturyLink
- Comcast
- Enventis
- Integra Telecom Holdings
- NuStar Energy
- Rogers Telecom
- Sprint
- TDS Metrocom
- TTM Operating Corporation
- TW Telecom
- Verizon (MCI)
- Windstream
- Xcel Energy
- XO Communications

- Zayo

Wells in the study area were identified from the Minnesota Well Index database[1].

5.1.2 Study Area and Affected Environment

The study area for utilities is defined as the area within and directly adjacent to the LOD for the Project. The LOD are defined as the estimated area where construction would occur for the Project at this stage of design.

Several public and private utilities are present in the study area. The general locations of several of these utilities in relation to the Project are shown in Figure A5-1, Figure A5-2, and Figure A5-3 by cities.

Figure A5-1 Locations of Major Utilities in the City of Brooklyn Park

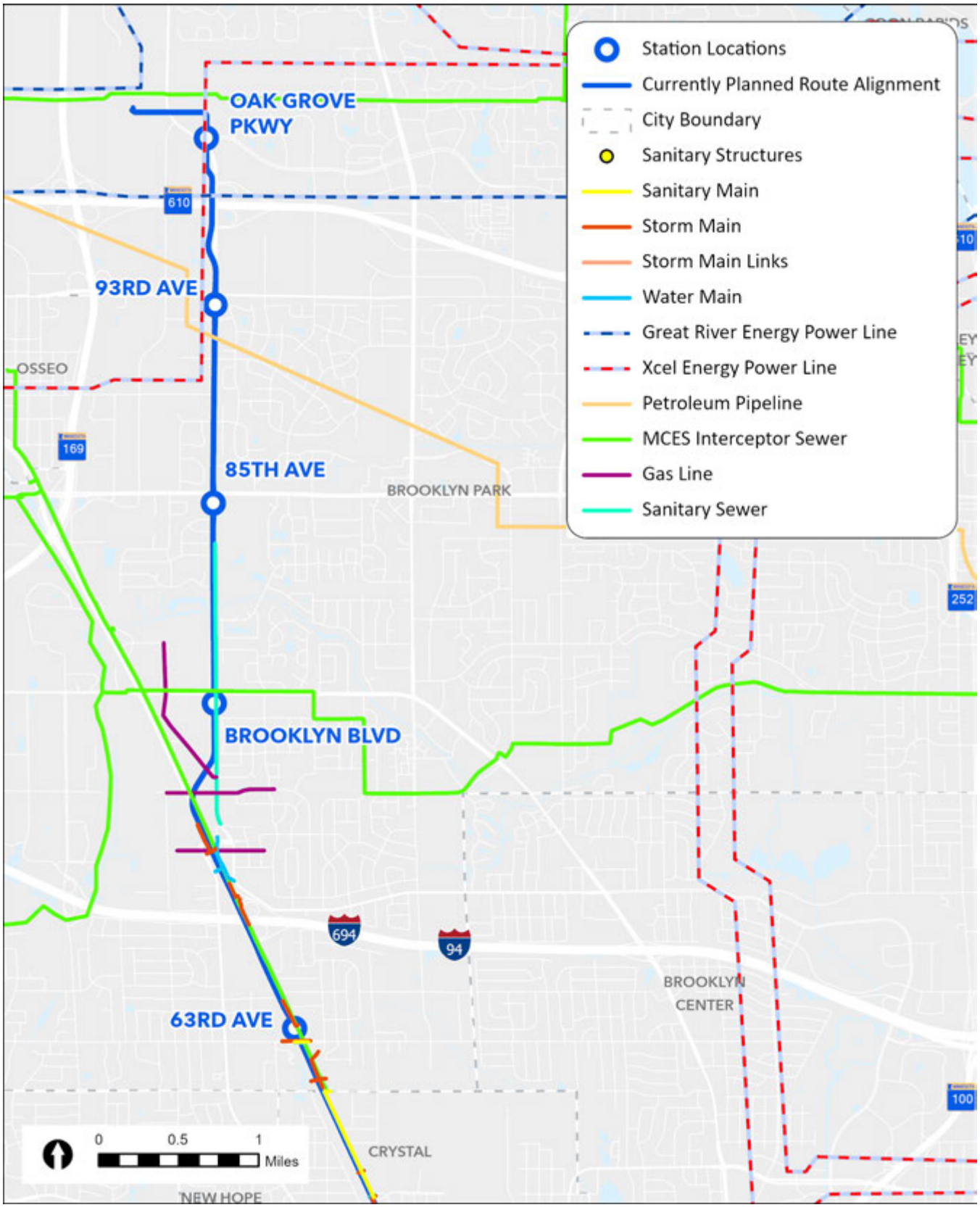
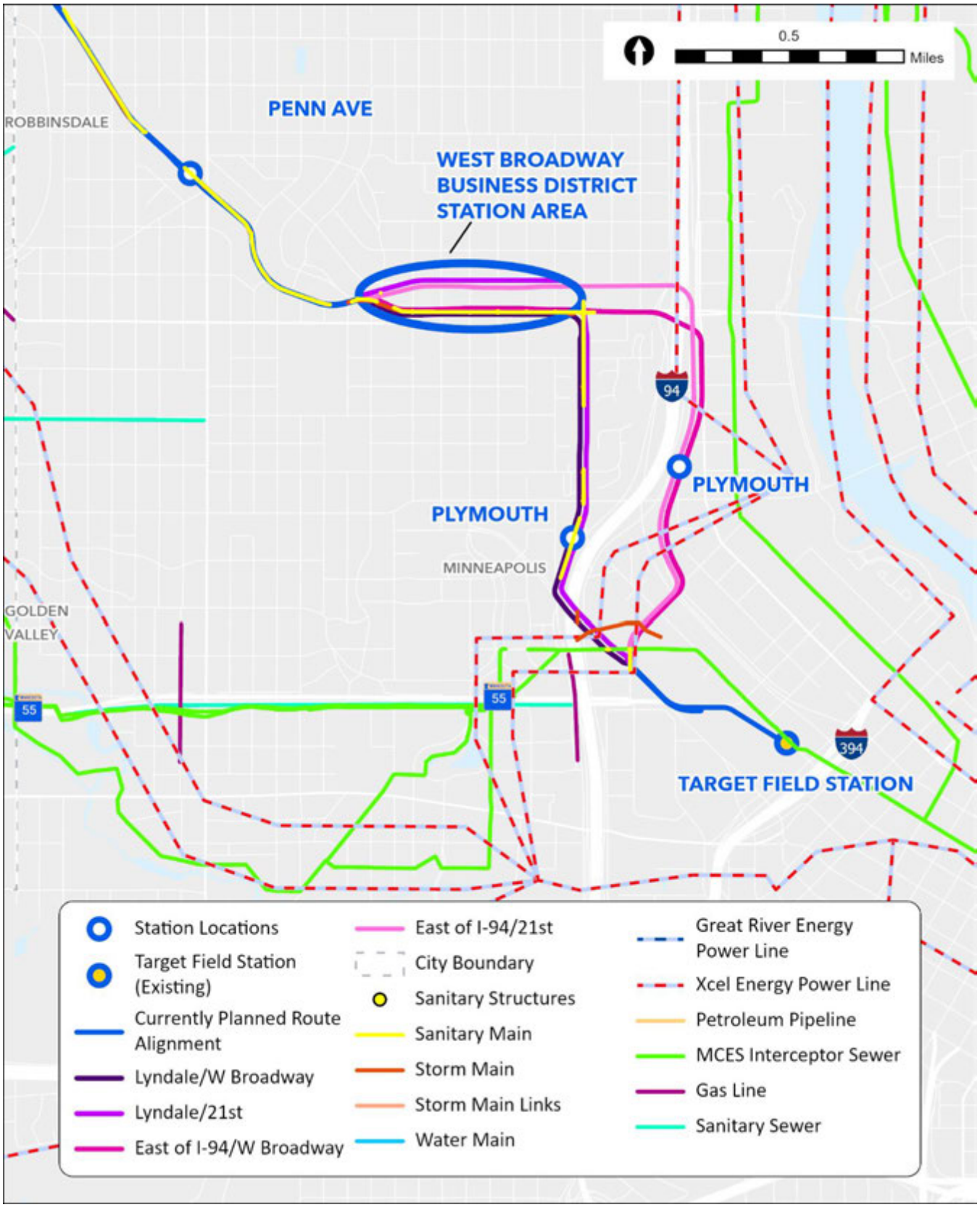


Figure A5-2 Locations of Major Utilities in the Cities of Brooklyn Park, Crystal, and Robbinsdale

Figure A5-3 Locations of Major Utilities in the City of Minneapolis



5.1.2.1 Existing Water Service

Existing water service in the study area is provided, maintained, and owned by the following entities:

- Joint Water Commission [2]
- City of Brooklyn Park
- City of Crystal
- City of Robbinsdale
- City of Minneapolis

Water mains in the study area typically range from 6 to 16 inches in diameter. At some locations, as shown in Table A5-2, water mains with a 20-inch diameter or larger cross or run parallel to the study area.

Table A5-2 Known Water Mains in Study Area

Water Main Description	City: Alignment and Design Option
24-inch-diameter water main on W Broadway Ave (CR 103) at 89th Ave N and Maplebrook Pkwy	Brooklyn Park
24-inch-diameter water main on W Broadway Ave south of 85th Ave N, parallel to the roadway	Brooklyn Park
20-inch-diameter water main on 63rd Ave N crossing CR 81	Brooklyn Park
36-inch-diameter water main crossing CR 81 on the south side of CR 9	Robbinsdale: all options
48-inch-diameter steel pipe water main north of Theodore Wirth Pkwy crossing under the Lowry Ave bridge	Robbinsdale/Minneapolis: all options
24-inch-diameter water main on Penn Ave from north of W Broadway Ave to south of W Broadway Ave	Minneapolis: all options
36-inch-diameter water main on Aldrich Ave from 21st Ave N to 11th Ave N	Minneapolis: all options

Twelve private wells[3] are located within the study area. These wells are identified in Table A5-3 and Figure A5-4. Portions of the Project are also located in Drinking Water Supply Management Areas and Wellhead Protection Areas, as shown in Figure A5-5.[4] Per the federal Homeland Security Act of 2002, the locations of wells that supply public water systems cannot be mapped.

Table A5-3 Known Private Wells in Study Area

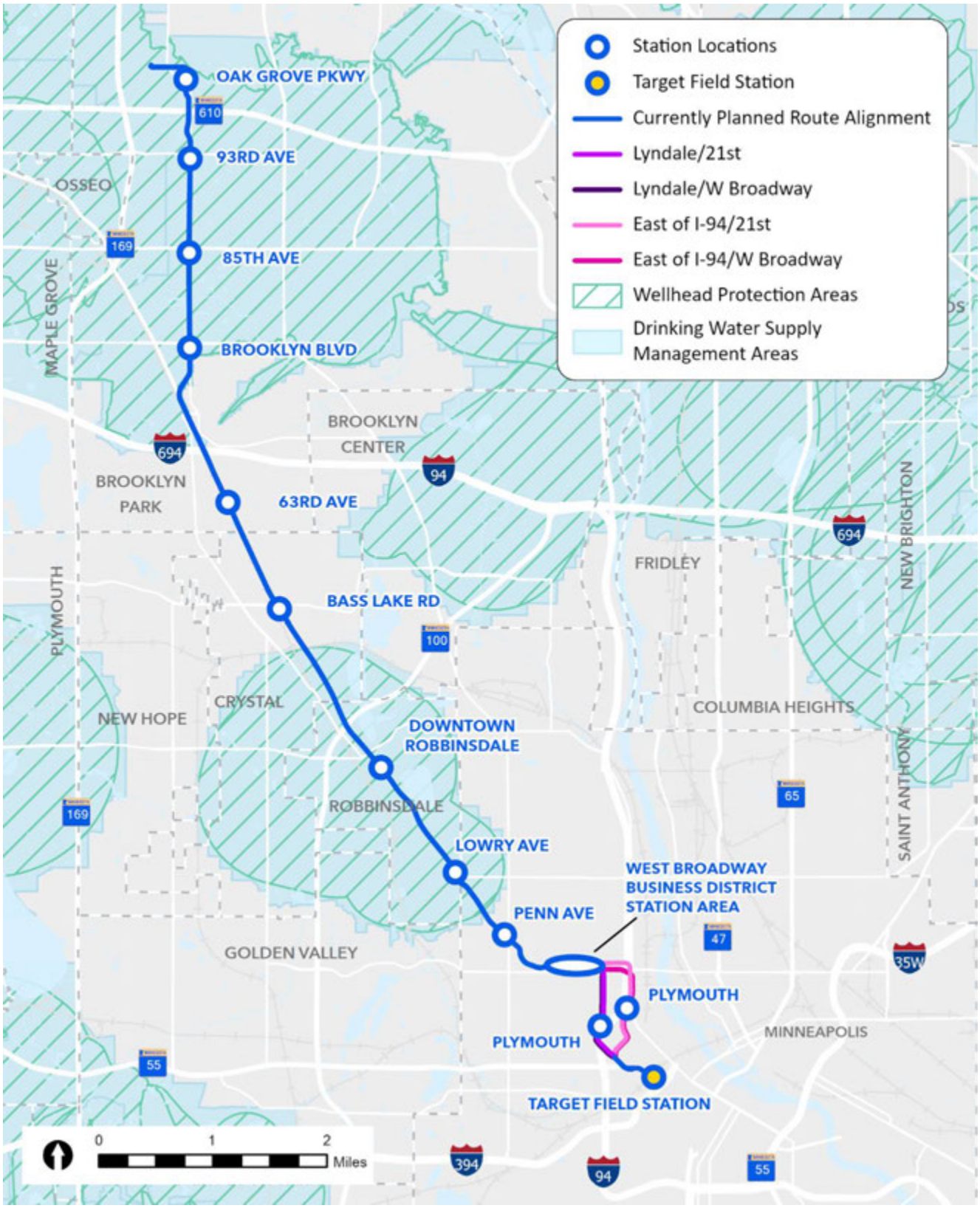
Minnesota Unique Well Number	Address	Well Type [a]	City: Alignment and Design Options
415896	8249 101st Ave N, Brooklyn Park, MN 55445	Domestic water supply	Brooklyn Park
255193	7300 Oak Grove Pkwy, Brooklyn Park, MN 55445	Irrigation well	Brooklyn Park
203310	7005 63rd Ave N, Brooklyn Park, MN 55428	Commercial water supply	Brooklyn Park
2006	6300 Lakeland Ave N, Brooklyn Park, MN 55428	Domestic water supply	Brooklyn Park
203515	5930 Lakeland Ave N, Crystal, MN 55429	Commercial water supply	Crystal: all options
203509	5800 Lakeland Ave N, Crystal, MN 55429	Unknown	Crystal: all options
203499	5636 Lakeland Ave N, Crystal, MN 55429	Abandoned well	Crystal: all options
1000004668	5548 Lakeland Ave N, Crystal, MN 55429	Domestic water supply	Crystal: all options
W0007314	5465 Lakeland Ave N, Crystal, MN 55429	Unknown	Crystal: all options
428993	4140 W Broadway Ave, Robbinsdale, MN 55422	Monitoring well	Robbinsdale: all options
200273	1931 W Broadway Ave, Minneapolis, MN 55411	Domestic water supply	Minneapolis: all options
200610	1313 3rd St N, Minneapolis, MN 55411	Commercial water supply	Minneapolis: East of I-94 option only

Source: Minnesota Geological Survey, Minnesota Well Index, 2023.
[a] Sealed wells were not included in this analysis.

Figure A5-4 Private Well Locations

Source: Minnesota Geological Survey, County Wells Index, 2023.

Figure A5-5 Drinking Water Supply Management Areas and Wellhead Protection Areas



Source: Minnesota Department of Health, *Wellhead Protection Areas* (St. Paul: Minnesota Department of Health, 2019), Wellhead Protection Areas - Resources - Minnesota Geospatial Commons (mn.gov).

5.1.2.2 Existing Sanitary and Storm Sewer Service

Sanitary and storm sewer services are owned and maintained by the public-works divisions of the areas in which they are located, including:

- Cities of Minneapolis, Robbinsdale, Crystal, and Brooklyn Park
- Hennepin County
- MCES

Several publicly owned sanitary and storm sewer services run parallel to and intersect with the Project Alignment. The sanitary sewers range from 8 to 86 inches in diameter, and storm sewers range from 9 to 144 inches in diameter, all varying in depth. An MCES interceptor sewer is also located in the study area.

Table A5-4 lists the sanitary sewer and MCES interceptor sewers in the study area. Significant storm sewers in the study area are provided in Table A5-5.

Table A5-4 Sanitary and MCES Interceptor Sewers in Study Area

Utility Type	Utility Location	City: Alignment and Design Options
MCES interceptor sewer	54-inch-diameter MCES interceptor sewer located on the south side of 101st Ave N, running parallel to the roadway	Brooklyn Park
Sanitary sewer	Sanitary sewer lines are located on the east side of W Broadway Ave, south of 83rd Ave N, parallel to the roadway	Brooklyn Park
MCES interceptor sewer	48-inch-diameter MCES interceptor sewer crosses W Broadway Ave at Brooklyn Blvd	Brooklyn Park
Sanitary sewer	21-inch-diameter sanitary line crossing CR 81 at 63rd Ave N	Brooklyn Park
Sanitary sewer	30-inch-diameter sanitary sewer line crossing CR 81 at Corvallis Ave	Crystal: all options
Sanitary sewer	12-inch-diameter sanitary line in 36-inch-diameter casing crossing at CR 9	Robbinsdale: all options
Sanitary sewer	21-inch-diameter sanitary line in 36-inch-diameter casing crossing at 40th Ave N	Robbinsdale: all options
Sanitary sewer	18- to 33-inch-diameter clay sanitary line running parallel along CR 81 from Lowry Ave to N 26th Ave generally located under the northbound lane	Minneapolis: all options
Sanitary sewer	15-inch-diameter clay to 36-inch-diameter brick sanitary line running parallel along CR 81 from 26th Ave N to Lyndale Ave N generally under the northbound lane	Minneapolis: all options
Sanitary sewer	An 86-inch-diameter brick sanitary sewer running under Lyndale Ave and 7th St N at 8th Ave N	Minneapolis: Lyndale option

Table A5-5 Significant Storm Sewers in Study Area

Utility Type	Utility Location	City: Alignment and Design Options
Storm sewer	48-inch-diameter reinforced concrete pipe (RCP) crosses CR 81 south of W Broadway Ave	Brooklyn Park
Storm sewer	42-inch-diameter RCP crosses CR 81 at 63rd Ave N	Brooklyn Park
Storm sewer	44-inch-diameter arch pipe crosses CR 81 just north of the Cities of Crystal and Brooklyn Park border	Brooklyn Park
Storm sewer	36-inch-diameter arch pipe crosses CR 81 just north of Crystal Airport Rd	Crystal: all options
Storm sewer	36-inch-diameter RCP running parallel to CR 81 south of Airport Rd running in the median between northbound and southbound lanes crossing the northbound lane at Airport Rd	Crystal: all options
Storm sewer	36-inch-diameter RCP crossing CR 81 at CR 10	Crystal: all options
Storm sewer	36-inch-diameter RCP running parallel to CR 81 under the northbound lane at Wilshire Blvd	Crystal: all options
Storm sewer	72-inch-diameter storm crossing CR 81 just south of Wilshire Blvd, the storm sewer then runs parallel west of the CR 81 bridge over BNSF to Corvallis Pond south of BNSF	Crystal: all options
Storm sewer	36-inch-diameter RCP running parallel to CR 81 under the southbound lane from Corvallis Ave to 50th Ave N	Crystal: all options
Storm sewer	66-inch-diameter RCP crossing CR 81 north of 40th Ave N running parallel to northbound CR 81 to south of Robbins Landing Frontage Rd	Robbinsdale: all options
Storm sewer	48-inch-diameter RCP crossing CR 81 south of Lakeview Terrace Park	Robbinsdale: all options
Storm sewer	48-inch-diameter RCP running parallel to CR 81 from Crystal Lake to Lakeview Pond	Robbinsdale: all options
Storm sewer	54-inch-diameter RCP crossing CR 81 south of Lakeview Pond	Robbinsdale: all options
Storm sewer	60-inch-diameter RCP running parallel to CR 81 from Lakeview Pond to Crystal Lake	Robbinsdale: all options
Storm sewer	42-inch-diameter RCP running parallel to CR 81 from 35th Ave N pond to northbound Lowry Ave ramp	Robbinsdale: all options
Storm sewer	33-inch-diameter RCP running parallel to CR 81 from N 29th Ave to Queen Ave running in approximately the center of the roadway	Minneapolis: all options
Storm sewer	48-inch-diameter RCP running parallel to CR 81 under the northbound lane from Queen Ave to McNair Ave, crossing CR 81 at McNair Ave	Minneapolis: all options
Storm sewer	60-inch-diameter RCP crossing CR 81 at Logan Ave	Minneapolis: all options
Storm sewer	60-inch-diameter RCP crossing CR 81 at Logan Ave	Minneapolis: all options
Storm sewer	39-inch-diameter storm pipe running parallel to 21st Ave N from Bryant Ave to Aldrich Ave at approximately the center of the roadway	Minneapolis: 21st Ave N options
Storm sewer	42-inch-diameter storm pipe running parallel to 21st Ave N from Aldrich Ave to Lyndale Ave N at approximately the center of the roadway	Minneapolis: 21st Ave N options

Utility Type	Utility Location	City: Alignment and Design Options
Storm sewer	36-inch-diameter RCP running parallel to CR 81 from James Ave to just west of Girard Ave at approximately the center of the roadway	Minneapolis: W Broadway options
Storm sewer	48-inch-diameter RCP running parallel to CR 81 from just west of Girard Ave to Dupont Ave under the northbound lanes and from Dupont Ave to Lyndale Ave N under the southbound lanes	Minneapolis: W Broadway options
Storm sewer	36-inch-diameter RCP crossing Lyndale Ave N just north of Plymouth Ave	Minneapolis: Lyndale options
Storm sewer	54-inch-diameter RCP crossing under 7th St between northbound I-94 and E Lyndale Ave. Pipe continues to run parallel to E Lyndale Ave from 7th St to Olson Memorial Hwy.	Minneapolis: Lyndale options
Storm sewer	144-inch-diameter RCP (Bassett Creek Tunnel) crossing 7th St at E Lyndale Ave and crossing N 10th Ave at N 5th St	Minneapolis: all options

5.1.2.3 Existing Electric and Gas Lines

Xcel Energy provides electrical service in the study area using overhead and underground distribution power lines. Xcel Energy and Great River Energy have electric transmission lines that intersect and run parallel to the Project. Table A5-6 provides a preliminary list of the overhead power lines that are in or adjacent to the LOD.

CenterPoint Energy owns several underground gas line utilities in the study area; many of these lines are part of the Belt Line, which supplies natural gas to distribution lines. The Council conducted an initial review of these lines using utility maps that were provided by CenterPoint Energy. A 12-inch-diameter gas line runs beneath Jolly Lane to the east of CR 81, and another 12-inch-diameter gas line runs from east to west beneath 73rd Ave N as it crosses the BNSF right-of-way. A 24-inch-diameter gas line, which is part of the Belt Line, crosses under CR 81 about 1,200 feet north of I-94. A 12-inch-diameter gas line runs beneath CR 9 crossing at CR 81. A 12-inch-diameter gas line crosses CR 81 at 30th Ave N.

A 20-inch-diameter gas line, which is part of the Belt Line, is located south of Golden Valley Rd. A 24-inch-diameter gas line runs parallel to Queen Ave, crossing under Olson Memorial Hwy. A 16-inch-diameter gas line, which is part of the Belt Line, runs from north to south and crosses Olson Memorial Hwy just west of I-94. The Belt Line also crosses the existing BNSF right-of-way near Golden Valley Rd and north of I-94. Additional information has been requested and will be incorporated with a future revision.

One 8-inch-diameter steel petroleum pipeline is in the study area. It crosses W Broadway Ave just north of 93rd Ave N, and then crosses 93rd Ave N northeast of W Broadway Ave. This pipeline, which is owned by NuStar Energy, distributes refined petroleum. Table A5-6 summarizes overhead power lines in the study area. Utilities identified are preliminary findings and will continue to be updated as the Project advances and additional utility information becomes available.

Table A5-6 Overhead Power Lines in Study Area (Preliminary)

Utility Type	Type	Utility Location	City: Alignment and Design Options
Xcel Energy	Distribution	South side of 101st Ave N	Brooklyn Park
Great River Energy	Transmission	North side of TH 610, running parallel to TH 610 and crossing over the CR 103/TH 610 interchange	Brooklyn Park
Xcel Energy	Distribution	CR 103: west side north of Winnetka Ave N, east side north of TH 610 to Winnetka Ave N, west side from CR 8 to north of TH 610	Brooklyn Park
Xcel Energy	Distribution	North side of 93rd Ave N (CR 30)	Brooklyn Park
Xcel Energy	Transmission	West side of W Broadway Ave (CR 103), north of 89th Ave N	Brooklyn Park
Xcel Energy	Distribution	CR 81: west side from Bass Lake Rd to 60th Ave N, east side from 60th Ave N to 65th Ave N, west side from 65th Ave N to 73rd Ave N	Crystal: all options
Xcel Energy	Distribution	CR 81: west side from 51st Ave N to CPKC	Crystal: all options
Xcel Energy	Transmission	North side of TH 100, running parallel to TH 100 and crossing over CR 81 on the north side of the TH 100/CR 81 interchange	Robbinsdale: all options

5.1.2.4 Existing Long-Distance Communication Service

An existing fiber-optic cable connecting North Memorial Hospital and Maple Grove Hospital runs on the west side of CR 81, between CR 81 and the BNSF right-of-way.

5.1.3 Environmental Consequences

This section identifies the long- and short-term impacts to utilities from the No-Build Alternative and Project alignment and design options.

5.1.3.1 Operating-Phase (Long-Term) Impacts

Coordination with local and State agencies may be required to relocate specific utilities outside the Project LOD. However, conflicts would be determined as design advances. Utilities located in the right-of-way and owned by cities may be subject to an individual franchise agreement as authorized by Minn. Stat. ch. 216B, Public Utilities, which provides the terms for which the utility companies may operate in the public right-of-way.

Public and private utilities must conform to MnDOT's Utility Accommodation on Highway Right of Way Policy, which requires owners to obtain a permit to place utility facilities on trunk highway right-of-way. Utility installations on, over, or under BNSF property would require review and approval by BNSF, must conform to the requirements in the BNSF Utility Accommodation Policy, and would require a Utility License Agreement issued by BNSF.

No-Build Alternative

The No-Build Alternative would have no long-term utility impacts.

Project Alignment and Design Options

The locations of private and public utilities that run parallel to or cross the Project Alignment would be refined during the Project's Engineering phase to determine whether the utilities would conflict with the Project and would need to be relocated to avoid conflict with LRT operations.

OVERHEAD UTILITIES

The horizontal and vertical locations of overhead electric and communication lines would be adjusted to provide adequate vertical and horizontal clearance for LRVs and the overhead catenary system. It might be possible to relocate some overhead utilities to a different type of pole or place them underground. However, existing overhead electric transmission lines cannot be easily relocated underground because of the substantial cost of burying them (compared to reconstructing them above ground) and because of operational issues and constraints associated with the diminished ability of buried lines to dissipate heat compared to overhead lines.

The Project would affect existing electrical transmission towers in the study area as a result of constructing the LRT track and adjacent roadway improvements.

UNDERGROUND UTILITIES

The Council anticipates impacts on underground utilities from the Project. The Council would evaluate underground utilities, both private and public, on a case by-case basis to determine their condition; to determine their reaction to loading from the LRT and freight rail; and to verify that the utility meets the vertical clearance requirements for the utility owner, MnDOT, and BNSF. Manholes and vaults that conflict with the Project and that limit access to the underground utilities would need to be relocated to provide adequate access.

The Council would need to evaluate whether existing ferrous metal utilities could be corroded by stray current from the LRT system. Protective measures might need to be considered for some underground utilities.

IMPACTS FROM PROJECT ALIGNMENT AND DESIGN OPTIONS

Among the alignment and design options evaluated in the City of Minneapolis, the Lyndale Ave N on W Broadway Ave option presents the greatest number of potential utility impacts, including an intersection with Xcel Energy's power line, a 24-inch-diameter water main running parallel and perpendicular to the Project Alignment along W Broadway Ave, a sanitary main running parallel to much of Lyndale Ave N and W Broadway Ave, and a storm main running along W Broadway Ave near Knox Ave N. Utilities located at 42nd Ave N, 41st Ave N, Noble Ave N, and 40th Ave N could be impacted by individual design options in Downtown Robbinsdale.

5.1.3.2 Construction-Phase (Short-Term) Impacts

This section identifies potential short-term impacts to utilities from the No-Build Alternative and Project alignment and design options.

No-Build Alternative

The No-Build Alternative would have no short-term utility impacts.

Project Alignment and Design Options

Construction-phase impacts to utilities are most likely to occur during excavation and grading, when placing structural foundations, and during work that requires large-scale equipment, which could affect overhead utilities. Disruptions in utility service would occur throughout construction to allow relocating utilities. The Council anticipates that these disruptions would be minor, with temporary connections provided, as the Council deems necessary, to customers before the utilities are permanently relocated. Utility owners would ultimately decide when and whether planned disruptions to service would be allowed.

Previously unidentified utilities could be encountered in the study area, and a utility could be unintentionally damaged during construction. Service disruptions could result. The large number of utilities present within the study area increases the likelihood of encountering previously unidentified utilities.

5.1.4 Avoidance, Minimization, and/or Mitigation Measures

This section describes potential measures that could be implemented to avoid, minimize, and/or mitigate potential utility impacts from the Project.

5.1.4.1 Operating-Phase (Long-Term) Mitigation Measures

No long-term impacts to utilities are anticipated because the relocation and reconstruction of utilities that would be conducted as part of the Project would maintain current service levels. The Council would evaluate utilities in areas adjacent to Project's LRT electrification components for potential corrosion concerns; protective measures (such as cathodic protection) would be taken to protect utilities from corrosion if warranted. Potential utility conflicts could also be resolved by lowering the existing utility, encasing the utility for additional protection, or relocating the utility.

5.1.4.2 Construction-Phase (Short-Term) Mitigation Measures

Utility location excavations and pre-construction surveys would be performed in general accordance with MnDOT requirements for the collection and depiction of subsurface utility information. These procedures would help minimize the number of unintended disruptions in utility service.

The Council would require the utility contractor to notify affected businesses and residents of any planned disruption in service because of construction. If utilities are discovered during construction that are not identified in the contract documents, the appropriate utility companies and agencies would be contacted to identify the line(s) and would be consulted on appropriate actions.

Any wells, either known or discovered during construction, that are in conflict and within the Project's permanent right-of-way would be abandoned and sealed according to State and local regulations. Wells outside but near the Project right-of-way would be avoided. For those locations where impacts to wells would interfere with a necessary supply of potable water or with monitoring groundwater conditions at a site, well replacement or other water supply provisions would be considered.

MDH guidance would be used to evaluate the feasibility of stormwater infiltration practices located in vulnerable Wellhead Protection Areas.

5.2 Floodplains

This section describes the floodplain areas that have been identified according to the standards of the NFIP managed by FEMA and the Minnesota Model Floodplain Ordinance and describes potential impacts of the No-Build Alternative and Project alignment and design options on floodplains. Wetlands are addressed separately in Section 5.3.

For this Supplemental Draft EIS, the floodplain analysis is conducted to evaluate the Project impact on floodplains within the study area including federal, State, and local regulatory requirements to identify potential avoidance, minimization, and mitigation measures.

5.2.1 Regulatory Context and Methodology

Floodplain management includes federal, State, and local regulatory and permitting authorities. The jurisdictional authority corresponds to LGUs and WMOs. Stakeholders for this Project include the following:

- FEMA
- DNR
- MWMO
- BCWMC
- SCWMC
- WMWMC
- City of Brooklyn Park
- City of Crystal
- City of Robbinsdale
- City of Minneapolis

5.2.1.1 Federal Emergency Management Agency

FEMA is the federal agency under which the NFIP is administered. The agency has the authority to regulate floodplains and floodways and it has established minimum floodplain management standards for communities participating in the NFIP. EO 11988, *Floodplain Management,* requires all federal agencies to evaluate and, to the extent possible, avoid adverse impacts to floodplain areas that may result in actions they administer, regulate, or fund.

EO 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, was implemented on Jan. 30, 2015. On Aug. 15, 2017, EO 13807 was implemented, which revoked EO 13690. On May 20, 2021, EO 13690 was reinstated. The guidelines that incorporate the Federal Flood Risk Management Standard and amendments found in EO 13690 include the following:

- Agencies, where possible, shall use natural systems, ecosystem processes, and nature-based approaches in the development of alternatives for all actions to which EO 11988 applies.
- Agencies are required to expand management from the base flood elevation to a higher vertical flood elevation and corresponding horizontal floodplain for federally funded projects.
- Federally funded projects are actions where federal funds are used for new construction, substantial improvement, or to address substantial damage to structures and facilities.
- Agencies will use higher standards for actions that they determine to be critical actions.

EO 13690 amends EO 11988 and states that the floodplain shall be:

- The elevation and flood hazard area that result from using a climate-informed science approach that uses the best-available, actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding based on climate science. This method will also include an emphasis on whether the action is a critical action as one of the factors to be considered when conducting the analysis.
- The elevation and flood hazard area that result from using freeboard[5] value, reached by adding an additional 2 feet to the base elevation for non-critical actions and from adding an additional 3 feet to the base flood elevation for critical actions. A critical action is any activity for which even a slight chance of flooding would be too great. [6]
- Base flood elevation is the elevation of surface water resulting from a flood that has a 1 percent chance of equaling or exceeding that level in any given year.
- The area subject to flooding by the 0.2 percent annual probability of flood (500-year event).
- The elevation and flood hazard area that results from using any other methods identified in an update to the Federal Flood Risk Management Standard.

As documented in the METRO Blue Line LRT Extension *Preliminary Floodplains Impacts and Mitigation Strategies* technical memorandum*,* dated Jan. 6, 2016, “the ESC team and the final EIS team met with the Federal Transit team

to discuss which of the above alignment and design options would be the most appropriate for the [METRO Blue Line LRT] extension project to use. Based on that meeting, as well a conversation with the Metropolitan Planning Organization, the [METRO Blue Line LRT] extension project is using Option 2, Non-Critical action (100-year elevation plus 2 feet of freeboard) to determine the elevation of the roadway profile, which would ensure the intent for resilient infrastructure in EO 13690 is met." The Non-Critical action determination was confirmed in February 2023 taking into consideration current federal, State, and local regulations.

