5 Physical and Environmental Analysis

Below is a summary comparing the impacts and mitigation in the 2016 Alignment with the Project Alignment.

Table 5-1. Comparison of Impacts and Mitigation – 2016 Alignment and Project Alignment

Resource	Did FEIS/ROD Identify an Impact and Mitigation?	Do the Proposed Modifications Change the Impacts to this Resource?	Do the Proposed Modifications Change the Mitigation?	Section Where Additional Information can be Found
Utilities	Yes, potential for stray currents to be mitigated through protection measures and minor disruptions to services to be mitigated by contractor notifications and best practices.	No	No	5.1
Floodplains	Yes, two floodplain areas affected – 16,800 cubic yards (10.41 acres) in Bassett Creek and 200 cubic yards (0.12 acres) in Grimes Pond to be mitigated through permit conditions and best management practices.	Reduced overall impact to floodplains. No impact to the Bassett Creek and Grimes Pond.	No	5.2
Wetlands and Aquatic Resources	Yes, impacts to 13.19 acres of wetlands for alignment and 2.5 acres for construction access route to be mitigated through compensatory wetland mitigation credits.	Reduced overall impact to wetlands.	No	5.3
Geology, Soils, and Topography	Yes, soil correction in areas of poor soils and short-term dewatering to be mitigated through permit requirements.	No	No	5.4
Hazardous Materials	Yes, identified 24 high-potential and 135 medium potential sites to be mitigated through Phase II sampling, Response Action Plan, Construction Contingency Plan, and contractor specifications.	Additional high- and medium-potential sites identified.	No	5.5

Resource	Did FEIS/ROD Identify an Impact and Mitigation?	Do the Proposed Modifications Change the Impacts to this Resource?	Do the Proposed Modifications Change the Mitigation?	Section Where Additional Information can be Found
Noise	Yes, 366 moderate and 618 severe noise impacts and construction noise to be mitigated through implementation of Quiet Zones, noise barriers, and contractor Noise Control Plan.	Fewer moderate and severe noise impacts that include 246 moderate and 173 severe impacts that could not be mitigated through Quiet Zones, noise barriers, or noise control plans.	Yes, Council will evaluate design and receiver-based mitigation options and mitigation will be identified in Supplemental Final EIS.	5.6
Vibration	Yes, 28 vibration impacts at residences and construction vibration to be mitigated through ballast mats and contractor requirements for pre-construction surveys and potential monitoring.	Same number of vibration impacts from Project Alignment at different locations. Vibration impact locations identified in 2016 FEIS/ROD are no longer valid.	No	5.7
Biological Environment	Yes, clearing 28 acres of forested land and potential effects on wildlife crossings to be mitigated through city tree ordinances, seasonal restrictions on tree removal, bald eagle nest surveys, and enhanced culvert crossings.	Lessened impact on forested land and potential wildlife crossing at about 10 acres.	No	5.8
Water Quality and Stormwater	Yes, 83-percent increase in impervious area to be mitigated through designing and constructing detention and infiltration facilities and permit requirements for potential construction effects.	Lessened impacts.	No	5.9
Air Quality	Yes, construction-phase potential for increased emissions mitigated through BMPs.	No	No	5.10
Energy	No	No	No	5.11

Chapter 5 presents anticipated impacts of the Project on the physical and environmental system. Results are presented for the No-Build Alternative for the purpose of establishing a basis to compare with the Build Alternative. Table 5-2 provides an overview of the physical and environmental resources evaluated; only Project elements with impacts on resources are presented in the body of this document. Potential operating-phase (long-term) and construction-phase (short-term) impacts are evaluated, and potential avoidance, minimization, and mitigation measures are presented. The No-Build and Build Alternatives evaluated in this chapter are illustrated and described in Chapter 2, and anticipated impacts from Project alignment and design options are evaluated in Appendix A-5 which include expanded discussion on regulatory context, methodology, study area, and affected environment.

Chapter 5 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. Details regarding specific regulations and impact assessment methodologies are provided in Appendix A-5.

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. A study area may extend 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 chapter is summarized in Table 5-2.

Table 5-2 Resources and Study Areas for the Physical and Environmental Analysis

Section	Resource Evaluated	Study Area Definition	Basis for Study Area
5.1: Utilities	Includes information about existing public and private utilities and summarizes potential utility impacts from the Project.	Within or adjacent to the LOD	Captures utilities within the LOD and adjacent utilities that could be affected.
5.2: Floodplains	Describes the existing floodplains in the study area, describes several factors that have caused floodplain impacts to change in the study area since publication of the Final EIS, and summarizes potential floodplain impacts from the Project.	Within or adjacent to the LOD	Captures floodplain impacts to upstream and downstream waters directly adjacent to the LOD.
5.3: Wetlands and Other Aquatic Resources	Describes the wetland types and boundaries that have been identified and field-delineated since publication of the Final EIS in the study area according to the federal and State standards and summarizes potential impacts to wetland and other aquatic resources from the Project.	Within or adjacent to the LOD	The distance captures the wetlands that are within and directly adjacent to the Project.
5.4: Geology, Soils, and Topography	Describes the existing geology, soils, and topography in the study area and summarizes potential impacts on geology, soils, and topography from the Project.	Within and adjacent to the LOD	Estimated area where construction would occur for the Project.
5.5: Hazardous Materials Contamination	Describes the properties in the study area that potentially contain hazardous or regulated materials based on the Modified Phase I Environmental Site Assessment (ESA) and describes the potential for encountering contaminated soil and/or groundwater from the Project.	500–550 feet on either side of the Project Alignment	American Society for Testing and Materials (ASTM) standards (E1527-13 and 40 CFR Part 312), as modified by MnDOT for transportation corridors.
5.6: Noise	Describes the existing noise environment in the study area and summarizes potential noise impacts from the Project.	Within 350 feet of the Project Alignment	Based on the screening distances provided in Chapters 4 of the FTA *Transit Noise and Vibration Impact Assessment Manual* (2018), a conservative 350-foot study area, measured from the center line of the Project Alignment, was used for the noise analysis.

Section	Resource Evaluated	Study Area Definition	Basis for Study Area
5.7: Vibration	Describes the existing vibration environment in the study area and summarizes potential vibration impacts from the Project.	Within 350 feet of the Project Alignment	Based on the screening distances provided in Chapters 9 of the FTA guidance manual, a conservative 350-foot study area, measured from the center line of the Project Alignment, was used for the vibration analysis.
5.8: Biological Environment	Describes the preferred habitats of rare, threatened, and endangered species in the study area and summarizes potential impacts to plants and animals and their habitat from the Project.	Within one-quarter 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.
5.9: Water Quality and Stormwater	Describes the existing water quality and stormwater conditions in the study area and summarizes potential stormwater impacts from the Project in terms of changes to impervious surfaces.	1 mile on either side of the Project Alignment for impaired waters; within the LOD for stormwater	National Pollutant Discharge Elimination System (NPDES) requirements for identifying impaired waters within or sensitive resources within 1 mile of a project.
5.10: Air Quality/Greenhouse Gas Emissions	Describes the existing air quality in the study area and analyzes the potential air quality impacts of the Project on criteria pollutants, a group of common air pollutants regulated by the United States Environmental Protection Agency (EPA) based on information regarding health and/or environmental effects of pollution. This section also addresses the Project's effect on GHG emissions and climate change.	All roadway segments adjacent to and crossing the Project, including the OMF	Established in cooperation with MPCA.
5.11: Energy	Reports the estimated changes in regional energy consumption from the Project and summarizes potential energy impacts from the Project.	Anticipated changes in travel patterns and bus operations resulting from the Project	Total energy consumption of the Project measured in British thermal units (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 Alternatives. Major utility owners that service the Project 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 Project area, but it does address those that could be affected by the Project.

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.

5.1.1 Regulatory Context and Methodology

The information provided in this Supplemental Draft EIS focuses on identifying major potential utility conflicts with the Build Alternative. Refer to Appendix A-5 for additional details about regulatory context and methodology for identifying utilities.

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 is defined as the estimated area where construction would occur for the Project.

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 5-1, Figure 5-2, and Figure 5-3 by Project city. Existing services for water, sanitary and storm sewer, electric and gas lines, and long-distance communication are presented in Appendix A-5.

5.1.3 Environmental Consequences

This section identifies the long-term (operating-phase) and short-term (construction-phase) impacts to utilities from the No-Build and Build Alternatives.

5.1.3.1 Operating-Phase (Long-Term) Impacts

Coordination with local and the State agencies may be required to relocate specific utilities outside the Project footprint. 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.

No-Build Alternative

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

Figure 5-1 Locations of Major Utilities in the City of Brooklyn Park

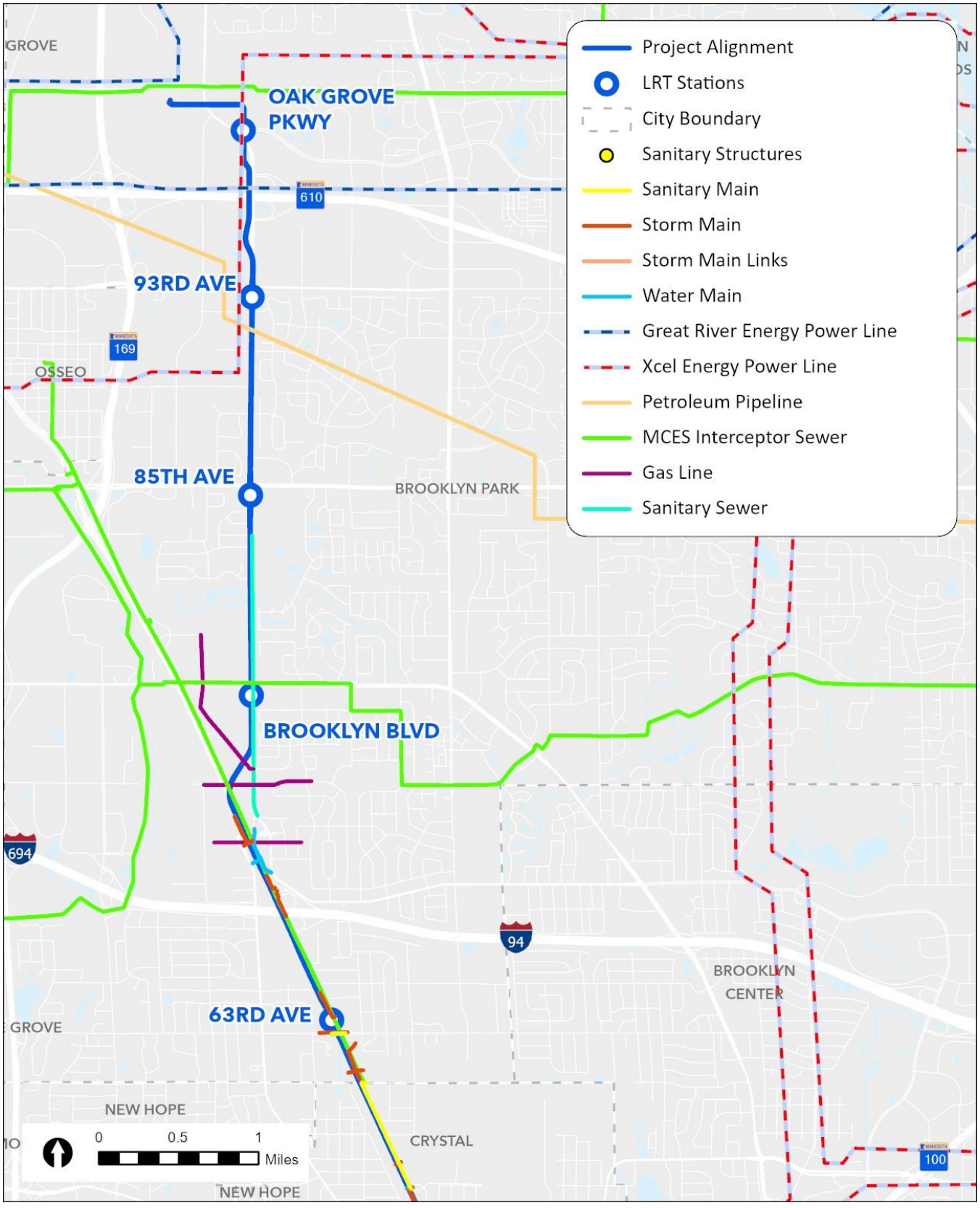


Figure 5-2 Locations of Major Utilities in the Cities of Brooklyn Park, Crystal, and Robbinsdale