The NFIP floodway standard in 44 CFR § 60.3.d restricts new development from obstructing the flow of water and increasing flood heights. Especially in flat areas, the floodplain provides a valuable function by storing floodwaters. When fill or buildings are placed in the flood fringe,[7] the flood storage areas are lost, and flood heights will go up because there is less storage for the floodwaters.[8] This is particularly important in smaller watersheds that respond sooner to changes in the topography. One approach that may be used to address this issue is to create compensatory storage to offset any loss of flood storage capacity; each jurisdictional authority has set specific compensatory storage requirements.

5.2.1.2 Minnesota Department of Natural Resources

DNR assists local communities by providing general regulatory assistance. Most LGUs have some form of a floodplain ordinance. DNR has developed State Model Ordinances for floodplain management within the state; the most recent update was issued in November 2022.

The floodplain ordinance was adopted pursuant to the authorization and policies contained in Minn. Stat. ch. 103F, Minnesota Rules 6120.5000 to 6120.6200, the rules and regulations of the NFIP in 44 CFR Parts 59-78, and other applicable legislation in the Minnesota Statutes. LGUs must, at a minimum, adopt these standards. DNR is required to review and approve all new and amended floodplain ordinances prior to their adoption to verify that minimum State and federal standards are met.

Development allowed in the floodway district is limited to that which has low flood damage potential. Railroad and light-rail construction is allowed with a permit subject to the standards for permitted uses in the floodway and must demonstrate that the development will not result in any of the following during the 1 percent annual chance of flood:

- Cause a stage increase of 0.00 feet or greater[9]
- Obstruct flood flows
- Increase velocities

A permit must be obtained from the Zoning Administrator to verify compliance with all applicable standards. All development must be designed and adequately anchored to prevent flotation, collapse, or lateral movement resulting from hydrodynamic and hydrostatic loads including the effect of buoyancy; and must be constructed by methods and practices that minimize flood damage and with materials and equipment resistant to flood damage.

Any development that would result in a stage increase greater than 0.00 feet may be allowed only with a conditional use permit or a variance; variances must be consistent with the general purpose of the Minnesota State Floodplain Management Standards and the intent of applicable provisions in State and federal law. Though variances may be used to modify permissible methods of flood protection, no variance shall ever permit a lesser degree of flood protection than the Regulatory Flood Protection Elevation (RFPE).

Public transportation facilities such as railroads must be elevated to the RFPE where such facilities are essential to the orderly functioning of the area, or where failure or interruption would result in danger to public health or safety. Minor or auxiliary roads or railroads may be constructed at a lower elevation where failure or interruption of transportation services would not endanger public health or safety. All public transportation facilities should be designed to minimize increases in flood elevations. The Project has been defined as an auxiliary transportation facility and must be constructed to meet the minimum RFPE.

Public utilities such as gas, electrical, and water supply systems to be located within the floodplain must be elevated and/or floodproofed to the RFPE, located to minimize or eliminate flood damage, and designed to eliminate infiltration of floodwaters into the systems and discharges from the systems into floodwaters. All public utilities should be designed to minimize increases in flood elevations.

5.2.1.3 Mississippi Watershed Management Organization

MWMO manages the water resources and habitat within the WMO boundaries. The current watershed management plan (2021–2031) sets out goals, strategies, and implementation actions based on past studies and current data on the watershed. MWMO encompasses 25,309 acres of urban watershed that drains directly into the Mississippi River; member communities include the City of Minneapolis as well as the Cities of Columbia Heights, Fridley, Hilltop, Lauderdale, St. Anthony Village, and Saint Paul.

Floodplain programs promote and ensure sound land use development in floodplain areas to promote the health and safety of the public, minimize loss of life, and reduce economic losses caused by flood damage by supporting both corrective and preventive measures for reducing flood damage. Programs often include requirements for zoning, subdivision or building, and special-purpose floodplain ordinances.

MWMO requires members to have a DNR-approved floodplain ordinance as part of the review of local watershed plans for inclusion of appropriate floodplain policies. If no ordinance is applicable, MWMO requires that there be no encroachment on floodways that results in reduced capacities or expedited flood flows. The only structures allowed in the flood zone are those that have been floodproofed and approved by DNR.

MWMO does not issue permits or provide approval letters for construction projects. MWMO would review the Project and work with the member communities to ensure implementation of its current standards. MWMO's floodplain standards are that public roadways shall not flood when adjacent to stormwater storage basins or subsurface stormwater management BMPs designated to store the 100-year event.

5.2.1.4 Bassett Creek Watershed Management Commission

BCWMC is an LGU that manages water resources within the Bassett Creek watershed per the authorities given in Minn. Stat. ch. 103B and Minnesota Rules 8410. The 2015–2025 Watershed Management Plan sets the guidelines for managing the water resources within the boundaries of the BCWMC to achieve the organization's vision. The watershed of Bassett Creek and its three branches cross nine cities: the Cities of Minneapolis, Robbinsdale, and Crystal as well as the Cities of Plymouth, Medicine Lake, Golden Valley, New Hope, Minnetonka, and St. Louis Park.

BCWMC does not have a permit program. The BCWMC Watershed Management Plan establishes goals, standards, and requirements that the member cities must incorporate into their official ordinances. BCWMC relies on its member cities to review improvement, redevelopment, and development proposals for compliance with BCWMC requirements, and to issue permits only after compliance has been determined.

The BCWMC rules address floodplain alteration within the watershed. The rules prohibit new structures or improvements in the floodplain, which would be subject to damage by the 100-year flood, including basements, public utilities, and streets. Where streets, utilities, and structures currently exist below the 100-year floodplain, BCWMC encourages member cities to remove these features as development/redevelopment allows. Projects within the floodplain must maintain no net loss to floodplain storage and no increase in flood level at any point along the trunk system. BCWMC defines the trunk system as including the Bassett Creek Main Stem (including the East Channel), Grimes Pond, North Rice Pond, South Rice Pond, and inundation areas in the Mary Hills Nature Area and Theodore Wirth Regional Park. The BCWMC rules prohibit expansion of existing nonconforming land uses within the floodplain unless fully floodproofed.

5.2.1.5 Shingle Creek and West Mississippi Watershed Management Commissions

SCWMC and WMWMC are Joint Power Associations of the State under the Minnesota Watershed Act. SCWMC and WMWMC's purpose is to preserve and use natural water storage and retention in the Shingle Creek and West Mississippi watersheds to meet Surface Water Management Act goals. Because many of the communities that are members of SCWMC are also members of WMWMC, SCWMC and WMWMC often work jointly on issues of interest to both and have adopted similar standards. The communities within the boundaries include parts of the Cities of Brooklyn Center, Brooklyn Park, Crystal, Maple Grove, Minneapolis, New Hope, Osseo, Plymouth, Robbinsdale, and Champlin.

The fourth-generation Watershed Management Plan final draft was issued on Feb. 14, 2023, and officially adopted at SCWMC and WMWMC's May 2023 meeting. This plan complies with the water resource protection requirements under Minnesota Statutes 103A through 103G in conformance with Minnesota Rules, Chapters 8410 and 8420.

SCWMC and WMWMC would review projects involving land-disturbing activities as requested by the local municipalities. It is the policy of SCWMC and WMWMC to prevent and control flooding damage by preserving existing water storage capacity below the 100-year critical flood elevation on all water bodies in the watershed to minimize the frequency and severity of high water, also by minimizing development in the floodplain that would unduly restrict flood flows or aggravate known high water problems.

Floodplain alteration or filling shall not cause a net decrease in flood storage capacity below the projected 100-year critical flood elevation unless it is shown that the proposed alteration or filling, together with the alteration or filling of all other land on the affected reach of the water body to the same degree of encroachment as proposed by the applicant, would not cause high water or aggravate flooding on other land and would not unduly restrict flood flows. SCWMC and WMWMC require compensatory storage for floodplain fill; compensatory storage is the excavated volume of material below the floodplain elevation required to offset floodplain fill.

5.2.1.6 City of Brooklyn Park

The City of Brooklyn Park has adopted zoning regulations to manage land uses in the mapped floodplain. These regulations include the minimum federal and State regulations, which are enforced on the 1 percent chance (100-year) floodplain that is mapped on the Flood Insurance Rate Map for the City of Brooklyn Park. The City of Brooklyn Park ordinance requires that no fill, excavation, or storage of materials or equipment that obstruct flows or increase flood elevations will be permitted within the flood fringe or floodway. The City's Zoning Code is the regulatory document that implements the Comprehensive Plan. The plan was accepted for implementation in January 2020.

There are two watersheds in the City of Brooklyn Park: the Shingle Creek watershed in the south and the West Mississippi watershed in the north. Development proposals affecting the watersheds are reviewed by the corresponding commissions. The City of Brooklyn Park Local Water Management Plan goal is to provide a reasonable level of protection within the city to limit potential flood damage, for which the following policies have been established: (1) prohibit encroachment that will reduce the storage capacity of floodplains, unless mitigating action is undertaken, and (2) allow only structures that have been floodproofed or will not be subject to excessive damage in the flood fringe or floodway.

For all development and redevelopment projects within the 100-year floodplain regardless of project size, compensating storage is required to mitigate floodplain fill. City Local Water Management Plan policy 2.1 prohibits encroachment that will reduce the storage capacity of floodplains unless mitigation action is undertaken. Chapter 152.515.B.3 requires the designated engineer to "…compute the floodway necessary to convey or store the regional flood without increasing flood stages and providing compensation storage volumes on a 1:1 basis below the 100-year flood elevation."

FEMA revised the Flood Insurance Study and Flood Insurance Rate Map for Hennepin County on Nov. 4, 2016.

5.2.1.7 City of Crystal

The City of Crystal City Code, Chapter V, Unified Development Code, Subsection 515.09 Floodplain overlay district states that no structure, fill (including roads and levees), deposit, obstruction, storage of materials or equipment, or other uses may be allowed as a conditional use in the floodway that will cause any increase in the stage of the 100-year regional flood or cause an increase in flood damages in the reaches affected. Floodplain development shall not adversely affect the hydraulic capacity of the channel and adjoining floodplain of any tributary watercourse or drainage system where a floodway or other encroachment limit has not been specified on the Official Zoning Map.

5.2.1.8 City of Robbinsdale

The City of Robbinsdale Floodplain Management Ordinance (Section 530.01) states that no structure, fill (including roads and levees), deposit, obstruction, storage of materials or equipment, or other uses may be allowed as a conditional use in the floodway that will cause any increase in the stage of the 100-year regional flood or cause an increase in flood damages in the reaches affected. Floodplain development shall not adversely affect the hydraulic capacity of the channel and adjoining floodplain of any tributary watercourse or drainage system where a floodway or other encroachment limit has not been specified on the Official Zoning Map.

5.2.1.9 City of Minneapolis

The Minnesota State Legislature has, in Minn. Stat. ch. 103F and ch. 462, delegated the responsibility to LGUs to adopt regulations designed to minimize flood losses.

The City of Minneapolis is a member organization of the MWMO. The City of Minneapolis administers and enforces the DNR-approved ordinances including review of development applications to ensure compliance with ordinances and administers the Minneapolis Flood Mitigation Program, designing and implementing flood risk reduction projects to minimize the impact on the water quality of the receiving surface water in addition to providing localized flooding relief.

Ordinance 551.1610 regulates development in the flood hazard areas of the City of Minneapolis. The ordinance states that linear projects within the floodplain shall be designed to minimize the increases in flood elevations and

shall be compatible with local comprehensive floodplain development plans. Protection to the RFPE shall be provided where failure or interruption of public facilities would result in danger to public health or safety where facilities are essential to orderly functioning of the area. Conditional uses in the floodway district are allowed provided that such uses have a low flood damage potential, shall not cause an increase in the stage of the regional flood, or cause an increase in flood damages in the reaches affected.

5.2.2 Study Area and Affected Environment

The study area for floodplain and floodway impacts is defined as the area coinciding with the LOD of the Project, including associated facilities. Four potential floodplain encroachments resulting from this Project have been identified in the study area, all located within the City of Brooklyn Park. The following sections summarize these floodplains. No floodplains exist within the study area for the City of Minneapolis.

5.2.2.1 Stormwater Pond at TH 610

This stormwater pond is located within the southeast ramp of the intersection of TH 610 and W Broadway Ave. This permanent stormwater management feature is mapped as a 100-year floodplain with an elevation of 869 NGVD 1929. Drainage improvement and volumetric impact analysis will be completed as part of the final design phases of the Project.

5.2.2.2 Century Channel Ponds

Century Channel ponds are located on the south side of 92nd Ave N (bisected by W Broadway Ave). This hydrologically isolated basin is mapped as a 100-year floodplain. Drainage improvements to the Century Channel ponds are proposed as part of the W Broadway Ave area road reconstruction.

5.2.2.3 Setzler Pond

Located in the northwest quadrant of 89th Ave N and W Broadway Ave, Setzler Pond is used for stormwater management and is mapped as a 100-year floodplain. The pond was created as a regional rate control pond; much of the stormwater that flows into Setzler Pond is runoff from the commercial and industrial land surrounding the pond from the north and west, as well as large contributing areas in the Cities of Maple Grove and Osseo. Runoff from a portion of W Broadway Ave between 89th Ave N and Setzler Pkwy is conveyed to the pond via ditches. Setzler Pond discharges through an existing culvert traveling below W Broadway Ave, reconnecting into Edinbrook/Century Channel.

Drainage improvements to Setzler Pond are proposed as part of the W Broadway Ave area road reconstruction. The pond would continue to receive Project Alignment and off-site drainage. It is anticipated that with additional impervious area adjacent to the pond, a new outlet control structure would be required before discharging to Edinbrook/Century Channel.

5.2.2.4 Shingle Creek

Shingle Creek is managed by SCWMC. Shingle Creek receives runoff from the City of Brooklyn Park as well as the Cities of Maple Grove, New Hope, Osseo, and Plymouth. This creek is the main stormwater conveyance feature in this area. The 100-year floodplain and floodway associated with Shingle Creek crosses the Project Alignment at the existing culvert crossing at W Broadway Ave. The areas adjacent to Shingle Creek on the east and west sides of W Broadway Ave are mapped as a 100-year floodplain and the channel of Shingle Creek is mapped as a floodway.

5.2.3 Environmental Consequences

This section identifies long- and short-term impacts to floodplains from the No-Build Alternative and Project alignment and design options.

5.2.3.1 Operating-Phase (Long-Term) Impacts

Long-term impacts refer to potential impacts after construction operations have been completed.

No-Build Alternative

The No-Build Alternative would have no long-term impacts to floodplains.

Project Alignment and Design Options

Impacts may be the result of excavation or fill required for the Project LOD or there may be excavation impacts because of construction of permanent stormwater management features. The anticipated impacts of the Project are summarized in Table A5-7 by water body. Impact areas are shown in Figure A5-6 and in detail for Figure A5-7 and Figure A5-8. Volumetric floodplain impacts would be identified in future drafts as engineering design advances. No floodplains are located in the vicinity of the OMF or any LRT station locations.

Table A5-7 Potential Acres of Impacted Floodplains by Water Body

Water Body	Type of Encroachment	Potential Area of Floodplain Impact (acres)	Estimated Total Area of Floodplain (Acres)
Stormwater Pond at TH 610	Transverse	0.05	2.56
Century Channel ponds	Transverse	0.75	5.61
Setzler Pond	Transverse	1.99	5.13
Shingle Creek	Transverse	9.47	94.8
Total		**12.21**	**105.54**

IMPACTS FROM PROJECT ALIGNMENT AND DESIGN OPTIONS

No floodplains are in the vicinity of any of the alignment options in the City of Minneapolis. All design options in the Cities of Crystal, Robbinsdale, and Minneapolis are outside floodplains; therefore, there are no differences in potential long-term impacts from individual options.

5.2.3.2 Construction-Phase (Short-Term) Impacts

The following sections identify potential short-term impacts that may occur during construction of the Project.

No-Build Alternative

The No-Build Alternative would have no short-term impacts to floodplains.

Project Alignment and Design Options

Project construction activities' impact on the floodplains may include temporary physical disturbances such as earthwork and grading activities, excavation and removal of soils not suitable for construction of the railroad, trench excavation for utilities installation, temporary drainage and stormwater management methods, and temporary erosion and sediment control BMPs. No floodplains are in the vicinity of the OMF or any of the LRT station locations.

IMPACTS FROM PROJECT ALIGNMENT AND DESIGN OPTIONS

No floodplains are in the vicinity of any of the alignment options in the City of Minneapolis. All design options in the Cities of Crystal, Robbinsdale, and Minneapolis are outside floodplains; therefore, no impacts related to the construction operations are anticipated.

5.2.4 Avoidance, Minimization, and/or Mitigation Measures

Several areas mapped as 100-year floodplain would be impacted within the study area. Complete avoidance of floodplain impacts from the Project and associated facilities is not feasible. Potential on-site or Project-specific floodplain storage mitigation would be evaluated as design details continue to be refined; final floodplain mitigation commitments will be documented in the Supplemental Final EIS and Amended ROD. The Project shall require coordination and permitting from local, State, and federal water resource agencies. Floodplain mitigation would be closely related to the measures identified for stormwater management, wetlands, and other aquatic resources.

Figure A5-6 Overview of Potential Floodplain Impacts from the Project

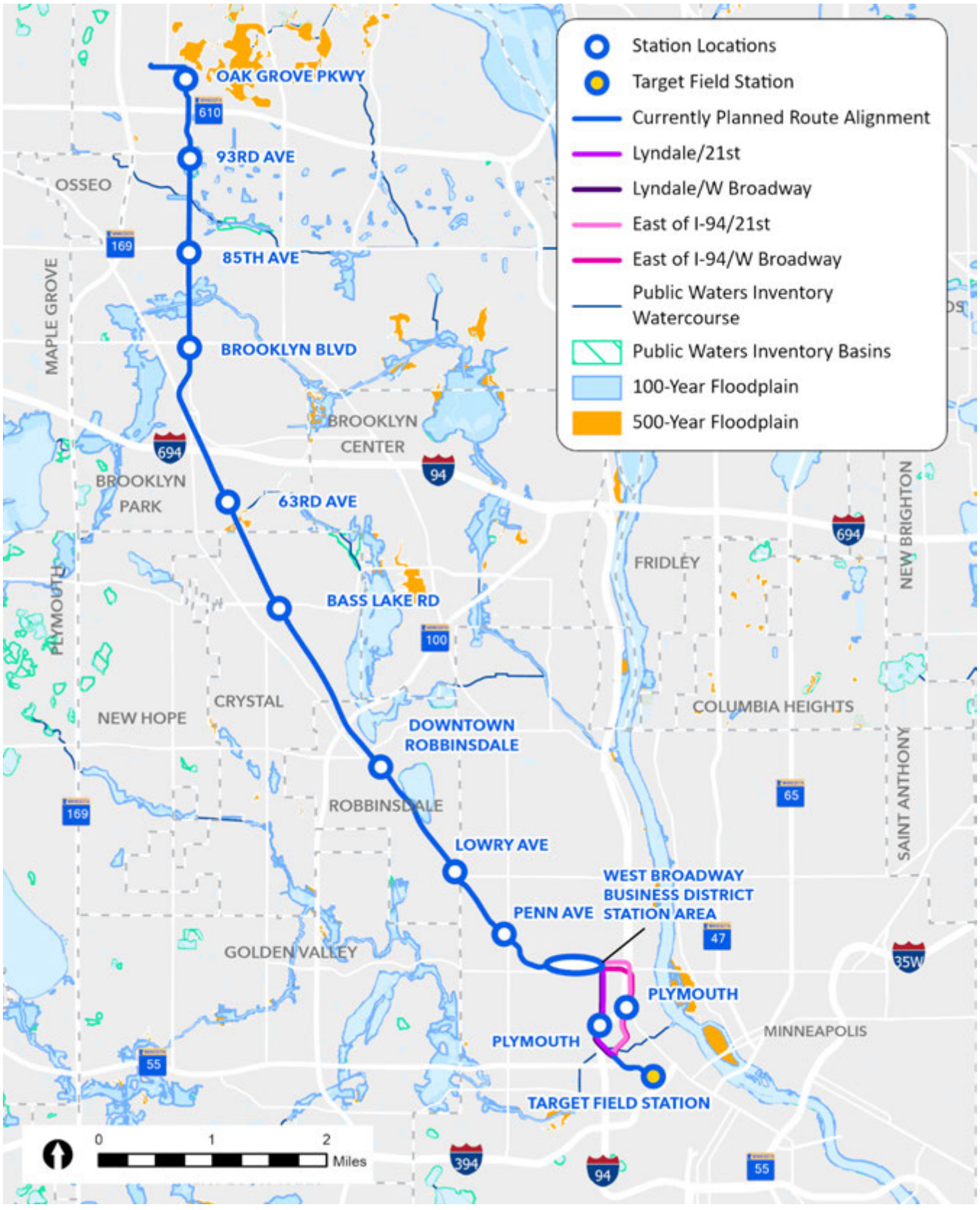
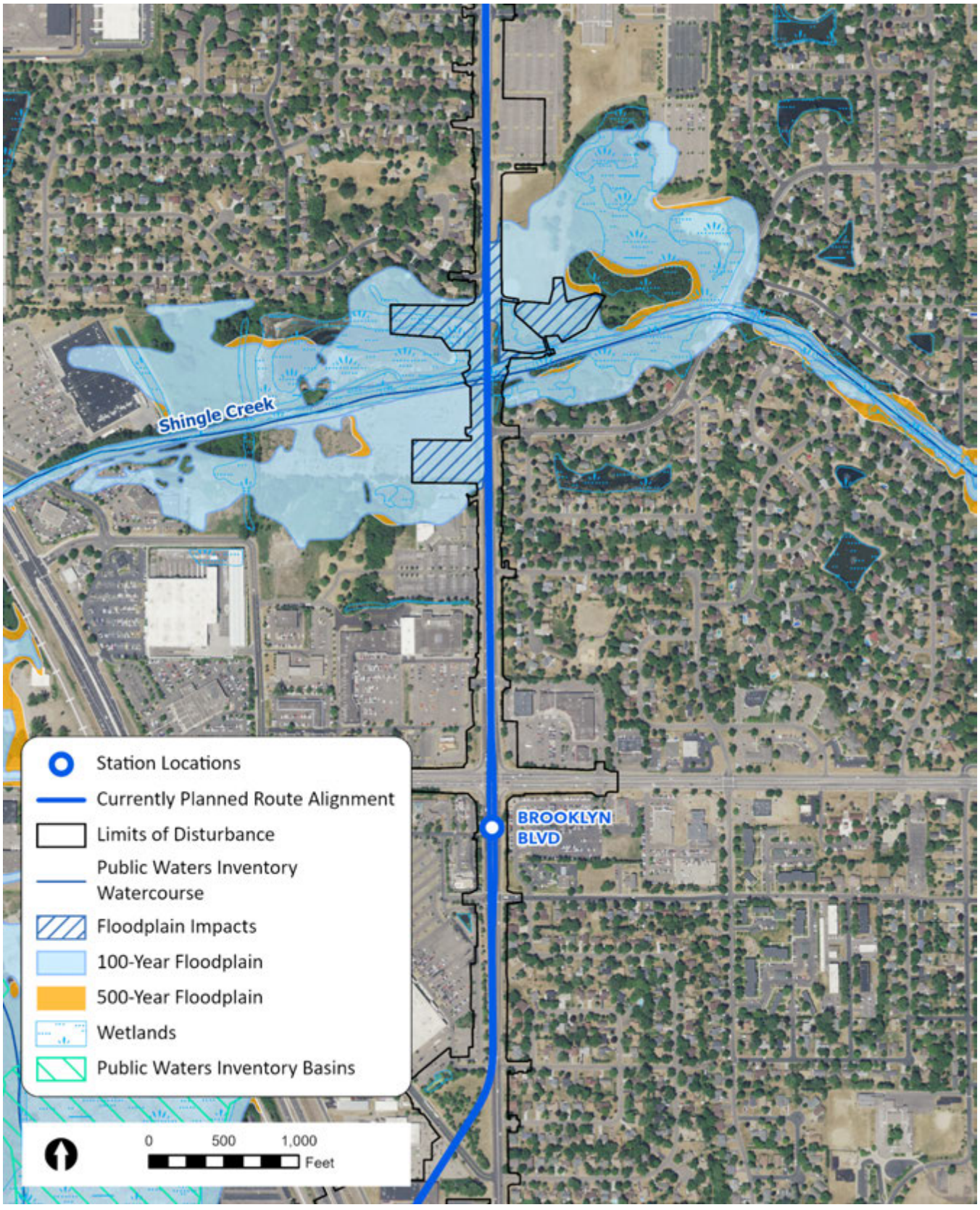


Figure A5-7 Potential Floodplains Impacts to Century Channel Ponds and Setzler Pond

Figure A5-8 Potential Floodplain Impacts to Shingle Creek



5.3 Wetlands and Other Aquatic Resources

This section describes the wetland types and boundaries that have been identified and delineated in the study area according to the standards of USACE and BWSR and describes the impacts of the No-Build Alternative and Project alignment and design options on wetlands and other aquatic resources. Floodplains are addressed separately in Section 5.2.

The wetland delineation serves to assess wetland impacts for the Project and to ensure that all proposed wetland impacts follow the sequencing process of the WCA of 1991 and the federal CWA.

In preparation of this Supplemental Draft EIS, wetland types and boundaries have been identified and delineated within and near the Project and associated facilities according to USACE and BWSR standards. Wetland boundaries and types have been approved by representatives of the WCA LGU and USACE.

Wetland impacts are estimated based on the known construction footprint of the current level of design for the Project and on the wetland jurisdictional determinations made by USACE and the WCA LGU.

5.3.1 Regulatory Context and Methodology

Wetlands are protected by local, State, and federal legislation because of their ecological and functional value. The federal CWA establishes the basic structure for regulating discharges of pollutants into WOUS and for regulating quality standards for surface waters. EPA oversees state implementation of the CWA and reviews and comments on Individual 401 Water Quality Certifications associated with applications for Section 404 Individual Permits.

5.3.1.1 Clean Water Act

CWA Section 404 establishes a program to regulate the discharge of dredged or fill material into WOUS. CWA Section 404 is under the purview of USACE (for the Project, the USACE St. Paul District) and requires a permit to be issued by USACE prior to the placement of any dredged or fill material into any WOUS, including wetlands. In Minnesota, transportation projects that will result in impacts to wetlands greater than 3.0 acres and any single and complete crossing impacts greater than 1.0 acre require an Individual Permit and a public comment period.

5.3.1.2 Public Waters

DNR regulates lakes, rivers, streams, and wetlands if they have been identified by the State as PWs or PWWs. PWs and PWWs are all water basins and watercourses that meet the criteria in Minn. Stat. 103G.005, Subdivision 15, and that are identified on Public Waters Inventory maps (Minn. Stat. 103G.201). Proposed impacts involving a change in the course, current, or cross section of PWs (including streams) and PWWs would require a Public Waters Work Permit from DNR. Utilities work in PWs or PWWs could require a utility crossing license from DNR.

5.3.1.3 Wetland Conservation Act

WCA, under the purview of BWSR and LGUs, establishes the goal of no net loss of wetlands (Minnesota Rule 8420). WCA requires that anyone proposing to drain or fill a wetland must try to avoid disturbing the wetland. If avoidance cannot be achieved, WCA requires that impacts be minimized to the extent possible, and any impacted areas be replaced with suitable and acceptable mitigation.

The designated LGU would need to determine the need for and requirements of a WCA wetland replacement plan for the Project. The Project is classified as a linear project that crosses through several LGUs that are responsible for implementation of the WCA. These jurisdictions include SCWMC, BCWMC, MnDOT, and the City of Minneapolis.

5.3.2 Study Area and Affected Environment

The study area for wetlands and other aquatic resources is land cover within or adjacent to the LOD. At the time of publication of this Supplemental Draft EIS, no wetlands were observed within or adjacent to Project alignment and design options.

Much of the study area is characterized by commercial, industrial, and residential development. The Project Alignment is generally an approximately 200-foot-wide corridor starting at Target Field Station for the southern terminus traveling north along CR 81 and W Broadway Ave until the northern terminus just north of TH 610 in the City of Brooklyn Park. The southernmost portion of the Project Alignment, within the City of Minneapolis, had not been finalized during the field delineation season, so all possible alignments were investigated for potential wetland habitat. This area, from Target Field Station north to Lowry Ave, is completely developed, and wetlands were not present in any of the potential alignments.

The majority of the study area consists of road right-of-way; however, a variety of upland and wetland plant communities are also present. At the northern end of the Project limits, the study area includes grassed upland open space, forested uplands, and small wetland basins.

The site drains east to the Mississippi River through numerous tributaries, including Mattson Brook, Shingle Creek, and an unnamed ditch/creek that discharges into Shingle Creek. A tunneled portion of Bassett Creek is also present in the study area, but it does not appear to collect drainage from the Project Alignment and instead conveys water from farther west into the Mississippi River.

The wetland communities on site are described in more detail in the following sections.

The following sections describe wetland resources located in the study area. Figure A5-9 presents an overview of wetlands near the Project and Figure A5-10 through Figure A5-16 present detail of wetlands near specific LRT station areas.

Figure A5-9 Overview of Wetlands near the Project

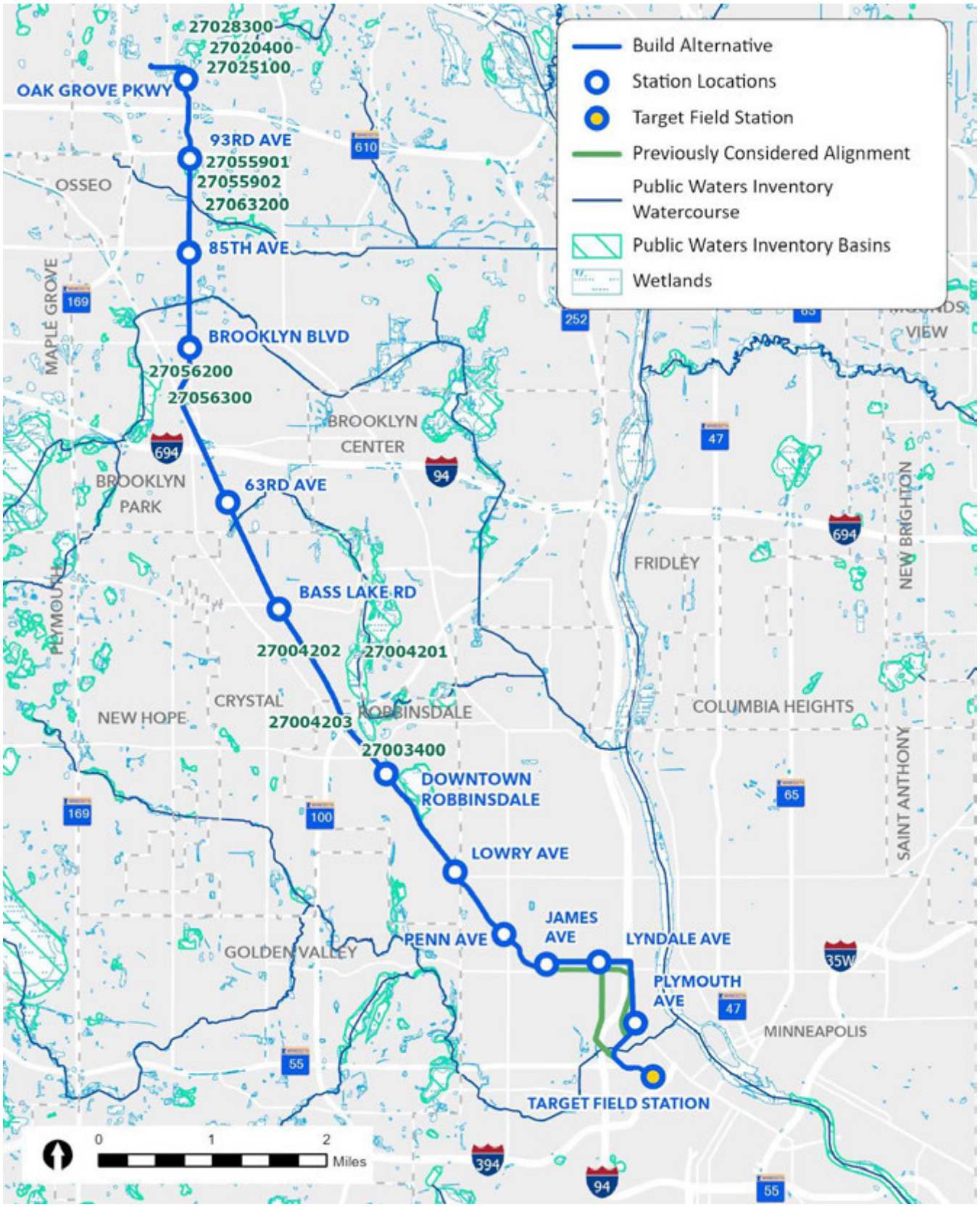


Figure A5-10 Detail of Wetlands near the Oak Grove Pkwy Station Area

Figure A5-11 Detail of Wetlands near the 85th and 93rd Ave N Station Areas

Figure A5-12 Detail of Wetlands near the Brooklyn Blvd Station Area

Figure A5-13 Detail of Wetlands near the 63rd Ave N Station Area

Figure A5-14 Detail of Wetlands near the Bass Lake Rd Station Area

Figure A5-15 Detail of Wetlands North of the Downtown Robbinsdale Station Area

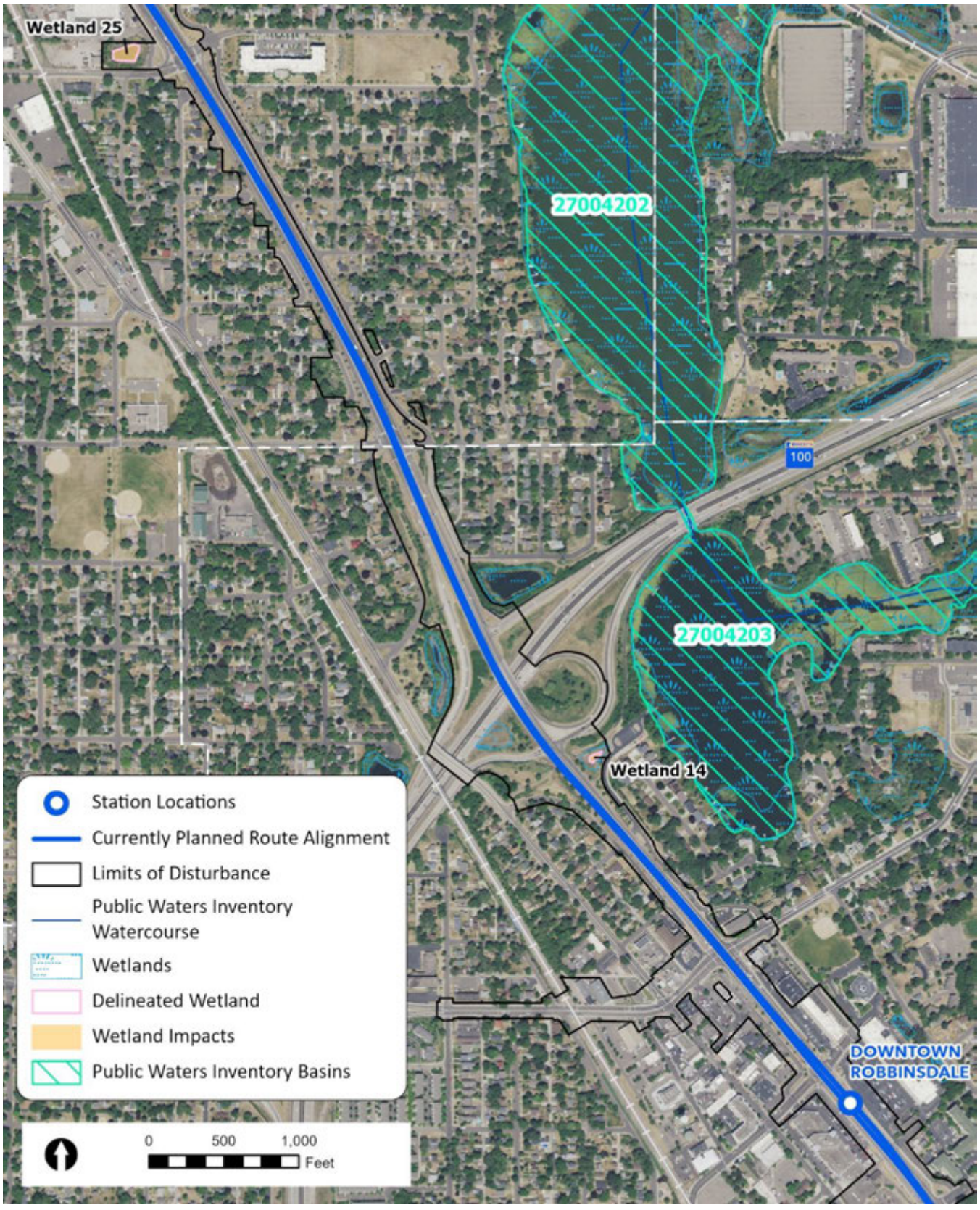
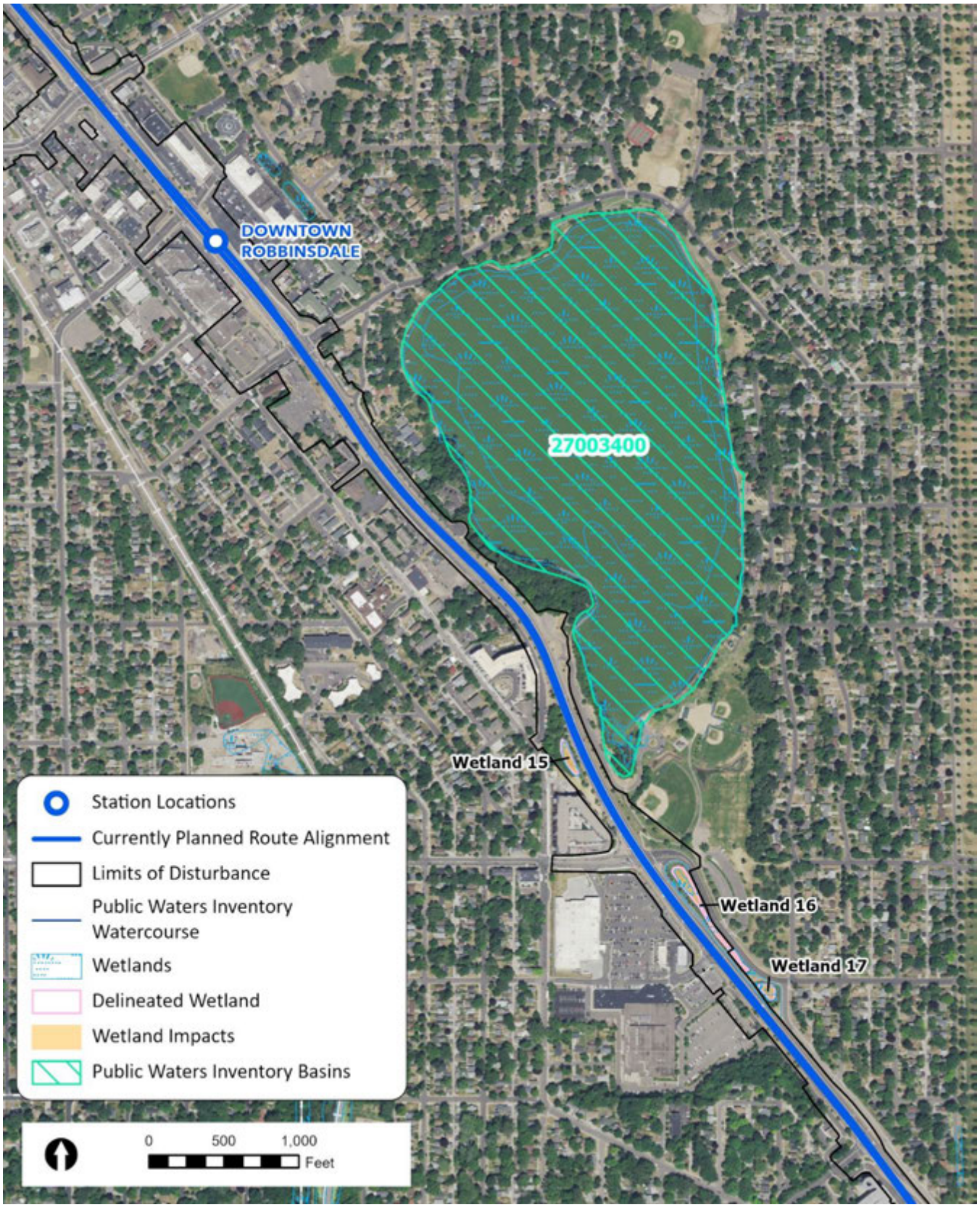


Figure A5-16 Detail of Wetlands near the Downtown Robbinsdale Station Area



5.3.2.1 Wetlands

A portion of the Project Alignment was delineated in 2015 (USACE Regulatory File 2017-03538_MMJ). The 2016 Alignment is no longer the Build Alternative and the prior delineation has expired; therefore, wetlands were delineated for the Project and associated facilities during late summer/early fall 2022.

An overview of wetland basins along the Project Alignment is provided in Figure A5-9 above.

For this analysis, delineated basins are divided into three categories: roadside ditches, natural basins, and stormwater ponds.

Wetland Delineation Results

Twenty-six wetland basins were identified, delineated, and classified (Figure A5-9 above). Table A5-8 provides the wetland results summary for all wetlands within the study area.

Table A5-8 Wetland Delineation Results[a]

Eggers and Reed Wetland Classification	Circular 39 Wetland Classification	Cowardin Wetland Classification	Natural Basins (acres) [a]	Roadside Ditches (acres) [a]	Stormwater Ponds (acres) [a]
Seasonally flooded basin	Type 1	PEM1A	0.16	0.07	3.83
Hardwood swamp	Type 1	PFO1A	0.11	--	--
Fresh (wet) meadow	Type 2	PEMB	0.45	--	--
Shallow marsh	Type 3	PEMC	0.86	0.55	3.04
Shallow open water	Type 5	PUBGx	--	0.18	2.22

[a] Acreage in the table includes areas of wetland within the area of investigation only. Wetlands may extend beyond the limits of the area investigated and actual wetland size may be larger than that indicated.

5.3.2.2 Waterways and Public Waters

Four stream crossings are located within the study area. Shingle Creek, Mattson Brook, and the unnamed creek near the airport are crossings classified as DNR public watercourses. Bassett Creek is also a public watercourse, except where it becomes a tunneled section directly underneath the Project Alignment, where it is not regulated.

In addition to the above watercourses, the Project intersects, or is directly adjacent to, several PWs and PWWs. A total of two basins are located within the Project LOD and three are adjacent to the Project Alignment.

Table A5-9 summarizes the aquatic resources that are in (or directly adjacent) the study area that are designated as DNR public waters.

Table A5-9 Public Water Summary

Public Waters ID	Size[a]	Notes	Project City
27-559 W (unnamed PWW)	0.70 acre	Two features are associated with this PWW basin on either side of W Broadway Ave. Both are completely outside the study area.	Brooklyn Park
119039 (Mattson Brook)	615 linear feet	Is a tunneled section within study area.	Brooklyn Park
84663 (Shingle Creek)	234 linear feet	Flows east under the roadway through culvert.	Brooklyn Park
101730 (unnamed creek)	139 linear feet	Flows east under the roadway through culvert.	Brooklyn Park
27-42 P (Twin Lake)	0	Two features are associated with this PW basin on the eastern side of CR 81. Both are completely outside the study area.	Brooklyn Park
27-34 P (Crystal Lake)	0	Flows east under the roadway through culvert.	Robbinsdale
(Bassett Creek)	261 linear feet or 292 linear feet	Length dependent on which alignment and design option is selected in the City of Minneapolis.	Robbinsdale

Source: DNR Public Waters Database (2014).
[a] Size includes areas of aquatic resources in the area of investigation only. They may extend beyond the limits of the area investigated.

5.3.3 Environmental Consequences

This section identifies the long- and short-term impacts to wetlands and other aquatic resources from the No-Build Alternative and Project alignment and design options.

5.3.3.1 Operating-Phase (Long-Term) Impacts

Long-term impacts result from the long-term operational activities of the Project following completion of construction. The following sections identify potential impacts to wetland resources and discuss their significance.

No-Build Alternative

The No-Build Alternative would have no long-term impacts to wetlands or other aquatic resources.

Project Alignment and Design Options

The expected wetland impacts of the Project are summarized in Table A5-10 by wetland type. The table describes total permanent and temporary impacts to wetlands, as well as impacts that are under the jurisdiction of USACE and WCA. Impact areas are shown in Figure A5-9 above.

Standard erosion-control BMPs would be used for work within adjacent wetland and aquatic resources where necessary, thereby minimizing impacts to the water bodies downslope and to aquatic wildlife.

Table A5-10 Impacts to Delineated Basins from the Project Alignment and Design Options by Wetland Type

Circular 39 Wetland Classification [a]	Eggers and Reed Wetland Classification [b]	Jurisdictional Impacts: USACE (Natural Basins and Ditches)	Jurisdictional Impacts: WCA (Natural Basins)	Not regulated Impacts (Stormwater Ponds[c])	Total Impacts
Type 1	Seasonally flooded basin	0.1949	0.1653	1.0324	1.2273
Type 1	Hardwood swamp	0.1092	0.1092	0.00	0.1092
Type 2	Fresh (wet) meadow	0.4524	0.4524	0.00	0.4524
Type 3	Shallow marsh	2.2026	1.6225	2.2013	4.4039
Type 5	Open water	0.1777	0.00	2.1989	2.3767
	Total	**3.1368**	**2.3494**	**5.4326**	**8.5694**

[a] Plant communities classified based on USFWS Circular 39.
[b] Plant communities classified based on *Wetland Plans and Plant Communities of Minnesota and Wisconsin* by Eggers and Reed (1997) (USACE St. Paul District).
[c] Stormwater ponds constructed in upland are not jurisdictional by the USACE or WCA.

OPERATION MAINTENANCE FACILITY

No wetland impacts are anticipated at the OMF location.

LRT STATIONS

Permanent wetland impacts are anticipated from the LRT station location at CR 81 at 63rd Ave N. These impacts would be to Wetland 10, which is classified as a Stormwater Pond, and is therefore not under the jurisdiction of WCA or USACE.

IMPACTS FROM PROJECT ALIGNMENT AND DESIGN OPTIONS

The Project alignment and design options follow the 2016 Alignment and the same features, except in the City of Minneapolis and at design option locations in the Cities of Crystal and Robbinsdale. No wetlands are located in the vicinity of any of the Project alignment and design options in the City of Minneapolis, and temporary impacts are not anticipated.

The Project alignment and design options in the Cities of Crystal, Robbinsdale, and Minneapolis are outside delineated wetlands; therefore, no impacts related to the construction operations are anticipated.

5.3.3.2 Construction-Phase (Short-Term) Impacts

Short-term impacts result from activities that would occur for a short period during installation and construction of the Project. No potential short-term wetland impacts are anticipated for the No-Build Alternative and Project alignment and design options.

5.3.4 Avoidance, Minimization, and/or Mitigation Measures

As discussed above, permanent impacts to wetland habitat are anticipated from the Project. Construction of the Project would require permits and replacement plan approval from the USACE St. Paul District for a Section 404 permit and a replacement plan approval under the WCA. A combined wetland permit application and replacement plan would be prepared for the Project and submitted upon completion of the Supplemental EIS process.

Complete avoidance of wetland impacts from the Project and associated facilities is not feasible; therefore, several measures to reduce wetland impacts from the Project and associated facilities have been incorporated into the design. Permitting coordination and future wetland sequencing efforts for wetland impacts will be identified in the Supplemental Final EIS. The Council considered the following measures to minimize wetland impacts in the study area:

- Operating-phase (long-term) impacts:
  - ***Reduce the LOD at LRT station location:*** CR 81 at 63rd Ave N. This station location causes additional impact to Wetland 10. If the LOD are reduced, impacts could be minimized.
  - ***Reduce the LOD at LRT station location:*** Oak Grove Pkwy. This station location causes additional impact to Wetlands 2 and 21. If the LOD are reduced, impacts could be minimized.
- Construction-phase (short-term) impacts:
  - ***BMPs for erosion control:*** Appropriate BMPs would be implemented to protect wetlands and other aquatic resources that are downslope of or downstream from areas disturbed because of earthmoving. Such BMPs could include silt fencing, silt curtains, erosion mats, and rapid revegetation of disturbed areas. The Council would continue to refine design elements to further reduce wetland impacts; final anticipated impacts will be disclosed in the Supplemental Final EIS.

5.3.4.1 Operating-Phase (Long-Term) Mitigation Measures

The Project requires coordination and permitting from local, State, and federal water resource agencies. The Project is being advanced through the NEPA/Section 404 permit merger process. This process integrates the USACE environmental review requirements associated with issuing Section 404 permits with FTA's environmental review process. Discussions with USACE indicate that the permit obtained by the Project in 2018 (based on the 2016 Project definition) can be amended to reflect the impacts and mitigation required for the updated Project design discussed in this Supplemental Draft EIS, and the subsequent Supplemental Final EIS.

Based on the USACE St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota,[10] the current replacement ratio for wetland credits in this area of Minnesota is 2.5 to 1 (mitigation to impacts), although, if mitigation is constructed prior to impacting wetlands (such as with wetland mitigation banks) and is of the same type as the impacted wetlands, the ratio is typically reduced to 2.0 to 1.

Potential mitigation activities include the purchase of wetland mitigation bank credits from established and approved wetland bank accounts in accordance with the applicable USACE, WCA, and LGU siting priority requirements prior to construction of the Project. The Project Alignment is entirely within the seven-county metro area, Major Watershed 20 (Mississippi River—Twin Cities), and Bank Service Area 7. Therefore, this would involve seeking purchases of private wetland mitigation credits within the seven-county metro area, Bank Service Area 7, and Major Watershed 20. This could also involve the search for suitable private wetland credits to adjacent Bank Service Areas and major watersheds if needed, though a mitigation ratio higher than 2 to 1 will typically apply in that case.

5.3.4.2 Construction-Phase (Short-Term) Mitigation Measures

While no short-term impacts are anticipated during this Project, should temporary impacts be encountered, they would follow the State and federal guidelines for temporary wetland impacts.

Wetland areas affected on a temporary basis during construction should be restored to their existing grade and hydrology (to existing conditions when applicable) and reseeded with an appropriate native wetland species seed mix, as required by the WCA and CWA. The restoration details associated with each short-term wetland impact should be identified in the WCA and CWA permit applications. Consultation with USACE may be required to determine whether purchase of wetland mitigation bank credits for CWA-regulated wetlands would be required for temporary impacts lasting longer than 180 days.

5.4 Geology, Soils, and Topography

This section describes the existing geology, soils, and topography in the study area and the short-term impacts on geology, soils, and topography from constructing the Project.

5.4.1 Regulatory Context and Methodology

In Minnesota, geologic resources are rarely regulated, with the exceptions of groundwater dewatering and mining activities. A permit from DNR is required to dewater in excess of 1 million gallons per year or 10,000 gallons per day.

The discharge from dewatering is regulated under the NPDES permit that is required for construction activities. If the water is contaminated, an individual NPDES permit must be obtained from MPCA, or the groundwater can be discharged to the sanitary sewer system if approved by MCES.

The geologic resources listed in this section are not isolated and can affect or be affected by other water resources discussed in Section 5.9.

The Council consulted the Geologic Atlas of Hennepin County[11] and the Minnesota Geospatial Commons for information regarding surface geology, bedrock geology, and groundwater resources.

5.4.2 Study Area and Affected Environment

The study area for geology, soils, and topography is defined as the area within and adjacent to the LOD of the Project. The following sections describe the geology, soils, and topography that are within and adjacent to the LOD of the Project Alignment.

5.4.2.1 Geology

The unconsolidated sediments in the study area were deposited primarily by glacial ice and meltwater during the last glaciation (Wisconsinan Stage). Sediments along most of the study area can be attributed to the advancement and retreat of the Superior lobe, the Grantsburg sublobe of the Des Moines lobe, and meltwater from these lobes. The underlying sandstone and carbonate bedrock are deeply cut with a branched network of valleys carved out by meltwater streams that drain toward master streams, such as the modern-day Mississippi River. Middle- and upper-terrace deposits of sand, gravelly sand, and loamy sand dominate much of the study area. Small areas of sandy to loamy till from the Des Moines lobe and Grantsburg sublobe are also present.

Lakes and wetlands throughout the region formed in low-lying areas created by the presence of underlying bedrock valleys or because of ice block melting as the glaciers were breaking up and retreating.

Karst features such as springs, caverns, and sinkholes are typically found in areas where carbonate bedrock is overlain by a thin cover of glacial material. Areas designated as active karst (less than 50 feet of soil/sediment covering bedrock) have been mapped along the Project Alignment between the Lowry Ave Station and W Broadway

Ave Business District Station area, and at Target Field Station (Figure A5-17). No field-verified karst features have been mapped in the study area, but two springs are located approximately 1.25 miles southeast of Target Field Station, and approximately 1.5 miles southwest of the Plymouth Ave Station on Lyndale Ave N.

The Hennepin County Bedrock Collapse Hazard Project[12] is a 2-year study that the Hennepin County Emergency Management division contracted Freshwater and Midwest Geological Consultants to identify where bedrock collapse could lead to sinkholes within the county. Bedrock collapse is a natural hazard in Hennepin County that occurs most commonly in the form of sinkholes. Sinkholes are a result of natural or human undermining of unconsolidated sediment that overlies bedrock. The Atlas identified three areas of concern for bedrock collapse within the county based on historical geologic assessments, well records, sewer records, and reports from the public. The areas of concern included the Channel Rock Disturbed Area along West River Rd from Lake St to Minnehaha Park (4 miles south of the study area), Dickman Park (1 mile northeast of the study area), and the Minneapolis-St. Paul International Airport (6.5 miles southeast of the study area). No known sinkholes are located within the study area.

5.4.2.2 Soils

Soil types vary in the study area. Soil data were obtained from the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey online map.[13]

The majority of the study area, located on previously developed land, includes soils that have been highly disturbed. The major soil types within the LOD for the Project are identified in Table A5-11.

Table A5-11 Major Soil Types within the LOD for the Project

Soil Type	Individual Soil Complexes	Details
Poorly drained to excessively drained soils	■ Anoka and Zimmerman loam ■ Verndale sandy loam ■ Forada sandy loam ■ Duelm loamy sand ■ Isan-Isan loam sand ■ Southhaven loam ■ Soderville loamy fine sand ■ Hubbard loamy sand ■ Hamel, overwash-hamel complex	Loam, sandy loams, loamy sands, and loamy fine sands. Poorly drained soils are associated with the wetlands and floodplain areas in the study area.
Somewhat poorly drained to excessively drained soils	■ Urban Land: Duelm complex ■ Urban Land: Dorset complex ■ Urban Land: Hubbard complex, Mississippi River Valley ■ Urban Land: Lester complex ■ Urban Land: Moon complex ■ Urban Land: Dundas complex ■ Urban Land: Udipsamments, cut and fill, complex ■ Urban Land: Udorthents, cut and fill land, complex ■ Urban Land: Udorthents, wet substratum, complex	Soils that are considered highly disturbed by human activity.

Soil Type	Individual Soil Complexes	Details
Poorly drained soils	■ Udorthents, wet substratum ■ Udorthents, cut and fill land	Soils located in filled areas that were previously marshes, stream terraces, or moraines.
Very poorly drained soils	■ Seelyeville and Markey soils, depressional	Soils located in depressions on stream terraces.

Certain areas in the study area contained soils, referenced herein as “poor soils,” that are rated as having low strength and high compressibility potential. These soils are susceptible to large, non-uniform settlement when moisture is present, and vary based on rock fragment content, organic matter content, soil texture, and existing bulk density.[14] Such soils are often described as peats, mucks, organic clays, soft clays, and swamp deposits. The largest area of poor soils identified in the study area is concentrated at the location of the Oak Grove Pkwy Station (Figure A5-18).

Figure A5-17 Active Karst Areas

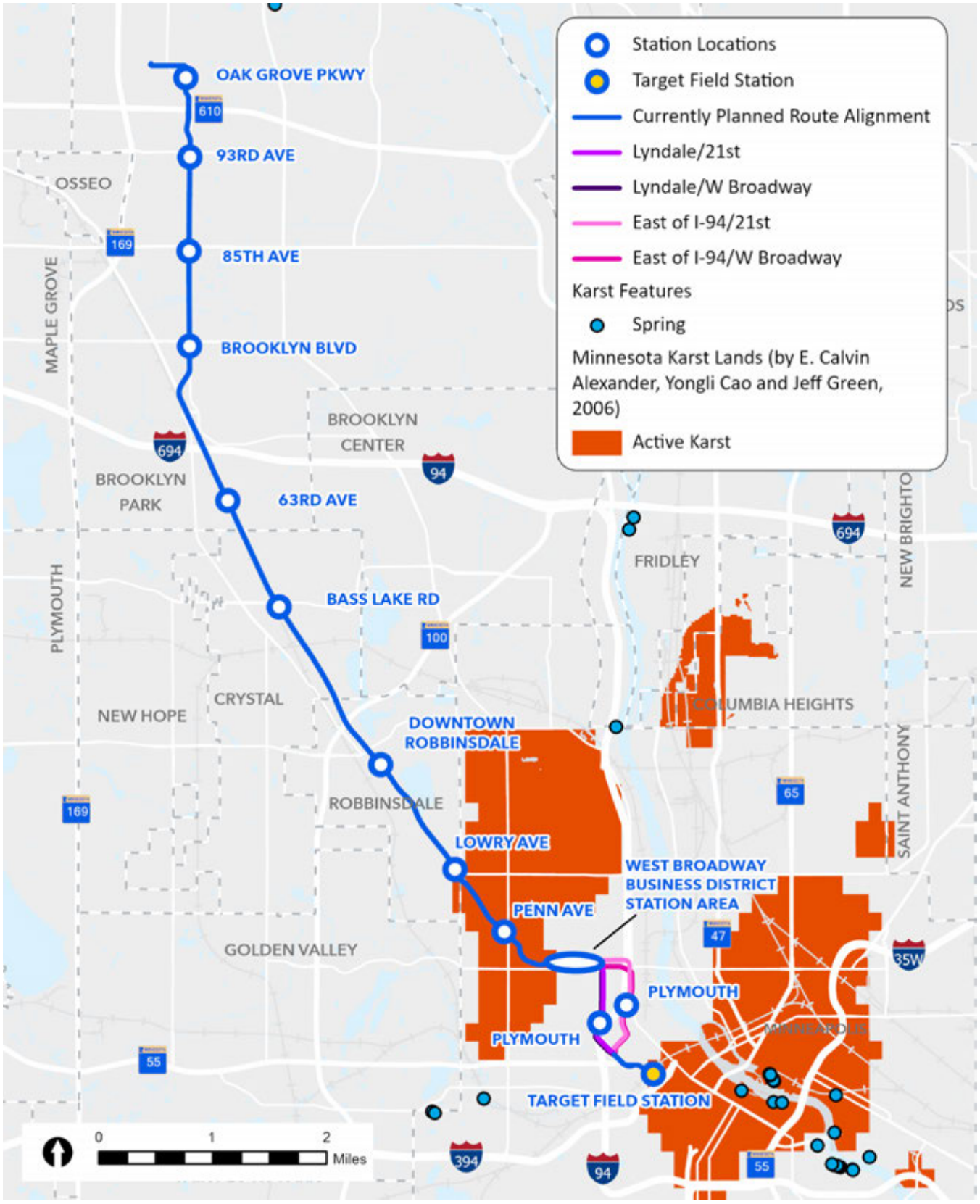
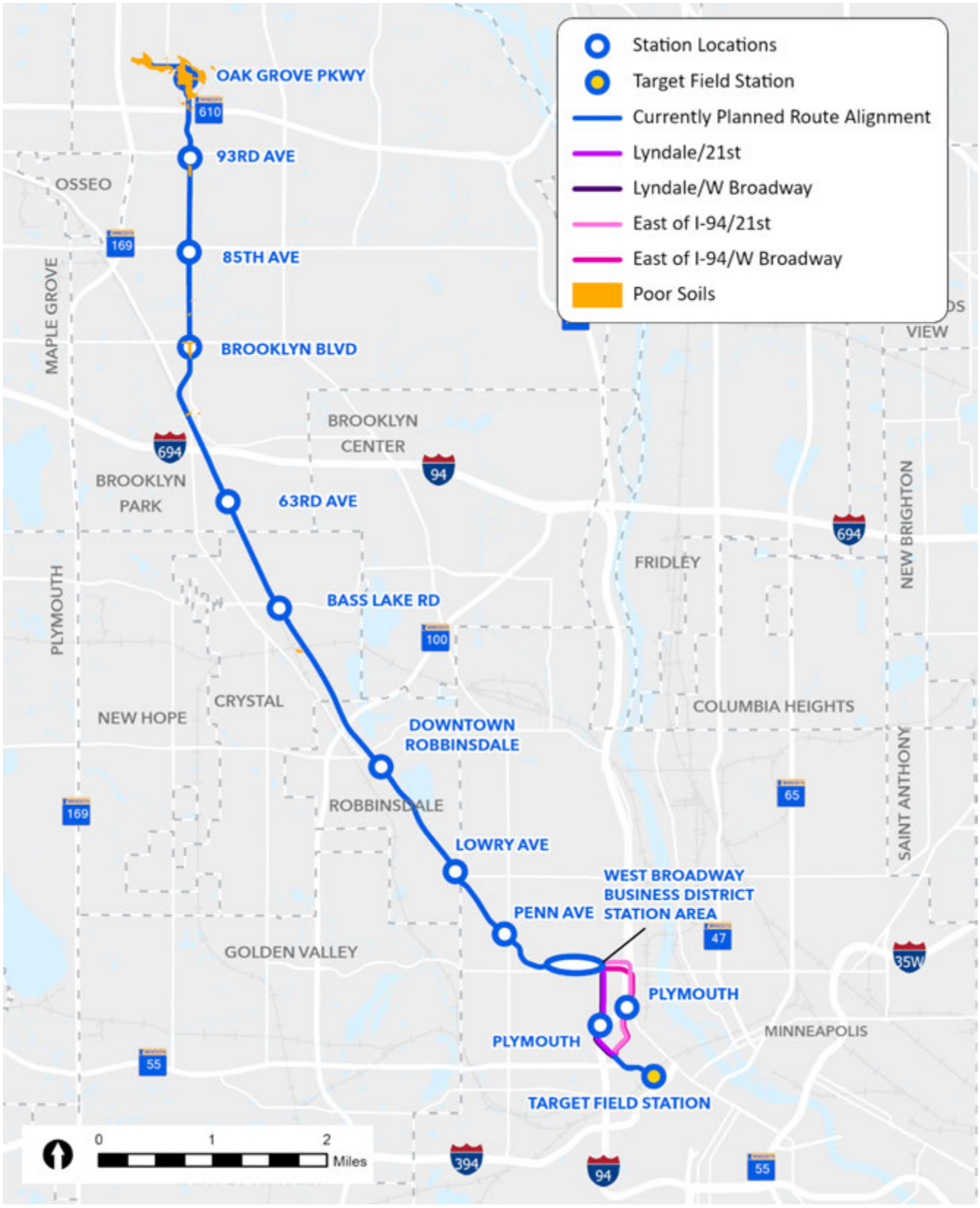


Figure A5-18 Poor Soils Near the Project



Source: University of Minnesota, Department of Geology and Geophysics; DNR Ecological and Water Resources Division.

5.4.2.3 Topography

The general topography of the study area consists of gently rolling hills. Land surface elevation ranges from 806 to 944 feet amsl throughout the study area based on light detection and ranging (LiDAR) data (a remote sensing method that uses light in the form of a pulsed laser to measure variable distances to the Earth) received from DNR (2019). The general grade along the Project Alignment decreases to the north. Low-lying areas in the study area, relative to the surrounding land, were noted in the vicinity of wetlands, water bodies, and natural areas that abut the Project Alignment in the City of Robbinsdale.

5.4.3 Environmental Consequences

This section identifies the long- and short-term impacts to geology, soils, and topography from the No-Build Alternative and Project alignment and design options.

5.4.3.1 Operating-Phase (Long-Term) Impacts

Long-term impacts under the No-Build Alternative and Project alignment and design options are discussed below.

No-Build Alternative

The No-Build Alternative would have no long-term impacts to geology, soils, or topography.

Project Alignment and Design Options

Impacts from the Project to geology and soils would occur solely during construction; therefore, no long-term impacts are anticipated from the Project.

5.4.3.2 Construction-Phase (Short-Term) Impacts

Construction-phase impacts result from activities that would occur for a short period at the same time as the installation and construction of the Project. Short-term impacts from the No-Build Alternative and Project alignment and design options are discussed below.

No-Build Alternative

The No-Build Alternative would have no short-term impacts to geology, soils, or topography.

Project Alignment and Design Options

No geologic features or hazards were identified in the study area; however, a portion of the Project is located in an area identified as active karst. Two springs were mapped within 1.5 miles of the study area. Though no karst features have been field-verified along the Project Alignment, the southern end of the study area has a high probability for karst, as shown in Figure A5-17. The design and operation of Project infrastructure could be affected if subsurface features are encountered during construction. The presence of karst could also exacerbate the spread of contamination if spills or releases of hazardous materials were to occur in this area. Details regarding releases of hazardous materials in karst areas are discussed further in Section 5.5.5.

Individual locations of limited dewatering for utility construction or similar short-duration installations may occur; however, there are no planned areas of large-scale, long-duration dewatering.

Areas of poor soils would complicate the design and construction phases of the Project. Poor soils in the study area could allow non-uniform settlement of built infrastructure if the soils are not adequately accommodated for in the design phase. The most concentrated area of poor soils is at the location of the Oak Grove Pkwy Station.

Because the majority of the Project would follow existing freight tracks or roads at similar elevations, substantial grading is not needed to work around steep slopes or other topographic extremes. Short-term dewatering would be needed for open-trench subsurface work in areas of high groundwater, but specific needs would be better defined as the final engineering design advances.

IMPACTS FROM PROJECT ALIGNMENT AND DESIGN OPTIONS

Project alignment and design options include four alignment options in the City of Minneapolis and several design options in the Cities of Crystal, Robbinsdale, and Minneapolis (e.g., LRT station locations, roadway configurations, associated park-and-ride locations).

Impacts to geology and topography from the Project alignment and design options are not anticipated during the construction phase because no geologic features or hazards were identified in the study area, and most of the Project follows existing transitways that exist at similar elevations and avoid topographic extremes.

Impacts to soils would be related to grading activities during construction of the Build Alternative and LRT station locations, interchanges/at-grade intersections, and park-and-ride locations for the design options.

5.4.4 Avoidance, Minimization, and/or Mitigation Measures

This section describes potential measures that the Council may implement to mitigate the Project's long- and short-term geology, soils, and topography impacts.

5.4.4.1 Operating-Phase (Long-Term) Mitigation Measures

No mitigation measures are warranted for long-term impacts to geology or soils because the effectiveness of identified avoidance measures and BMPs would prevent any adverse impacts.

5.4.4.2 Construction-Phase (Short-Term) Mitigation Measures

All Project-related construction activity would adhere to the appropriate standards and applicable permitting requirements of MPCA, MnDOT, and Hennepin County for grading and erosion control. Dewatering permits, if required, would be obtained from DNR. See Section 5.5.5 for mitigation of the increased risk to groundwater resources from spills in karst areas.

For areas of poor soils, the Project design would incorporate typical geotechnical elements to provide a stable base for Project components (for example, track and station platforms) and to avoid differential settlement of soils. Typical geotechnical design elements include over-excavation and replacement with compacted fill, use of lightweight fill, and in more extreme cases the implementation of load transfer platforms.

5.5 Hazardous-Materials Contamination

This section describes the properties in the study area that potentially contain hazardous or regulated materials and describes the potential to identify potential soil, groundwater, soil vapor, or debris-impacted sites along the Project Alignment.

5.5.1 Regulatory Context and Methodology

MPCA oversees regulations pertaining to contaminated soil, groundwater, and waste cleanup plan approvals; petroleum UST registration and removal; and NPDES permitting. MDH regulates asbestos abatement. Activities that encounter contaminated materials must follow State requirements for safe handling and disposal under the purview of MPCA and MDH.

No single comprehensive source of information is available that identifies known or potential sources of environmental contamination. Therefore, to identify and evaluate properties that potentially contain hazardous or regulated materials (such as petroleum products) or other sources of contamination, a Modified Phase I ESA was prepared in conformance with the EPA All Appropriate Inquiries rule and ASTM E1527-21, as modified by MnDOT OES guidelines for transportation projects. It was not within the scope of the Phase I ESA to evaluate the level of contamination or confirm contamination.

This analysis is based on information in the Modified Phase I ESA conducted by the Council to identify—to the extent feasible pursuant to the processes described in ASTM E1527-21 and in a manner consistent with good commercial or customary practice—Recognized Environmental Conditions, Historical Recognized Environmental Conditions, and Controlled Recognized Environmental Conditions in connection with the Project alignment and design option locations. A *Modified Phase I Environmental Site Assessment, METRO Blue Line Extension*, is prepared by SEH (I) (March 2023) and *Updated Modified Phase I Environmental Site Assessment, METRO Blue Line Extension*, is prepared by Braun Intertec (December 2023).

A Modified Phase I ESA is an accepted industry practice for transportation projects and consists of the following key components for evaluating properties for the likelihood of contamination: (1) site reconnaissance, (2) records review, (3) historical review, and (4) interviews with representatives from local government. The Modified Phase I ESA is a qualitative review that evaluates the risk of encountering contamination during construction based on the key components listed above for properties along the Project alignment and design option locations. It does not measure the severity of any potential hazardous materials found on site.