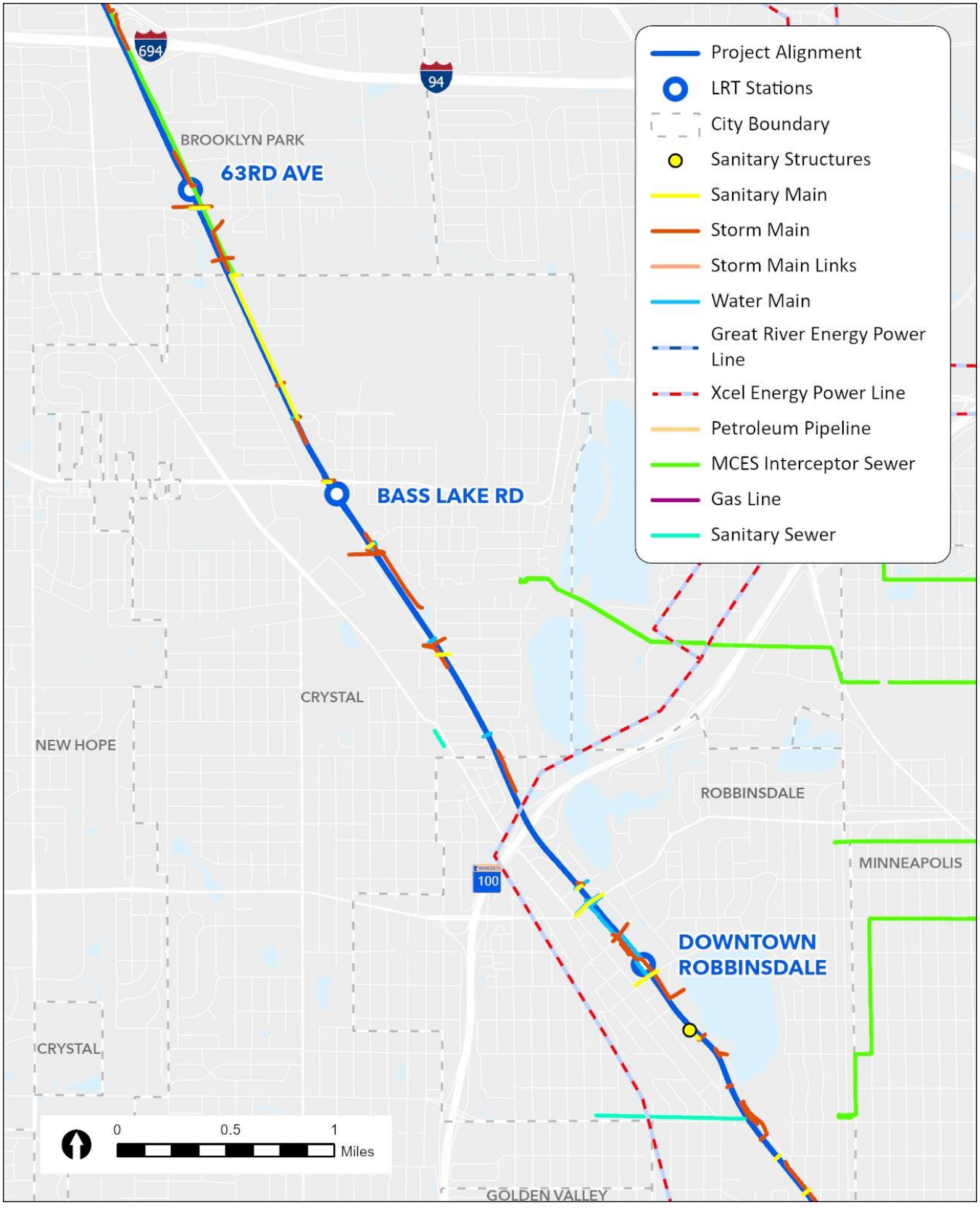
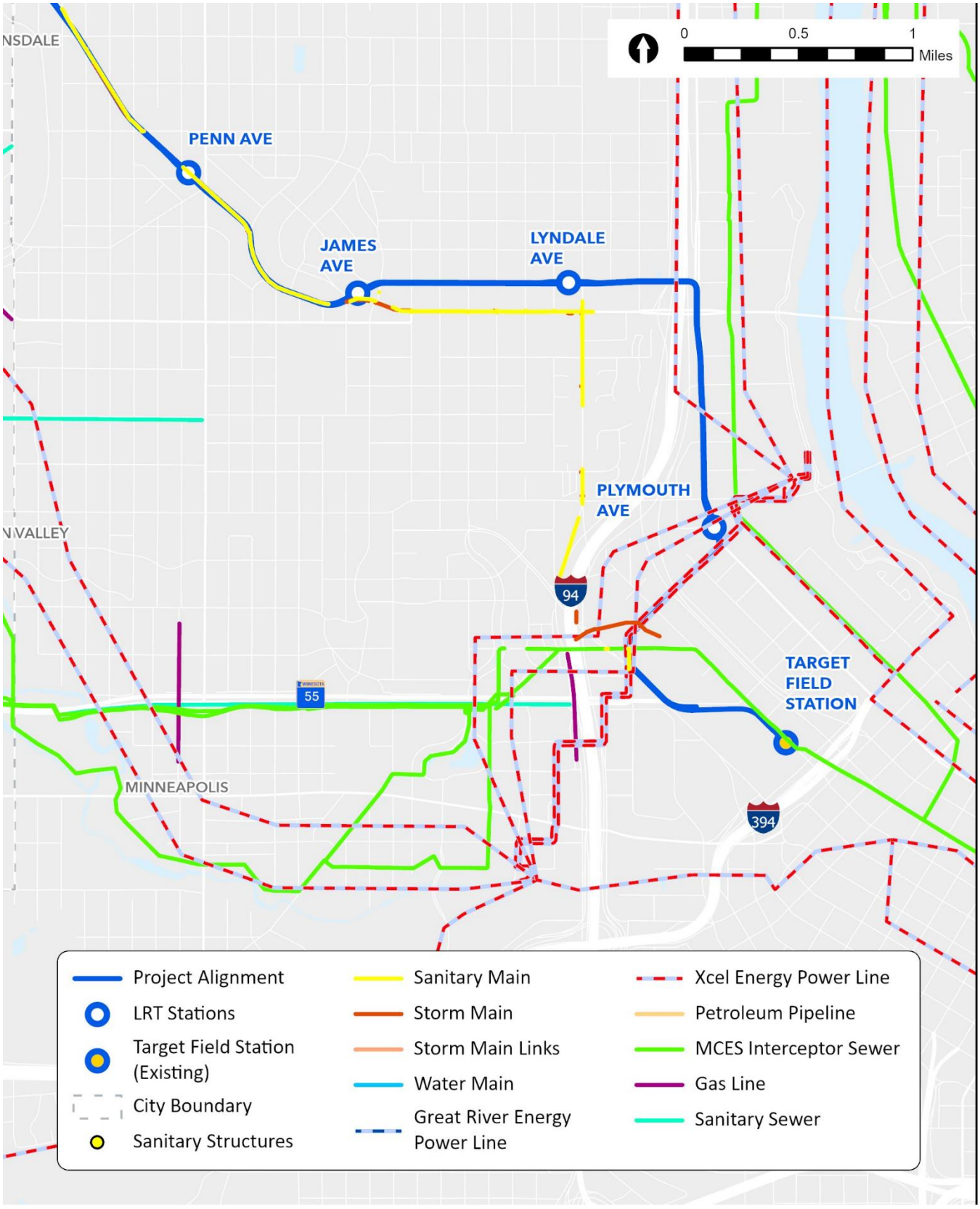


Figure 5-3 Locations of Major Utilities in the City of Minneapolis



Build Alternative

The locations of private and public utilities that run parallel to or cross the Project would be confirmed as engineering design advances to determine whether the utilities would conflict with the Project and would need to be relocated to avoid conflict with operations.

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

The horizontal and vertical locations of overhead electric and communication lines would be adjusted to provide adequate vertical and horizontal clearance for LRT vehicles and the OCS. Relocation of some overhead utilities to a new placement or structure could also be considered.

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 and reaction to loading from the Project and to verify that the utility meets the vertical clearance requirements for the utility owner and MnDOT. Manholes and vaults that conflict with the Project area and that limit access to 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 Project's LRT system. Protective measures might need to be considered for some underground utilities.

In the City of Minneapolis, construction for the Build Alternative on 10th Ave would potentially impact two underground Xcel Energy 115kV transmission lines. Reconstruction activities on W Broadway Ave would potentially impact several existing utilities, 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 40th Ave N could be impacted by the park-and-ride facility and LRT station 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 and Build Alternatives.

No-Build Alternative

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

Build Alternative

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 Project 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 needed to accommodate the Project would maintain current service levels. The Council would coordinate with utility owners to evaluate utilities in areas adjacent to Project LRT electrification components for potential corrosion concerns and identify protective measures (such as cathodic protection). Potential utility conflicts could also be resolved through coordination with the utility owners.

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, which 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 and evaluated (according to the standards of the National Flood Insurance Program [NFIP] managed by the Federal Emergency Management Agency [FEMA], FTA and the United States Department of Transportation (USDOT) Floodplain Management and Protection policy and guidance, and the State of Minnesota Model Floodplain Ordinance) and describes potential impacts of the No-Build and Build Alternatives on floodplains. Wetlands are addressed separately in Section 5.3.

5.2.1 Regulatory Context and Methodology

The jurisdictional authority corresponds to local government units (LGUs) and watershed management organizations (WMOs). Stakeholders for this Project include FEMA; DNR; Mississippi Watershed Management Organization (MWMO); Bassett Creek Watershed Management Commission (BCWMC); Shingle Creek Watershed Management Commission (SCWMC); West Mississippi Watershed Management Commission (WMWMC); and the Cities of Brooklyn Park, Crystal, Robbinsdale, and Minneapolis. Refer to the *Water Resources Technical Report* in Appendix A-5 for additional details about regulatory context and methodology and permitting authorities for floodplain management.

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 (Table 5-3). Refer to Appendix A-5, *Water Resources Technical Report*, for additional details about floodplains.

Table 5-3 Floodplains in the Study Area

Water Body	Type of Encroachment
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.[a] Drainage improvement and volumetric impact analysis will be completed as part of the final design phases of the Project.
Century Channel ponds	These 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 project.
Setzler Pond	Located in the northwest quadrant of 89th Ave N and W Broadway Ave, this pond is used for stormwater management and is mapped as a 100-year floodplain. Setzler 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. Setzler Pond would continue to receive Project area 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.
Shingle Creek	Shingle Creek is managed by SCWMC. It receives runoff from the City of Brooklyn Park as well as the Cities of Maple Grove, New Hope, Osseo, and Plymouth. Shingle 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. The estimated total area of floodplain identified in this assessment, is specific to the area of floodplain within the study area, which is approximately from the eastern edge of the mapped floodplain at Candlewood Dr to the western edge at CR 81.

[a] NGVD 1929 = National Geodetic Vertical Datum of 1929

5.2.3 Environmental Consequences

This section identifies long-term (operating-phase) and short-term (construction-phase) impacts to floodplains from the No-Build and Build Alternatives.

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.

Build Alternative

Impacts may be the result of excavation or fill required for the Project footprint, or there may be excavation impacts because of construction of permanent stormwater management features. The anticipated impacts of the Project are summarized in Table 5-4 by water body. Overall Project floodplain impact areas are shown in Figure 5-4 and in detail for each impacted water body in Figure 5-5 through Figure 5-7. Volumetric floodplain impacts would be identified in future technical reports as Project design advances. No floodplains are located in the vicinity of the OMF or any of the LRT stations.

Table 5-4 Potential Area of Water Body Encroachment on Floodplains

Water Body	Type of Encroachment	Potential Area of Floodplain Encroachment (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**

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.

Build Alternative

The impacts of Project construction activities on the floodplains may include temporary physical disturbances, such as earthwork and grading activities, excavation and removal of soils not suitable for construction, trench excavation for utilities installation, temporary drainage and stormwater management methods, and temporary erosion and sediment control BMPs.

5.2.4 Avoidance, Minimization, and/or Mitigation Measures

Areas mapped as 100-year floodplains would be impacted within the Project 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 would require coordination and permitting from local, State, and federal water resource agencies, and floodplain mitigation would be closely related to the measures identified for stormwater management, wetlands, and other aquatic resources.