The risk ranking categories used to evaluate potentially contaminated properties are listed in Table A5-12 below. The summary ranking list is not inclusive of every property use. Site rankings may be adjusted based on evidence collected and professional judgment. All sites within the study area were evaluated and received a ranking of “high,” “medium,” or “low” for environmental risk. Properties that do not qualify as high, medium, or low ranked sites are considered unlikely for contamination and ranked “*de minimis*.”

These rankings are based solely on the sites’ potential for contamination and not on the sites’ proximity to the Project construction limits.

Table A5-12 Risk Ranking Categories

Environmental Risk Ranking Category	Description
High	All active and inactive Voluntary Investigation and Cleanup sites, all active and inactive Minnesota Environmental Response and Liability Act/Superfund sites, all active and inactive dump sites, all active leak sites, all dry cleaners (with on-site or unknown chemical processing), all bulk chemical/petroleum facilities, all active agricultural release sites, railroad facilities (fueling, yards, or maintenance), clandestine chemical/drug laboratories, all historical industrial sites with likely chemical use (printing, photography, blacksmithing, plating, dentistry) on the premises, and perfluorocarbon potential source areas.
Medium	All closed leak sites, all sites with USTs or aboveground storage tanks, machine shops, all sites with historical vehicle repair activities, all bulk grain/feed storage, all historical lumber yards, all closed agricultural release sites, historical USTs in roadway, graveyards, and all sites with detections of non-petroleum chemicals. A site-specific data sheet was not prepared for medium-risk sites with a small spill or a small spill and hazardous-waste generator as the ranking rationale per the Project scope. Additionally, small, closed leaks on residential sites or leaks identified outside of the study area were not fully summarized (per the Project scope) because of the low potential impact to Project Alignment and future construction.
Low	Hazardous-waste generators; railroad lines; current lumber yards; golf courses; and possibly some farmsteads, residences, or commercial properties with poor housekeeping practices.

Source: *Modified Phase I Environmental Site Assessment, METRO Blue Line Extension,* prepared by SEH (March 2023). MnDOT modifications to the ASTM 1527-21 Phase I ESA standard for transportation corridors include these risk ranking categories, and the modifications have been accepted by MPCA for its regulatory programs that apply to contaminated and regulated materials management.

5.5.2 Study Area

The study area for hazardous materials contamination includes potentially contaminated properties or regulated material facilities within 500 feet of the Project Alignment and the OMF but is expanded to 550 feet in the City of Minneapolis. The analysis was organized by the city boundaries for the Cities of Brooklyn Park, Crystal, Robbinsdale, and Minneapolis.

5.5.3 Affected Environment

Potentially contaminated properties are often found in previously developed industrial and commercial areas. These types of land uses are common throughout the study area, increasing the potential to encounter contaminated soils, groundwater, and materials based on prior use and development along the Project alignment and design options.

The Project alignment and design option between downtown city (Cities of Brooklyn Park, Crystal, Robbinsdale, and Minneapolis) centers are primarily residential with some interspersed light commercial districts featuring filling stations, offices, grocery stores, churches, city parks, and restaurants. A total of 335 to 396 properties depending upon the Project alignment and design options in the study area have a potential for contamination based on the ranking criteria in Section 5.5.1. The sites are identified in the Modified Phase I ESA prepared in March and December 2023 and as shown in Figure A5-19, and in greater detail in Figure A5-20 through Figure A5-23. Table A5-13 summarizes known hazardous/regulated materials sites identified in the study area, as documented in the Modified Phase I ESA for the Project alignment and design options (see Appendix A-5).

Table A5-13 Number of Recorded Properties with Potential Contamination for Project Alignment and Design Options (Cities of Brooklyn Park, Crystal, Robbinsdale, and Minneapolis)

City	Properties with Low Potential for Contamination	Properties with Medium Potential for Contamination	Properties with High Potential for Contamination	Total
Lyndale Ave N on N 21st Ave	53	211	102	366
Lyndale Ave N on W Broadway Ave	53	210	104	367
East of I-94 on 21st Ave N	53	229	138	420
East of I-94 on W Broadway Ave	53	224	140	417

Source: *Modified Phase I Environmental Site Assessment, METRO Blue Line Extension,* prepared by SEH (March 2023) and *Modified Phase I Environmental Site Assessment*, *METRO Blue Line Extension (BLE)*, prepared by Braun Intertec (December 2023) for the City of Minneapolis.

Note: If a site is located in two municipalities, it is only counted one time and is represented by the municipality that hosts the largest percentage of the site.

The known hazardous/regulated materials sites located within the study area for the City of Minneapolis Project alignment and design options are summarized below in Table A5-14.

Table A5-14 Number of Recorded Properties with Potential Contamination in City of Minneapolis Project Alignment and Design Options

Project Alignment and Design Options	Properties with Low Potential for Contamination	Properties with Medium Potential for Contamination	Properties with High Potential for Contamination	Total
Lyndale Ave N on N 21st Ave	21	105	59	185
Lyndale Ave N on W Broadway Ave	21	104	61	186
East of I-94 on 21st Ave N	21	123	95	239
East of I-94 on W Broadway Ave	21	118	97	236

Source: *Modified Phase I Environmental Site Assessment, METRO Blue Line Extension,* prepared by I (March 2023) and *Modified Phase I Environmental Site Assessment*, *METRO Blue Line Extension (BLE)*, prepared by Braun Intertec (December 2023) for the City of Minneapolis.

Figure A5-19 Contamination Risk Along the Project Alignment

Figure A5-20 Contamination Risk Along the Project Alignment in the City of Brooklyn Park

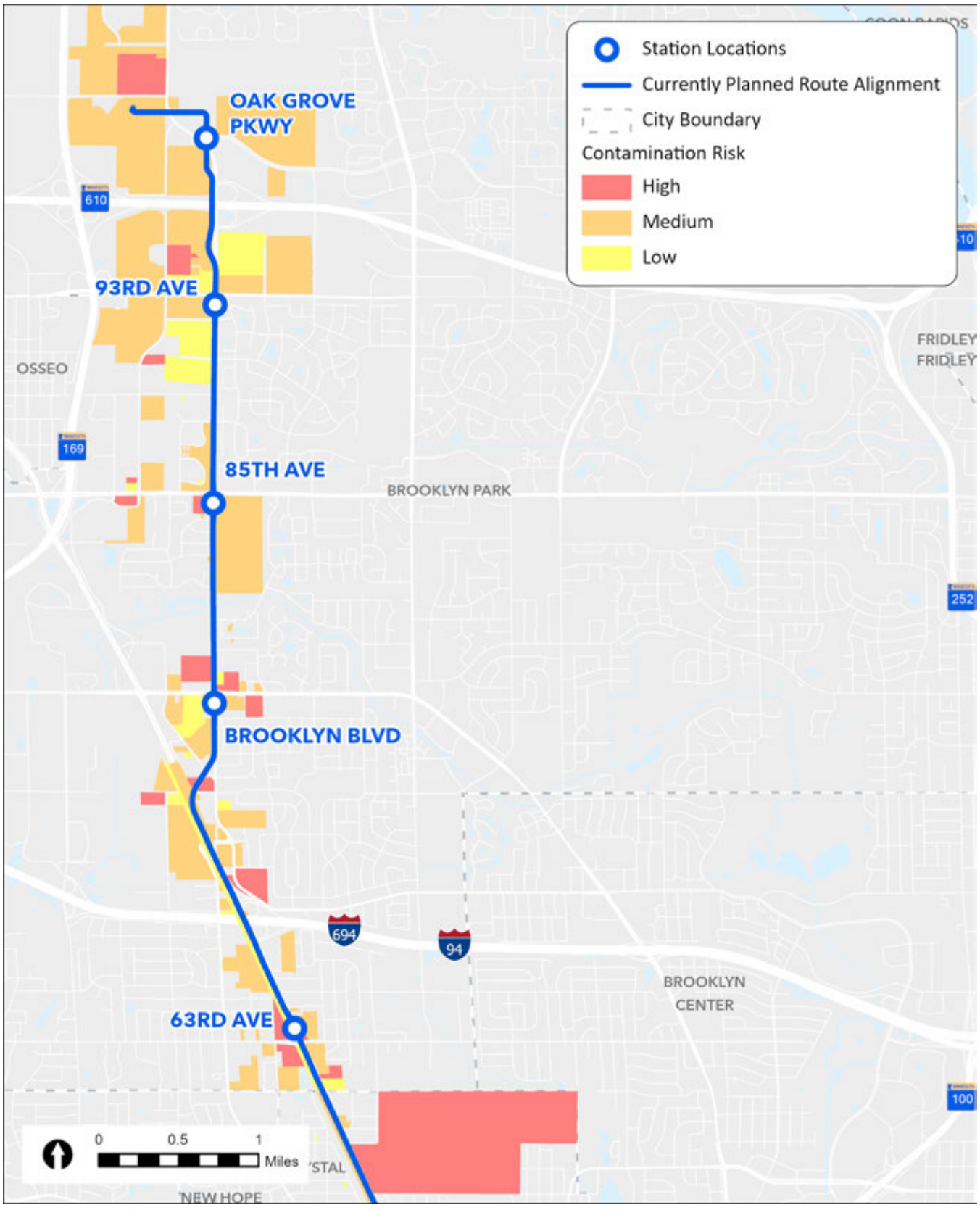


Figure A5-21 Contamination Risk Along the Project Alignment in the City of Crystal

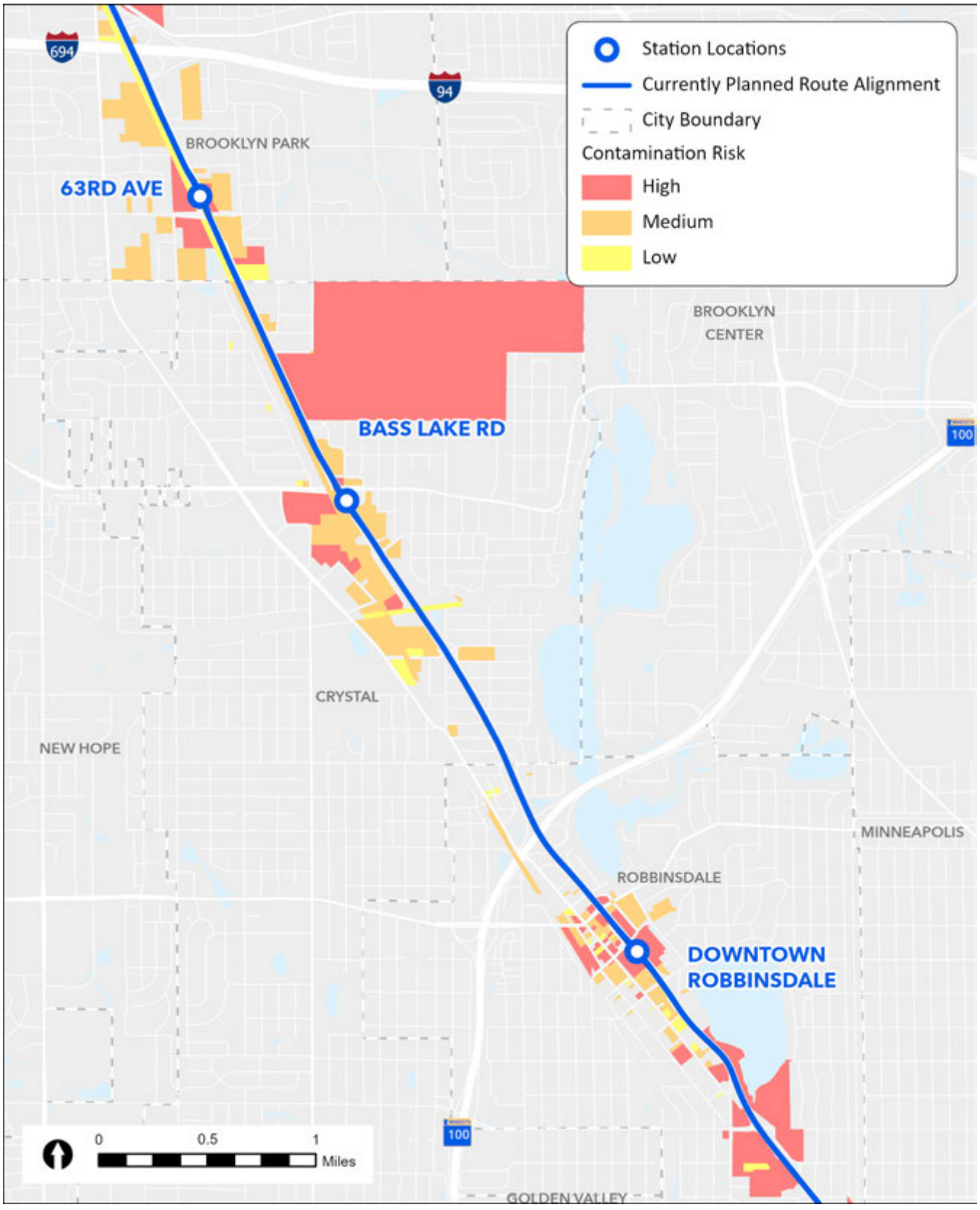
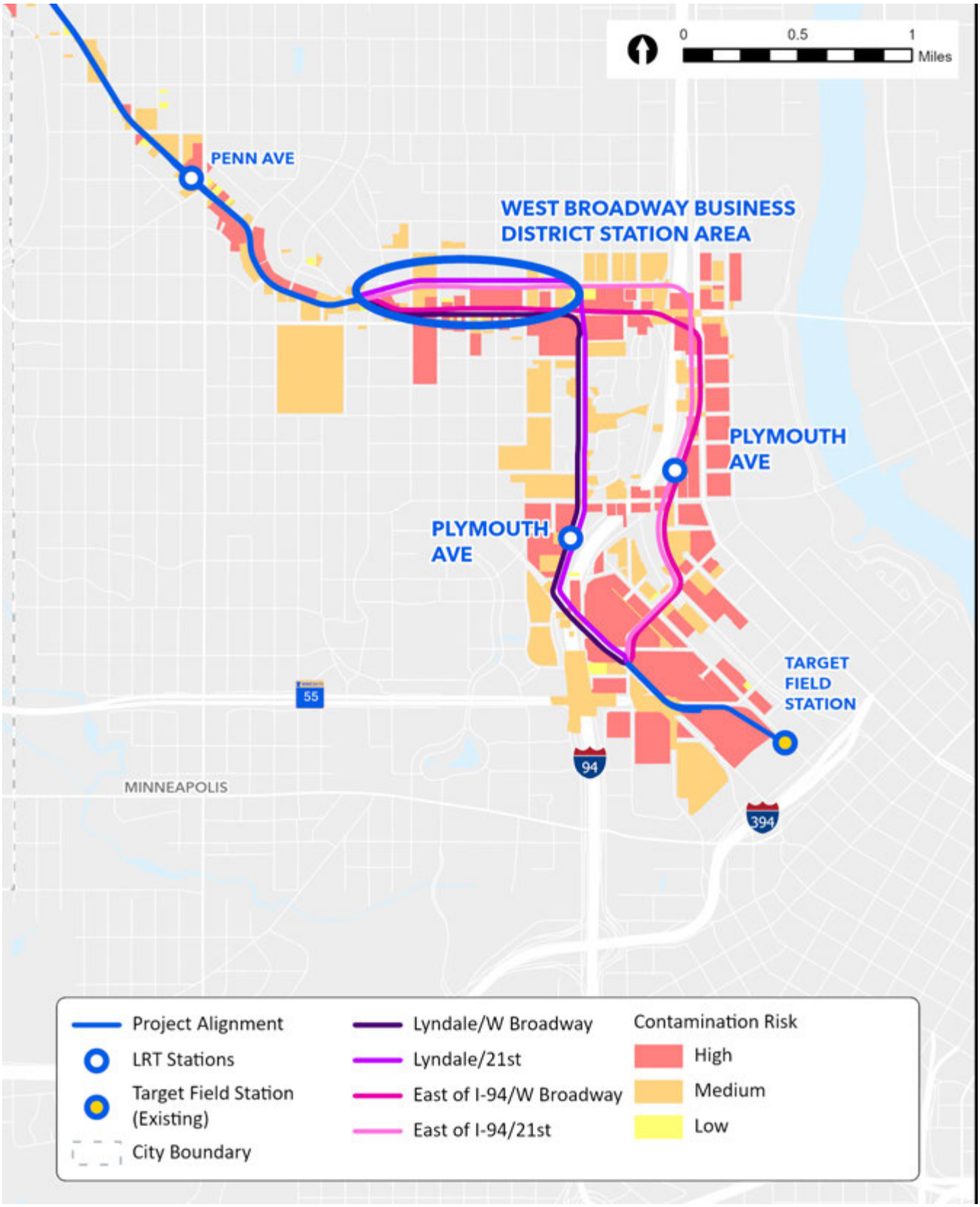


Figure A5-22 Contamination Risk Along the Project Alignment in the City of Robbinsdale

Figure A5-23 Contamination Risk Along the Project Alignment in the City of Minneapolis



5.5.4 Environmental Consequences

This section addresses long- and short-term impacts to hazardous materials contamination from the No-Build Alternative and Project alignment and design options.

5.5.4.1 Operating-Phase (Long-Term) Impacts

Long-term hazardous- and contaminated-material impacts are not expected because the Project would not generate hazardous and contaminated materials or regulated wastes.

No-Build Alternative

There is no likelihood of encountering contamination from hazardous or regulated materials in the No-Build Alternative.

Project Alignment and Design Options

No hazardous or regulated materials would be produced by the Project during operation. No permanent storage tanks would be installed for this Project. Oils, grease, and other waste materials generated during vehicle maintenance and repair activities would be collected and disposed of in accordance with recognized industry BMPs for rail transit maintenance facilities.

Acquiring land that is contaminated or contains hazardous or regulated material creates risk in the form of costs and potential liability to the Project and Project sponsors. The extent of that risk would be based on the type and extent of the contamination. Therefore, acquiring land with known contamination that cannot be easily remediated or contained would be avoided to the extent possible. Avoidance would be determined after the Phase II ESA to identify contamination as the engineering design advances. The long-term risk to the Project would be determined once remediation is completed in areas of known and encountered contamination during construction.

The long-term operation of the OMF would require responsible management and containment of hazardous materials that are used and stored on site, consistent with applicable regulatory standards (principally Minnesota Rules, Chapter 7045).

5.5.4.2 Construction-Phase (Short-Term) Impacts

This section addresses short-term impacts to hazardous- and contaminated-materials contamination from the No-Build Alternative and Project alignment and design options.

No-Build Alternative

There is no likelihood of encountering contaminated or regulated materials in the No-Build Alternative. Therefore, no positive or negative impacts are expected.

Project Alignment and Design Options

The Modified Phase I ESA identified between 335 and 396 properties depending upon the Project alignment and design options in the study area that have a potential for contamination based on the ranking criteria in Section 5.5.1. Construction activities involving subsurface disturbance can spread or release existing contamination

that is present along the Project Alignment. Encountering unknown contaminated materials can also pose a threat to human health and the environment.

Refer to Table A5-14 for a summary of high-potential, medium-potential, and low-potential properties were identified in the study area for the Project alignment and design options in the City of Minneapolis. The Project alignment and design options with the greatest number of properties with high potential for contamination are located in the Project alignment options east of I-94. The City of Minneapolis has been developed since the 1880s, which is at least 50 years prior to the development in other segments.

Any high- and medium-risk properties identified in the Modified Phase I ESA have greater-known risk of existing contamination. Potential construction-phase impacts may include time and expense of identifying, testing, and removing the contaminated materials found within the LOD. The Council would use the results of the Modified Phase I ESA to plan the next phase of investigation, known as a Phase II ESA, which is a subsurface investigation wherein soil and groundwater samples are collected and analyzed by a certified laboratory. This subsurface investigation provides a quantitative measurement of existing contamination in areas of proposed ground disturbance in and near identified high- and medium-risk properties. The results of the Phase II ESA identify areas of contamination above regulatory standards that could require special handling and/or disposal during construction. Health and safety considerations might also need to be addressed in areas that exceed published levels of acceptable exposure for construction workers.

5.5.5 Avoidance, Minimization, and/or Mitigation Measures

Based on the results of Phase II ESA drilling investigations, a CCP may be developed as part of a RAP for properly handling, treating, storing, and disposing of solid wastes, hazardous materials, petroleum products, and other regulated materials/wastes that are used or generated during construction and if previously unknown hazardous materials are discovered during construction.

5.5.5.1 Operating-Phase (Long-Term) Mitigation Measures

Effective avoidance measures would prevent adverse impacts and would be evaluated after the Phase II ESA is finalized during the development of the Supplemental Final EIS.

5.5.5.2 Construction-Phase (Short-Term) Mitigation Measures

As the Project advances, it would be further refined to avoid disturbance to properties with known contaminants, as possible. The MPCA Brownfield Program is a fee-for-service program that provides technical assistance and issues liability-assurance letters to promote the investigation, cleanup, and redevelopment of property that is contaminated with petroleum and hazardous substances. The Council would update its enrollment of the Project in the MPCA Brownfield Program to reflect the Project Alignment. In cases where the disturbance of hazardous and contaminated material cannot be avoided, the Council would conduct site remediation in accordance with the MPCA Brownfield Program regulatory framework and the approved RAPs for the Project.

A Spill Prevention, Control, and Countermeasures Plan may be prepared by the construction contractor for MPCA's approval. This plan would establish protocols to minimize impacts to soils and groundwater if a release of hazardous substances were to occur during construction. In addition to contaminated soil and groundwater, the potential exists for structures on acquired land to contain asbestos, lead paint, or other hazardous materials.

Any existing structures on acquired land would be surveyed for the presence of hazardous/regulated materials prior to their demolition or modification. Potentially hazardous materials would be handled and managed in compliance with all applicable regulatory standards and would be disposed of in accordance with all Hazardous Materials Abatement Plans for in-place hazardous/regulated materials, and the RAP/CCP for hazardous/regulated materials in the site soils.

A Phase II ESA report is anticipated to be completed in March 2024 and a RAP/CCP is anticipated to be completed in June 2024 to address subsurface disturbance within areas identified as higher risk in the Modified Phase I ESA, after the publication of the Supplemental Draft EIS but prior to the start of construction.

5.6 Noise

This section describes the existing noise environment in the study area and potential noise impacts from the Project. A technical report has been prepared in support of this section titled *Noise and Vibration Technical Report*.

5.6.1 Regulatory Context and Methodology

This section provides an overview of the regulatory context and methodology used for the analysis. Noise has been assessed in accordance with guidelines specified in FTA's *Transit Noise and Vibration Impact Assessment Manual.*[15] The noise assessment methodology for assessing noise impacts from LRT operations includes the steps shown in Table A5-15. In addition, the Council conducted a construction noise impact assessment using the methodology in Section 7 of the FTA *Transit Noise and Vibration Impact Assessment Manual.*[16]

Table A5-15 Steps in Noise Assessment Methodology

Step Number	Description
1	Identify noise-sensitive land uses in the study area using aerial photographs, GIS data, and field surveys, within 350 feet of a light rail alignment, as per FTA guidance.
2	Measure existing noise levels in the study area near sensitive receptors.
3	Predict project noise levels from transit operations using preliminary engineering plans and information on speeds, headways, track type, vehicle type, and grade-crossing operations for a project. Project noise level assessment included LRT operations, horns, and bells at grade crossings and stations; associated roadway improvements; and changes in feeder bus operations at selected stations. Details regarding the information used to predict future project noise levels are provided in the *Noise and Vibration Technical Report*.
4	Assess the impact of a project by comparing the predicted project noise levels with existing noise levels using the FTA noise impact criteria in Chapter 3 of the FTA *Transit Noise and Vibration Impact Assessment Manual*.
5	Recommend mitigation at locations where predicted project noise levels exceed the FTA impact criteria.

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

5.6.1.1 Understanding Noise

"Sound" is defined as small changes in air pressure above and below the standard atmospheric pressure. "Noise" is usually considered to be unwanted sounds. The three parameters that define noise are described in Table A5-16 below.

Table A5-16 Noise Parameters

Parameter	Definition
Level	The level of sound is the magnitude of air pressure change above and below atmospheric pressure and is expressed in dB. Typical sounds fall within a range between 0 dB (the lower limits of human hearing) and 120 dB (the highest sound levels experienced in the environment). A 3 dB change in sound level is perceived as a barely noticeable change outdoors, and a 10 dB increase (or decrease) in sound level is perceived as a doubling (or halving) of the sound level.
Frequency	The frequency (pitch or tone) of sound is the rate of air pressure change. It is expressed in cycles per second, or Hertz. Human ears can detect a wide range of frequencies from around 20 to 20,000 Hertz. However, human hearing is not effective at high and low frequencies, and the dBA is used to correlate noise measurements with human response to noise. The dBA has been widely adopted by acousticians as the most appropriate descriptor for environmental noise.
Time pattern	Because environmental noise is constantly changing, it is common to condense this information into a single number, called the L_{eq}. The L_{eq} represents the changing sound level over a period, typically 1 hour or 24 hours in transit noise assessments. The common noise descriptor used for LRT and freight rail projects is the L_{dn}. This descriptor has been adopted by most agencies as the best way to describe how people respond to noise in their environment. L_{dn} is a 24-hour cumulative A-weighted noise level that includes all noises that happen within a day, with a 10 dB penalty for nighttime noise (10 p.m. to 7 a.m.). This nighttime penalty means that any noise events at night are equivalent to 10 similar events during the day. Typical L_{dn} values for various transit and freight operations are shown in Figure A5-24.

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

5.6.1.2 Noise Criteria

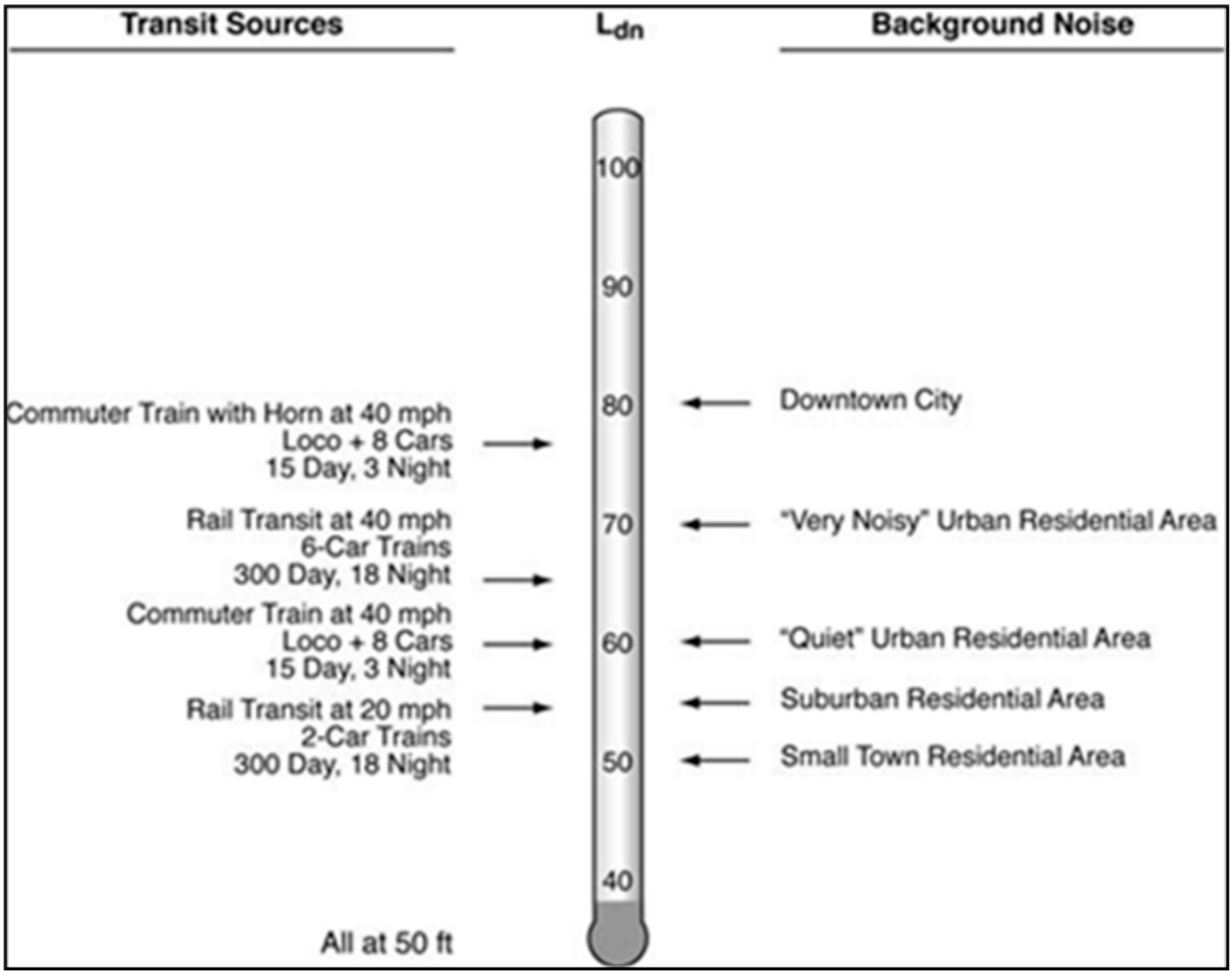
This section describes FTA and MPCA noise impact criteria and their applicability to this noise assessment.

FTA Noise Criteria

FTA's noise impact criteria are described in Section 4 of the FTA *Transit Noise and Vibration Impact Assessment Manual*.[17] FTA's noise impact criteria are based on well-documented research on community response to noise and both the existing noise levels and the change in noise exposure caused by a transit project. The FTA noise criteria compare project noise levels to existing noise levels (not to noise levels with the No-Build Alternative). See Figure A5-24.

FTA's noise criteria are based on the land use category of the sensitive receptor. The L_{dn} descriptor is used to assess transit-related noise at residential land uses where overnight sleep occurs (Category 2), and the L_{eq} descriptor is used to assess transit-related noise at other land uses, as shown in Table A5-17.

Figure A5-24 Typical Day-Night Sound Level (Ldn) Noise Exposure Levels



Source: Cross Spectrum Acoustics (CSA), 2023.

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Table A5-17 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)$ [a]	Land where quiet is an essential element of its intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and National Historic Landmarks with considerable outdoor use. Recording studios and concert halls are also included in this category.
2	Outdoor L_{dn}	This category is applicable to all residential land use and buildings where people normally sleep, such as hotels and hospitals.
3	Outdoor $L_{eq}(h)$ [a]	This category is applicable to institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities are also included in this category.

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

[a] L_{eq} for the loudest hour of project-related activity during hours of noise sensitivity.

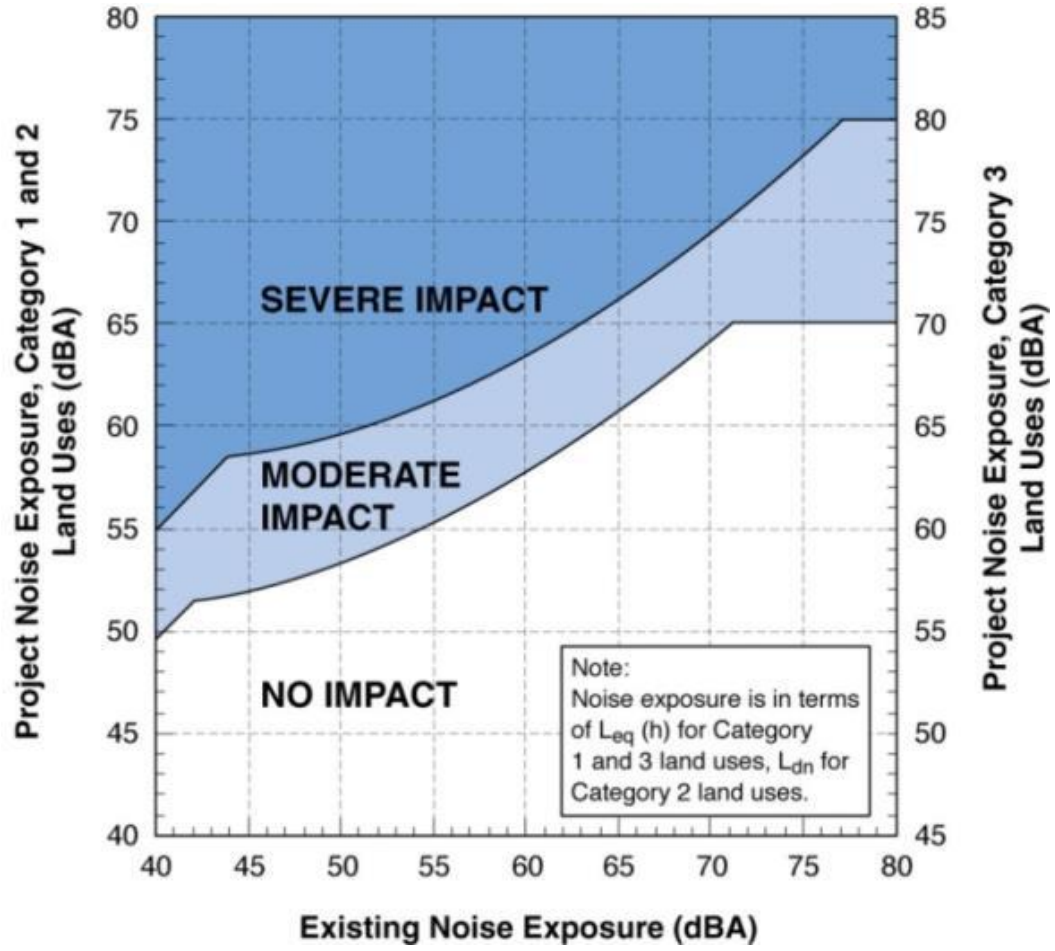
The noise impact criteria are defined by the two curves shown in Figure A5-25. The figure illustrates existing noise exposure and project-related noise exposure and demonstrates that FTA's noise impact thresholds vary with existing noise levels. FTA's noise impact criteria include the levels of impact shown in Table A5-18.

Table A5-18 FTA-Defined Noise Impact Levels

Level of Impact	Description
None	Project-generated noise is not likely to cause community annoyance. Noise projections in this range are considered acceptable by FTA and mitigation is not required.
Moderate	Project-generated noise in this range is considered to cause impact at the threshold of measurable annoyance. Moderate impacts serve as an alert to project planners for potential adverse impacts and complaints from the community. Mitigation should be considered at this level of impact based on project specifics and details concerning the affected properties.
Severe	Project-generated noise in this range is likely to cause a high level of community annoyance. A project sponsor should first evaluate alternative locations/alignments to determine whether it is feasible to avoid severe impacts altogether. In densely populated urban areas, evaluation of alternative locations may reveal a tradeoff of affected groups, particularly for surface rail alignments. Projects that are characterized as point sources rather than line sources often present greater opportunity for selecting alternative sites. This guidance manual and FTA's environmental impact regulations both encourage project sites that are compatible with surrounding development when possible. If it is not practical to avoid severe impacts by changing the location of a project, mitigation measures must be considered.