Figure 5-4 Overview of Potential Floodplain Impacts from the Project

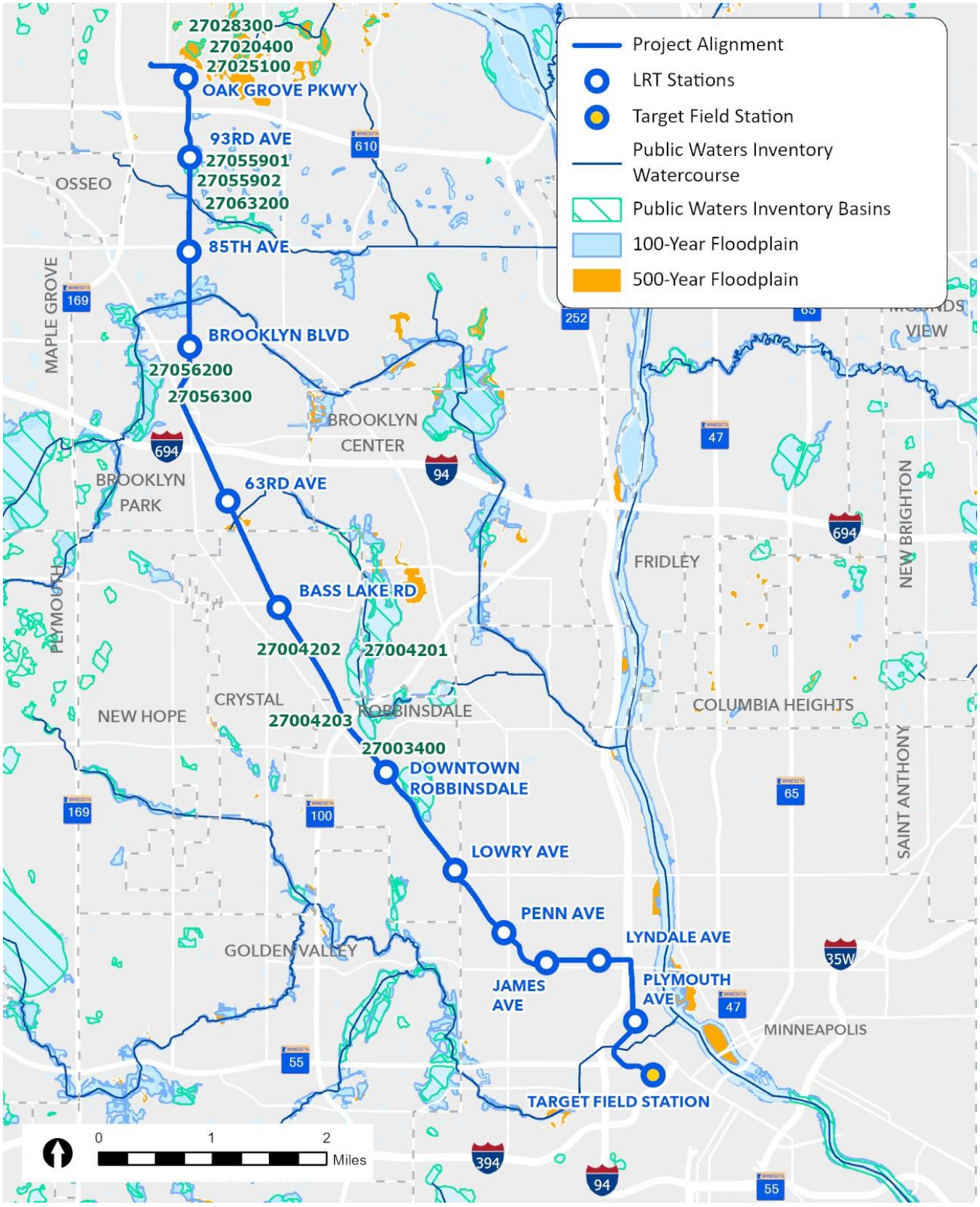


Figure 5-5 Potential Floodplain Impacts to Stormwater Pond at TH 610

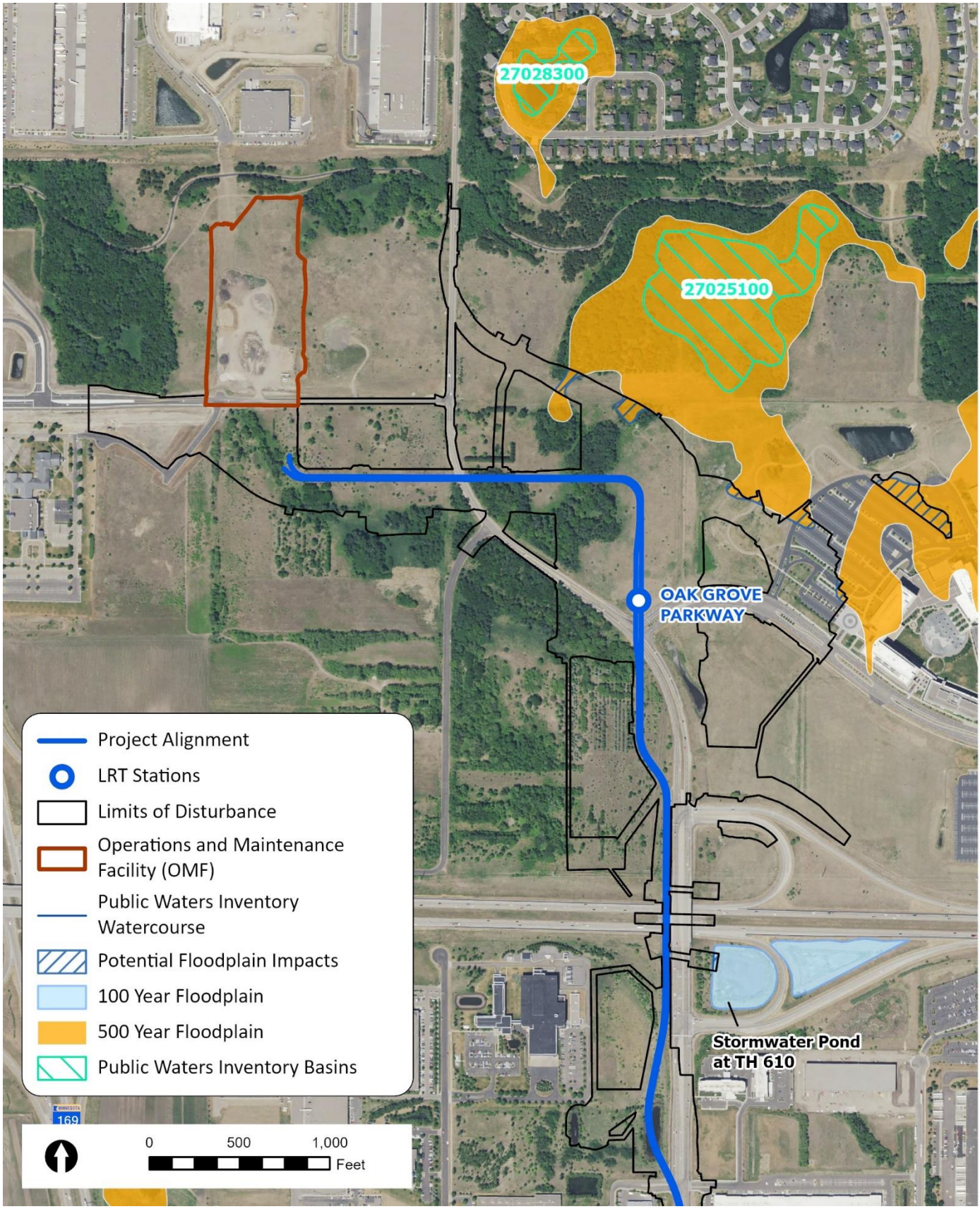
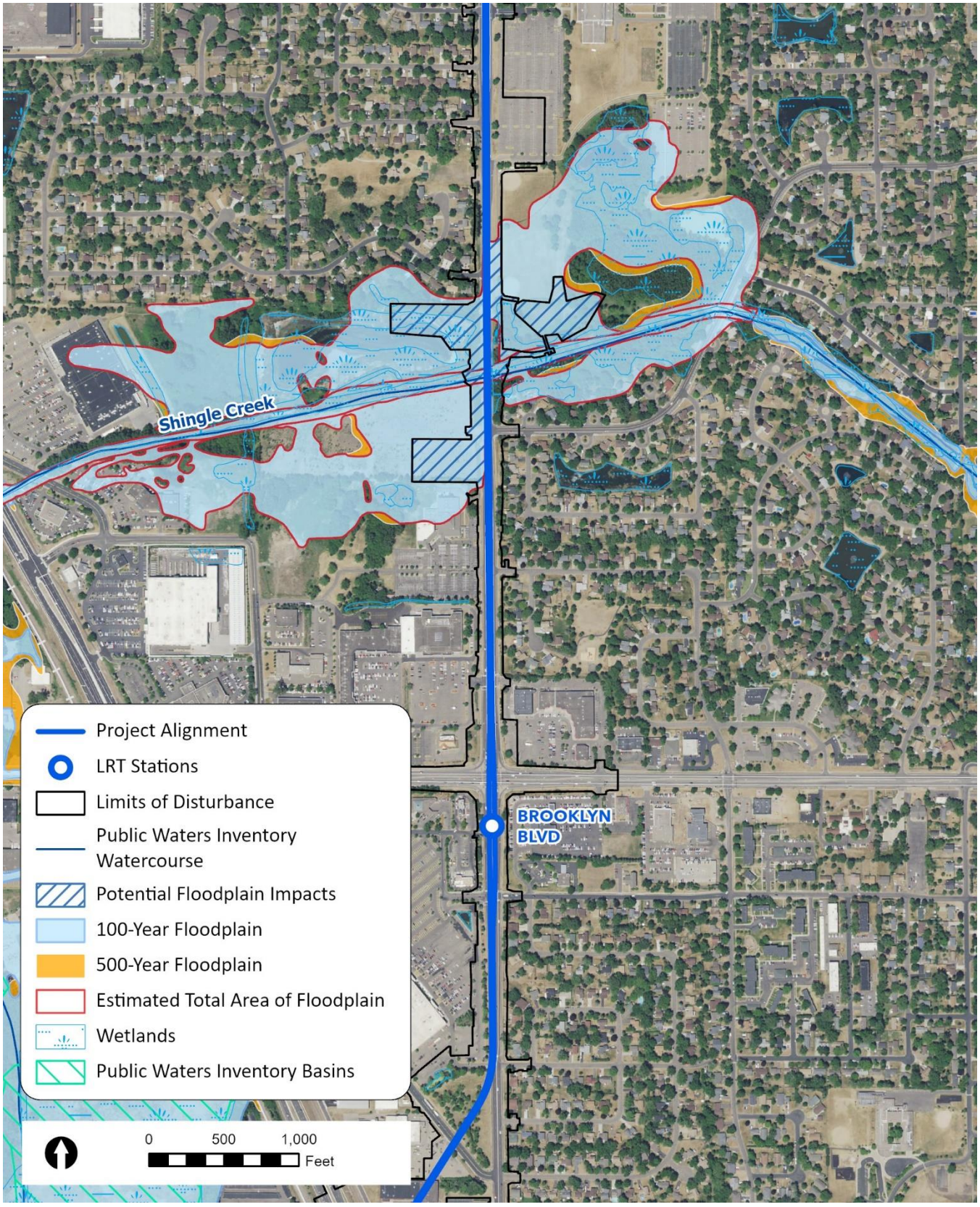


Figure 5-6 Potential Floodplain Impacts to Century Channel Ponds and Setzler Pond

Figure 5-7 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 the Minnesota Board of Water and Soil Resources (BWSR) and describes the impacts of the No-Build and Build Alternatives on wetlands and other aquatic resources. Floodplains are addressed separately in Section 5.2, and additional details are presented in Appendix A-5, *Water Resources Technical Report*.

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 Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the Waters of the United States (WOUS) and for regulating quality standards for surface waters. The United States Environmental Protection Agency (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. Refer to the *Water Resources Technical Report* in Appendix A-5 for additional details about regulatory context and methodology for wetland evaluation.

5.3.2 Study Area and Affected Environment

The study area for wetlands and other aquatic resources is land within or adjacent to the LOD. Figure 5-8 presents an overview of wetlands near the Project, and Figure 5-9 through Figure 5-15 present details of wetlands near or within the LOD. Refer to the *Water Resources Technical Report* in Appendix A-5 for additional details about wetlands and the study area.

5.3.2.1 Wetlands

A portion of the Project Alignment was delineated in 2015 (USACE Regulatory File 2017-03538_MMJ). The delineation has expired (valid for 5 years); therefore, wetlands were delineated for the entire Project area in fall 2022. Additional descriptions of findings and methodology are provided in Appendix A-5, *Water Resources Technical Report*, including wetlands that were delineated in 2015 and 2022. Table 5-5 summarizes the wetland results for all wetlands within the study area.

Table 5-5 Wetland Delineation Results[a]

Eggers and Reed Wetland Classification	Circular 39 Wetland Classification	Cowardin Wetland Classification	Natural Basins # of Basins/acres [a]	Roadside Ditches # of Basins/acres [a]	Stormwater Ponds # of Basins/acres [a]
Seasonally flooded basin	Type 1	PEM1A	2/0.16	1/0.07	2/3.83
Hardwood swamp	Type 1	PFO1A	1/0.11	--	--
Fresh (wet) meadow	Type 2	PEMB	2/0.45	--	--
Shallow marsh	Type 3	PEMC	2/0.86	3/0.55	7/3.04
Shallow open water	Type 5	PUBGx	--	1/0.18	6/2.22

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

Figure 5-8 Overview of Wetlands Near the Project

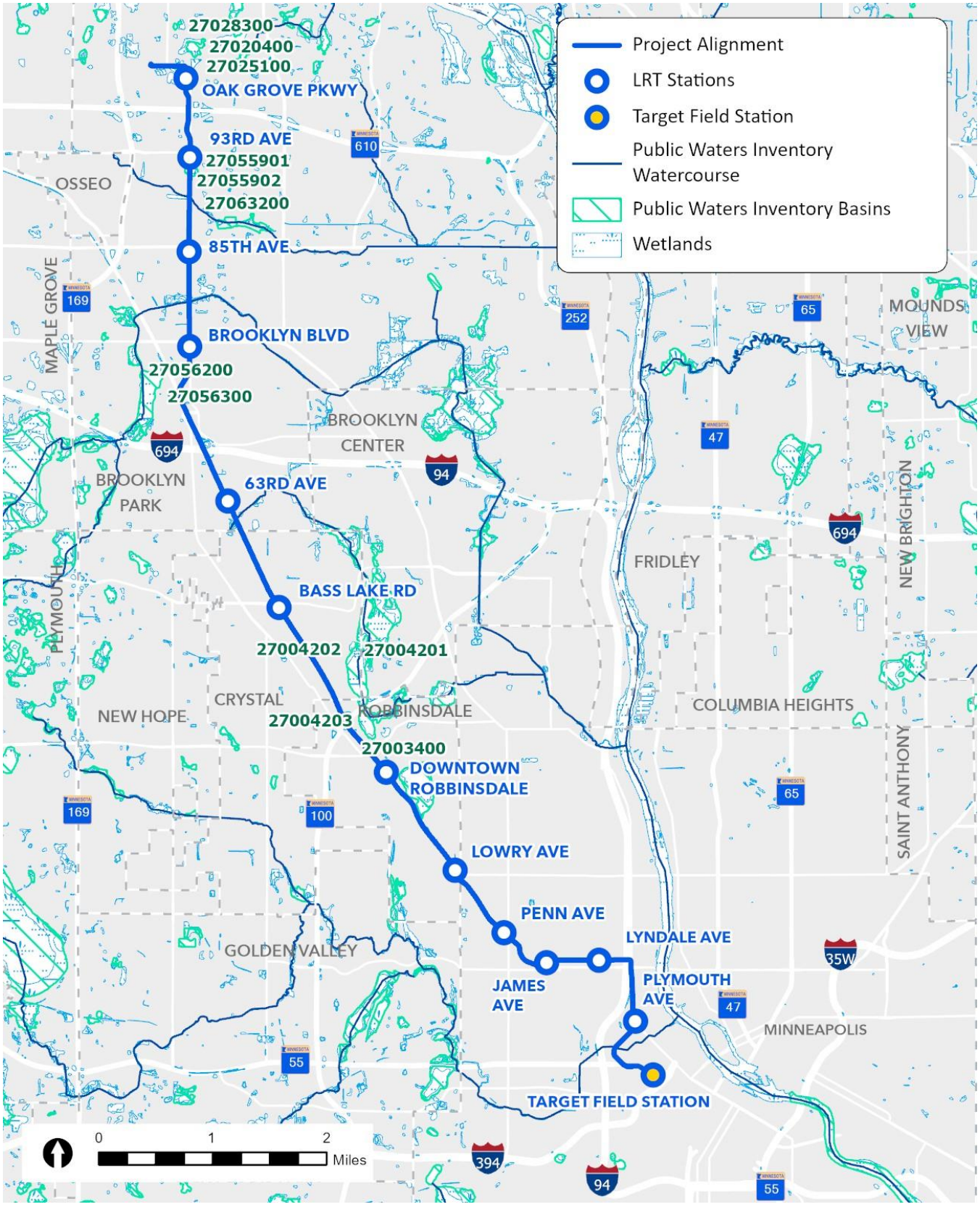


Figure 5-9 Detail of Wetlands Near the Oak Grove Pkwy Station Area

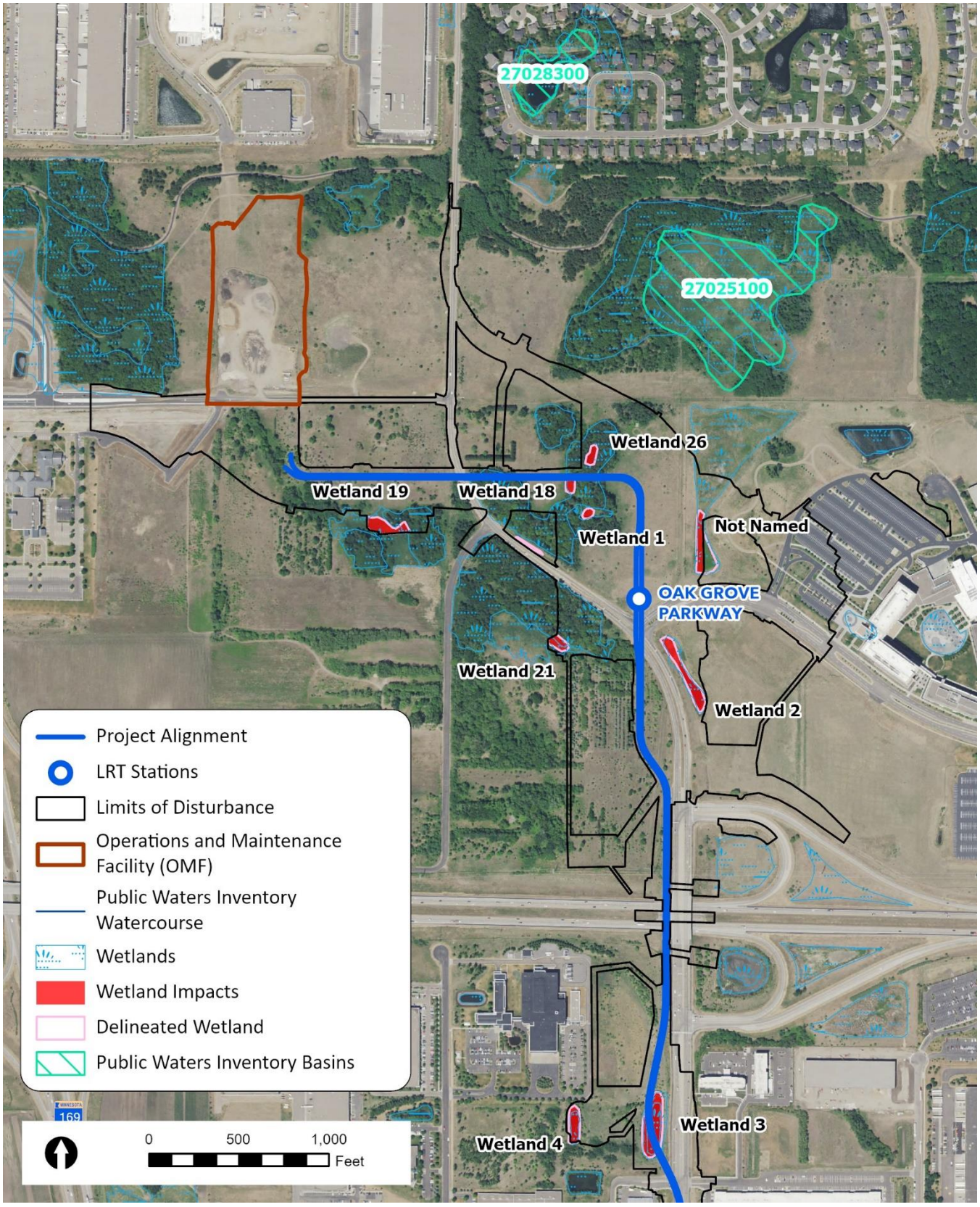


Figure 5-10 Detail of Wetlands Near the 85th and 93rd Ave N Station Areas

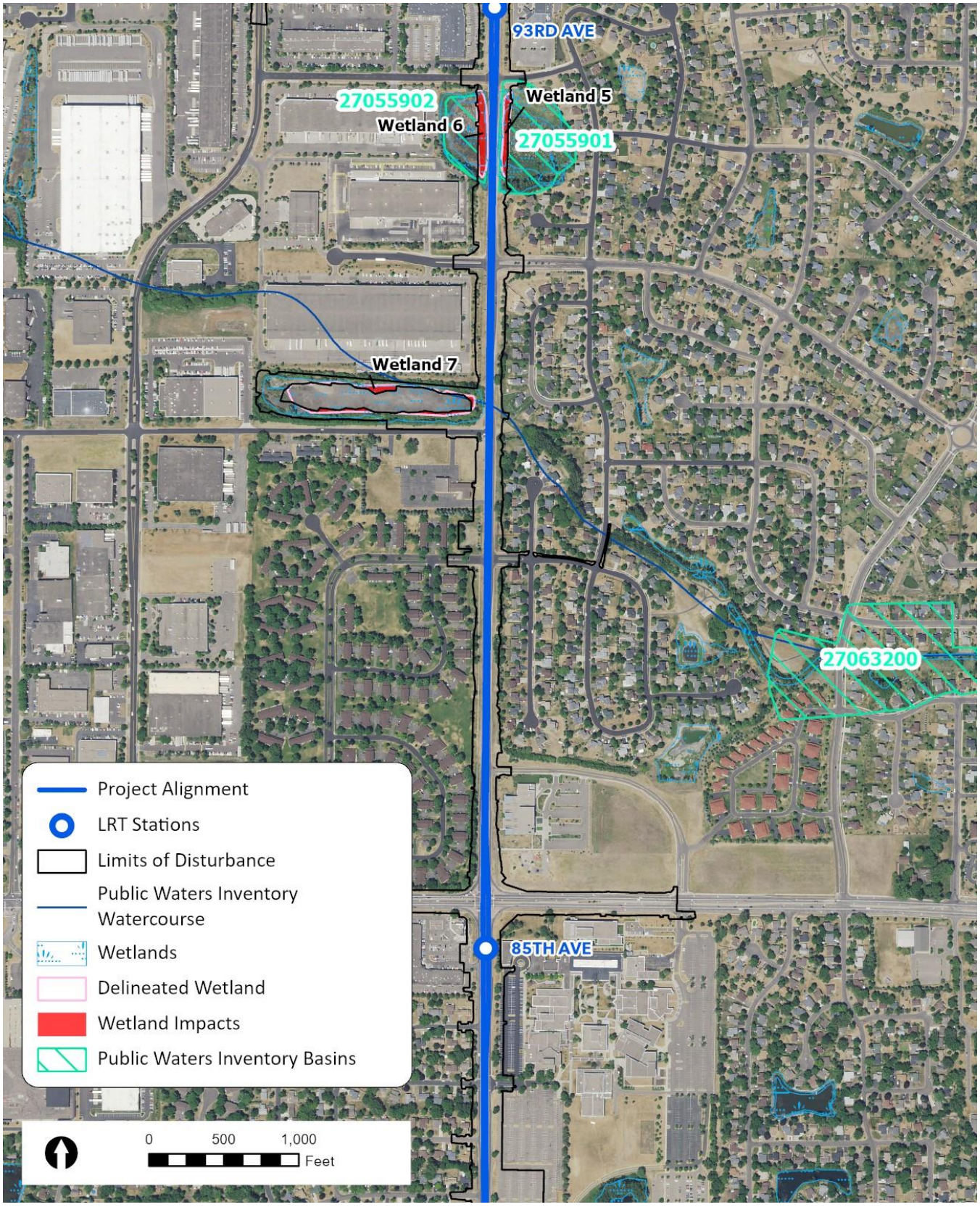


Figure 5-11 Detail of Wetlands Near the Brooklyn Blvd Station Area

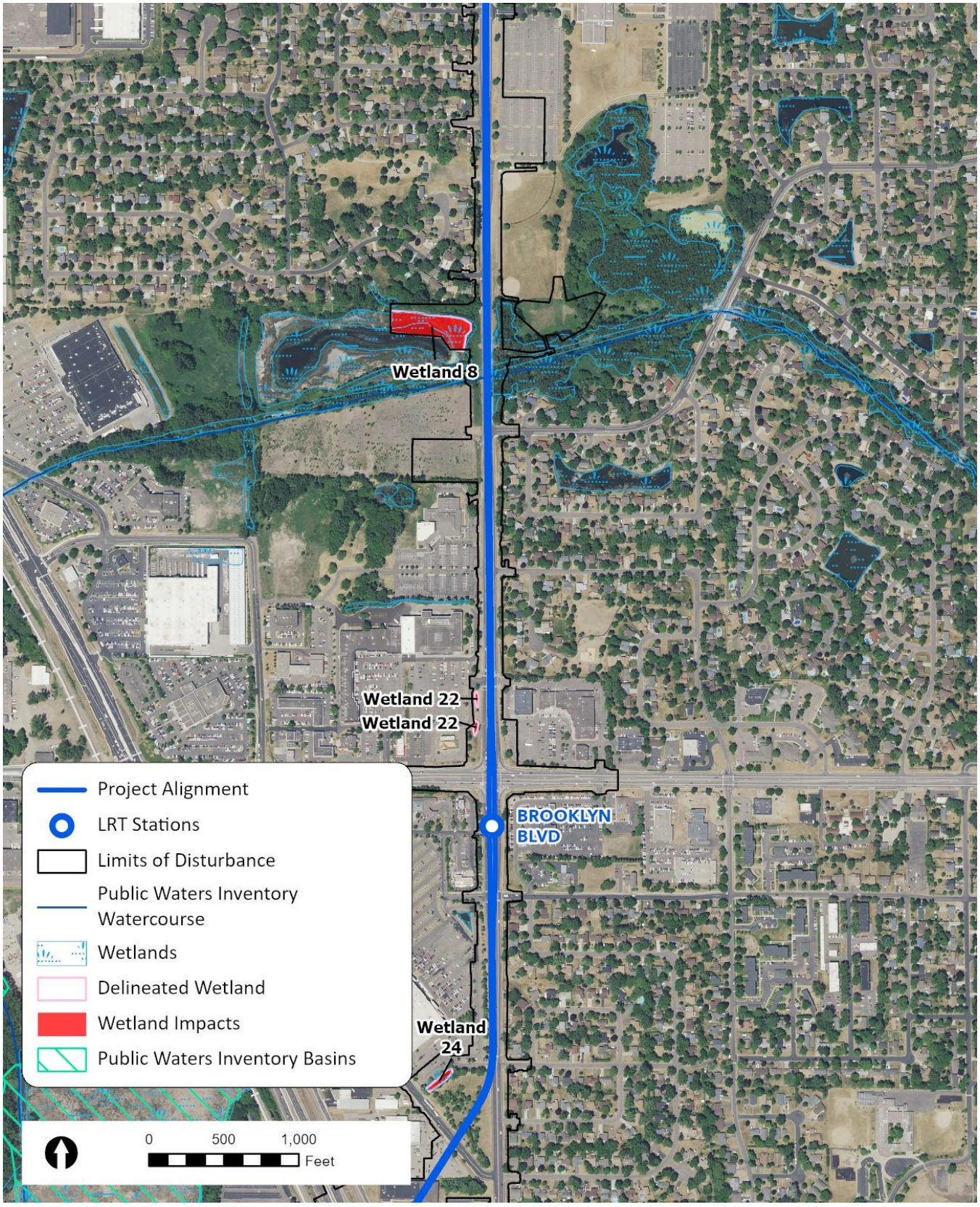


Figure 5-12 Detail of Wetlands Near the 63rd Ave N Station Area

Figure 5-13 Detail of Wetlands Near the Bass Lake Rd Station Area

Figure 5-14 Detail of Wetlands North of the Downtown Robbinsdale Station Area

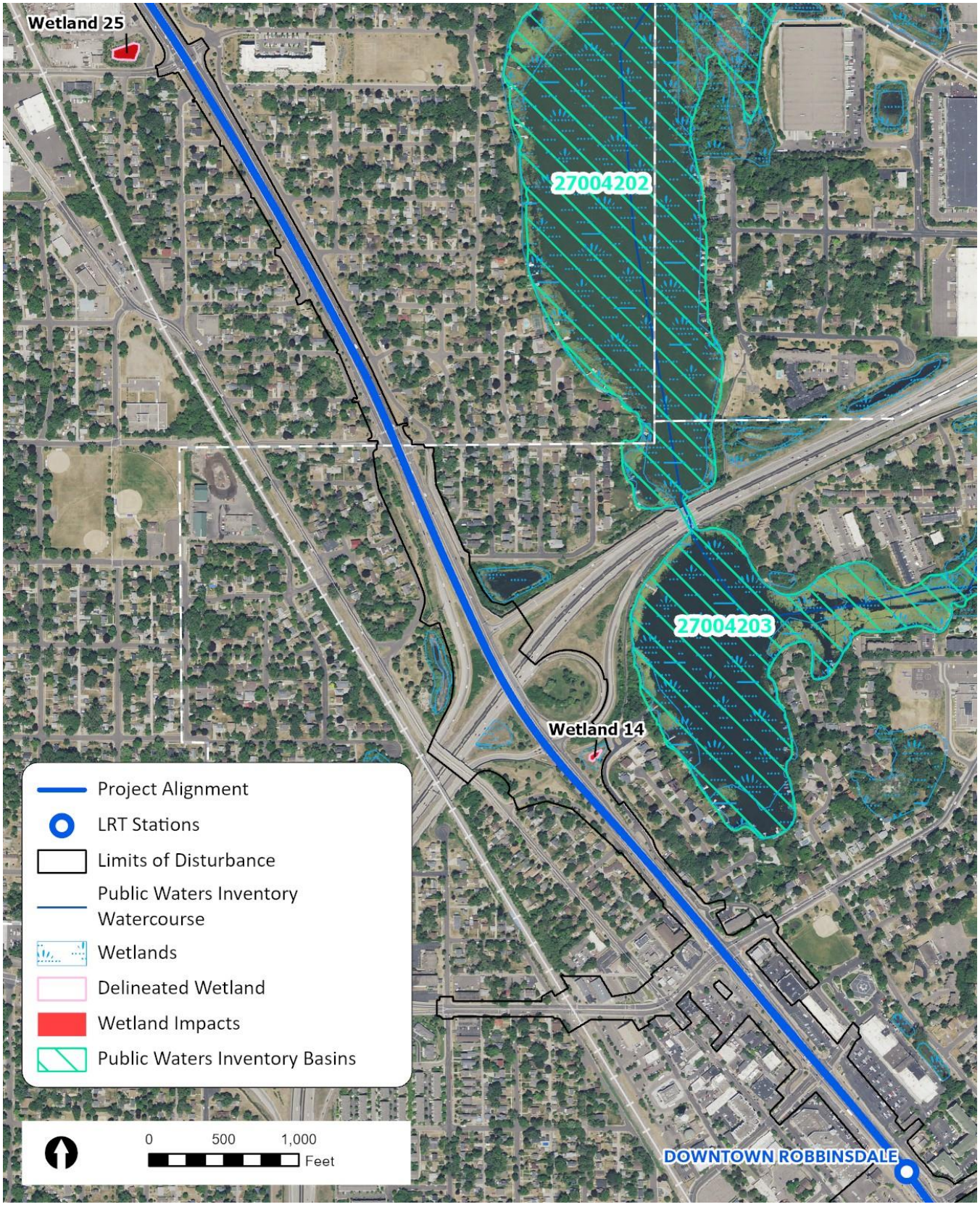


Figure 5-15 Detail of Wetlands Near the Downtown Robbinsdale Station Area

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 and is not regulated. In addition to the above watercourses, the Project intersects, or is directly adjacent to, several public water basins (PWs) and public water wetlands (PWWs). A total of two DNR basins are located within the study area, and three are adjacent to the Project Alignment as outlined in Table 5-6, which summarizes the aquatic resources that are in (or directly adjacent) the study area that are designated as DNR public waters.