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

Figure A5-25 FTA Noise Impact Criteria



Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

FTA Construction Noise Criteria

The Council applied FTA's construction noise criteria, summarized in Table A5-19, for the analysis of short-term noise impacts. FTA's construction noise criteria provide adequate protection for short-term noise impacts and allow reasonable mitigation measures to be applied to the Project. Additionally, MPCA noise criteria were evaluated for the Project, and the Council would work with local jurisdictions to ensure that reasonable measures are taken to limit construction noise.

Table A5-19 FTA Construction Noise Criteria

Land Use	8-hour L_{eq}: Daytime (dBA)	8-hour L_{eq}: Nighttime (dBA)	Noise Exposure 30-day Average (dBA)
Residential	80	70	75
Commercial	85	85	80
Industrial	90	90	85

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

MPCA Noise Criteria

MPCA has an established set of noise standards (Minnesota Rules, Chapter 7030) that provide limits on environmental noise using the L_{10} and L_{50} descriptors, which represent the noise level exceeded 10 percent (6 minutes) and 50 percent (30 minutes) of the time, respectively, during an hour. The standards include both daytime (Table A5-20) and nighttime (Table A5-21) limits for three categories of land use or noise area classification, with residential land included in noise area classification 1. Classifications 2 and 3 are generally for commercial and industrial land uses, respectively.

Table A5-20 Daytime MPCA Noise Standards

Noise Area Classification	L_{10} (dBA)	L_{50} (dBA)
1	65	60
2	70	65
3	80	75

Source: Minnesota Rules, Chapter 7030, Noise Pollution.

Table A5-21 Nighttime MPCA Noise Standards

Noise Area Classification	L_{10} (dBA)	L_{50} (dBA)
1	55	50
2	70	65
3	80	75

Source: Minnesota Rules, Chapter 7030, Noise Pollution.

5.6.2 Study Area and Affected Environment

The study area for noise is generally defined as those properties within 350 feet of the Project Alignment. This section describes existing noise-sensitive land uses and noise levels in the study area.

5.6.2.1 Noise-Sensitive Land Uses

Noise-sensitive land uses are identified from aerial photographs, conceptual engineering plans, and a site survey. Information regarding noise-sensitive land uses by city in the study area is provided in the *Noise and Vibration Technical Report*.

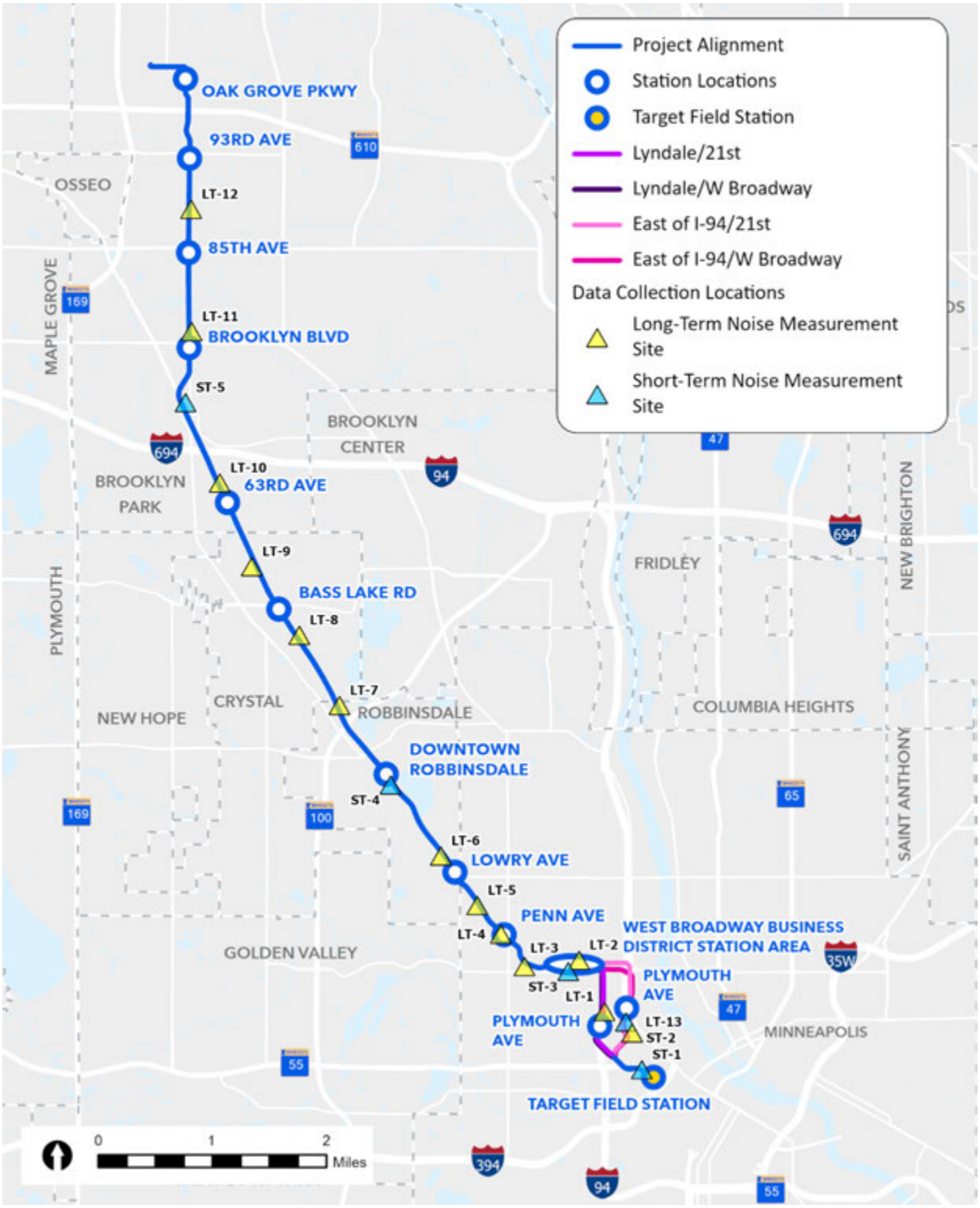
5.6.2.2 Noise Measurements

A series of noise measurements are collected along the Project Alignment to understand existing noise levels. Because the thresholds for impact in FTA's noise criteria are based on existing noise levels, measuring the existing noise and characterizing noise levels at sensitive locations in the study area is an important step in the impact assessment.

Locations of existing noise measurements are shown in Figure A5-26. Twelve long-term noise-monitoring sites and five short-term noise-monitoring sites have been identified for the Project. In addition, one location, the Capri Theater, is identified where both noise and vibration measurements would be collected.

The long-term noise measurements were used to characterize the existing noise at residential locations, and the short-term noise measurements were used to characterize the existing noise at non-residential locations.

Figure A5-26 Locations of Noise Measurement Sites



Source: *Noise and Vibration Technical Report.* Cross-Spectrum Acoustics, Inc. 2023.

Note that locations of noise measurement sites would continue to be refined following completion of fieldwork.

5.6.3 Environmental Consequences

This section identifies the long- and short-term impacts to noise from the No-Build Alternative and Project alignment and design options.

5.6.3.1 Operating-Phase (Long-Term) Impacts

Long-term impacts would be a result of the operation of LRVs. Potential long-term noise impacts from the Project are described in the following sections.

No-Build Alternative

The No-Build Alternative would have no operating-phase noise impacts.

Project Alignment and Design Options

Detailed information on potential long-term noise impacts for the Project Alignment is provided in Chapter 5 (Section 5.6) and in the *Noise and Vibration Technical Report*.

5.6.3.2 Construction-Phase (Short-Term) Impacts

Short-term noise impacts would be associated with the Project's construction activities. Potential short-term noise impacts from the Project are described in the following sections.

No-Build Alternative

The No-Build Alternative would have no construction-phase noise impacts.

Project Alignment and Design Options

Construction noise levels are subject to local noise ordinances and noise rules administered by MPCA (Minnesota Rules, Chapter 7030). MPCA administers these noise rules to establish maximum allowable noise levels; where applicable, MPCA procedures allow for the issuance of noise variances. To address both the applicable local noise ordinances and the MPCA noise rules, the Council may develop a Noise Control Plan. A Noise Control Plan contains information regarding when advanced notice of construction activities will be provided to affected communities. A Noise Control Plan also contains other stipulations to help avoid or minimize construction noise impacts. For example, a Noise Control Plan may require that construction equipment used by contractors be properly muffled and in proper working order.

Affected communities would be given advance notice of any planned abnormally loud construction activities. In general, construction would occur within daytime hours. However, nighttime construction could sometimes be required; for example, to reduce traffic impacts or improve safety. A nighttime construction mitigation plan would be developed if nighttime construction were necessary.

Construction noise can vary greatly depending on the type of construction activities, equipment used, staging of the construction process, layout of the construction site, and distance to sensitive receptors. Elevated noise levels during construction are, to a degree, unavoidable for this type of project, and short-term noise during construction of the Project can be intrusive to residents near the construction sites. For most construction equipment, diesel engines are typically the dominant noise source. For other activities, such as impact pile driving and jackhammering, noise generated by the actual process dominates.

For residential land use, short-term noise impacts from at-grade track construction can extend to about 120 feet from the construction site. However, if nighttime construction is conducted, short-term noise impacts from at-grade track construction can extend to about 380 feet from the construction site.

5.6.4 Avoidance, Minimization, and/or Mitigation Measures

This section describes potential measures that the Council may implement to mitigate the Project's long- and short-term noise impacts. FTA guidance states that severe noise impacts need to be mitigated, unless there are no feasible or practical means to do so.[18] For moderate noise impacts, discretion should be used, and Project-specific factors should be included in the consideration of mitigation. Project-specific factors can include both the existing noise levels and the projected increase in noise levels, the types and number of noise-sensitive land uses with impacts, existing sound insulation of buildings, and the cost-effectiveness of providing noise mitigation. Metro Transit has adopted a mitigation approach that details which moderate impacts qualify for mitigation. For more information about the Metro Transit mitigation approach, see the *Noise and Vibration Technical Report* in Appendix A-5.

Construction noise levels are subject to local noise ordinances and noise rules administered by MPCA (Minnesota Rules, Chapter 7030). MPCA administers these noise rules to establish maximum allowable noise levels; where applicable, MPCA procedures allow for the issuance of noise variances. To address both the applicable local noise ordinances and the MPCA noise rules, the Council may develop a Noise Control Plan.

The primary means of mitigating noise from construction activities is to require the contractor to prepare a detailed Noise Control Plan. A noise control engineer or acoustician would work with the contractor to prepare a Noise Control Plan in conjunction with the contractor's specific equipment and methods of construction. Key elements of a Noise Control Plan include the following:

- Contractor's specific equipment types
- Schedule and methods of construction
- Maximum noise limits for each piece of equipment with certification testing
- Prohibitions on certain types of equipment and processes during the nighttime hours without local agency coordination and approved variances
- Identification of specific sensitive sites near construction sites
- Methods for projecting construction noise levels
- Implementation of noise-control measures where appropriate
- Methods for responding to community complaints

5.7 Vibration

This section describes the existing vibration in the study area and potential vibration impacts from the Project. A technical report in support of this section is provided in the *Noise and Vibration Technical Report*.

5.7.1 Regulatory Context and Methodology

This section provides an overview of the regulatory context and methodology used for the analysis, an assessment of existing vibration measurements, a description of the expected vibration impacts, and a description of mitigation measures to be implemented with the Project. Additionally, this section describes the methodology used to assess predicted vibration impacts and to develop mitigation strategies. Vibration has been assessed in accordance with guidelines specified in FTA's *Transit Noise and Vibration Impact Assessment Manual*.[19]

The vibration assessment methodology for assessing vibration impacts from LRT operations includes the steps shown in Table A5-22. In addition, the Council conducted a construction vibration impact assessment using the methodology in Section 7 of the FTA *Transit Noise and Vibration Impact Assessment Manual.*[20]

Table A5-22 Steps in Vibration Assessment Methodology

Step	Description
1	Identify vibration-sensitive land uses in the study area using aerial photographs, GIS data, and field surveys, typically within 350 feet of the Project.
2	Measure vibration-propagation characteristics of the soil in the study area near sensitive receptors.
3	Predict Project vibration levels from transit operations using preliminary engineering plans and information on speeds, headways, track type, and vehicle vibration characteristics. Details regarding the information used to predict Project vibration levels are provided in the *Noise and Vibration Technical Report*.
4	Assess the impact of the Project by comparing the predicted Project vibration levels with the FTA vibration impact criteria in Chapter 8 of the FTA *Transit Noise and Vibration Impact Assessment Manual*.
5	Recommend mitigation at locations where projected vibration levels exceed the FTA impact criteria.

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

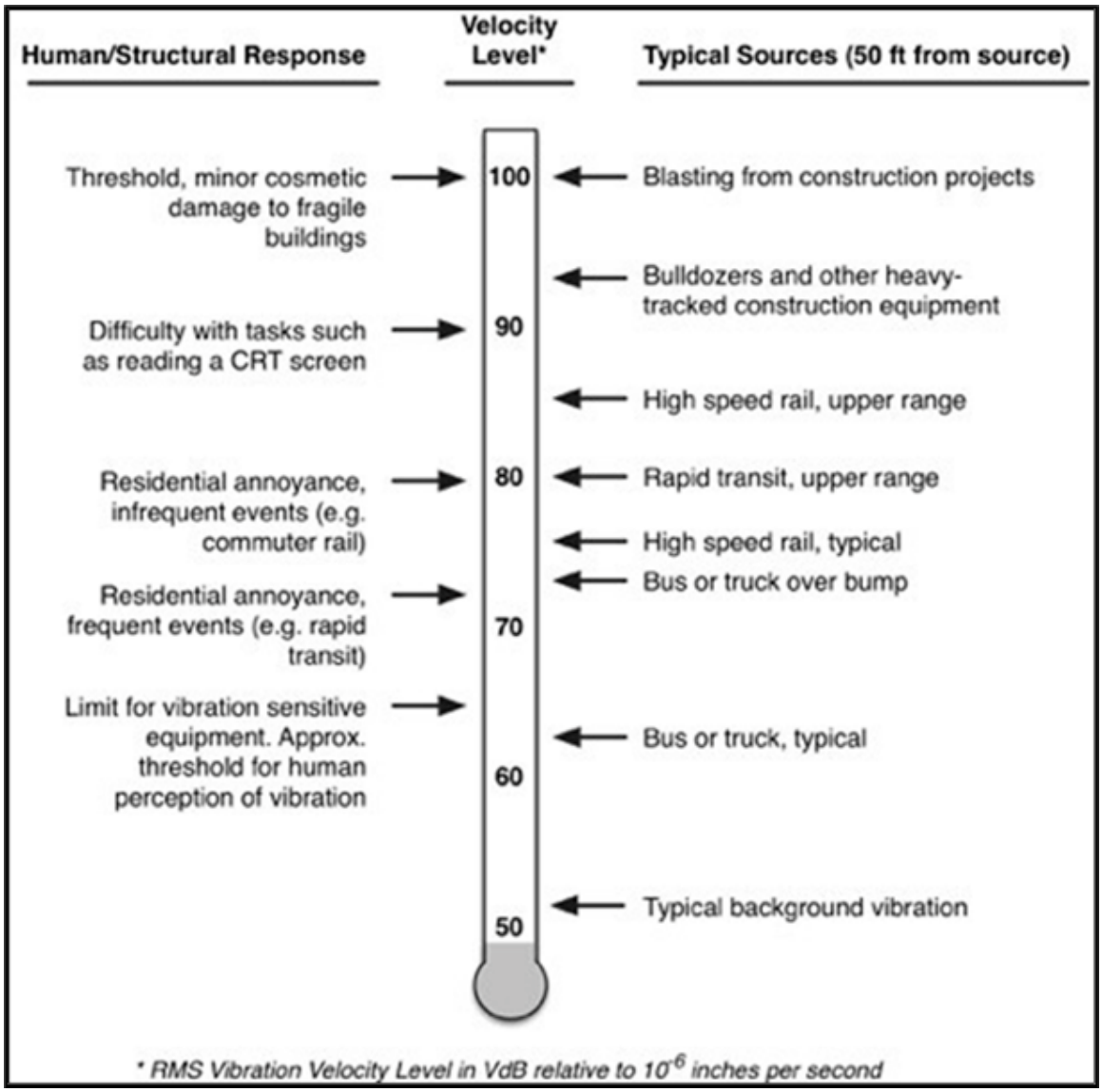
5.7.1.1 Understanding Vibration

Ground-borne vibration is the motion of the ground transmitted into a building that can be described in terms of displacement, velocity, or acceleration. Vibration velocity is used in transit and is defined by the parameters shown in Table A5-23.

Table A5-23 Vibration Parameters

Parameter	Definition
Level	Vibration is expressed in terms of vibration velocity level using vibration decibels (VdB) with a reference of 1 micro-inch per second. The level of vibration represents how much the ground is moving. The threshold of human perception to transit vibration is about 65 VdB, and annoyance begins to occur for frequent events at vibration levels over 70 VdB.
Frequency	Vibration frequency is expressed in Hertz. Human response to vibration is typically from about 6 to 200 Hertz.
Time pattern	Environmental vibration changes all the time, and human response is roughly correlated to the number of vibration events during the day. The more events that occur, the more sensitive people are to the vibration. Figure A5-27 illustrates typical ground-borne vibration levels for transit projects as well as the corresponding human and structural responses to vibration.

Figure A5-27 Typical Vibration Levels



Source: Cross-Spectrum Acoustics, Inc. 2023.

5.7.1.2 Vibration Criteria

The vibration impact criteria used for the Project are based on the information in Chapter 8 of the FTA *Transit Noise and Vibration Impact Assessment Manual*. The criteria for a general vibration assessment are based on land use and train frequency, as shown in Table A5-24. Some buildings, such as concert halls, recording studios, and theaters, can have a higher sensitivity to vibration (or ground-borne noise) but do not fit into the three categories. Because of the sensitivity of these buildings, special attention is paid to these buildings during the environmental assessment of a project. Table A5-25 shows the FTA criteria for acceptable levels of vibration for several types of special buildings.

Table A5-24 and Table A5-25 include additional criteria for ground-borne noise, which is a low-frequency noise that is radiated from the motion of room surfaces, such as walls and ceilings, in buildings due to ground-borne vibration. Ground-borne noise is defined in terms of dBA, which emphasizes middle and high frequencies, which are more

audible to human ears. The criteria for ground-borne noise are much lower than those for airborne noise to account for the low-frequency character of ground-borne noise; however, because airborne noise typically masks ground-borne noise for aboveground (at-grade or elevated) transit systems, ground-borne noise is assessed only for operations in tunnels, where airborne noise is not a factor, or at locations such as recording studios, which are well-insulated from airborne noise.

Table A5-24 Ground-Borne Vibration and Noise Impact Criteria for General Assessment

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec) for Frequent Events [a]	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec) for Occasional Events [b]	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec) for Infrequent Events [c]	Ground-Borne Noise Impact Levels (dBA re 20 micro Pascals) for Frequent Events [a]	Ground-Borne Noise Impact Levels (dBA re 20 micro Pascals) for Occasional Events [b]	Ground-Borne Noise Impact Levels (dBA re 20 micro Pascals) for Infrequent Events [c]
1: Buildings where vibration would interfere with interior operations	65 [d]	65 [d]	65 [d]	N/A [e]	N/A [e]	N/A [e]
2: Residences and buildings where people normally sleep	72	75	80	35	38	43
3: Institutional land uses with primarily daytime use	75	78	83	40	43	48

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

[a] *Frequent events* are defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.

[b] *Occasional events* are defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.

[c] *Infrequent events are* defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.

[d] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research would require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

[e] Vibration-sensitive equipment is generally not sensitive to ground-borne noise.

Table A5-25 Vibration Impact Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec) for Frequent Events [a]	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec) for Occasional or Infrequent Events [b]	Ground-Borne Noise Impact Levels (dBA re 20 micro Pascals) for Frequent Events [a]	Ground-Borne Noise Impact Levels (dBA re 20 micro Pascals) for Occasional or Infrequent Events [b]
Concert halls	65	65	25	25
Television studios	65	65	25	25
Recording studios	65	65	25	25
Auditoriums	72	80	30	38
Theatres	72	80	35	43

Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

[a] *Frequent events* are defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.

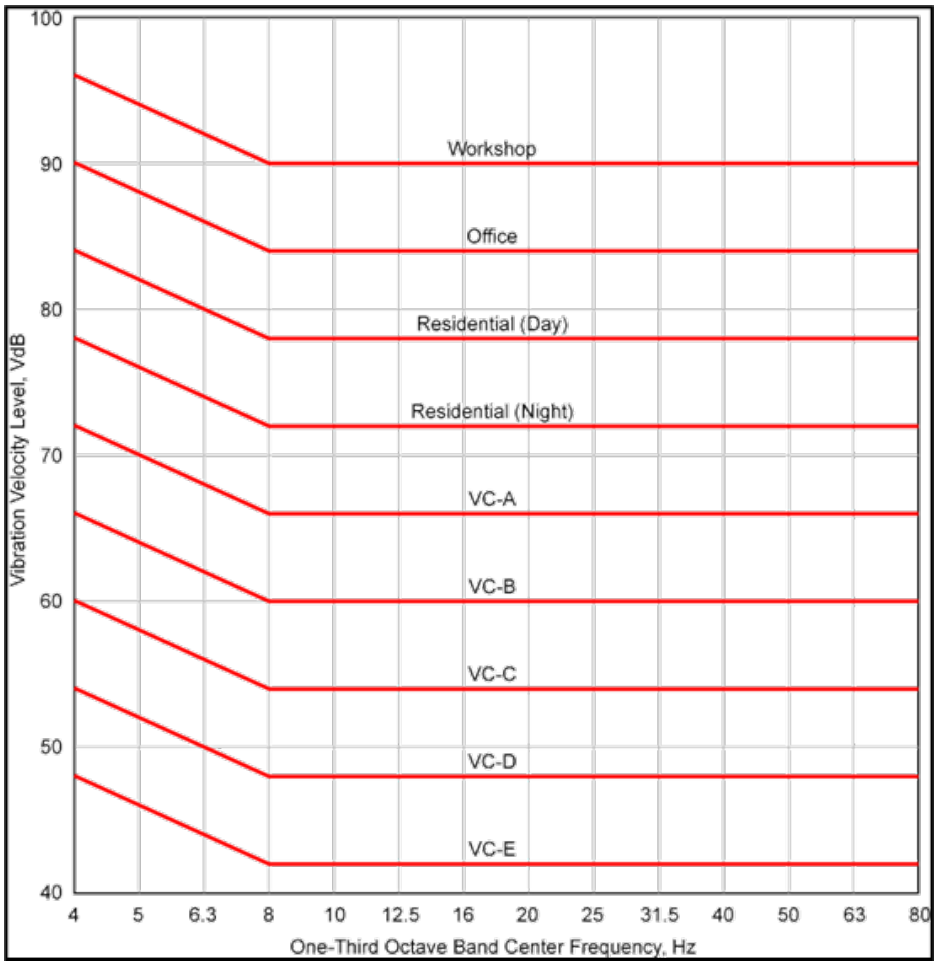
[b] *Occasional or infrequent events* are defined as fewer than 70 vibration events per day. This category includes most commuter rail system.

If the building would rarely be occupied when the trains are operating, there is no need to consider impact. As an example, consider locating a commuter rail line next to a concert hall. If no commuter trains operate after 7 p.m., it should be rare that the trains interfere with the use of the hall.

The criteria for a detailed vibration assessment are shown in Figure A5-28, and descriptions of the curves are provided in the *Noise and Vibration Technical Report*. The curves in Figure A5-28 are applied to the projected vibration spectrum for the Project. If the vibration level at any one frequency exceeds the criteria, there is an impact. Conversely, if the entire proposed vibration spectrum of the Project is below the curve, there would be no impact.

For the Project, the detailed vibration assessment criteria would be used to assess operational ground-borne vibration, except at special buildings where the general vibration assessment criteria would be used.

Figure A5-28 FTA Detailed Vibration Criteria



Source: Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

5.7.2 Study Area and Affected Environment

The study area for vibration is generally defined as properties within 350 feet of the Project Alignment. This section describes vibration-sensitive land uses and existing vibration measurements in the study area.

5.7.2.1 Vibration-Sensitive Land Uses

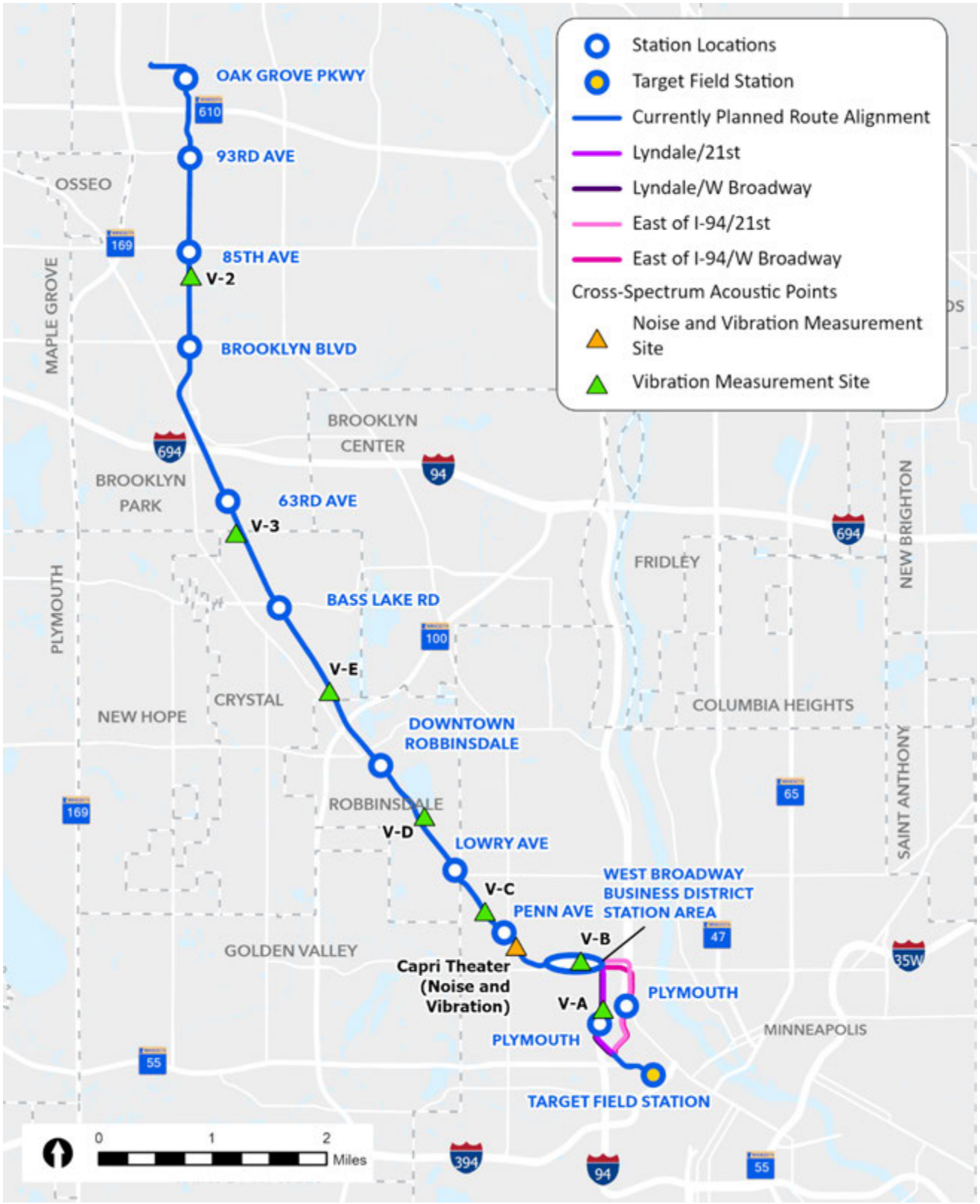
Vibration-sensitive land uses are identified from aerial photographs, conceptual engineering plans, Project outreach to businesses to identify sensitive uses within buildings, and a site survey. Information regarding vibration-sensitive land uses by city is provided in the *Noise and Vibration Technical Report*.

5.7.2.2 Vibration Measurements

A series of vibration measurements are collected along the Project Alignment to understand existing vibration levels. Specific information regarding instrumentation, procedures, analysis methods, and measurement locations is available in *Noise and Vibration Technical Report*.

Locations for collection of vibration measurements are shown in Figure A5-29. Seven vibration monitoring sites have been identified for the Project. One location, the Capri Theater, is identified where both noise and vibration measurements would be collected.

Figure A5-29 Locations of Vibration Measurement Sites



Source: *Noise and Vibration Technical Report.* Cross-Spectrum Acoustics, Inc. 2023.

5.7.3 Environmental Consequences

This section identifies potential long- and short-term vibration impacts from the No-Build Alternative and Project alignment and design options.

5.7.3.1 Operating-Phase (Long-Term) Impacts

Long-term vibration impacts would be a result of the operation of LRVs. Potential long-term vibration impacts from the Project are described in the following sections.

No-Build Alternative

The No-Build Alternative would have no operating-phase vibration impacts.

Project Alignment and Design Options

Detailed information on long-term vibration impacts, including impacted locations for the Project Alignment is provided in Chapter 5 (Section 5.7) and in the *Noise and Vibration Technical Report*.

5.7.3.2 Construction-Phase (Short-Term) Impacts

Short-term vibration impacts would be associated with the Project's construction activities. Temporary, short-term vibration impacts from construction activities are described in the following sections.

No-Build Alternative

The No-Build Alternative would have no construction-phase vibration impacts.

Project Alignment and Design Options

Vibration related to construction activities can result from the operation of heavy equipment (pile driving, vibratory hammers, hoe rams, vibratory compaction, and loaded trucks) needed to construct bridges, retaining walls, roads, and park-and-ride facilities. Including vibration limits in construction specifications will reduce the effects on nearby structures. Although construction vibrations are temporary, it is appropriate to assess the potential for human annoyance and damage.

Most buildings along the Project Alignment are engineered concrete and masonry, or reinforced concrete, steel, or timber construction. Except for impact pile driving, the potential for damage is limited to buildings within 20 feet of construction activities. The distance for the potential for damage to buildings from impact pile driving is up to 40 feet (see Section 5.2.4 in the *Noise and Vibration Technical Report*).

5.7.4 Avoidance, Minimization, and/or Mitigation Measures

Vibration impacts that exceed the FTA criteria are considered significant and would be mitigated unless there are no feasible or practical means to do so. Long-term vibration mitigation is applied primarily at the source, generally the track structure, and depends on the frequency content of the vibration and any resonances of the materials. Short-term vibration mitigation is applied primarily at the location of construction and can include limiting construction hours, including limits on vibration in construction specifications, selection of alternative construction methods, and careful selection of truck routes. Additional information on common vibration mitigation measures is provided in the *Noise and Vibration Technical Report*.

5.8 Biological Environment

This section describes the preferred habitats of rare, threatened, and endangered species in the study area and the expected impacts to plants and animals and their habitat from the No-Build Alternative and Project alignment and design options. The analysis completed for this section was conducted in coordination with USFWS and DNR regarding the presence of, and potential impacts to, threatened or endangered species and other biological resources in the study area.

This section is divided into four parts: endangered and threatened species, wildlife habitat, migratory birds, and noxious weeds.

The biological assessment serves to identify State- or federally listed or monitored species potentially within the Project Alignment and to discuss potential impacts to biological resources that may result from the Project. This section also discusses measures to avoid, minimize, and mitigate for potential impacts to biological resources within the study area.

5.8.1 Regulatory Context and Methodology

Endangered species are plants or animals determined by USFWS or DNR to be in imminent danger of extinction under the federal Endangered Species Act or Minnesota Endangered Species Statute (Minn. Stat. 84.0895). The United States' chief federal wildlife protection statute is the Endangered Species Act of 1973 (16 USC §§ 1531–1544). The Minnesota State Legislature passed Minnesota's Endangered and Threatened Species Statute in 1971, which is included within the Minnesota State Rules 6134. The purpose of these regulations is to aid in the recovery and conservation of imperiled species and to retain or restore healthy populations. These laws require consultation with USFWS and DNR to ensure that rare or protected species are not harmed by a proposed action. The following sections describe the regulatory agencies and the methodology applied to analyze impacts from the Project.

5.8.1.1 Endangered and Threatened Species

Section 7 of the Endangered Species Act of 1973 (16 USC §§ 1531–1544) requires that all federal agencies consider and avoid, if possible, adverse impacts to federally listed threatened or endangered species or their critical habitats that could result from their direct, regulatory, or funding actions. USFWS is responsible for compiling and maintaining the federal list of threatened and endangered species. Section 7 of the Endangered Species Act also prohibits the taking of any federally listed species by any person without prior authorization. The term "taking" is broadly defined at the federal level and explicitly extends to any habitat modification that could significantly impair the ability of that species to feed, reproduce, or otherwise survive.

Potential impacts to federally listed species require coordination with USFWS in a Section 7 consultation. The result of the Section 7 consultation is one of the following determinations for each species evaluated:

- **No effect:** No impacts, whether positive or negative, on the species would occur.
- **May affect, not likely to adversely affect:** Any impacts would be beneficial, insignificant, or discountable.
- **May affect, likely to adversely affect:** Any impacts would be negative and beyond an insignificant or discountable level.

Minnesota's Endangered Species Statute (Minn. Stat. 84.0895) and associated rules (Minnesota Rules 6212.1800–6212.2300) regulate the taking, importation, transportation, and sale of state endangered or threatened species.

DNR administers the state law and manages the listing of state rare, threatened, and endangered species. Species listed as Special Concern by DNR have no protections afforded to them.

The Council reviewed the USFWS Endangered Species Program website[21] to determine whether any federally listed threatened or endangered species have been documented or have critical habitat in Hennepin County or the study area. Additionally, Project biologists initiated coordination with USFWS concerning federally listed species or designated critical habitat in the study area. Appendix A-5 includes the Biological Analysis prepared using IPaC, a digital project planning tool that provides information to project proponents to help determine whether a project will have effects on federally listed species or designated critical habitat, as well as other sensitive resources. Additionally, the Verification Letter from USFWS for the Project under the Jan. 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions is included in Appendix A-5.

The Council used the DNR NHIS database to identify State- and federally listed species, rare plant communities, animal aggregation areas (such as colonial waterbird nesting areas), and other features known to be present in and near the study area. Per the stipulations of the NHIS program, known locations of listed species and other rare features cannot be specifically described or depicted in public documents. Rather, locations of rare species and features can be described and depicted only in a general manner. Section 5.8.2.1 discusses specific rare species and features that have been documented in and near the study area.