Table 5-6 Public Water Summary

Public Waters ID	Size[a]	Notes	Project City
27-559 W (unnamed PWW)	0.70 acre	East side of W Broadway Ave. Two features are associated with this PWW basin ID on either side of W Broadway Ave.	Brooklyn Park
27-559 W (unnamed PWW)	0.46 acre	West side of W Broadway Ave. Two features are associated with this PWW basin ID on either side of W Broadway Ave.	Brooklyn Park
119039 (Mattson Brook)	615 linear feet	Is a tunneled section within the study area.	Brooklyn Park
84663 (Shingle Creek)	234 linear feet	Flows east under the roadway through a culvert.	Brooklyn Park
101730 (unnamed creek)	139 linear feet	Flows east under the roadway through a culvert.	Brooklyn Park
27-42 P (Twin Lake)	0: outside the Project Alignment	Two features are associated with this PW on the eastern side of CR 81. Both are completely outside the study area.	Robbinsdale
27-34 P (Crystal Lake)	0: outside the Project Alignment	Flows east under the roadway through a culvert.	Robbinsdale
Bassett Creek	292 linear feet	Bassett Creek Tunnel crosses the Project Alignment at 10th Ave N to the south of the viaduct.	Minneapolis

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

5.3.3 Environmental Consequences

This section identifies the long-term (operating-phase) and short-term (construction-phase) impacts to wetlands and other aquatic resources from the No-Build and Build Alternatives.

5.3.3.1 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 wetlands or other aquatic resources.

Build Alternative

The expected wetland impacts of the Project are summarized in Table 5-7 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 the Minnesota Wetland Conservation Act (WCA). Impact areas are shown in Figure 5-9 through Figure 5-15 above. Impacts to each delineated basin within and near the Project are further described and depicted in the *Water Resources Technical Report* in Appendix A-5. Standard erosion-control BMPs would be used for work within and adjacent to wetland and aquatic resources where necessary, thereby minimizing impacts to the water bodies downslope and to aquatic wildlife.

Permanent wetland impacts are anticipated from the LRT station located at CR 81 at 63rd Ave N. These impacts would be to Wetland 10 (see Figure 5-12 above), which is classified as a Stormwater Pond and is not under the jurisdiction of WCA or USACE.

Table 5-7 Impacts to Delineated Basins from the Build Alternative by Wetland Type

Circular 39 Wetland Classification [a]	Eggers and Reed Wetland Classification [b]	Jurisdictional Impacts: USACE (Natural Basins and Ditches in acres)	Jurisdictional Impacts: WCA (Natural Basins in acres)	Impacts to Unregulated Waters (Stormwater Ponds [c] in acres)	Total Impacts
Type 1	Seasonally flooded basin	0.20	0.17	1.03	1.23
Type 1	Hardwood swamp	0.11	0.11	0.00	0.11
Type 2	Fresh (wet) meadow	0.45	0.45	0.00	0.45
Type 3	Shallow marsh	2.20	1.62	2.20	4.40
Type 5	Open water	0.18	0.00	2.20	2.38
	Total	**3.14**	**2.34**	**5.43**	**8.57**

[a] Plant communities classified based on United States Fish and Wildlife Service (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 areas are not jurisdictional by the USACE or WCA.

Impacts to three streams are anticipated from the Project. These impacts are associated with widening the roadway to accommodate the rail and thereby lengthening culverts. Impacts are outlined in Table 5-8.

Table 5-8 Potential Stream Impacts from the Project

Stream Name	Impact Action	Potential Impact (linear feet)
Mattson Brook	Culvert lengthening	441.82 ft
Shingle Creek	Culvert lengthening	238.86 ft
Unnamed Creek	Culvert lengthening	142.10 ft
Total		**822.78 ft**

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. Soil erosion could occur from grading activities that might cause temporary impacts to wetlands during

construction. This risk will be mitigated by the erosion and sediment control BMPs that will be implemented during construction.

5.3.4 Avoidance, Minimization, and/or Mitigation Measures

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 EIS process and sent to the WCA LGUs, DNR, and USACE.

Complete avoidance of wetland impacts from the Project and associated facilities is likely not feasible; therefore, measures to reduce wetland impacts from the Project and associated facilities have been incorporated into the design, such as Project Alignment shifts and use of roadway median. Permitting coordination and future wetland sequencing efforts for wetland impacts will be identified in the Supplemental Final EIS.

5.3.4.1 Long-Term Mitigation Measures

The Council will continue to refine design elements to try to further reduce wetland impacts; final anticipated impacts will be disclosed in the Supplemental Final EIS.

The Project requires coordination and permitting from local, State, and federal water resource agencies. As discussed in Chapter 9, 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 the 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.

Potential mitigation activities include the purchase of wetland mitigation bank credits from established and approved wetland bank accounts to offset permanent impact to wetland habitat in accordance with the applicable USACE, WCA, and LGU siting priority requirements prior to construction of the Project.

5.3.4.2 Construction-Phase (Short-Term) Mitigation Measures

Appropriate BMPs for erosion and sediment control 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.

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 National Pollutant Discharge Elimination System (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 Metropolitan Council Environmental Services (MCES).

The geologic resources within the Project area can affect or be affected by other water resources discussed in Section 5.9. The Council consulted the Geologic Atlas of Hennepin County[1] 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. Refer to Appendix A-5 for a detailed description of the geology, soils, and topography that are within and adjacent to the LOD of the Project Alignment.

5.4.2.1 Geology

The geology in the Project area consists of glacial sand, gravel, and loam deposits overlying sandstone and limestone bedrock layers. Karst features such as springs, caverns, and sinkholes are typically found in areas where limestone and similar bedrock types are 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 (Figure 5-16). 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.

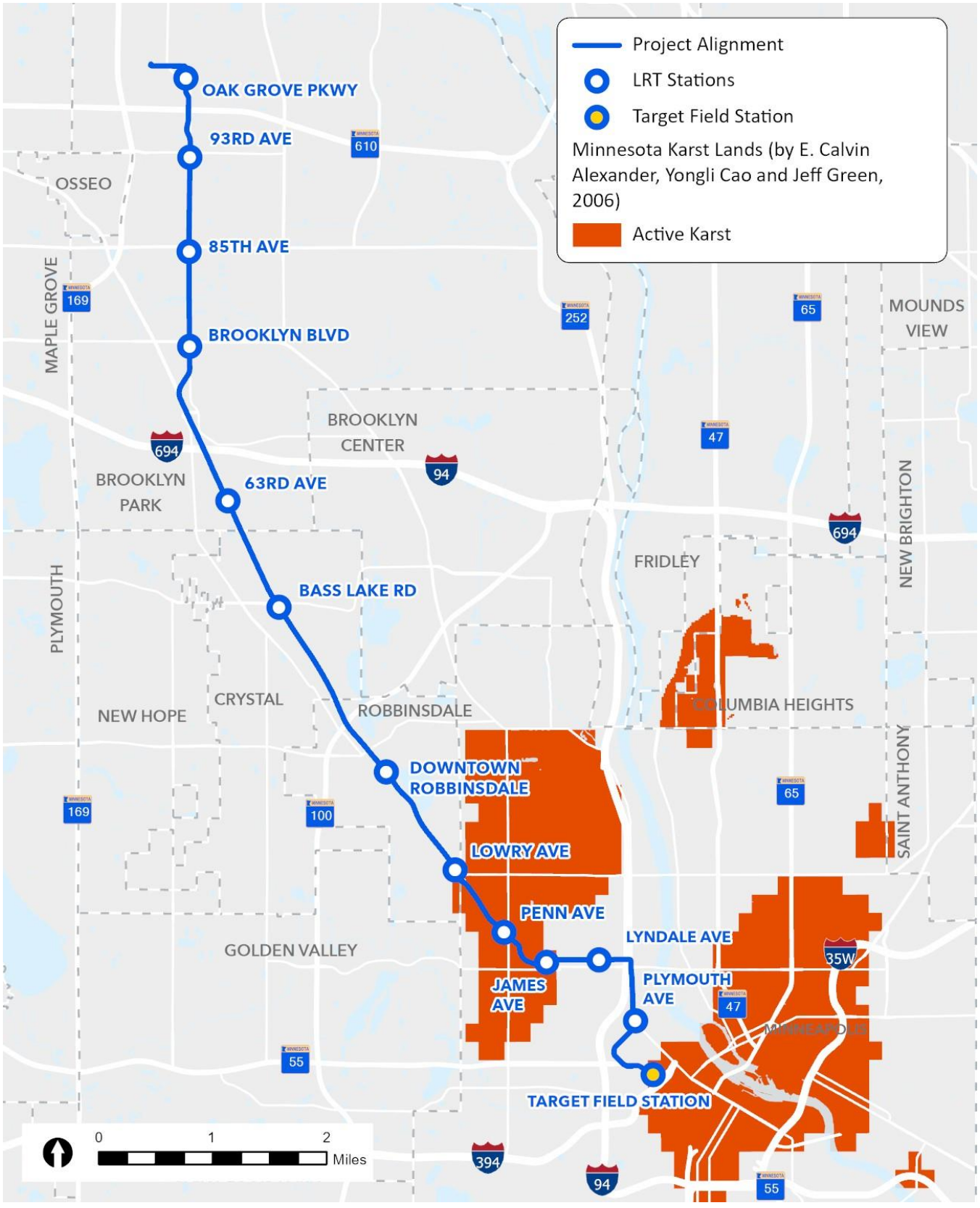
5.4.2.2 Soils

Most 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 5-9.

Table 5-9 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.
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.

Figure 5-16 Active Karst Areas



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 above mean sea level (amsl) throughout the study area. 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.

The largest area of poor soils (soils generally unsuitable for construction purposes) identified in the study area is concentrated at the location of the Oak Grove Pkwy Station (Figure 5-17).

5.4.3 Environmental Consequences

This section identifies the long-term (operating-phase) and short-term (construction-phase) impacts to geology, soils, and topography from the No-Build and Build Alternatives.

5.4.3.1 Operating-Phase (Long-Term) Impacts

Long-term impacts under the No-Build and Build Alternatives are discussed below.

No-Build Alternative

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

Build Alternative

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 and Build Alternatives are discussed below.

No-Build Alternative

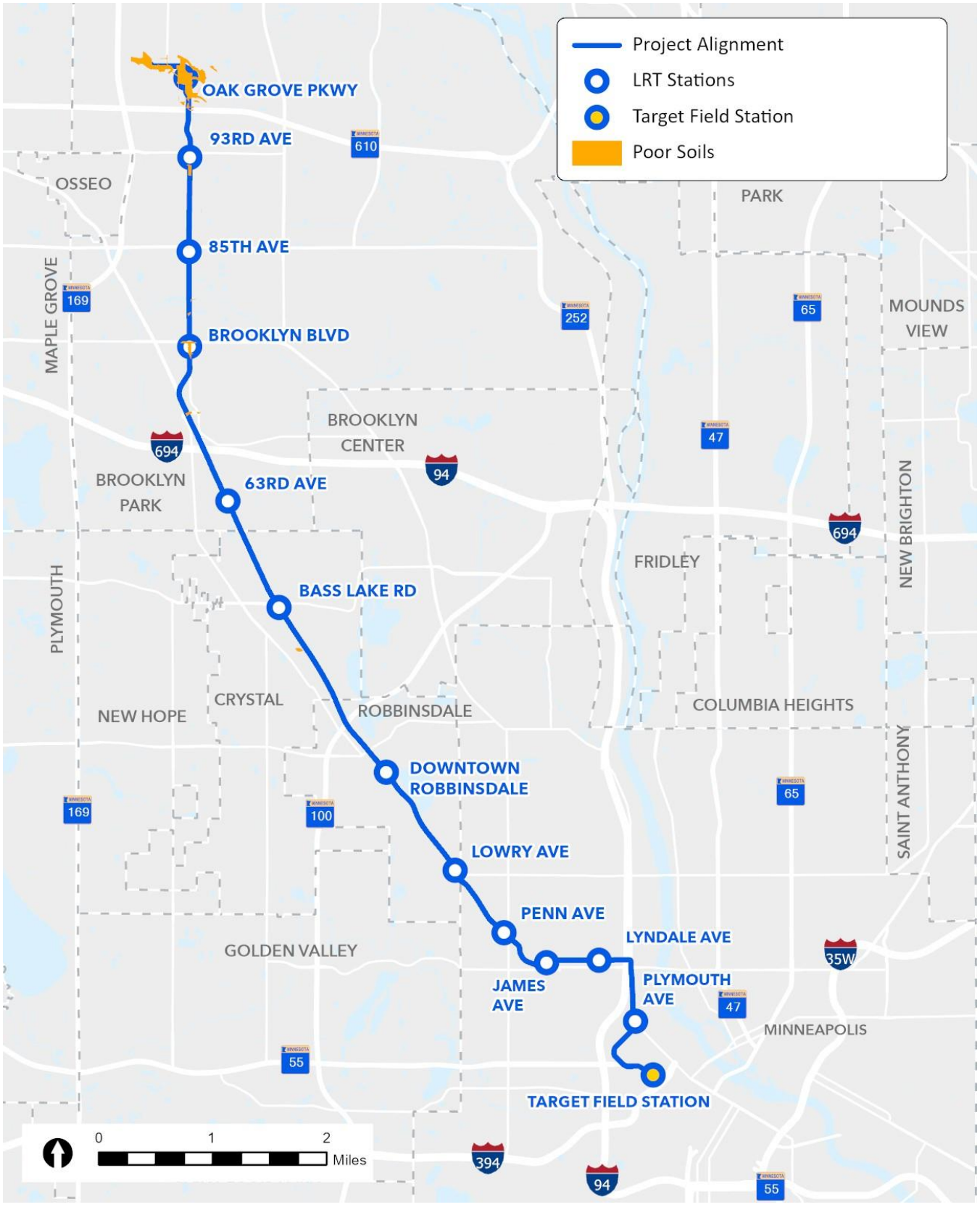
The No-Build Alternative would have no short-term impacts to geology, soils, or topography.