5.8.1.2 Wildlife Habitat

Wildlife species that inhabit terrestrial or aquatic habitat in the study area are generalist species adapted to urban conditions. These species are generally more tolerant of human presence and activities, including traffic (pedestrian, rail, and vehicle), and have demonstrated by their presence that they adapt readily to the human environment.

Regionally Significant Ecological Areas

Significant terrestrial and aquatic habitats in the study area were identified by collecting data from the MLCCS and field visits. The MLCSS identified 55.73 acres of regionally significant ecological areas, with 54.27 acres of terrestrial habitat and 1.46 acres of aquatic habitat. The Council compared these polygons to recent (2021) aerial photographs to identify areas where land use and cover had changed after the MLCCS data were gathered and trimmed the MLCCS polygons accordingly.

5.8.1.3 Migratory Birds

The MBTA of 1918 (16 USC §§ 703–712) governs the taking, killing, possession, transportation, and importation of migratory birds including eggs, parts, and nests. Such actions are prohibited unless authorized under a valid permit. The MBTA was enacted to protect migratory bird populations from over-harvesting. This law applies to migratory birds native to the United States and its territories. It does not apply to non-native migratory birds or resident species that do not migrate on a seasonal basis.

USFWS oversees and enforces the MBTA and issues depredation permits for destroying active nests of species covered under the MBTA. A depredation permit is not needed for destroying nests that are not active. DNR also has permit authority over destroying active nests.

Bald eagles are native migratory birds protected under the MBTA and by the Bald Eagle and Golden Eagle Protection Act of 1940 (16 USC §§ 668–668d, 54 Stat. 250), and amended several times since, which prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald or golden eagles, including their parts (including feathers), nests, or eggs.

5.8.1.4 Noxious Weeds

Noxious weed species are regulated by federal and State laws. The Federal Noxious Weed Act, Title 7, Chapter 61, Section 2803, regulates federally listed noxious weeds through the United States Department of Agriculture. Under this rule, the sale, purchase, exchange, or receipt of federal noxious weeds is illegal.

The Minnesota Noxious Weed Law (Minn. Stat. 18.75–18.91) defines a noxious weed as an annual, biennial, or perennial plant that the Commissioner of Agriculture designates to be injurious to public health, the environment, public roads, crops, livestock, or other property. Prohibited noxious weeds must be controlled or eradicated as required in Minn. Stat. 18.78.

The Council identified noxious weed concentrations in the study area during fieldwork in fall 2022. The Council used the Minnesota and Federal Noxious and Prohibited Weed List (updated Jan. 1, 2023) to verify the status of observed noxious weeds.

5.8.2 Study Area and Affected Environment

The study area for the biological environment is land cover within or adjacent to the LOD. The following sections describe the affected environment within the study area, including endangered and threatened species, wildlife habitats, migratory birds, and noxious weeds.

5.8.2.1 Endangered and Threatened Species

The Council reviewed the DNR NHIS database, which includes known occurrences of State- and federally listed species. The Council also used the USFWS IPaC system to review if the Project Alignment intersected the range of any federally listed species. Both services were queried in January 2023 and would require updated reviews prior to Project construction.

State-Listed Species

Review of State requirements related to threatened and endangered species was completed in accordance with Minnesota's Endangered Species Statute (Minn. Stat. 84.0895) and associated rules (Minnesota Rules, Parts 6212.1800–6122.2300 and Chapter 6134). The Minnesota NHIS database was queried to determine what rare, threatened, or endangered plant or animal species or other significant natural features are known to occur within 1 mile of the Project Alignment.

Based on the query, rare features have been documented within the study area (within 1 mile), and no species are known to occur within the Project limits (see Table A5-26).

Table A5-26 State-Listed Species Documented in Study Area

Common Name	Scientific Name	Status	Notes
Water willow	*Decodon verticillatus*	State Special Concern	Not likely present in the study area
Least darter	*Etheostoma microperca*	State Special Concern	Not likely present in the study area

Common Name	Scientific Name	Status	Notes
Peregrine falcon	*Falco peregrinus*	State Special Concern	Not likely present in the study area
Black sandshell	*Ligumia recta*	State Special Concern	Not likely present in the study area
Rock pocketbook	*Arcidens confragosus*	Endangered	Not likely present in the study area
Wartyback	*Quadrula nodulata*	Threatened	Not likely present in the study area
Blanding's turtle	*Emydoidea blandingii*	Threatened	May be present in study area

Source: DNR NHIS database, Licensing Agreement LA2022-033.

Water willow *(Decodon verticillatus)*. The water willow (State Special Concern), an herbaceous plant, is not likely present in the study area, and is not a State-listed species; therefore, it is not discussed further.

Least darter *(Etheostoma microperca)*. The least darter (State Special Concern), a small fish, is not likely present in the study area, and is not a State-listed species; therefore, it is not discussed further.

Peregrine falcon *(Falco peregrinus)*. The peregrine falcon (State Special Concern), a bird, is not likely present in the study area and is not a State-listed species; therefore, it is not discussed further.

Black sandshell *(Ligumia recta)*. The black sandshell (State Special Concern), a freshwater mussel, is not likely present in the study area, and is not a State-listed species; therefore, it is not discussed further.

Rock pocketbook *(Arcidens confragosus)*. The rock pocketbook (Endangered), a freshwater mussel, is not likely present in the study area, because the habitat is not present; therefore, it is not discussed further.

Wartyback *(Quadrula nodulata)*. The wartyback (Threatened), a freshwater mussel, is not likely present in the study area, because the habitat is not present; therefore, it is not discussed further.

Blanding's turtle *(Emydoidea blandingii)*. Blanding's turtle (State Threatened) could be present in the study area; therefore, it is discussed further in Section 5.8.4.1

Federally Listed Species

The IPaC system Biological Analysis report, produced via the IPaC database, addresses potential effects of a project and determines whether a project may affect any federally threatened, endangered, proposed, or candidate species. Based on Project location, USFWS identified the federally listed species that may be affected by the Project, which are shown in Table A5-27.

Table A5-27 Federally Listed Species Documented in Study Area

Common Name	Scientific Name	Status	Notes
NLEB	*Myotis septentrionalis*	Endangered	Forested areas throughout Minnesota could be used for summer roosting habitat.
Tricolored bat	*Perimyotis subflavus*	Proposed Endangered	During the spring, summer, and fall, tricolored bats are found in forested habitats where they roost in trees, primarily among leaves of live or recently dead deciduous hardwood trees.
Higgins eye	*Lampsilis higginsii*	Endangered	Habitat is not present in the study area.
Snuffbox mussel	*Epioblasma triquetra*	Endangered	Habitat is not present in the study area.
Winged mapleleaf	*Quadrula fragosa*	Endangered	Habitat is not present in the study area.

Common Name	Scientific Name	Status	Notes
Monarch butterfly	*Danaus plexippus*	Candidate	During the breeding season, monarchs lay their eggs on their milkweed host plant. Milkweeds are present within the study area.

Source: DNR NHIS Database, Licensing Agreement LA2022-033.

There is no designated critical habitat within or adjacent to the study area. The Biological Assessment generated by the IPaC analysis is provided in the Biological Environment Technical Report and in Appendix A-4.

NLEB *(Myotis septentrionalis: federally endangered)*. Forested areas in the study area provide summer roosting habitat for the NLEB. Therefore, this species is discussed further in Section 5.8.4.1.

Tricolored bat *(Perimyotis subflavus: federally proposed endangered)*. Forested areas in the study area provide roosting during spring, summer, and fall. Therefore, this species is discussed further in Section 5.8.4.1.

Higgins eye *(Lampsilis higginsii: federally endangered)*. No habitat is present in the study area and thus the Higgins eye is not likely present in the study area. Therefore, this species of freshwater mussel is not discussed further.

Snuffbox mussel *(Epioblasma triquetra: federally endangered)*. No habitat is present in the study area and thus the snuffbox mussel is not likely present in the study area. Therefore, this species of freshwater mussel is not discussed further.

Winged mapleleaf *(Quadrula fragosa: federally endangered)*. No habitat is present in the study area and thus the winged mapleleaf is not likely present in the study area. Therefore, this species of freshwater mussel is not discussed further.

Monarch butterfly *(Danaus plexippus: federal candidate species)*. Open meadow habitat in the study area contains milkweeds where monarchs could lay their eggs. Therefore, this species is discussed further in Section 5.8.4.1. The monarch is a candidate species and not yet listed or proposed for listing. Consultation with USFWS under Section 7 of the Endangered Species Act is not required for candidate species like the monarch butterfly.

5.8.2.2 Wildlife Habitat

The following sections describe general and significant habitats within the study area.

General Habitat

The Project is proposed to be constructed mainly in areas that have been previously disturbed or developed with impervious surfaces and buildings. However, the Project and associated facilities would affect aquatic and terrestrial wildlife habitat. The size and quality of these natural areas or open spaces determines the likelihood of their supporting terrestrial and aquatic wildlife.

The study area is characterized as urbanized and lacks the open space (such as park land) that could contain habitat for more species. The southern portion of the Project from Downtown Minneapolis is located within the existing road right-of-way, and there is relatively little undisturbed and maintained/mowed or wooded habitat.

There is some vegetated open land (forest land, shrubland, and forb and grassland) north of TH 610 on undeveloped parcels. Songbirds might nest in these disturbed but undeveloped habitats; however, given the fragmented condition

of the habitat and the fact that invasive species survive better in a fragmented habitat, many nests are taken over by invasive species such as brown-headed cowbirds and other aggressive species.

Disturbed habitats in the study area provide suitable conditions for generalist wildlife species adapted to urban conditions. Generalist mammal species include white-tailed deer, raccoons, opossums, gray squirrels, woodchucks, and chipmunks. Common generalist bird species that are well-adapted to these conditions are robins, cardinals, blue jays, crows, brown-headed cowbirds, grackles, starlings, and English sparrows. Disturbed aquatic habitat in and near the study area supports a variety of common generalist amphibian species, such as frogs and toads, and reptiles, such as turtles and snakes.

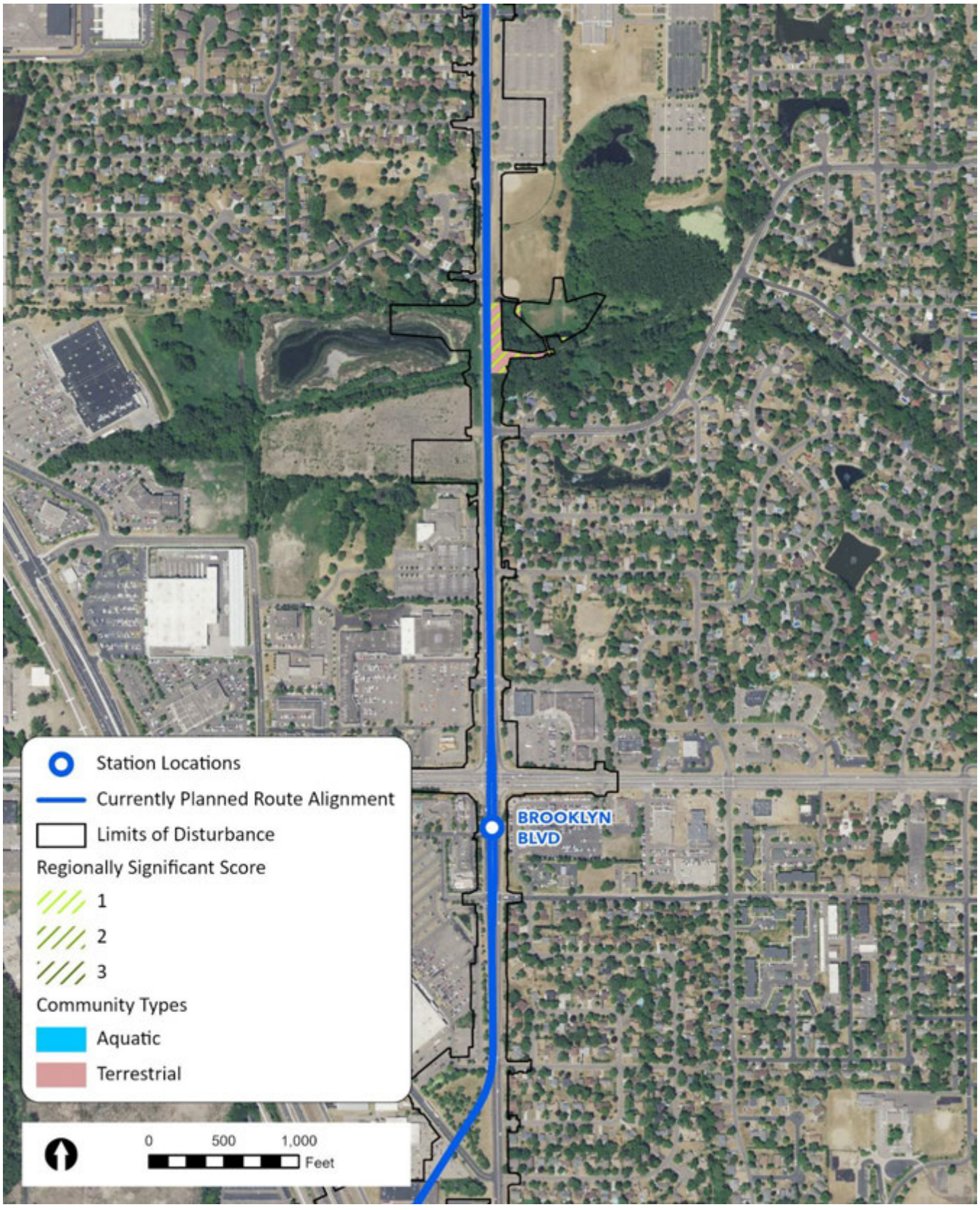
Significant Terrestrial and Aquatic Habitats

The MLCCS[22] was used to identify mapped RSEAs and Regional Ecological Corridors. This is an analysis of regionally significant Terrestrial and Wetland Ecological Areas in the seven-county metropolitan area. Individual forest, grassland, and wetland models were integrated to identify and rank the Terrestrial and Wetland Ecological Areas. The scores are determined by examining important ecological attributes of the ecological patches including size, shape, cover type diversity, and adjacent land use.

The MLCSS identified 55.73 acres of RSEA, located north of TH 610 in the City of Brooklyn Park (Figure A5-30), and a smaller area farther south adjacent to Shingle Creek (Figure A5-31). The ecological models were run on the most current MLCCS data available (2008). Data collected during the 2022 field visits were used to verify and update sites identified by the MLCCS (Table A5-28).

Figure A5-30 Detail of Regionally Significant Ecological Areas near the Oak Grove Pkwy Station Area

Figure A5-31 Detail of Regionally Significant Ecological Areas near the Brooklyn Blvd Station Area



The notable aquatic habitats summarized in Table A5-28 provide refuge for a variety of frogs, toads, turtles, snakes, and birds. Additionally, the notable terrestrial habitats summarized in the table could provide summer roosting habitat for NLEBs, a federally threatened species.

Table A5-28 Regionally Significant Ecological Areas in Study Area

Notable Habitat Type	Total Size (acres)	Score
Terrestrial	**54.27**	**Total**
Terrestrial	0.002	1 (low)
Terrestrial	25.89	2 (medium)
Terrestrial	28.38	3 (high)
Aquatic	**1.46**	**Total**
Aquatic	0.82	1 (low)
Aquatic	0.56	2 (medium)
Aquatic	0.08	3 (high)

Sources: MLCCS (2008) and field data from Council (2022).

5.8.2.3 Migratory Birds

USFWS noted several migratory bird species in species records in the study area. No impacts to migratory birds or their nests are anticipated from the Project. Minor impacts may occur because of habitat loss.

These species might pass through or nest in or near the study area as part of their seasonal migrations. Some migratory bird species might nest in vegetated habitats, and others, such as barn swallows and cliff swallows, have adapted to building mud nests under bridges and other human-made structures.

Because the Project Alignment follows existing road right-of-way along CR 81, no bridges or other structures present within the Project Alignment would be suitable for barn or cliff swallows and nests.

5.8.2.4 Noxious Weeds

The Minnesota Noxious Weed List (updated 2020) was updated to determine the status of invasive species encountered during fieldwork in the study area in fall 2022. Table A5-29 summarizes noxious plant species within the study area, their status, and general locations observed during fieldwork.

Table A5-29 Noxious Plant Species in Study Area

Plant Species	Noxious Status [a]	Notes
Garlic mustard *(Alliaria petiolata)*	RN	Ubiquitous in forested plant communities throughout the study area
Canada thistle *(Cirsium arvense)*	SN	Common throughout the study area
Wild parsnip *(Pastinaca sativa)*	SN	Common on disturbed embankments throughout the study area
Japanese knotweed *(Polygonum cuspidatum)*	SN	Observed in highly disturbed forest
European buckthorn *(Rhamnus cathartica)*	RN	Ubiquitous in the herbaceous, shrub, and tree strata of forested areas throughout the study area

Plant Species	Noxious Status [a]	Notes
Poison ivy *(Toxicodendron radicans)*	SN	Common in vegetated areas throughout the study area

Sources: Council field data (2015); Minnesota Department of Agriculture Noxious Weed List (updated 2020).
[a] RN = restricted noxious weed, SN = State noxious weed.

5.8.3 Environmental Consequences

This section identifies the long- and short-term impacts to the biological environment from the No-Build Alternative and Project alignment and design options.

5.8.3.1 Operating-Phase (Long-Term) Impacts

No long-term impacts would result from the long-term operational activities of the Project following completion of construction.

No-Build Alternative

The No-Build Alternative would have no long-term impacts to biological resources.

Project Alignment and Design Options

The Project would not intentionally cause impact to any State- or federally listed species. However, in some cases secondary impacts are possible because of habitat loss.

ENDANGERED AND THREATENED SPECIES

Forest complexes in the study area could provide suitable summer roosting habitat for NLEBs and the tricolored bat, classified as federally endangered and proposed endangered species, respectively. The monarch butterfly depends on open meadows where milkweed grows to complete its life cycle.

Table A5-30 summarizes the total extent of and total impacts to forest area/wooded parcels and open meadows with milkweed species in the study area.

Table A5-30 Habitat for Federally Endangered and Threatened Species in Study Area

Habitat Type	Total Size in Study Area (acres)	Impact Size in Project Limits (acres)
Forested, suitable for bats	21.38	10.26
Open meadow/prairie, milkweed populations present	66.80	49.67

Sources: MLCCS (2008) and field data from the Council (2022).

WILDLIFE HABITAT

Because of the urban setting of the Project, the wildlife that inhabits these areas are generalist species adapted to urban conditions. These species are generally more tolerant of human presence and activities, including traffic (pedestrian, rail, and vehicle), and have demonstrated by their presence that they adapt readily to the human environment. The notable aquatic habitats summarized in Table A5-28 provide refuge for a variety of frogs, toads, turtles, snakes, and birds. Additionally, the notable terrestrial habitats summarized in the table could provide summer roosting habitat for NLEBs, a federally threatened species.

Table A5-28 (above) lists the total impacts to notable terrestrial and aquatic habitats; these impacts are shown in Figure A5-30 and Figure A5-31 above.

New restrictions to wildlife crossings are not anticipated, as the Project Alignment would be located along high-traffic roadways in an urban setting. Minor instances of habitat fragmentation may occur on the northern portion of the Project limits, north of TH 610, where there are currently undeveloped parcels that would be impacted by the Project.

The LRT station areas, which would generally be less than 600 feet long, could include barriers to prevent people from crossing the tracks for limited distances. These barriers would also limit wildlife crossings along the Project Alignment.

MIGRATORY BIRDS

Impacts to migratory birds would be minor and limited to habitat loss within the study area. To ensure that impacts are not encountered during the nesting season, tree clearing should be timed to avoid the nesting season for each bird. Information on nesting seasons for migratory birds is provided in Table A5-31.

Table A5-31 Nesting Season for Migratory Birds within Study Area

Species	Nesting and Breeding Season
American golden-plover *(Pluvialis dominica)*	N/A: breeds elsewhere
Bald eagle *(Haliaeetus leucocephalus)*	Dec. 1–Aug. 31
Black tern *(Chlidonias niger)*	May 15–Aug. 20
Black-billed cuckoo *(Coccyzus erythropthalmus)*	May 15–Oct. 10
Bobolink *(Dolichonyx oryzivorus)*	May 20–July 31
Canada warbler *(Cardellina canadensis)*	May 20–Aug. 10
Chimney swift *(Chaetura pelagica)*	March 15–Aug. 25
Eastern whip-poor-will *(Antrostomus vociferus)*	May 1–Aug. 20
Golden eagle *(Aquila chrysaetos)*	N/A: breeds elsewhere
Golden-winged warbler *(Vermivora chrysoptera)*	May 1–July 20
Lesser yellowlegs *(Tringa flavipes)*	N/A: breeds elsewhere
Long-eared owl *(Asio otus)*	March 1–July 15
Red-headed woodpecker *(Melanerpes erythrocephalus)*	May 10–Sept. 10
Rusty blackbird *(Euphagus carolinus)*	N/A: breeds elsewhere
Short-billed dowitcher *(Limnodromus griseus)*	N/A: breeds elsewhere
Western grebe *(Aechmophorus occidentalis)*	June 1–Aug. 31
Wood thrush *(Hylocichla mustelina)*	May 10–Aug. 31

NOXIOUS WEEDS

Six species of noxious weeds (see Table A5-29 above) were observed along many areas within the LOD. Infestations are also present outside the LOD. Disturbed soils can create conditions in which infestation of noxious and invasive species can increase. Infestations could be controlled during the operating phase of the Project by spot-spraying appropriate herbicides, or other approved means of removal.

Operation Maintenance Facility

The OMF north of 101st Ave N would have no impacts to wetlands or forested habitat but could impact several instances of milkweed. The OMF would impact highly disturbed non-native grassland that was previously agricultural, and specimens of milkweed (critical to the monarch butterfly) were observed during the field investigation.

LRT Stations

LRT station locations would be placed mostly within the existing road right-of-way, with the exception of the northernmost station at Oak Grove Pkwy. The Oak Grove Pkwy Station is located on land that consists of highly disturbed non-native grassland and forest land.

No known State- or federally listed species have been documented in the vicinity of the LRT station sites. The Council does not anticipate that LRT station locations would affect the preferred habitats of listed species or of more common generalist wildlife species.

5.8.3.2 Construction-Phase (Short-Term) Impacts

The following sections describe potential short-term impacts to the biological environment from the No-Build Alternative and Project alignment and design options.

No-Build Alternative

The No-Build Alternative would have no short-term impacts to biological resources.

Project Alignment and Design Options

Short-term impacts to the biological environment could include temporary physical disturbances such as construction of access roads, creation of construction staging areas, and dewatering in some areas. Construction-related noise could include pile driving and noise from the engines of heavy equipment. Such physical and noise disturbances can temporarily disrupt wildlife use of habitat. The typical wildlife species that use such urban habitats are resilient habitat generalists, and they can successfully occupy habitats a safe distance from construction-related disturbances.

No short-term impacts to migratory birds are proposed because of this Project.

No critical habitats or known threatened or endangered species are located in the vicinity of any of the alignment and design options and temporary impacts are not anticipated from construction.

5.8.4 Avoidance, Minimization, and/or Mitigation Measures

This section describes potential measures that the Council may implement to mitigate the Project's long- and short-term biological environment impacts. Possible measures for individual species are summarized below.

5.8.4.1 Permitting

Under federal law, An Endangered Species Act Section 10(a)(1)(B) Incidental Take Permit is required for any "take" of an endangered or threatened species when an entity believes that its otherwise lawful activities may result in take of endangered or threatened species.

For all Minnesota Listed Species, a permit is required to take, pursue, capture, kill, dig up, dispose of, destroy, purchase, import, possess, transport, or sell live or dead endangered or threatened plants or animals, including their parts or seeds. Permit issuance is discretionary and based on the DNR's assessment of all relevant information.

5.8.4.2 Endangered and Threatened Species

Northern long-eared bat. Impacts to NLEBs' summer roosting habitat can be reduced by avoiding tree clearing and grubbing. On Nov. 30, 2022, USFWS published a final rule in the Federal Register that reclassifies the NLEB from threatened to endangered. The rule went into effect on March 31, 2023. Based on its analysis of proposed tree clearing in the study area and adherence to the Final Range-wide Northern Long-eared Bat determination key (Dkey), USFWS has concurred with FTA's determination that the Project merits a determination of "may affect, Incidental Take Not Prohibited" with respect to the NLEB and the correspondence is include in Appendix A-5. The Council is working closely with USFWS to ensure that impacts to NLEBs are minimized to the extent practicable. USFWS has concurred with FTA's determination that the Project may affect the NLEB, and further consultation with USFWS may be needed.

Tricolored bat. Impacts to the tricolored bat can be minimized by following similar tree removal limitations as has been prescribed for the NLEB. As a proposed listing, specific guidance is not published yet. Coordination requirements with USFWS would be determined by the status of the listing, published guidance, and the types of impacts proposed. The Council will work closely with USFWS to ensure that impacts to tricolored bats are minimized to the extent practicable.

Monarch butterfly. Impacts to monarch butterflies are derived primarily from habitat loss, specifically to their primary food source, milkweed. Impacts can be avoided by maintaining critical species and habitat. Mitigation can be achieved by preserving and enhancing habitat. As a candidate species, specific guidance has not been provided, and there are no requirements to coordinate with USFWS. However, the Council will work closely with USFWS to ensure that impacts to monarch butterflies are minimized to the extent practicable.

Blanding's turtle. DNR has issued guidelines on measures to minimize impacts to Blanding's turtles. These measures, which include provisions such as observing seasonal work windows between Sept. 15 and June 19, may not be feasible because of climate and construction timing; therefore, BMPs are recommended such as installing and removing silt fences, and distributing educational materials to use at the construction site to inform the contractor and workers what to look for and how to handle any turtles that are present. With adherence to the DNR guidelines concerning minimization of impacts to Blanding's turtles, impacts to this species would likely be negligible.

Wildlife Habitat

Complete avoidance of impacts to notable terrestrial and aquatic habitats in the study area is not feasible. Potential measures to reduce these impacts could include replacement and preservation of tree habitat; restoration of prairie habitats; or implementation of stormwater BMPs such as infiltration, retention, and detention facilities. Unavoidable impacts to aquatic habitat could be mitigated by purchasing suitable wetland credits from an established wetland mitigation bank. Unavoidable impacts to notable terrestrial habitat could be mitigated by restoring vegetation around the Project and other notable habitats to be determined during design efforts. Where effective and feasible, suitable wildlife crossings would be accommodated within proposed culverts to allow wildlife species to cross from one side of the LRT/freight rail tracks to the other.

5.8.4.3 Migratory Birds

USFWS describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the study area. Effective measures should be employed at all project development sites nationwide with the goal of reducing impacts to birds and their habitats.

5.8.4.4 Noxious Weeds

Given the urban and highly disturbed nature of the study area, noxious weeds are ubiquitous. Some measures, such as spot-spraying with appropriate herbicides and cleaning equipment as it enters and exits the construction area, can be used to control invasive species within construction and staging areas; a vegetation management plan would be developed to include measures like these to control noxious weeds in the study area. However, permanent eradication of invasive or noxious weeds in the study area would not be feasible.

5.9 Water Quality and Stormwater

This section describes the existing water quality and stormwater conditions in the study area, along with the stormwater impacts associated with the No-Build Alternative and Project alignment and design options, as determined by assessing changes in impervious surfaces. The analysis for this section was informed by stormwater management requirements of the following organizations: BCWMC; MWMO; SCWMC; WMWMC; MnDOT; and the Cities of Minneapolis, Robbinsdale, Crystal, and Brooklyn Park.

5.9.1 Regulatory Context and Methodology

Stormwater impacts are typically evaluated by quantifying changes to impervious surfaces as a result of implementing a project. Impervious surfaces include road and parking lot pavements, sidewalks, rooftops, and other hard surfaces that are impenetrable to water, which can significantly deter stormwater infiltration and reduce groundwater and surface water recharge. Runoff associated with rainfall and snowmelt discharges from impervious surfaces, accumulating pollutants before entering downstream water bodies.

For this analysis, to account for the worst-case scenario in calculating impacts, the Council assumed that LRT guideway segments that include ballasted track are impervious. Track ballast consists of crushed and compacted stone used to support the track and facilitate drainage. However, the stormwater runoff calculations developed for the Project assume that the ballast is slightly less impervious than asphalt or concrete pavement, because it can store more rainfall in the spaces between the crushed stones. The Council would need to continue coordination with the regulating watershed management commissions and organizations (collectively referred to as WMOs) and cities to determine whether ballasted track is considered impervious or pervious surface for regulatory purposes, as the definition of impervious surface and classification of track ballast can vary according to each organization's policy.

Regulatory and permitting authority for stormwater management falls to municipalities, MPCA, and WMOs. Each WMO is governed by a Joint Powers Agreement between WMOs and the member communities whose jurisdictions are located within the boundaries of the WMO. Regulations are subject to change over time, and the Project would be subject to the regulations that are in effect when the Project design is submitted for approval by the permitting authorities. The stormwater management system for the Project Alignment was designed to meet the most stringent requirements for that particular segment. In all cases except for the OMF and park-and-ride structures, the WMO rules were the most stringent requirements.

5.9.1.1 Agencies

Several agencies in the study area regulate stormwater management within their jurisdictional boundaries. Table A5-32 documents specific stormwater requirements of each of the following agencies with jurisdiction in the study area:

- BCWMC
- SCWMC and WMWMC[23]
- MWMO
- MPCA
- Cities of Brooklyn Park, Crystal, Robbinsdale, and Minneapolis

Table A5-32 Regulatory Matrix of Stormwater Requirements

Organization, Commission, or City	Rate Control	Water Quality	Volume Control
BCWMC	Maintain or reduce peak flow rates for the 2-, 10-, and 100-year, 24-hour storm event	Water quality criteria are achieved if a project meets compliance with MWMO's volume control requirements.	Capture and retain 1.1 inches of stormwater runoff from new and fully reconstructed impervious surfaces. If infeasible, proceed according to the objectives listed below: ■ 0.55 inch of runoff and remove 75% TP on an average annual basis ■ Capture maximum amount of runoff practicable, remove 60% TP on an average annual basis ■ 1.1 inches of runoff new and fully reconstructed impervious surfaces, provided at off-site location
SCWMC/WMWMC	Maintain or reduce peak flow rates for the 2-, 10-, and 100-year, 24-hour storm event, and the 100-year, 10-day critical storm event	Water quality criteria are achieved if a project meets compliance with SCWMC/WMWMC's volume control requirements. If volume control is infeasible, maintain or reduce the discharge of TP and TSS.	Provide abstraction equal to the larger of: ■ 1 inch times the new impervious surface created by a project ■ 0.5 inch times the new and fully reconstructed impervious surface

Organization, Commission, or City	Rate Control	Water Quality	Volume Control
MWMO[a]	Must meet the rate control requirements of member municipalities	Water quality criteria are achieved if a project meets compliance with MWMO's volume control requirements.	Capture and retain the larger of: ■ 1.1 inches times the new impervious surface created by a project ■ 0.55 inch times the new and fully reconstructed impervious surface
MPCA	Sedimentation basins (if applicable) must be designed to discharge the water quality volume at no more than 5.66 cubic feet per second per acre of surface area of the basin	Water quality volume of 1 inch of runoff must be retained on site. If infiltration is infeasible, other stormwater management methods must be implemented to treat water quality volume.	Capture and retain 1 inch times the new impervious surfaces created by a project.
City of Brooklyn Park	Maintain or reduce stormwater runoff peak flow rates as compared with the existing conditions for the 2-, 10-, and 100-year, 24-hour storm event	Must meet SCWMC standards (see above).	Must meet SCWMC standards (see above).
City of Crystal	Maintain or reduce stormwater runoff peak flow rates as compared with the existing conditions for the 2-, 10-, and 100-year, 24-hour storm event	Must meet SCWMC standards (see above).	If stormwater detention facilities are constructed, design according to MPCA publication "Protecting Water Quality in Urban Areas," the Minnesota Stormwater Manual, and the City of Crystal Unified Development Code.
City of Robbinsdale	Must meet SCWMC and BCWMC standards (see above)	Must meet SCWMC and BCWMC standards (see above).	Must meet SCWMC and BCWMC standards (see above).
City of Minneapolis	Maintain or reduce stormwater runoff peak flow rates as compared with the existing conditions for the 2-, 10-, and 100-year, 24-hour storm event	Remove 70% TSS from a 1.25-inch storm event. Additional TP removal to various extents based on location, as described in the City of Minneapolis Stormwater and Sanitary Sewer Guide.	Capture and retain the larger of: ■ 1.1 inches times the new impervious surface created by a project ■ 0.55 inch times the new and fully reconstructed impervious surface

[a] MWMO does not review or permit design plans and relies on member municipalities to enforce stormwater ordinances and performance standards.