Build Alternative

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. 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. Short-term dewatering would be needed for work around steep slopes or other topographic extremes and open-trench subsurface work in areas of high groundwater, but specific needs would be better defined as the final design of the Project advances.

Areas of poor soils would complicate the design and construction phases of the Project. The most concentrated area of poor soils is at the location of the Oak Grove Pkwy Station.

Figure 5-17 Poor Soils Near the Project



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

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-term (operating-phase) and short-term (construction-phase) 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.

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 5.5.4 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 LRT station platforms) and to avoid differential settlement of soils.

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 within the Project Alignment.

5.5.1 Regulatory Context and Methodology

MPCA oversees regulations pertaining to contaminated soil, groundwater, and waste cleanup plan approvals; petroleum underground storage tank (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. The Minnesota Department of Agriculture (MDA) oversees sites with wood treatment, chemical, herbicide, and pesticide contamination.

To identify and evaluate properties that potentially contain hazardous or regulated materials (such as petroleum products) or other sources of contamination, the Council completed a Modified Phase I Environmental Site Assessment (ESA) in conformance with EPA, All Appropriate Inquiry, and American Society for Testing and Materials (ASTM) E1527-21, as modified by the MnDOT Office of Environmental Stewardship (OES) guidelines for completion of Phase I ESAs. It was not within the scope of the Phase I ESA to evaluate the level of contamination or confirm contamination. *Modified Phase I Environmental Site Assessment, METRO Blue Line Extension*, prepared by Short Elliott Hendrickson, Inc. (SEH) (March 2023) and *Updated Modified Phase I Environmental Site Assessment, METRO Blue Line Extension*, prepared by Braun Intertec (December 2023) are provided in Appendix A-5. Risk ranking categories are described in the Phase I ESA and Appendix A-5.

Risk ranking categories used to evaluate potentially contaminated properties are listed in Table 5-10 below.

Table 5-10 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 Project Alignment buffer 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 and Affected Environment

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

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

A total of 433 sites (152 high, 228 medium, and 53 low risk sites) are identified in the Modified Phase I ESA prepared in March and December 2023 and as shown in Figure 5-18 and in greater detail in Figure 5-19 through Figure 5-22. Table 5-11 summarizes known hazardous/regulated materials sites identified in the study area, as documented in the Modified Phase I ESA (see Appendix A-5).

Figure 5-18 Contamination Risk Along the Project Alignment

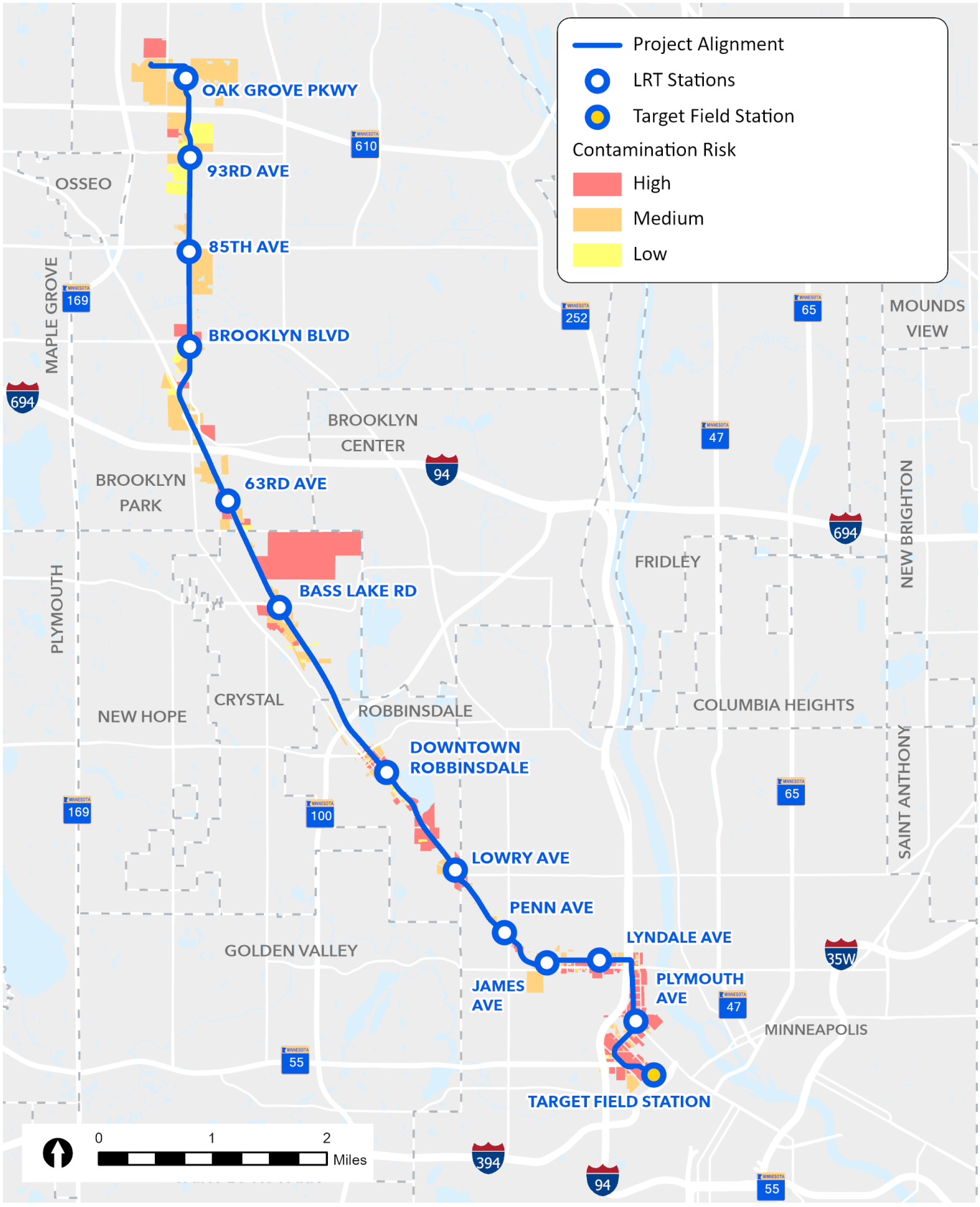


Figure 5-19 Contamination Risk Along the Project Alignment in the City of Brooklyn Park

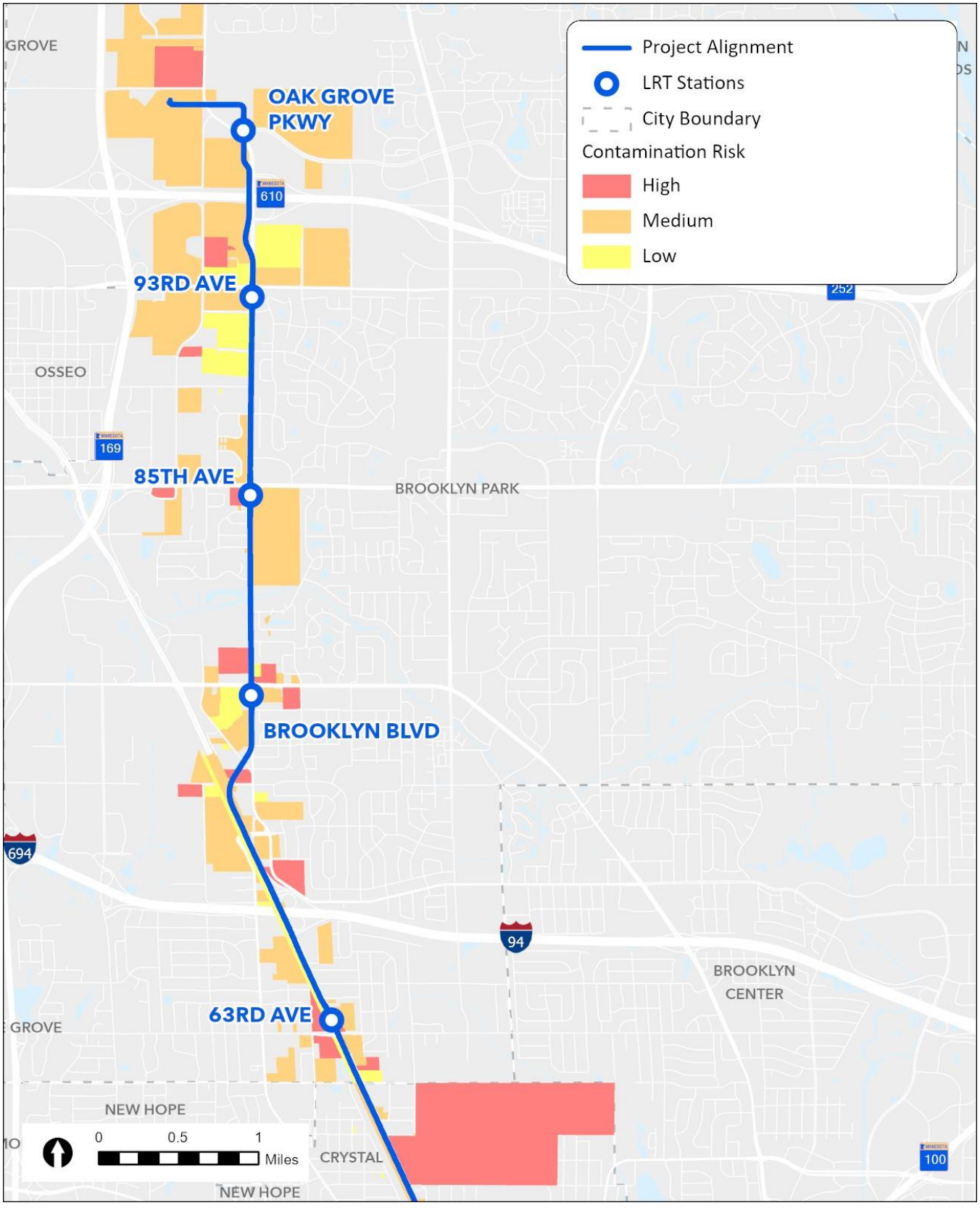


Figure 5-20 Contamination Risk Along the Project Alignment in the City of Crystal

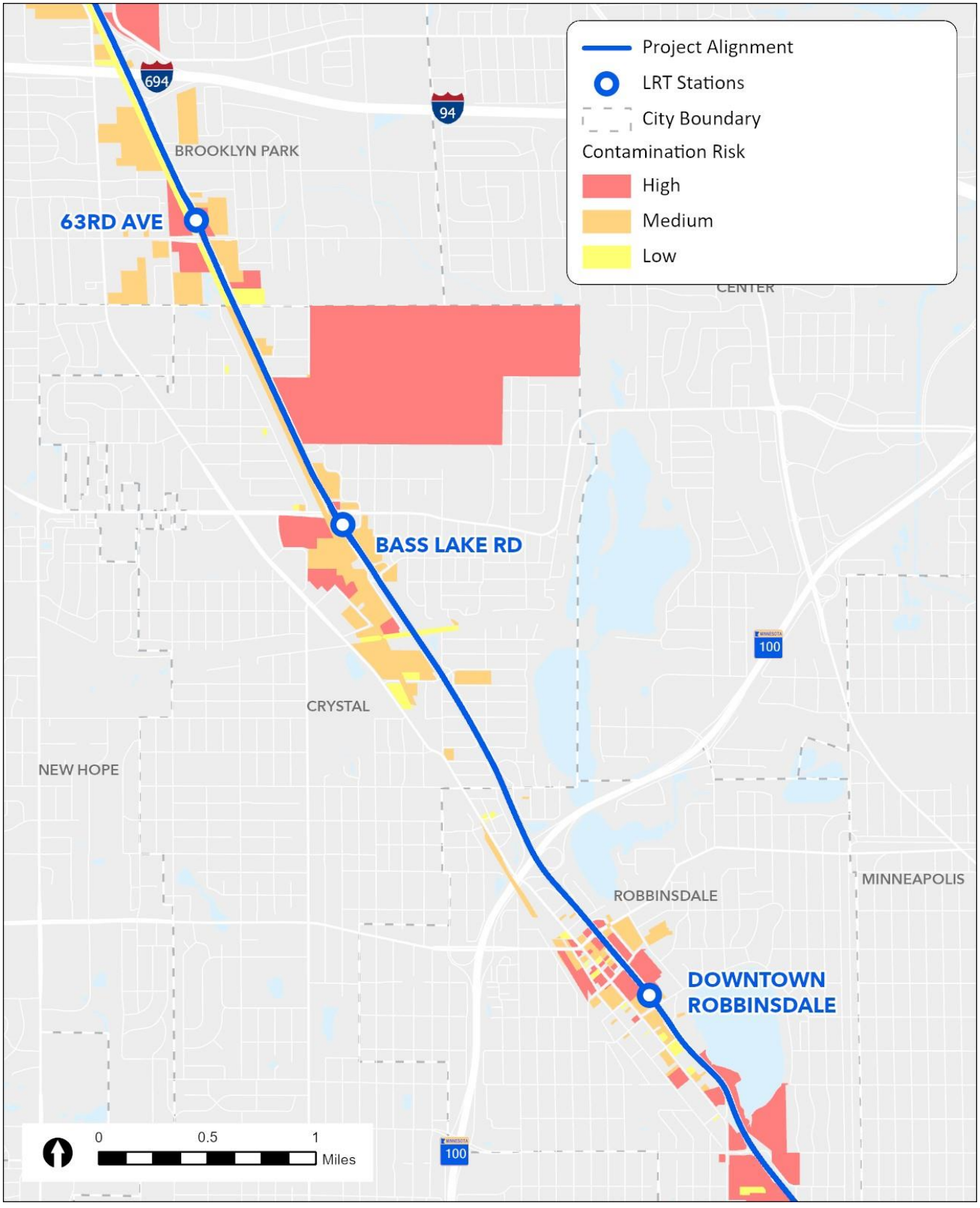


Figure 5-21 Contamination Risk Along the Project Alignment in the City of Robbinsdale