5.9.2 Study Area and Affected Environment

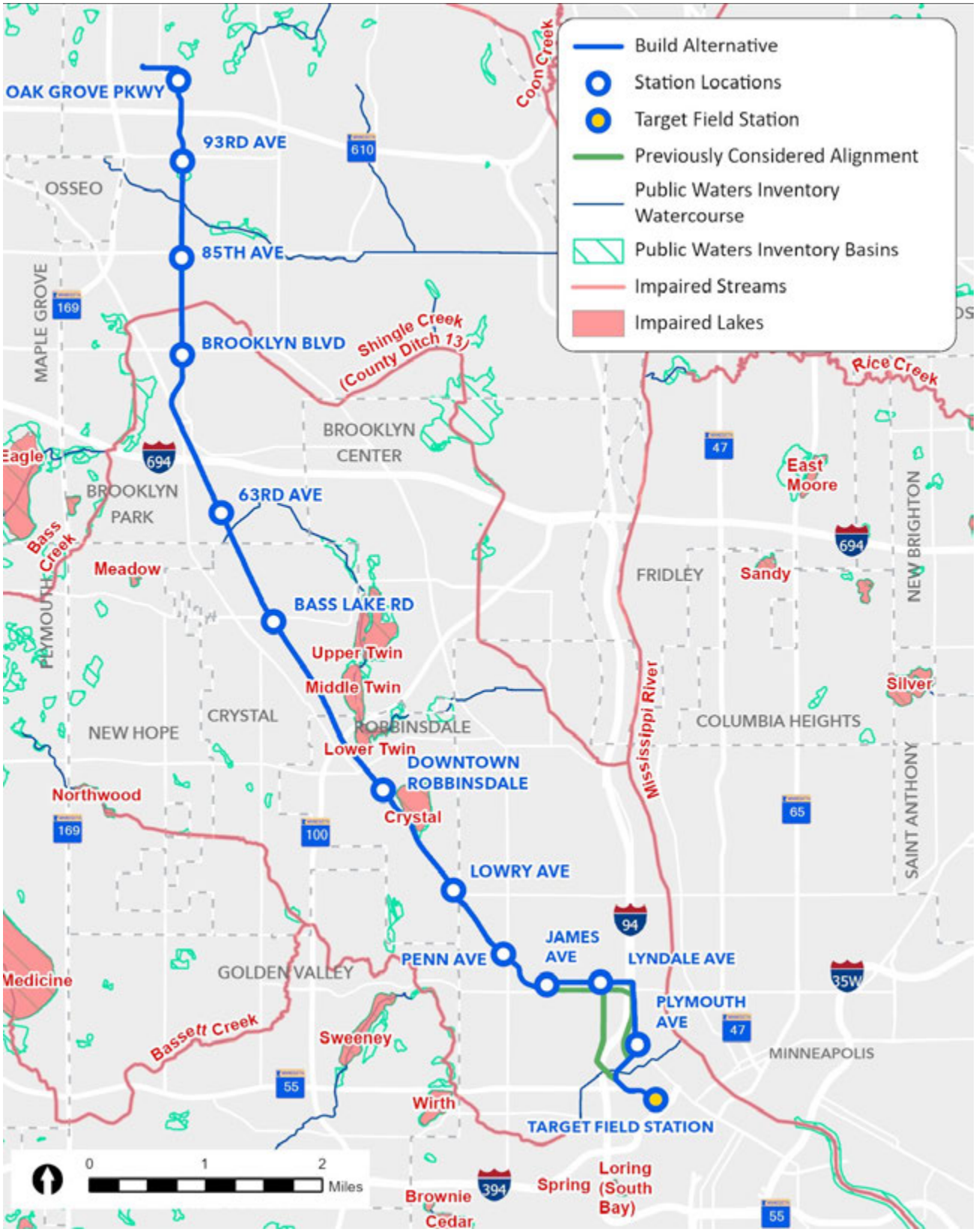
The study area for stormwater is defined as the LOD for the Project and the receiving waters within and immediately adjacent to the Project Alignment. The study area includes impaired waters that are located within 1 mile on either side of the Project Alignment and that would receive stormwater discharge from the Project Alignment as per State regulation and as shown in Table A5-33 and Figure A5-32.

Table A5-33 Downstream Impaired Waters within 1 Mile of the Project

Impaired Receiving Water	Impairments	TMDL Status
Shingle Creek	Benthic macroinvertebrates bioassessments; chloride; dissolved oxygen; fish bioassessments; E. coli	*Shingle and Bass Creeks Biota and Dissolved Oxygen TMDL Implementation Plan* (2012); *Shingle Creek Chloride TMDL Report* (2006); plan required for fish bioassessments
Upper Twin Lake	Mercury in fish tissue; PCBs in fish tissue; PFOS in fish tissue; nutrients	*Twin and Ryan Lakes TMDL Implementation Plan* (2007); plan required for PCBs in fish tissue and PFOS in fish tissue
Middle Twin Lake	Mercury in fish tissue; PCBs in fish tissue; PFOS in fish tissue; nutrients	*Twin and Ryan Lakes TMDL Implementation Plan* (2007); plan required for PCBs in fish tissue and PFOS in fish tissue
Lower Twin Lake	Mercury in fish tissue; PCBs in fish tissue; PFOS in fish tissue	*Twin and Ryan Lakes TMDL Implementation Plan* (2007); plan required for PCBs in fish tissue and PFOS in fish tissue
Crystal Lake	Nutrients	*Crystal Lake Nutrient TMDL Implementation Plan* (2009)
Bassett Creek	Benthic macroinvertebrate bioassessments; chloride; fish bioassessments; fecal coliform	*Upper Mississippi River Bacteria TMDL Study and Protection Plan* (2014); plan required for benthic macroinvertebrate bioassessments and fish bioassessments
Mississippi River	Mercury in fish tissue; PCBs in fish tissue; nutrients; fecal coliform	*Upper Mississippi River Bacteria TMDL Study and Protection Plan* (2014); plan required for PCBs in fish tissue and fecal coliform

Source: MPCA, 2023. Total maximum daily load (TMDL) projects; available online at: https://www.pca.state.mn.us/business-with-us/total-maximum-daily-load-tmdl-projects.

Figure A5-32 Impaired Waters



Source: Minnesota Pollution Control Agency, *Impaired Waterbodies, Minnesota, 2022* (St. Paul: Minnesota Pollution Control Agency, 2022), Impaired Waterbodies, Minnesota, 2022 - Resources - Minnesota Geospatial Commons (mn.gov).

The study area is generally urbanized; highly altered compared to natural conditions; and characterized primarily by commercial, industrial, and residential development. The intensity of development ranges from suburban to urban and includes farmland in the northern part of the study area. Figure A5-32 above identifies the impaired waters receiving runoff in the study area, including the Mississippi River; Bassett Creek; Crystal Lake; Lower, Middle, and Upper Twin Lakes; Twin Creek; and Shingle Creek. Receiving stormwater facilities include Twin Creek, Heritage Park South Pond, North and South Rice Ponds, Grimes Pond, Setzler Pond, Century Channel, and the TH 610 Ponds. Table A5-33 above provides specific information on the impairment and TMDL status of these water bodies.

Currently, the majority of the study area has no formal stormwater treatment to meet current water quality regulatory requirements. Stormwater typically flows directly into surrounding vegetated ditches or storm sewer systems. Vegetated ditches can provide water quality benefits such as sediment stabilization and pollutant filtration. The vegetated ditches generally discharge to existing wetlands and drainageways, which ultimately drain to nearby surface waters, some of which are impaired (Figure A5-32 above). Stormwater that is collected in storm sewer systems is typically conveyed directly to receiving waters, frequently with little or no water quality treatment or flow rate attenuation.

Several existing stormwater management and treatment facilities are located near the Project Alignment. These include, but are not limited to, the following:

- Target North Campus BMPs
- A stormwater quality pond in the southeast quadrant of Oak Grove Pkwy and W Broadway Ave
- A stormwater quality pond in the northwest quadrant of 94th Ave N and W Broadway Ave
- Setzler Pond, a regional rate-control pond (south and west of the W Broadway Ave–93rd Ave N intersection)
- Brooklyn Park wetland regrading and outlet structure improvement (just north of the W Broadway Ave–Candlewood Drive intersection; intended primarily to mitigate wetland and floodplain fill impacts immediately to the south)
- Cub Foods/Target parking lot BMPs (southwest quadrant of the W Broadway Ave–Brooklyn Boulevard intersection)
- Crystal Airport infiltration basin
- Hydrodynamic separators at the intersection of Xerxes Avenue and North 14th Avenue in the City of Minneapolis
- South Treatment System at the Heritage Park redevelopment
- Target Field stormwater management

Table A5-32 above summarizes the WMC, WMO, MPCA, and municipal regulatory requirements:

- Cities of Brooklyn Park, Crystal, Robbinsdale, and Minneapolis
- Hennepin County
- MCES

5.9.3 Environmental Consequences

This section identifies the long- and short-term impacts to water quality and stormwater from the No-Build Alternative and Project alignment and design options.

5.9.3.1 Operating-Phase (Long-Term) Impacts

The following sections consider long-term water quality and stormwater impacts resulting from the operational activities of the Project following completion of construction.

No-Build Alternative

The No-Build Alternative would have no long-term impacts to stormwater.

Project Alignment and Design Options

The Project alignment and design options would increase the impervious area within the LOD (see Table A5-34). The impervious surfaces constructed would include ballasted track, platforms, park-and-ride facilities, an OMF, aerial structures for the LRT guideway, roadway, and sidewalk improvements. These additional impervious surfaces and drainage systems (e.g., curb, gutters, and storm drain pipes) would increase the flow rate and volume of stormwater runoff from the sites within the Project footprint. Several culvert extensions would also be necessary to accommodate the Project. The Council would coordinate these extensions with the appropriate jurisdictional agencies.

Table A5-34 Increase in Impervious Surface for Options by Project City

Project Alignment and Design Options (by City)	Existing Impervious Area (acres)	Project Impervious Area (acres)	Increase in Impervious (acres)
No-Build Alternative	186.9–194.5 (varies by alignment and design option)	186.9–194.5 (varies by alignment and design option)	0.0
Brooklyn Park	83.4	125.5	42.1
Crystal (at-grade)	30.2	32.8	8.6
Crystal (interchange)	31.7	34.6	9.5
Robbinsdale: south of 40-Elim	26.8	30.6	3.8
Robbinsdale: south of 40-U.S. Bank	27.4	30.8	3.4
Robbinsdale: south of 41 URC	26.6	30.2	3.6
Robbinsdale: south of 41 U.S. Bank	27.4	30.8	3.4
Minneapolis (Lyndale Ave N on W Broadway, one station)	46.8	52.6	5.8
Minneapolis (Lyndale Ave N on W Broadway, two stations)	46.7	52.6	5.9
Minneapolis (Lyndale Ave N/N 21st Ave, one station)	50.1	56.0	5.9
Minneapolis (Lyndale Avenue N/N 21st Ave, two stations)	49.8	56.2	6.4
Minneapolis (east of I-94 on W Broadway, one station)	49.5	56.8	7.3
Minneapolis (east of I-94 on W Broadway, two stations)	49.4	56.8	7.4
Minneapolis (east of I-94 on N 21st Ave, one station)	52.0	59.4	7.4
Minneapolis (east of I-94 on N 21st Ave, two stations)	50.6	58.5	7.9

Source: Impervious coverage quantities were calculated by SEH based on conceptual engineering plans developed by Kimley-Horn Associates (April 2023).

IMPACTS FROM PROJECT ALIGNMENT AND DESIGN OPTIONS

Four alignment and design options were analyzed in the City of Minneapolis and various design options were analyzed in the Cities of Crystal, Robbinsdale, and Minneapolis (e.g., LRT station locations, roadway configurations, associated park-and-ride locations). The nature of long-term impacts to water quality associated with the alignment options is consistent with the potential impacts described above. The options vary only within the City of Minneapolis and are located within the same watershed. Alignment options and associated lengths are listed below. Minor increases to impervious surface are associated with increased alignment lengths:

- Lyndale Ave N/N 21st Ave to Oak Grove Pkwy (13.2 miles)
- Lyndale Ave N/W Broadway Ave to Oak Grove Pkwy (13.1 miles)
- E I-94/N 21st Ave to Oak Grove Pkwy (13.4 miles)
- E I-94/W Broadway Ave to Oak Grove Pkwy (13.3 miles)

Design options (e.g., LRT station locations, roadway configurations, associated park-and-ride locations) are located in the Cities of Crystal, Robbinsdale, and Minneapolis. Design options are located at existing interchanges or at-grade intersections, downtown areas, and business districts that consist primarily of impervious surface land cover in their existing condition. As such, minor short-term impacts to water quality may be anticipated for the alignment and design options. The variance in alignment length may result in an additional 1 to 2 percent increase in impervious surface area relative to the overall Project.

5.9.3.2 Construction-Phase (Short-Term) Impacts

Short-term impacts are impacts that potentially occur only during construction activities as a result of the Project.

No-Build Alternative

The No-Build Alternative would have no construction-phase impacts to stormwater.

Project Alignment and Design Options

Construction activities associated with constructing utilities, the LRT guideway, track platforms, park-and-ride facilities, an OMF, aerial structures for the LRT guideway, roadway, and sidewalk improvements for the Project would disturb soil, which can lead to erosion and sedimentation during and after rainfall. Stormwater runoff can potentially erode vegetation and drainageways, form gullies, and transport sediment into storm drain systems and receiving water bodies. This process can impact water quality if temporary BMPs, which are required through the permitting process, are not in place prior to a storm event.

IMPACTS FROM PROJECT ALIGNMENT AND DESIGN OPTIONS

The Project includes four alignment and design options in the City of Minneapolis and design options in the Cities of Crystal, Robbinsdale, and Minneapolis as described above. The nature of construction-phase impacts to water quality associated with the Project alignment and design options is consistent with the potential impacts described above. Potential increases to the LOD would occur because of variations in alignment lengths, construction activities, or the construction generally associated with alignment and design options. Additional disturbed area would result in an increased amount of exposed sediment that can escape the Project area and enter vegetated ditches and storm drains.

5.9.4 Avoidance, Minimization, and/or Mitigation Measures

Permits, reviews, and approvals from regulatory agencies, including the MPCA, municipalities, and watershed districts and management organizations described above, would be required prior to Project construction. Regulatory requirements include the development of SWPPPs as part of the permitting process, which include long- and short-term mitigation measures to preserve water quality and offset potential impacts associated with Project construction. Plans include structural and non-structural practices to plan, prepare, avoid, and respond to potential water quality impacts.

5.9.4.1 Operating-Phase (Long-Term) Mitigation Measures

Long-term mitigation measures would include the design and construction of permanent BMPs, such as detention and infiltration facilities, which would control and treat stormwater runoff to mitigate for impacts caused by increased impervious surfaces because of the Project. Various BMPs, including ponds and infiltration areas, are described below.

Stormwater Treatment Ponds

Stormwater treatment ponds provide flow rate control and water quality treatment. To the extent practicable, ponds can be sited near low points or adjacent to outfalls within the Project right-of-way. The Council may consider opportunities to collaborate with partner cities within the Project Alignment for combined stormwater management opportunities. A wet detention pond, also commonly called a National Urban Runoff Program pond, is an example of this type of BMP. In locations where stormwater treatment ponds are not practicable, alternative measures including underground stormwater storage and detention can provide flow rate control.

Infiltration BMPs

Infiltration BMPs are used primarily to provide runoff volume control and water quality treatment and can be designed to provide flow rate control. Certain areas may be suitable for infiltration BMPs based on soil types near the Project Alignment. Based on the National Cooperative Soil Survey from the Natural Resources Conservation Service, a large portion of the Project Alignment contains soils appropriate for infiltration BMPs. Infiltration basins and infiltration trenches that are integrated into guideway and sidewalk areas in urban areas would be considered in final design. In areas where infiltration is not feasible (e.g., areas with contaminated soils, shallow and/or sensitive groundwater resources, or low soil porosity), filtration BMPs would be considered instead of infiltration. Examples of infiltration BMPs include infiltration basins, bioswales, ditch treatment using ditch blocks, tree trenches, rain gardens, and underground infiltration systems.

Filtration BMPs

Filtration BMPs can be used in locations where contaminated soils, poorly draining soils, or proximity to groundwater preclude the use of infiltration BMPs. They can also be used at treatment pond locations by using the bench above the normal water level as a filtration bench. This would allow a certain volume of water in the pond to filter through engineered soils and collect in a drain tile that flows to the pond outfall. Soil borings may be taken during design to determine where infiltration or filtration BMPs are appropriate based on site-specific conditions. Examples of filtration BMPs include biofiltration basins, ditch treatment using ditch blocks and perforated underdrains, manufactured treatment devices, and underground media filtration systems.

Table A5-35 includes a summary of potential stormwater BMPs and their locations by segment of the Project Alignment.

Table A5-35 Potential Stormwater BMPs

Category	BMPs	Potential Benefits	Limitations
Stormwater treatment ponds	Wet detention ponds, dry detention ponds, underground stormwater detention structures	Rate control, water quality	No runoff volume reduction. Topography needed for engineered outlets.
Infiltration	Infiltration basins, infiltration trenches, rain gardens, tree trenches, bioswales, underground infiltration galleries	Rate control, volume control, water quality	Prohibited in areas with poorly draining soils, contaminated soils, and areas within 3 feet of the seasonally high water table.
Filtration	Biofiltration basins, iron-enhanced sand filters, vegetated swales, manufactured treatment devices	Rate control, water quality	No runoff volume reduction.

5.9.4.2 Construction-Phase (Short-Term) Mitigation Measures

An NPDES Construction Stormwater Permit from MPCA would be required because the Project would disturb 1 acre or more of land. Because the Project would disturb more than 50 acres of land and would produce discharges within 1 mile of impaired waters, the Council would submit the NPDES Construction Stormwater Permit application to MPCA at least 30 days prior to the start of construction. Other Minnesota agencies requiring permits could include watershed districts, municipalities, and soil and water conservation districts. The NPDES permit requires development of a SWPPP, which must be submitted at the time of the permit application and implemented during construction.

Short-term mitigation measures would include developing erosion- and sediment-control plans to control runoff and reduce erosion and sedimentation during construction and to limit the amount of sediment carried into lakes, streams, wetlands, and rivers by stormwater runoff. These plans, in combination with the SWPPP, would identify methods to control runoff, stabilize slopes and exposed soils, and limit the discharge of sediment into drainage systems and natural areas. As practicable, construction activities would be phased to disturb as small an area as possible at any one time.

5.10 Air Quality/Greenhouse Gas Emissions

Motorized vehicles affect air quality by emitting airborne pollutants. Changes in traffic volumes, travel patterns, and roadway locations affect air quality by changing the number of vehicles and the congestion levels in a given area.

This section describes the existing air quality in the study area and analyzes the air quality impacts of the No-Build Alternative and Project alignment and design options on criteria pollutants—a group of common air pollutants regulated by EPA based on information on their health and/or environmental effects—and on GHGs.

A CO hot-spot screening assessment has been performed to satisfy the requirements of federal transportation conformity air quality rules (40 CFR Part 93, Subpart A). A qualitative evaluation of MSATs has also been performed

for this Project in accordance with FHWA guidance. The Council developed the scope and methods of these analyses in collaboration with MPCA, Hennepin County, MnDOT, and FHWA.

5.10.1 Regulatory Context and Methodology

Air quality is evaluated as part of the NEPA review process for large projects receiving federal funding or approvals. This is done in accordance with the federal CAA of 1970 and the CAAA of 1977 and 1990. EPA regulates air quality and delegates this authority to the State, and MPCA monitors air quality and regulates emissions of air pollutants.

Air quality impacts are defined as an exceedance of established regulatory thresholds for certain pollutants. The criteria pollutants identified by EPA are ozone (O_3), particulate matter (PM), CO, nitrogen dioxides (NO_x), lead (Pb), and sulfur dioxide (SO_2). The Council assessed the air quality impacts of the Project by comparing the projected pollutant concentrations with the No-Build Alternative and Project alignment and design options to the NAAQS.

EPA designates geographic areas based on measurements of criteria pollutant concentrations compared to the NAAQS. An attainment designation means that concentrations in the area are below the NAAQS, a nonattainment designation means that concentrations in the area are exceeding the NAAQS, and maintenance areas are areas that have been redesignated within the prior 20 years from nonattainment to attainment.

No areas in Minnesota are designated as nonattainment for criteria pollutants. Hennepin County, where the Project would be located, is designated as a maintenance area for CO. As a result, the Transportation Conformity Rule (40 CFR Part 93) requires the Council to demonstrate that the Project would comply with the SIP and would maintain compliance with the NAAQS for CO. Therefore, an evaluation of CO impacts has been performed.

For this Supplemental Draft EIS, the Council did not analyze the impacts of criteria pollutants other than CO. For projects affecting highway vehicle emissions, CO has historically been the only pollutant of significance. However, with lowered PM standards for fine particles ($PM_{2.5}$), greater concern has recently been focused on both $PM_{2.5}$ and particulate matter under 10 microns in diameter (PM_{10}) emissions from highways, with FHWA now recommending hot-spot analyses in nonattainment areas for these pollutants if a project involves significant increases in diesel truck traffic. A hot-spot analysis is defined in 40 CFR § 93.101 as an estimation of likely future localized pollutant concentrations and a comparison of those concentrations to the relevant NAAQS. A hot-spot analysis assesses the air quality impacts on a scale smaller than an entire nonattainment or maintenance area, including, for example, congested highways or transit terminals. Such an analysis of the area substantially affected by the Project demonstrates that CAA conformity requirements are met for the relevant NAAQS in the "study area." When a hot-spot analysis is required, it is included within a Project-level conformity determination. Because the Project would not increase diesel truck traffic, and because the Project area is also not in nonattainment or maintenance status for $PM_{2.5}$ or PM_{10}, no hot-spot analysis is needed for these PM components. The other criteria pollutants—nitrogen dioxides, sulfur dioxide, ozone, and lead—are not substantial concerns given the nature of the Project and study area; therefore, they have not been analyzed for this Supplemental Draft EIS.

In addition to the criteria air pollutants, EPA regulates air toxics. Seven compounds with significant contributions from mobile sources are identified by EPA as MSATs: acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter. As agreed to by FTA, the Council has applied the FHWA guidance for assessing MSAT effects for transportation projects in the NEPA process to this Project.

5.10.2 Study Area and Affected Environment

The study area for evaluating air quality effects from the Project was established in cooperation with MPCA. The analysis performed includes consideration of CO and MSATs. The evaluation of these pollutants is typically considered in the immediate Project area where traffic volumes, travel patterns, and roadway locations could affect air quality. Therefore, the study area for air quality includes all roadway segments adjacent to and crossing the Project.

In addition to traffic-related emissions, there would be minor amounts of emissions from an OMF to be located near the northern end of the Project. Therefore, the study area for air quality also includes the OMF.

Air quality is evaluated based on impacts to humans in the affected environment. Humans experience air quality impacts by breathing unsafe concentrations of airborne pollutants. Exposure to CO and MSATs emitted from motor vehicles, the pollutants of primary focus for this Project, can occur in homes, businesses, and recreation facilities located adjacent to affected roadway segments or on pedestrian facilities along Project-area roads.

5.10.3 Environmental Consequences

This section identifies the long- and short-term impacts to air quality and GHG emissions from the No-Build Alternative and Project alignment and design options.

5.10.3.1 Operating-Phase (Long-Term) Impacts

No-Build Alternative

The No-Build Alternative would have no long-term impacts to air quality or greenhouse gas emissions.

Project Alignment and Design Options

Long-term impacts would be a result of the operation of LRVs. The following sections describe potential operating-phase air quality and GHG impacts from the No-Build Alternative and Project alignment and design options.

National Ambient Air Quality Standards

The Council assessed the impacts from criteria pollutants by applying a CO hot-spot screening methodology to determine whether CO concentrations would exceed the NAAQS. The CO analysis is described below in the section titled Hot-Spot Screening for Carbon Monoxide.

CARBON MONOXIDE

CO is a traffic-related pollutant that has been a cause of concern in the Twin Cities Metropolitan Area. In 1999, EPA redesignated all of Hennepin, Ramsey, and Anoka Counties and portions of Carver, Scott, Dakota, Washington, and Wright Counties as maintenance areas for CO. This means that these counties were previously classified as nonattainment areas but were found to be in attainment and are now classified as maintenance areas. Maintenance areas are required to have actions undertaken to demonstrate continuing compliance with CO standards. Because the Project would be located in Hennepin County, an evaluation of CO for assessing air quality impacts is required in NEPA documents.

GREENHOUSE GASES AND CLIMATE CHANGE

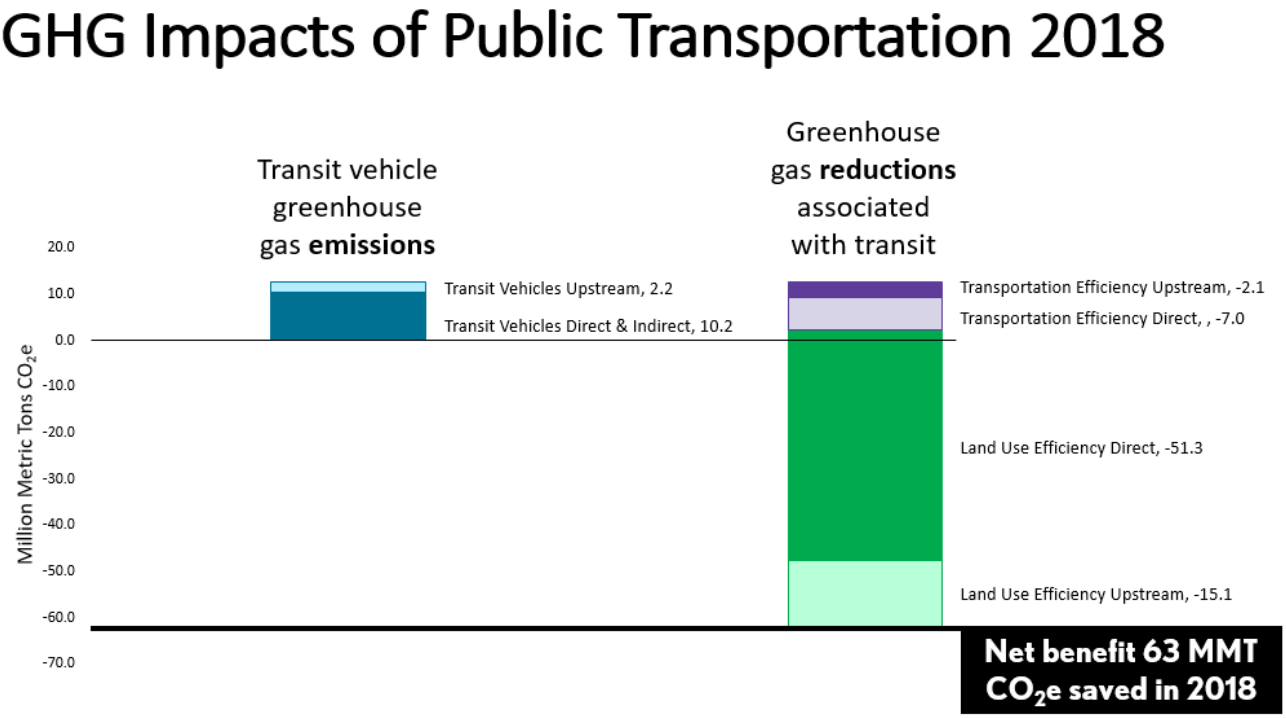
Climate change results from an increase in atmospheric GHG concentrations from the incremental addition of GHG emissions from a vast multitude of individual sources. The totality of climate change impacts is not attributable to

any single action but is exacerbated by a series of actions as well as interrelated systems and sectors. Transportation is the largest contributor to GHG emissions in the state of Minnesota, accounting for approximately 25 percent of the state's GHG emissions.[24] Despite being a major contributor to GHG emissions, transportation can deliver strategies to reduce climate impacts through mode shift, increased public transit usage, and decarbonization of vehicles. This Project is an example of one such strategy—it would provide additional public transportation service and contribute to the VMT reductions outlined in the latest Statewide Multimodal Transportation Plan, Minnesota GO.[25] This plan aims to decrease overall annual GHG emissions from the transportation sector by 80 percent by 2040 and to reduce statewide VMT-per-capita by 14 percent at the same 2040 horizon.

These statewide initiatives are in line with national goals and guidance. The latest guidelines from CEQ, titled "National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change,"[26] indicate that NEPA reviews should quantify the Project's GHG emissions, place GHG emissions in appropriate context and disclose relevant GHG emissions and relevant climate impacts, and identify alternatives and mitigation measures to avoid or reduce GHG emissions.[27]

Public transportation is a proven climate change solution. The Transit Cooperative Research Program Research Report 226, "An Update on Public Transportation's Impacts on Greenhouse Gas Emissions,"[28] shows that the benefit of public transportation vastly outweighs any emissions generated by transit systems, as shown in Figure A5-33. While there are direct GHG emissions from fleet operations as well as upstream emissions for fleet operations to be considered, and agencies must manage their impacts in a drive to sustainability, the system-wide efficiency gains from utilization of public transit systems provide a net benefit CO_2e savings. Transportation efficiency refers to transit passengers who avoid taking taxis or ride-hailing services; land use efficiency refers to shorter and fewer trips thanks to better land use patterns. In 2018, the national net benefit CO_2e savings was 63 million metric tons, which is equivalent to the annual GHG emissions output of 16 coal power plants.

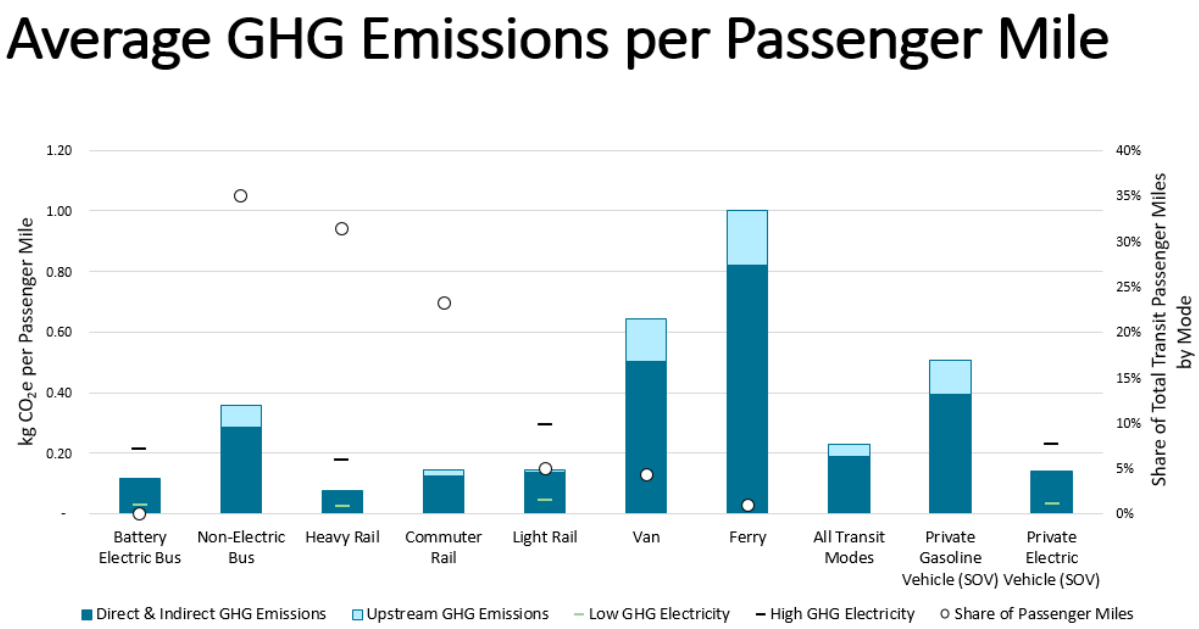
Figure A5-33 Greenhouse Gas Impacts of Public Transportation



Source: Transit Cooperative Research Program, Research Report 226, *An Update on Public Transportation's Impacts on Greenhouse Gas Emissions* (Washington, D.C.: Transit Cooperative Research Program, 2021) https://doi.org/10.17226/26103.

Transit systems continue to get cleaner year over year, and in 2018 the emissions generated per passenger mile by public transportation were 26 percent lower than in 2005. An analysis of average GHG emissions per passenger mile (Figure A5-34) shows that for LRT, emissions are significantly lower than for non-electric bus or single-occupancy gasoline vehicles. A typical trip on public transit emits 55 percent fewer GHG emissions than driving or ride-hailing alone.

Figure A5-34 Average Greenhouse Gas Emissions per Passenger Mile



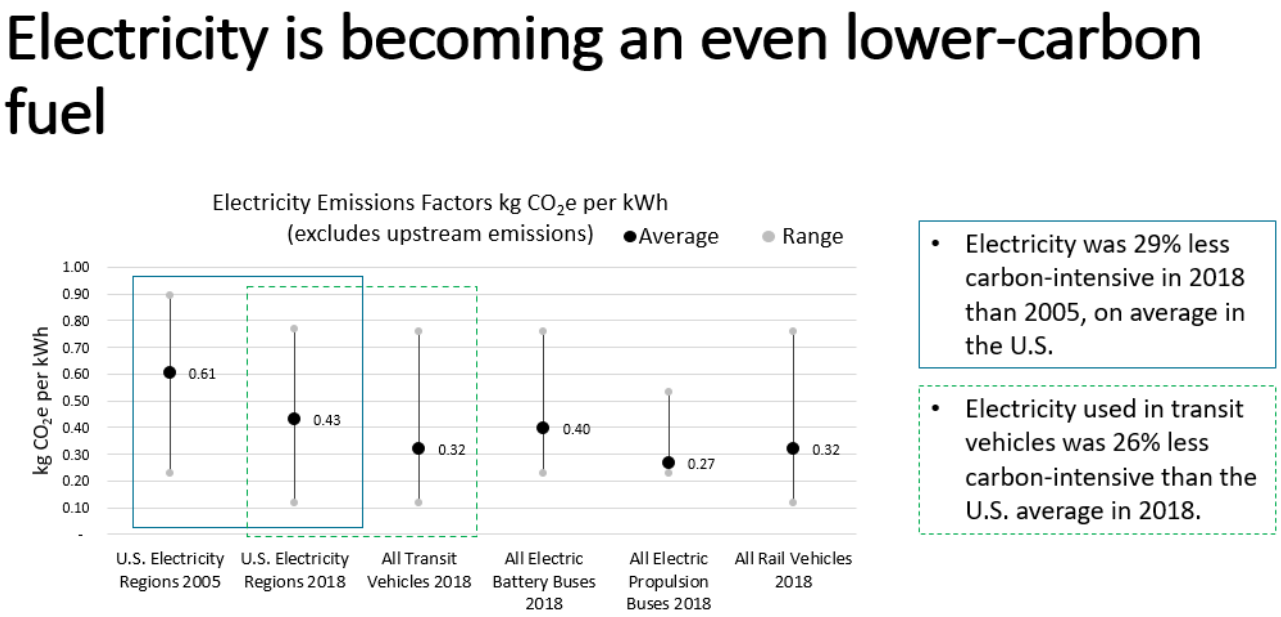
SOV is single occupancy vehicle. Average private vehicle occupancy for commute trips is 1.18 passengers, for all trips 1.67 passengers (NHTS).

Source: Transit Cooperative Research Program, Research Report 226, *An Update on Public Transportation's Impacts on Greenhouse Gas Emissions* (Washington, D.C.: Transit Cooperative Research Program, 2021) https://doi.org/10.17226/26103.

For this Project specifically, GHG emissions were calculated by multiplying the VMT of each type of vehicle by the CO_2 emission factors taken from the New and Small Starts Evaluation and Rating Process Final Policy Guidance[29] based on projected CO_2e emission factors for the planning horizon for the Project (2040).

Figure A5-35 illustrates the reduction in carbon intensity of the electrical grid between 2005 and 2018 using EPA's eGRID emission factor database. Through the continued decarbonization of the power grid, these emissions estimates are forecast to reduce approaching the zero-carbon target year of 2050.

Figure A5-35 Electricity Emissions Factors (kg CO_2e per kWh)



Source: Transit Cooperative Research Program, Research Report 226, *An Update on Public Transportation's Impacts on Greenhouse Gas Emissions* (Washington, D.C.: Transit Cooperative Research Program, 2021) https://doi.org/10.17226/26103.

Table A5-36 shows the estimated VMT reduction for both the 2019 and 2040 build scenarios (miles from trips that change from private vehicle to transit) and the reduction of VMT per new transit customer. The total reduction on VMT is higher for the Lyndale Ave N alignment in 2019 and 2040, but the reduction per customer is approximately the same for each alignment in 2019 and 2040.