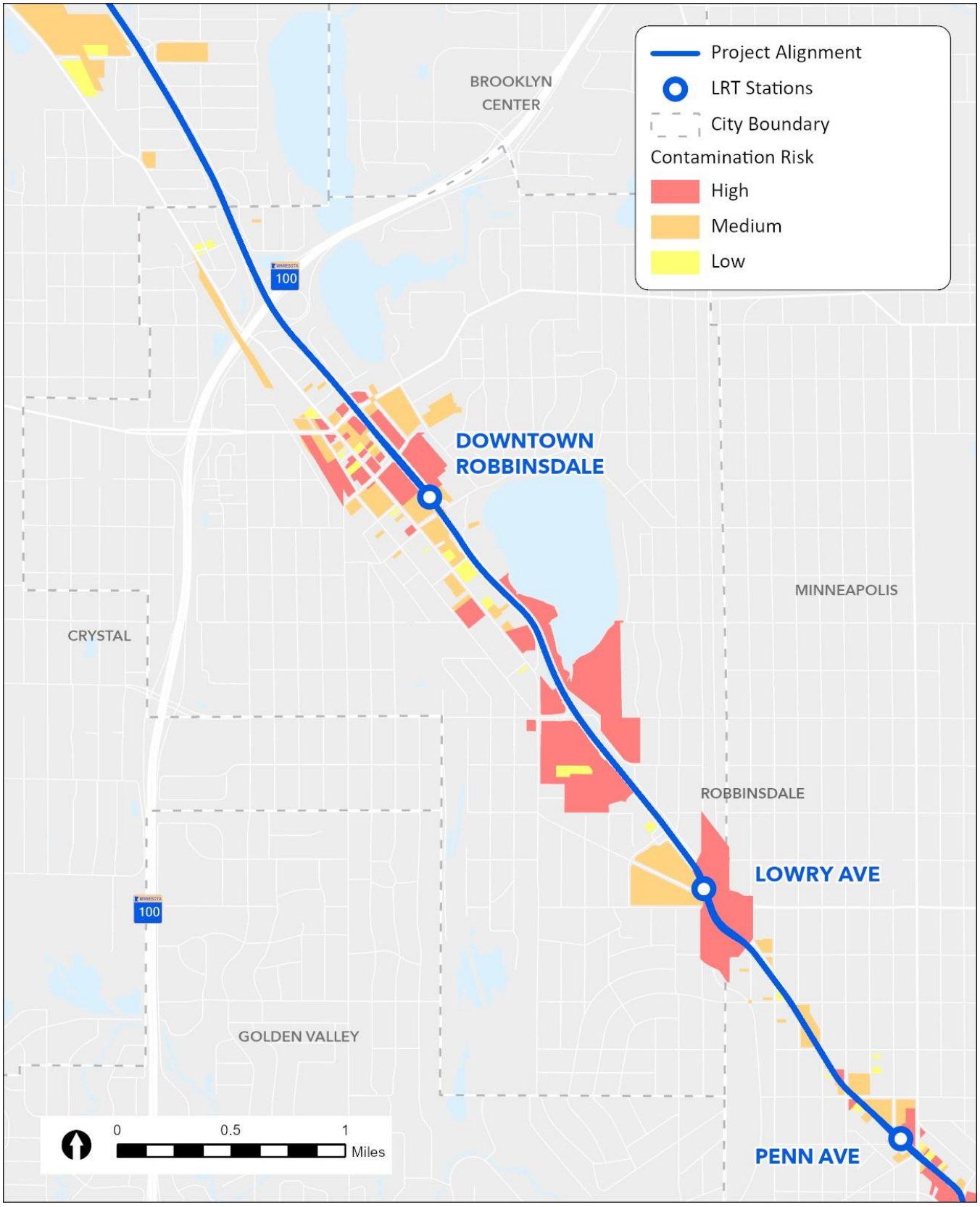


Figure 5-22 Contamination Risk Along the Project Alignment in the City of Minneapolis

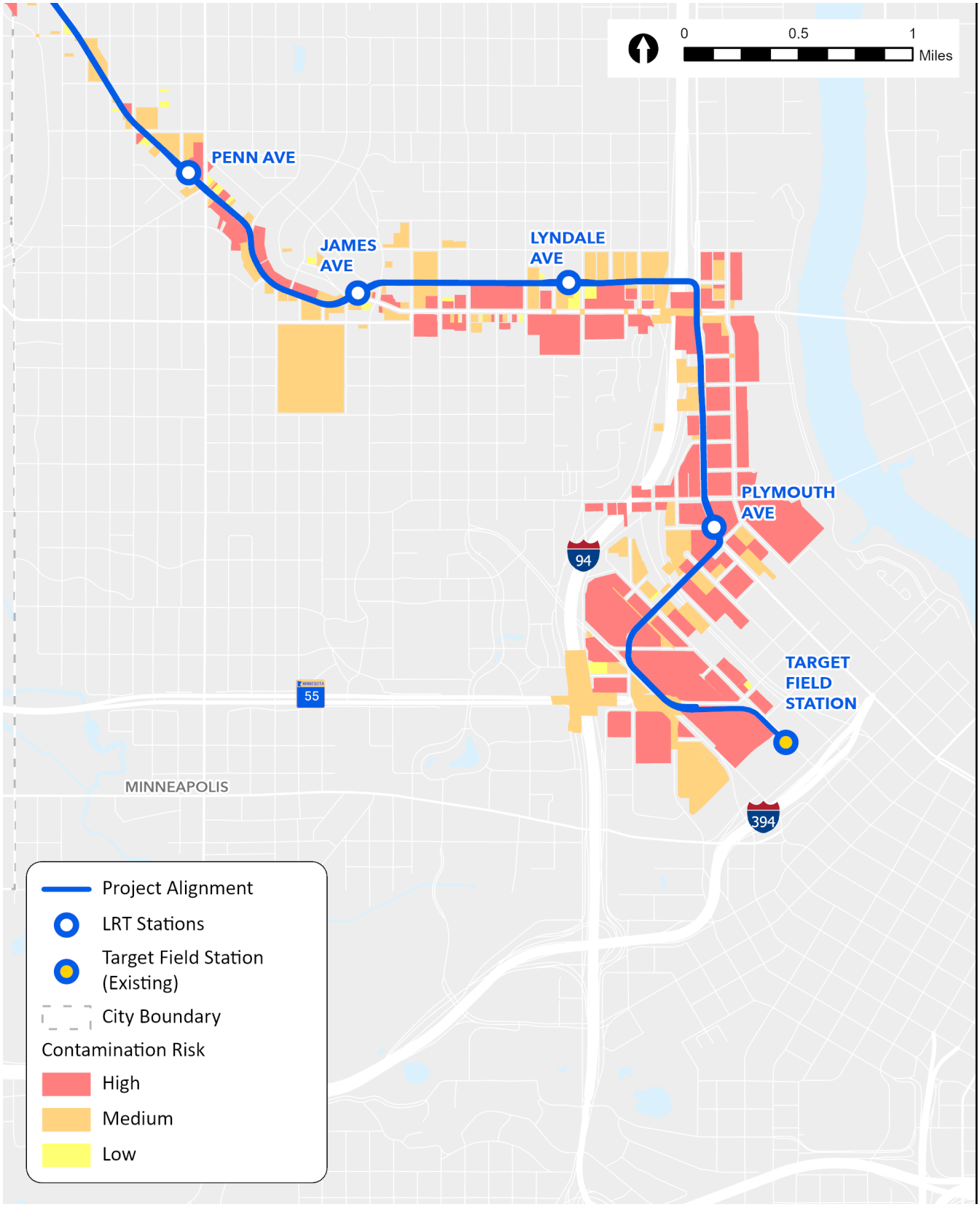


Table 5-11 Number of Recorded Properties with Potential Contamination

City	Properties with Low Potential for Contamination	Properties with Medium Potential for Contamination	Properties with High Potential for Contamination	Total
Brooklyn Park	14	48	12	74
Crystal	3	30	7	40
Robbinsdale	15	28	24	67
Minneapolis	21	122	109	252
Total	53	228	152	433

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.

5.5.3 Environmental Consequences

This section addresses long-term (operating-phase) and short-term (construction-phase) impacts to hazardous-materials contamination from the No-Build and Build Alternatives.

5.5.3.1 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.

Build Alternative

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 the OMF.

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. A Phase II ESA, which is a subsurface investigation where soil and groundwater samples are collected and analyzed by a certified laboratory, will be completed as part of the Supplemental Final EIS. 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.

5.5.3.2 Construction-Phase (Short-Term) Impacts

This section addresses short-term impacts to hazardous- and contaminated-materials contamination from the No-Build and Build Alternatives.

No-Build Alternative

No construction would occur under the No-Build Alternative; therefore, there would be no likelihood of encountering contaminated or regulated materials.

Build Alternative

The Modified Phase I ESAs identified 433 properties 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 expose existing underground contamination that is present along the Project Alignment. Encountering unknown contaminated materials can also pose a threat to human health and the environment if not properly managed.

High- and medium-risk properties identified in the Modified Phase I ESAs have greater-known risk of existing contamination. A Phase II ESA (to be completed during the Supplemental Final EIS) will provide additional information regarding the presence, extent, and magnitude of contamination.

5.5.4 Avoidance, Minimization, and/or Mitigation Measures

The results of future Phase II ESA investigation work would be reviewed during design activities for the Project and impacts to areas of contaminated soil and/or groundwater would be avoided or minimized to the extent practicable.

5.5.4.1 Long-Term Mitigation Measures

No mitigation measures would be anticipated for long-term hazardous- and contaminated-materials impacts because the appropriate measures would be taken to avoid acquiring contaminated property. In cases where contaminated property could not be avoided, assurances would be obtained through appropriate regulatory programs that would limit liability for the contamination.

5.5.4.2 Construction-Phase (Short-Term) Mitigation Measures

Phase II ESA results may 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.

As the Project advances, design would be further refined to avoid disturbance to properties with known contaminants, where possible. 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 Response Action Plan (RAP) and Construction Contingency Plan (CCP) for the Project.

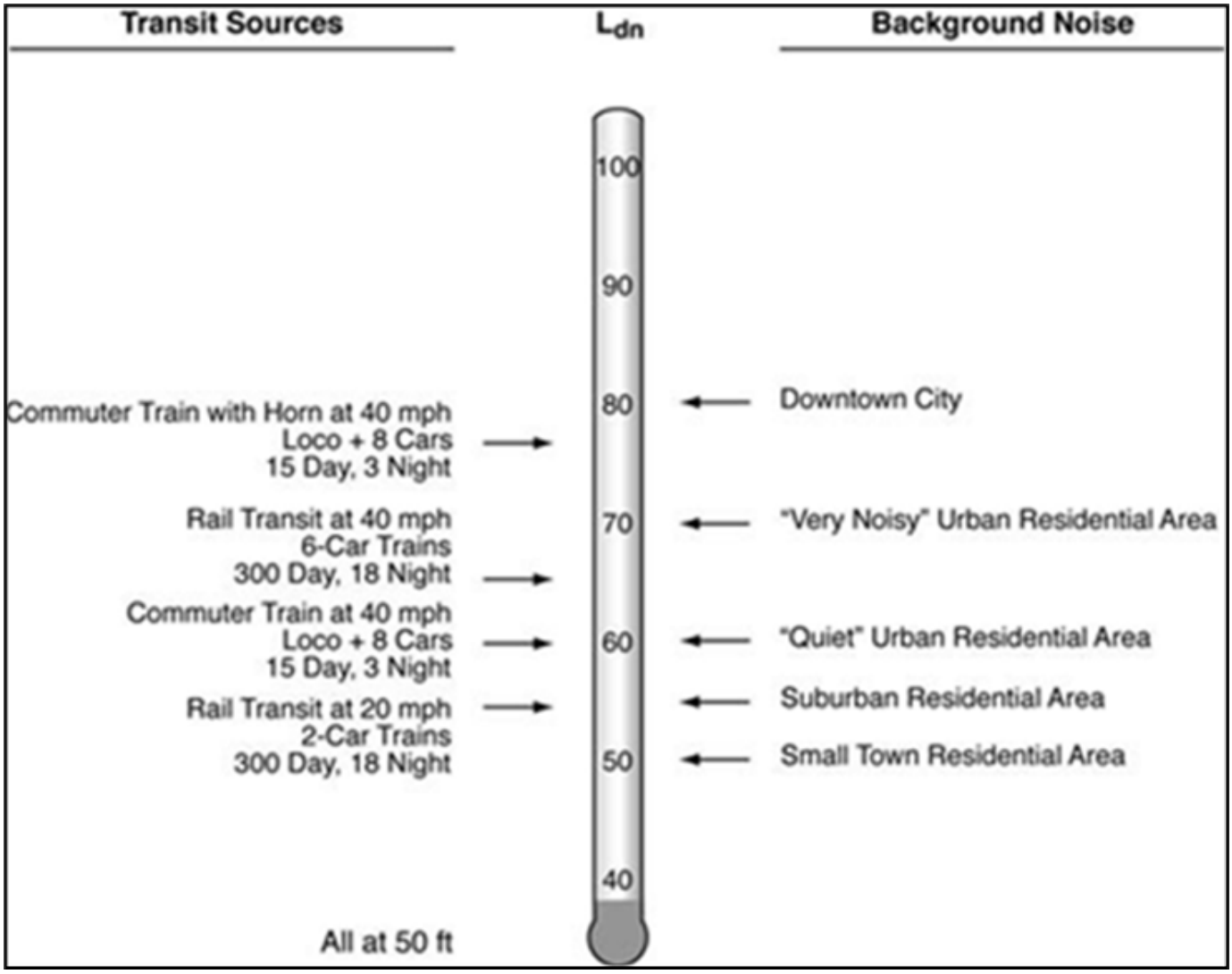
5.6 Noise

This section describes the existing noise environment in the study area and the potential noise impacts of the Build Alternative. Additional details about regulatory context and methodology and analysis of the Project alignment and design options considered are presented in the *Noise and Vibration Technical Report* in Appendix A-5.

5.6.1 Regulatory Context and Methodology

Noise resulting from operation and construction of the Project was assessed in accordance with guidelines specified in FTA's *Transit Noise and Vibration Impact Assessment Manual*.[2] Two primary noise measurement descriptors are used to assess noise impacts in accordance with FTA criteria: the constant equivalent sound level of a fluctuating source over a 1-hour period (1-hour Leq) and the day-night sound level (Ldn), a cumulative 24-hour level that accounts for greater nighttime sensitivity for noise. Typical Ldn noise exposure levels from transit sources are shown in Figure 5-23.