Table A5-36 Anticipated VMT Reduction for 2019 and 2040 Build Scenarios

Parameter	2019 East of I-94 Option	2019 Lyndale Option	2040 East of I-94 Option	2040 Lyndale Option
Daily reduction in VMT over No-Build Alternative	(82,100.00)	(81,400.00)	(89,600.00)	(88,600.00)
New transit customers	8,200.00	8,200.00	8,900.00	8,900.00
Daily reduction in VMT per new customer	(10.01)	(9.93)	(10.07)	(9.96)

Source: VMT were calculated through Twin Cities Regional STOPS model and forecast run 1: West I-94 (Lyndale Ave), 3/23/2023 and STOPS model run 2: East I-94 (Washington Ave), 3/28/2023.

Table A5-37 shows emissions of transportation-related GHG, expressed as CO_2e, for both the 2019 and 2040 build scenarios across each alignment option. Regional passenger vehicle emission rates developed by the Council within the latest GHG emissions inventory are based on a regionally specific travel demand model, EPA's MOVES model, and regional vehicle fleet information from both the Minnesota Department of Vehicle Services registration data and MPCA's vehicle age distribution categories. This model and the calculated emission factors are specific to the conditions of the Twin Cities Metropolitan Area and are more accurate than national averages. The total CO_2e emissions factor for light-duty passenger vehicle emissions is 355.69 grams per VMT.[30]

The Project would decrease transportation-related GHG emissions in the metropolitan area by up to 11,600 MT of GHG compared to the transportation-related GHG emissions with the No-Build Alternative.

Table A5-37 Emissions for Equivalent Passenger Vehicle per Regional Emissions Model (MT CO_2e)

Scenario	2019 East of I-94	2019 Lyndale Ave	2040 East of I-94	2040 Lyndale Ave
Daily	(29.20)	(28.95)	(31.87)	(31.51)
Annual	(10,658.78)	(10,567.91)	(11,632.49)	(11,502.66)

Source: CO_2e factors were calculated from: Minnesota Metro Transit, *Passenger and Commercial Transportation Methodology* (MN Metro Transit, 2023), Passenger and Commercial Transportation Methodology (shinyapps.io).

AIR QUALITY CONFORMITY

The 1990 CAAA require that SIPs must demonstrate how states with nonattainment and maintenance areas would meet federal air quality standards.

EPA issued final rules on transportation conformity (40 CFR Part 93, Subpart A), which describe the methods required to demonstrate that transportation projects comply with the SIP. The final rules require that transportation projects must be part of a conforming LRTP and 4-year Transportation Improvement Program (TIP). The Project is part of the 2040 Transitway System shown in the Council's 2040 TPP, adopted on Jan. 14, 2015. The Project is included in the latest version (2016–2019) of the TIP (Sept. 23, 2015). The 2040 TPP was found to be in conformity by FHWA and FTA on March 13, 2015.

The 2040 TPP supports expanding transit services as a means of improving regional air quality. Chapter 4, Transportation Finance, of the 2040 TPP describes federal funding policies that lead to coordinated investments in transportation infrastructure to mitigate congestion and improve air quality through fewer VMT in private cars. Appendix E, Additional Air Quality Information, of the 2040 TPP[31] demonstrates that the 2040 TPP conforms to the requirements of the CAA. In summary, the Project improvements are consistent with the Council's goal of improving regional air quality.

On Nov. 8, 2010, EPA approved a request for a limited maintenance plan for the Twin Cities maintenance area. Under a limited maintenance plan, EPA has determined that there is no requirement to estimate projected emissions over the maintenance period and that "emissions budgets in limited maintenance plan areas may be treated as essentially not constraining for the length of the initial maintenance period because it is unreasonable to expect that such an area will experience so much growth in that period that a violation of the CO NAAQS would result."[32]

Therefore, no regional modeling analysis for the LRTP and TIP is required. However, federally and State-funded projects are still subject to isolated intersection-level, or "hot-spot," analysis requirements. The limited maintenance plan adopted in 2010 determined that the level of CO emissions and resulting ambient concentrations in the Twin Cities maintenance area will continue to demonstrate attainment of the CO NAAQS. Therefore, the Council did not perform regional emissions modeling as part of the evaluation for this Supplemental Draft EIS. However, the Council did perform a hot-spot screening assessment, as required, which is summarized below.

Hot-Spot Screening for Carbon Monoxide

CO is assessed by evaluating the worst-operating (hot-spot) intersections in the study area. In 2010, EPA approved a screening method developed by MnDOT to determine which intersections need hot-spot analysis. The hot-spot

screening method uses a traffic volume threshold of 82,300 entering vehicles per day (vpd) for signalized intersections affected by a project. If an affected intersection exceeds this threshold in the design year, or if a project affects 1 out of 10 specific intersections in the Twin Cities Metropolitan Area, then a quantitative CO hot-spot analysis is required. If an affected intersection is not 1 of the listed 10, and if the total traffic through the intersection is less than the 82,300 vpd benchmark, then the intersection screens out of quantitative analysis and is not considered a threat to the area's attaining the NAAQS.

The signalized intersections that would be affected by the Project are not among the 10 listed intersections in the approved MnDOT hot-spot screening procedure. To determine whether any intersections would exceed the 82,300 vpd benchmark, the Council obtained the traffic projections for the year 2040 vpd for the busiest intersections along the Project Alignment for comparison. These numbers are based on the 2040 forecasts in the Hennepin County transportation plan. The intersections with the highest total traffic volumes for each intersection are listed below:

- W Broadway Ave and Brooklyn Blvd: 37,600 vpd
- CR 81 and Bass Lake Rd: 46,600 vpd
- Broadway Ave/Washington Ave = 37,800 vpd (Project Alignment: east of I-94 alternative)
- CR 81/42nd Ave = 36,700 vpd (Project Alignment)
- CR 81/TH 100 southbound ramp = 37,900 vpd (Project Alignment)
  CR 81/Bass Lake Rd = 51,100 vpd

Neither of the above-listed intersections would meet or exceed the screening threshold of 82,300 vpd in 2040. Given that the screening criteria indicate no potential for CO hot spots that could approach or exceed the NAAQS, quantitative hot-spot analysis is not required for transportation conformity purposes.

Table A5-38 lists recent (2022) monitored CO concentrations at Twin Cities monitors. Improvements in vehicle technology and in motor fuel regulations continue to result in reductions in vehicle emission rates of CO and other pollutants. The EPA MOVES emissions model estimates that CO and other pollutant emission rates will continue to fall from existing rates through 2040. Consequently, year 2040 vehicle-related CO concentrations in the study area are likely to be lower than existing concentrations, even after considering the projected increases in development-related and background traffic.

Table A5-38 Monitored 2022 Carbon Monoxide Concentrations vs. NAAQS (ppm)

Monitor Site	1-Hour (2nd Maximum)	1-hour NAAQS	8-Hour (2nd Maximum)	8-hour NAAQS
12821 Pine Bend Trail, Rosemount	0.6	35ppm [a]	0.4	9ppm [a]
16750 Kenyon Ave, Lakeville	0.6		0.5	
2124 120th St E, Inver Grove Heights	0.6		0.6	
9399 Lima St, Blaine	0.8		0.7	
528 Hennepin Ave, Minneapolis	3.1		1.1	
1444 E 18th St, Minneapolis	1.6		1.4	

[a] ppm represents parts per million which is a commonly used dimensionless measure of small levels or concentrations of pollutants.

Source: Environmental Protection Agency, Air Quality Data Collected at Outdoor Monitors Across the US (EPA 2023) (Air Data: Air Quality Data Collected at Outdoor Monitors Across the US | EPA)—NAAQS compliance based on 2nd maximum.

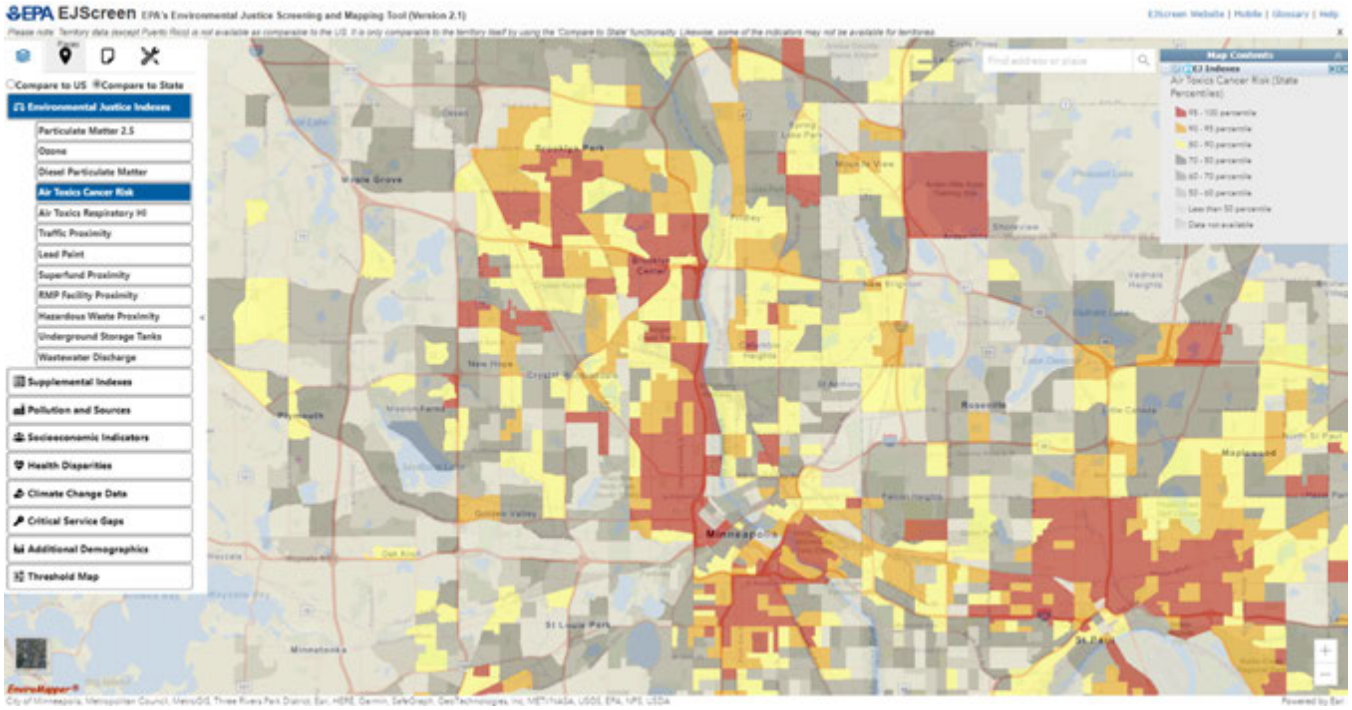
The CO screening assessment and existing monitoring data show that the Project would not cause CO concentrations that exceed State or federal standards.

MOBILE-SOURCE AIR TOXICS

Controlling air toxic emissions became a national priority with the passage of the CAAA of 1990, whereby Congress mandated that EPA regulate 188 air toxics, also known as hazardous air pollutants. EPA has assessed this list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8430, Feb. 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System.[33]

In addition, EPA identified seven compounds discussed in Section 5.10.1 with significant contributions from mobile sources that are among the national- and regional-scale cancer risk drivers from its 1999 National Air Toxics Assessment.[34] These air toxic cancer-risk drivers are a concern for the study area, which has historically been subject to levels of air toxics at a level much higher than the statewide average. A snapshot of air toxics impacts from EPA's EJScreen mapping tool (Figure A5-36) highlights the disparity that exists in this area.

Figure A5-36 Air Toxics Cancer Risk



Source: United States Environmental Protection Agency, *EPA's Environmental Justice Screening and Mapping Tool (Version 2.11)* (EPA, 2023) EJScreen: Environmental Justice Screening and Mapping Tool | US EPA.

While historical air toxics emissions have come from a multitude of sources in this area, this Project aims to reduce vehicle emissions that can contribute to the issue. With a focus on transit usage and overall emission reductions, localized air quality impacts and related human-health outcomes can be improved.

FHWA provides guidance on evaluating MSATs for highway projects as part of the NEPA process, which FTA is applying to the Project. This guidance specifies a tiered approach for MSAT evaluation:

- No analysis is required for projects with no meaningful MSAT effects. These are projects qualifying as a categorical exclusion under 23 CFR § 771.117(c), that are exempt under the CAA conformity rule, or that would have no meaningful impacts on traffic volumes or vehicle mix.

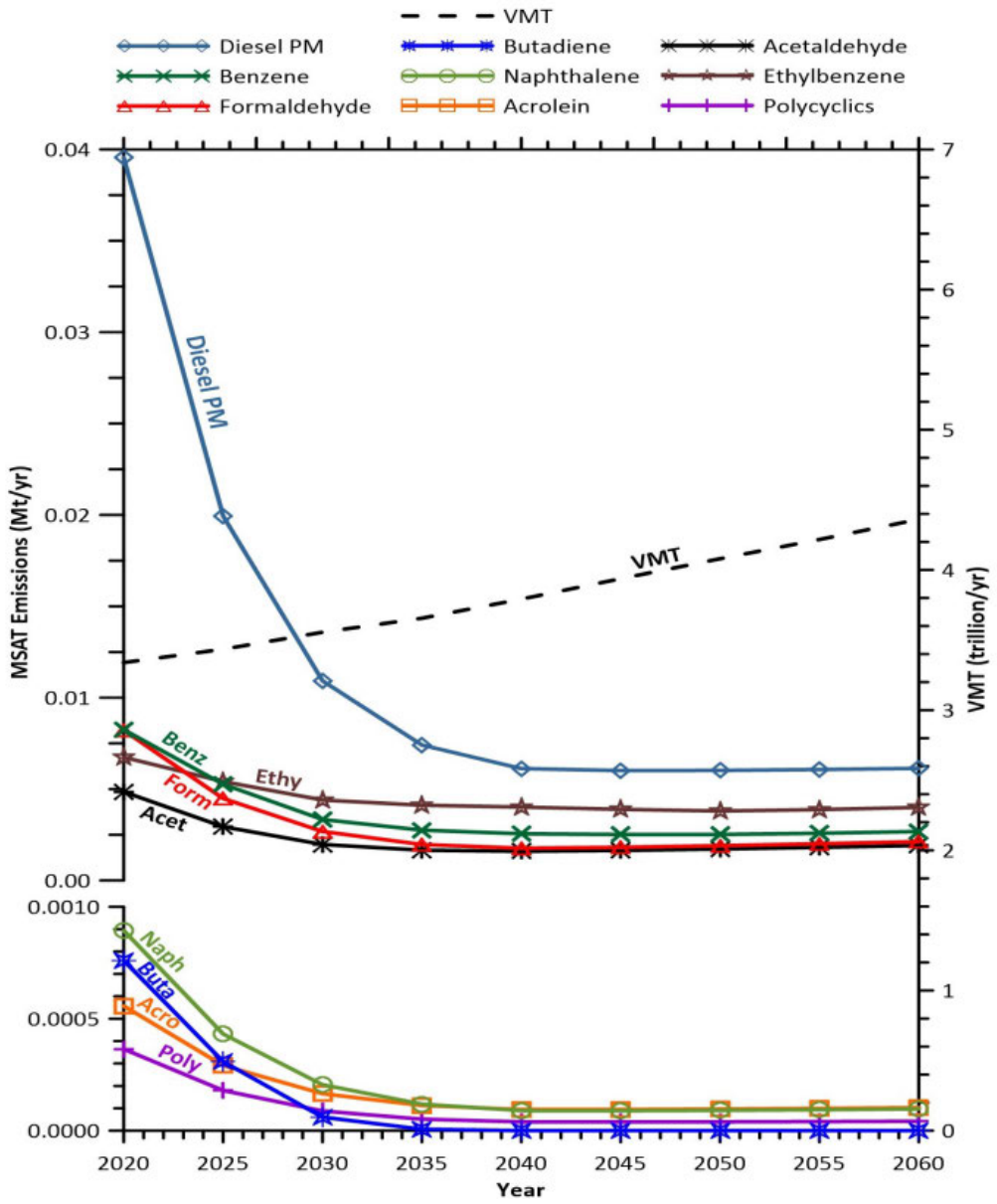
- Qualitative analysis is prescribed for projects with low potential MSAT effects. Most projects fall into this category if they do not meet the criteria for the other two categories.
- Quantitative analysis is required for major highway-capacity projects on facilities with more than 140,000 to 150,000 vpd or for intermodal freight terminal projects with high levels of diesel PM.

This qualitative evaluation of MSAT impacts for the Project was performed according to the FHWA guidance. This is appropriate based on the scope of improvements contemplated as part of this Project, particularly modifications to roads and intersections through the study area. FHWA guidance states that the qualitative assessment should compare, in narrative form, the expected effects of the Project on traffic volumes, vehicle mix, or routing of traffic and the associated changes in MSATs for the No-Build Alternative and Project alignment and design options, based on traffic volumes, vehicle mix, and speed. The assessment should also discuss national trend data projecting substantial overall reductions in emissions because of stricter engine and fuel regulations issued by EPA.

Summary of MSAT Information

The 2007 EPA rule further requires controls that would dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. According to FHWA analysis using EPA's MOVES3, even if vehicle activity emissions (i.e., VMT) were to increase by 31 percent from 2020 to 2060 as forecasted, a reduction of 76 percent in the total annual emissions for the priority MSAT is projected from 2020–2060, as shown in Figure A5-37.

Figure A5-37 FHWA Projected National MSAT Emission Trends 2020–2060 for Vehicles Operating on Roadways



Source: U.S. Department of Transportation, *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents- EPA MOVES3 model run conducted by FHWA, March 2021.* (USDOT, 2023) MSAT - Policy And Guidance - Air Toxics - Air Quality - Environment - FHWA (dot.gov).

Air toxics analysis is a continuing area of research. Although much work has been done to assess the overall health risk of air toxics, many questions remain unanswered. In particular, the tools and techniques for assessing project-specific health outcomes because of lifetime MSAT exposure remain limited. These limitations impede the ability to evaluate how the potential health risks posed by MSAT exposure should be factored into project-level decision making within the context of NEPA.

Information is incomplete or unavailable to credibly predict project-specific health impacts that could occur because of changes in MSAT emissions associated with a proposed set of transportation alternatives. FHWA, EPA, the Health Effects Institute, and others have funded and conducted research studies to try to more clearly define potential risks

from MSAT emissions associated with transportation projects. However, technical tools are not available to predict project-specific health impacts of MSAT emissions. In compliance with 40 CFR § 1502.22(b), FHWA has provided a discussion demonstrating that scientific techniques, tools, and data are not sufficient to accurately estimate human-health impacts that could result from a transportation project in a way that would be useful to decision makers.

Qualitative MSATs Analysis

There are two ways that highway vehicle MSAT emissions would change, as compared to the No-Build Alternative, if the Project were implemented. One is that the passing LRVs would briefly impede traffic near at-grade rail-highway crossings, causing more MSAT emissions in these locations because of vehicle idling, acceleration, and deceleration. The second is that, by having people ride the LRT system instead of driving to their destinations, the MSAT emissions from highway travel would tend to decrease. The second effect would outweigh the first effect, meaning that regional MSAT emissions would decrease for the Project as compared to the No-Build Alternative.

While regional MSAT emissions would decrease with Project implementation, localized emissions would tend to increase in the vicinity of at-grade rail-highway crossings. However, given that the LRVs pass very quickly, emissions associated with idling, accelerating, or decelerating highway vehicles near these crossings should be far less than MSAT emissions near typical signalized intersections on busy streets in urban areas. (For an analysis of traffic operations at intersections along the Project Alignment, see Chapter 3, Section 3.3 of this Supplemental Draft EIS.)

With the No-Build Alternative and Project alignment and design options, MSAT emissions would likely be lower than present levels in the design year (2040) as a result of EPA's national control programs, which are projected to reduce annual MSAT emissions by 72 percent between 2020 and 2060 (Figure A5-37 above). On a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than they are today. The magnitude of the EPA-projected reductions is so great (even after accounting for traffic growth) that MSAT emissions in the study area are likely to be lower under a wide variety of future conditions.

Project Alignment and Design Options

Impacts are not likely to be widely variable between the alignment and design options. Similar activities would result from all alignment options, and only minor spatial differences would be associated with the different design options.

5.10.3.2 Construction-Phase (Short-Term) Impacts

No-Build Alternative

The No-Build Alternative would have no long-term impacts to air quality or greenhouse gas emissions.

Project Alignment and Design Options

Construction activities and impacts would be temporary and would be limited to the direct Project area, including the construction sites and access routes to those sites. Constructing the Project would affect traffic volumes and operations on roads in and around the study area. During construction, some intersections might need to temporarily operate with reduced capacities or be temporarily closed. The Council expects that, under these conditions, traffic would detour to parallel roads near the construction area. This short-term impact could include both emissions from construction equipment and emissions from traffic disruptions due to increased congestion and slower traffic speeds. Implementation of BMPs (such as using energy-efficient construction equipment and vehicles

and limiting equipment and vehicle idling time during construction) would reduce GHG emissions from construction activities.

Currently, no quantitative GHG emission thresholds at the federal or state level are applicable to the Project. The Project's construction emissions would be temporary, and the Council would make an effort to minimize the amount of emissions generated during construction. If amortized over the life of the Project, the GHG emissions would be minimal. In addition, the Project is included in the Regional Transportation Plan and the TIP. These transportation plans consider climate change mitigation, adaptation, and resilience for sustainable development of the region. Therefore, GHG emissions from the Project would not hinder the region's GHG emission-reduction efforts.

No other construction-phase impacts to air quality are anticipated.

Project Alignment and Design Options

Impacts are not likely to be widely variable between the Project alignment and design options. Similar equipment and activities would be required for all alignment and design options, and similar BMPs can be employed for all options to mitigate emissions and impacts.

In addition to traffic-related emission increases, construction activities can cause higher concentrations of air pollutants. Construction equipment powered by fossil fuels emits the same air pollutants as highway vehicles. Exposed earthen materials can also produce increased PM when they are moved or disturbed by wind. The BMPs described in Section 5.10.4 would ensure that concentrations of air pollutants are kept at the lowest possible levels during the construction phase.

5.10.4 Avoidance, Minimization, and/or Mitigation Measures

The following section describes potential measures that could be implemented to avoid, minimize, and/or mitigate potential air quality and GHG emissions impacts from the Project.

5.10.4.1 Operating-Phase (Long-Term) Mitigation Measures

The analysis presented in this Supplemental Draft EIS demonstrates that air pollutant concentrations during the operating phase of the Project would not exceed the NAAQS; therefore, no mitigation measures are necessary. The State does not require permits related to air quality for projects of this type.

The Council estimates that operation of the Project would slightly reduce GHG emissions compared to the No-Build Alternative because of the reduction in automobile traffic. Therefore, the Project would help reduce any effects of GHG emissions on climate.

5.10.4.2 Construction-Phase (Short-Term) Mitigation Measures

Given the scattered, intermittent, and temporary nature of construction activities, the Council does not expect any exceedances of ambient air quality standards during the construction phase of the Project. However, the contractor would implement a series of BMPs during construction to control dust. These BMPs could include the following preventive and mitigation measures:

- Minimize land disturbance during site preparation
- Use watering trucks to minimize dust
- Cover trucks while hauling soil or debris off site or transferring materials

- Stabilize dirt piles to limit movement and fugitive dust releases as soon as practicable
- Use dust suppressants on unpaved areas
- Minimize unnecessary vehicle and machinery idling
- Revegetate any disturbed land post-construction
- Use energy-efficient construction equipment and vehicles

The Council would develop traffic-control measures in subsequent stages of the Project to address detours and the flow of traffic.

Construction would cause an unavoidable temporary increase in GHG emissions because of both direct emissions from construction equipment exhaust and indirect emissions from production of construction materials such as steel and concrete. However, in the long term, these emissions would tend to be offset by the net reductions in emissions from Project operation.

5.11 Energy

This section reports estimated changes in regional energy consumption due to the No-Build Alternative and Project alignment and design options.

5.11.1 Regulatory Context and Methodology

The analysis results are reported in Btu per mile as calculated from the VMT reported for each option by the Twin Cities Regional Travel Demand Model. A Btu is a commonly used unit of energy that represents the amount of heat energy needed to raise the temperature of 1 pint of water by 1 degree Fahrenheit. Energy consumption factors are based on estimates of average energy consumption rates.

The energy impact of the Project was determined by comparing the total energy consumption of the Project to that of the No-Build Alternative. The amount of energy used per mile by each mode of transportation is presented in Table A5-39. By multiplying these energy-use factors by the total miles traveled, annual energy use can be estimated.

Table A5-39 Energy Consumption Factors

Travel Mode	Factor (Btu/Vehicle-Mile)
Light rail transit	20,040
Heavy duty vehicles	20,812
Bus	34,877
Passenger vehicles	4,292

Source: U.S. Department of Energy, *Transportation Energy Data Book: Edition 40, Oak Ridge National Laboratory*, (USDOE 2022). Home - Transportation Energy Data Book Transportation Energy Data Book (ornl.gov).

5.11.2 Study Area and Affected Environment

The study area for energy includes the seven-county Twin Cities Metropolitan Area, with an emphasis on anticipated changes in travel patterns and bus operations associated with the Project. The focus is on direct energy use; that is, the energy consumed through the operation of vehicles including automobiles, buses, and trucks.

The land use in the study area is primarily urban with undeveloped land at the north end. Development along the Project Alignment includes residential, business, industrial, institutional, park, and transportation uses. Existing land uses along the Project Alignment are identified and described in Chapter 4, Section 4.1 of this Supplemental Draft EIS.

5.11.3 Environmental Consequences

This section identifies the long- and short-term impacts to energy from the No-Build Alternative and Project alignment and design options.

5.11.3.1 Operating-Phase (Long-Term) Impacts

Long term impacts are presented in Table A5-40. To calculate energy impacts from the Project, the change in VMT from Table A5-36 were multiplied by the light-duty passenger vehicle Btu value from Table A5-39. The change in VMT would reduce an estimated 140,000 MMBtu for the 2040 build.

Table A5-40 MMBtu[a] for Equivalent Passenger Vehicle

Scenario	2019 East of I-94	2019 Lyndale Ave	2040 East of I-94	2040 Lyndale Ave
Daily	(352.37)	(349.37)	(384.56)	(380.27)
Annual	(128,616.22)	(127,519.61)	(140,365.57)	(138,798.99)

[a] MMBtu = 1 million British thermal units.

An important note on the energy consumption analysis is that these values do not indicate the methods by which the energy was generated. There are large benefits in switching transportation mode type with respect to climate change, as the buses and heavy-duty and passenger vehicles rely on direct fossil-fuel combustion, while the LRT option relies on electricity (as a mixture of indirect fossil-fuel combustion and renewable energy sources). Electric LRT provides a shorter pathway to decarbonization through rapid capability to incorporate renewable power sources in the next few decades.

As discussed in the air quality analysis, decarbonization of the power grid would create an even more significant benefit for electrified mobility modes, the most readily available of which is LRT. Figure A5-35 in Section 5.10.3.1 illustrates the reduction in carbon intensity of the electrical grid between 2005 and 2018 using EPA's eGRID emission factor database. Through the continued decarbonization of the power grid, these emissions estimates are forecast to reduce approaching the zero-carbon target year of 2050.

No-Build Alternative

The annual regional direct energy consumption for on-road and light-rail activity under the No-Build Alternative is estimated at about 234.789 trillion Btu based on output from the Twin Cities Regional Travel Demand Model as modified for the Project.

Project Alignment and Design Options

All alignment and design options would have slightly lower energy consumption than the No-Build Alternative, primarily because of reduced passenger car miles and energy use, which would more than offset the energy use of the LRVs and the slight increase in energy use for buses. The estimated annual regional direct energy consumption for the Project is 234.670 trillion Btu. The energy savings in 2040 for the Project compared to the No-Build Alternative are estimated at 119 billion Btu annually.

5.11.3.2 Construction-Phase (Short-Term) Impacts

The following sections describe potential short-term construction-phase emissions impacts from the Project.

No-Build Alternative

The No-Build Alternative would have no construction-phase impacts to energy use.

Project Alignment and Design Options

Energy would be required to construct the Project, to produce the raw materials used in construction, and to operate construction equipment. Energy use would be local and temporary. Compared to the energy consumption of the entire Twin Cities Metropolitan Area, construction of the Project would not have a substantial effect on regional energy consumption. Table A5-41 describes potential construction-phase emissions impacts from the Project.

Table A5-41 Construction-Phase Emissions Impacts

Emission Type	Upstream (MMBtu)[a]	Downstream (MMBtu)[a]	Total (MMBtu)[a]
Construction	42,243	3,660	45,903
Transitway maintenance	0	2,492	2,492
Total	42,243	6,152	48,395

[a] MMBtu = 1 million British thermal units.

5.11.4 Avoidance, Minimization, and/or Mitigation Measures

The following section describes potential measures that could be implemented to avoid, minimize, and/or mitigate potential energy-related impacts from the Project.

5.11.4.1 Operating-Phase (Long-Term) Mitigation Measures

No mitigation measures are warranted for long-term impacts to energy because, unlike the No-Build Alternative, the Project would decrease total annual regional energy consumption. During operation, the Project would use regenerative braking, similar to the Blue and Green Lines currently in operation. Energy generated by LRV braking can be used by another LRV if they are in the same power section at the same time; otherwise, the energy would dissipate as heat from the top of the LRV.

Opportunities to reduce energy consumption include constructing energy-efficient structures such as park-and-ride facilities, LRT stations, and the OMF. The Council assessed these energy-saving opportunities and appropriate energy-saving measures, and the following have been incorporated into the Project:

- Follow the State of Minnesota Sustainable Building Guidelines (MSBG-B3) (similar to standards required to achieve Leadership in Energy and Environmental Design [LEED] certification)
- Use highly efficient light-emitting diode (LED) lighting for the Project (street lighting to building lighting)
- Maximize use of daylight at the OMF, supplemented with lighting control management software
- Coordinate with Xcel Energy for efficient OMF heating, cooling, and lighting control systems
- Use energy recovery units in the OMF
- Use a high-efficiency chiller at the OMF
- Use condensing boilers at the OMF
- Use a closed-cell cooling tower (free winter cooling)

5.11.4.2 Construction-Phase (Short-Term) Mitigation Measures

No mitigation measures are warranted for short-term impacts to energy because the impacts would be local and minor compared to regional energy consumption.

[1] Minnesota Department of Health, *Minnesota Well Index (MWI)* (St. Paul: Minnesota Department of Health, 2023), Minnesota Well Index (MWI).

[2] The Cities of Crystal, Golden Valley, and New Hope formed a joint powers board in 1963 to manage drinking water supply for the three cities. Each of the three cities maintains its own distribution system, utility billing, meter reading, and water sampling functions.

[3] Private wells are those that do not supply the public water system.

[4] The Drinking Water Supply Management Area is the Minnesota Department of Health–approved surface and subsurface area surrounding a public water supply well that completely contains the scientifically calculated Wellhead Protection Area and is managed by the entity identified in a wellhead protection plan. The boundaries of Drinking Water Supply Management Areas are delineated by identifiable physical features, landmarks, or political and administrative boundaries. A Wellhead Protection Area is the recharge area to a public well and is the area managed by the public water supplier, as identified in the wellhead protection plan, to prevent contaminants from entering public wells.

[5] FEMA defines freeboard as follows:

a) "An additional amount of height above the Base Flood Elevation used as a factor of safety (e.g., 2 feet above the Base Flood) in determining the level at which a structure's lowest floor must be elevated or floodproofed to be in accordance with state or community floodplain management regulations." (FEMA 2020)

b) "Freeboard is a factor of safety usually expressed in feet above a flood level for purposes of floodplain management. 'Freeboard' tends to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, bridge openings, and the hydrological effect of urbanization of the watershed. Freeboard is not required by NFIP standards, but communities are encouraged to adopt at least a one-foot freeboard to account for the one-foot rise built into the concept of designating a floodway and the encroachment requirements where floodways have not been designated. Freeboard results in significantly lower flood insurance rates due to lower flood risk." (FEMA 2020)

[6] Additional information on critical actions is available on FEMA's website: FEMA Policy FP-206-21-003-0001 Implementation of the FFRMS for HMA Programs.

[7] Minnesota Department of Natural Resources defines Floodway and Flood Fringe as follows:

"a) Floodway is the channel of the river or stream and the adjacent land that must remain free from obstruction so that the 100-year flood can be conveyed downstream." (DNR 2014)

b) "Flood Fringe is the remaining portion of the floodplain. FEMA and state regulations permit communities to allow the flood fringe to be obstructed and developed if standards (i.e., elevating and floodproofing structures) are met." (DNR 2014)

[8] Additional information on Floodplain definitions is available on DNR's website: http://files.dnr.state.mn.us/publications/waters/floodplain_management_fact_sheet_2.pdf

[9] Per MN Floodplain Ordinance, Section 5.0 Floodway district, 5.21 Standards for permitted uses in floodway in addition to Section 4.0.

[10] USACE St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota (2009).

[11] Geologic Atlas of Hennepin County (Minnesota Geological Survey 1989).

[12] Freshwater. 2021. *Hennepin County Bedrock Collapse Project: July 2021*. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://freshwater.org/wp-content/uploads/2021/10/Hennepin-County-Report.pdf

[13] United States Department of Agriculture. 2019. Web Soil Survey. Accessed February 28, 2023. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

[14] United States Department of Agriculture 2019.

[15] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

[16] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

[17] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

[18] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

[19] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

[20] Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual), FTA Report No. 0123, Office of Planning and Environment (Washington, D.C.: Federal Transit Administration, 2018), https://www.transit.dot.gov/research-innovation/transit-noise-and-vibration-impact-assessment-manual-report-0123.

[21] United States Fish and Wildlife Service (U.S. FWS) Endangered Species website (2023), https://fws.gov/program/endangered-species.

[22] Minnesota Land Cover Classification System (MLCCS 2008).

[23] Referred to as SCWM WMC when referencing their joint watershed management plan.

[24] Minnesota Pollution Control Agency (MPCA), *Greenhouse gas emissions in Minnesota 2005–2020* (Minneapolis, Minnesota: Minnesota Pollution Control Agency, 2022) Greenhouse gas emissions in Minnesota 2005–2020 (state.mn.us).

[25] Minnesota Department of Transportation (MnDOT), *Statewide Multimodal Transportation Plan* (Minneapolis, Minnesota: MnDOT, 2022) Minnesota GO :: Statewide Multimodal Transportation Plan.

[26] Council on Environmental Quality (CEQ), *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change* (CEQ 2023). Federal Register : National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change.

[27] Metropolitan Council. Climate Action Work Plan (Minneapolis Minnesota, 2022) Climate Action Work Plan.

[28] Transit Cooperative Research Program, *Research Report 226: An Update on Public Transportation's Impacts on Greenhouse Gas Emissions* (Washington, D.C.: Transit Cooperative Research Program, 2021) https://doi.org/10.17226/26103.

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