Figure 5-23 Typical Day-Night Sound Level (Ldn) Noise Exposure Levels



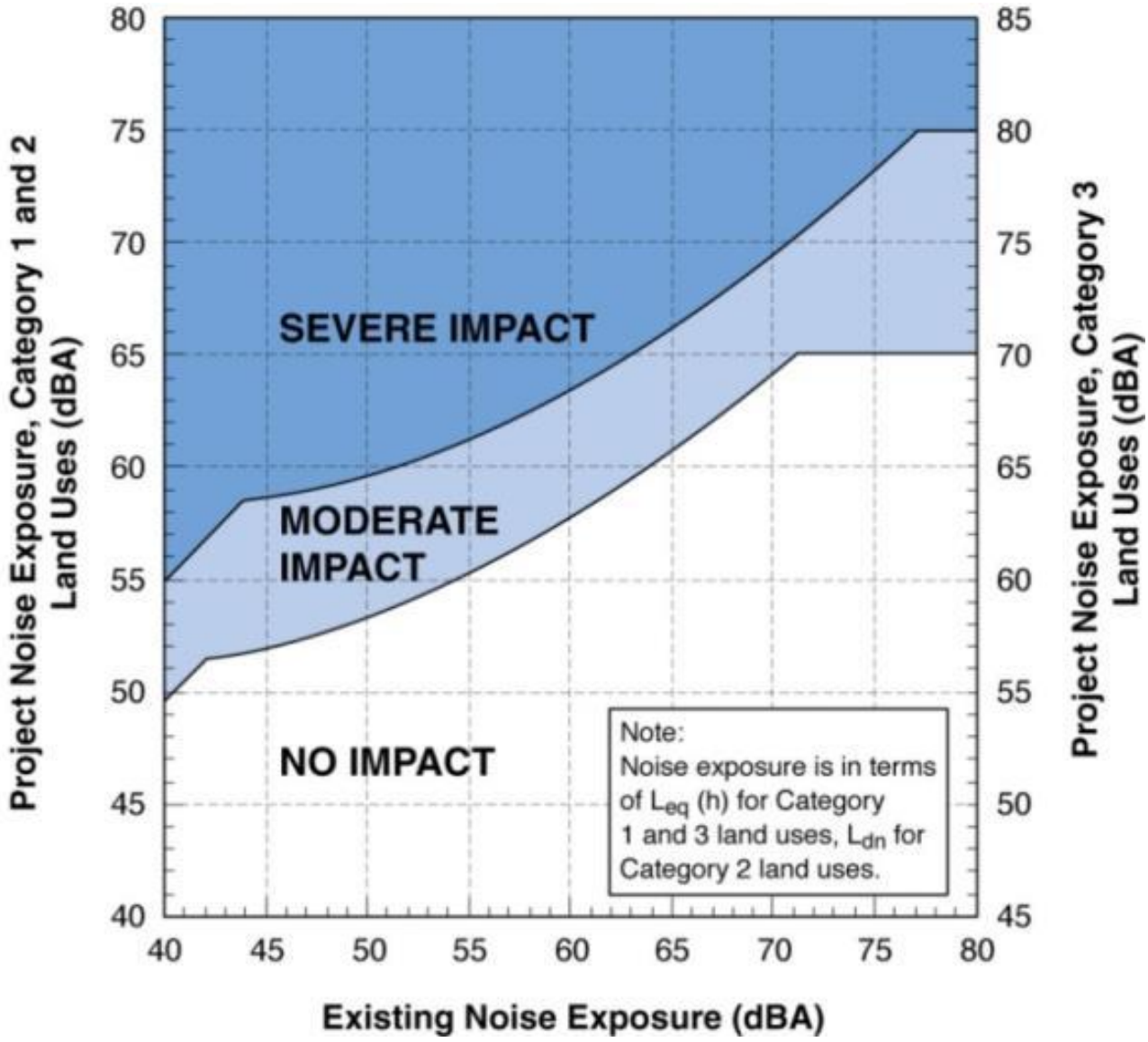
Source: Cross Spectrum Acoustics (CSA), 2023.

The FTA defines noise criteria based on outdoor noise levels and the specific type of land that would be affected. Two types of noise impacts—severe impacts and moderate impacts—are defined for each land use category based on the existing outdoor noise level and the "project noise exposure," which is the noise generated by the Project. The A-weighted decibel (dBA) is used to describe noise levels from transit sources because it most closely matches the human ear's response to audible noise. Because the dBA scale is logarithmic, a 10-decibel (dB) increase in a noise level is perceived as a doubling of loudness, while a 3-dB increase in a noise level in an outdoor setting is typically just perceptible to the human ear. See the *Noise and Vibration Technical Report* in Appendix A-5 for additional details about noise and impact definitions.

Given the complex nature of the FTA criteria, the following example is provided to clarify how impacts are identified. The FTA noise impact criteria are shown in Figure 5-24. Based on Figure 5-24, consider an example of a residential land use (FTA Category 2) with an existing Ldn of 65 dBA. If the projected noise from light rail operations is below 61 dBA, there is no noise impact. A moderate impact would occur if light rail noise levels were between 61 and 66 dBA, and a severe noise impact would occur if light rail noise were above 66 dBA. If noise from the light rail is 62 dBA Ldn (a moderate impact), the total future noise would be 67 dBA Ldn (because noise is added on a

logarithmic scale), a 2 dB increase in the overall noise. Typically, for outdoor noise sources, an increase of less than 3 dB is not perceptible to an average person. Although the 2-dB increase is not likely to be perceptible, it could still be identified as an impact under FTA criteria, and mitigation would be considered based on the existing noise levels, the Project contribution, and the land use type. This example shows how the Project contribution could be lower than the existing noise levels and still result in a noise impact. It also illustrates how FTA criteria focuses on preventing increasing noise levels in areas that already have high levels of background noise.

Figure 5-24 FTA Noise Impact Criteria



Source: FTA 2018.

Project-related construction noise is also assessed in accordance with FTA criteria. The FTA construction noise criteria provides adequate protection for short-term noise impacts and allows for reasonable mitigation measures to be applied to the Project.

5.6.2 Study Area and Affected Environment

FTA defines screening distances for different types of transit projects that are meant to be sufficiently large to encompass all potential locations that could be impacted by noise. For LRT, FTA's screening distances are 350 feet from the alignment if there is an unobstructed view and 175 feet from the alignment if there are intervening buildings. For this analysis, a conservative study area is defined as 350 feet from the center line of the light rail alignment. Noise-sensitive land uses were identified from aerial photographs, Project drawings, and a site visit. Information regarding noise-sensitive land uses by city in the study area is provided in the *Noise and Vibration Technical Report* in Appendix A-5.

5.6.2.1 Noise Measurements

A series of noise measurements were conducted 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 are important steps in the impact assessment. Locations of existing noise measurements are shown in Figure 5-25. Table 5-12 summarizes the results of the existing noise measurement for 12 long-term, noise-monitoring sites and five short-term, noise-monitoring sites identified for the Project. One location, the Capri Theater, is a special land use where both noise and vibration measurements were 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 nonresidential locations. At each site, the noise measurement was collected approximately at a distance from a building(s) that would closely match the building's proximity to the Project Alignment. The results of the existing noise measurements are used to determine the existing noise levels for all the noise-sensitive locations through modeling. The noise measurement results at each location are provided in the *Noise and Vibration Technical Report* in Appendix A-5.

Figure 5-25 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.

Table 5-12 Summary of Existing Noise Level Measurements

Site No.[a]	City	Measurement Location	Measurement Start Date	Measurement Start Time	Meas. Dur. (hr)	Noise Level Ldn (dBA)	Noise Level Leq (dBA)
LT-13	Minneapolis	1020 N 3rd St	Sept. 6, 2023	14:00	24	69.5	67.5
LT-12	Brooklyn Park	8819 Oregon Ave	April 4, 2023	16:00	24	62.0	59.0
LT-11	Brooklyn Park	7431 78th Ct	April 4, 2023	16:00	24	65.3	59.4
LT-10	Brooklyn Park	7013 Dutton Ave	April 4, 2023	17:00	3[b]	56.4	58.8
LT-9	Crystal	5906 Elmhurst Ave	April 3, 2023	15:00	24	63.4	61.1
LT-8	Crystal	5257 Xenia Ave	April 3, 2023	15:00	24	58.7	57.5
LT-7	Robbinsdale	4536 Regent Ave	April 3, 2023	16:00	24	60.5	58.6
LT-6	Robbinsdale	3369 W Broadway Ave	April 4, 2023	11:00	24	70.2	68.6
LT-5	Minneapolis	2741 N Upton Ave	April 4, 2023	12:00	24	69.3	68.1
LT-4	Minneapolis	2239 W Broadway Ave	April 5, 2023	17:00	24	69.1	67.6
LT-3	Minneapolis	1931 N Morgan Ave	May 2, 2023	15:00	24	64.9	61.6
LT-2	Minneapolis	2117 Dupont Ave	April 5, 2023	13:00	24	54.7	53.5
LT-1	Minneapolis	626 Harry Davis Ln	April 5, 2023	10:00	24	62.0	59.7
ST-5	Brooklyn Park	Prince of Peace Lutheran Church	April 6, 2023	10:06	1	63.9[c]	65.9
ST-4	Robbinsdale	3978 W Broadway Ave	April 3, 2023	16:00	1	56.7[c]	56.7
ST-3	Minneapolis	1127 W Broadway Ave	April 6, 2023	10:30	1	66.3[c]	68.3
ST-2	Minneapolis	277 N 12th Ave	April 5, 2023	14:19	1	63.8[c]	65.8
ST-1	Minneapolis	Element Minneapolis downtown	April 5, 2023	11:48	1	64.5[c]	66.5

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

[a] LT = long-term; ST = short-term

[b] The sound level meter's battery failed prior to completion of 24-hour measurement. Ldn estimated using methods described in Appendix E of the FTA guidance manual.

[c] Ldn estimated using methods described in Appendix E of the FTA guidance manual.

5.6.2.2 MPCA Noise Standards Analysis

Using the noise measurement data gathered at the long-term noise measurement sites described above, an analysis was also conducted using the MPCA L10 and L50 noise standards. The L10 descriptor represents the noise level that was exceeded 10 percent of the time during a monitoring period. The L50 descriptor represents the noise level that was exceeded 50 percent of the time during a monitoring period. At each location where a long-term noise measurement was conducted, the maximum hourly L10 and L50 for both daytime and nighttime over a 24-hour period were calculated.

The results, shown in Table 5-13, show the range of existing (without the Project) L10 and L50 values for both daytime and nighttime. At most locations along the Project Alignment, the L10 and L50 standards are already being exceeded by existing noise sources during many hours of the day. Refer to Section 2.1.2.3 in the *Noise and Vibration Technical Report* in Appendix A-5 for details regarding the MPCA noise standards. Most of the existing exceedances of the thresholds are due to exempt noise sources, such as roadway noise and aircraft overflights. The higher existing

L10 and L50 noise levels are at locations close to major roadways along the Project Alignment. At locations farther from roadways, the L10 and L50 noise levels are lower.

Table 5-13 Summary of Existing L10 and L50 Noise Levels at Long-Term Noise Measurement Locations

Site No.[a]	City	Measurement Location	Daytime Hourly L10 Range (dBA)[b]	Nighttime Hourly L10 Range (dBA)[b]	Daytime Hourly L50 Range (dBA)[c]	Nighttime Hourly L50 Range (dBA)[c]
LT-13	Minneapolis	1020 N 3rd St	68–74	62–71	65–70	55–68
LT-12	Brooklyn Park	8819 Oregon Ave	57–65	48–62	47–61	38–56
LT-11	Brooklyn Park	7431 78th Ct	55–64	49–60	49–59	40–55
LT-10	Brooklyn Park	7013 Dutton Ave	56–62	50–61	54–59	46–56
LT-9	Crystal	5906 Elmhurst Ave	58–68	51–65	53–64	44–60
LT-8	Crystal	5257 Xenia Ave	56–62	51–57	52–59	45–53
LT-7	Robbinsdale	4536 Regent Ave	55–61	49–60	53–59	45–57
LT-6	Robbinsdale	3369 W Broadway Ave	69–74	62–69	63–70	48–63
LT-5	Minneapolis	2741 N Upton Ave	68–74	56–71	60–68	42–60
LT-4	Minneapolis	2239 W Broadway Ave	70–72	58–70	58–66	40–55
LT-3	Minneapolis	1931 N Morgan Ave	63–66	58–65	58–62	47–59
LT-2	Minneapolis	2117 Dupont Ave	50–58	43–52	47–53	39–47
LT-1	Minneapolis	626 Harry Davis Ln	60–64	48–61	53–59	44–53

Source: CSA, 2023
[a] LT = long-term
[b] The L10 descriptor represents noise levels exceeded 10 percent (6 minutes) of the time during an hour (60 minutes). This standard includes both daytime and nighttime limits.
[c] The L50 descriptor represents noise levels exceeded 50 percent (30 minutes) of the time during an hour (60 minutes). This standard includes both daytime and nighttime limits.

5.6.3 Environmental Consequences

This section identifies the long-term (operating-phase) and short-term (construction-phase) impacts to noise from the No-Build and Build Alternatives. For a description of cumulative effects, see Chapter 6, Operating-Phase (Long-Term) Impacts.

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.

Build Alternative

The detailed results of the noise assessment are presented in the *Noise and Vibration Technical Report* in Appendix A-5 for residential and institutional (e.g., churches and schools) land uses for each Project city. The results include figures showing locations of the noise impacts and tabulation of location information for each sensitive receptor group, existing noise levels, Project noise exposure (i.e., the Project contribution), impact criteria, and potential noise impacts.

Noise from light rail operations could entail wheel/rail rolling noise, warning bells (used at stations), wheel squeal (on tight radius curves), special trackwork (crossovers and storage tracks), and ancillary facilities in maintenance and storage areas. In most instances, the number of noise impacts is greater in the City of Minneapolis due to more noise sensitive properties adjacent to the Project and the higher existing noise in the urban environment. The results of the noise impact assessment are shown in Table 5-14 and described below for each Project city.

Because of the time limit component of the MPCA noise standards, the Project will not exceed the standards under the Project operating conditions. LRVs will pass by a location for approximately 10 seconds 12 times an hour (based on the operating assumptions of 10-minute headways in each direction) for a total of 120 seconds, or two minutes. Because the duration of exposure to LRT noise does not exceed the L10 (6 minutes) and L50 (30 minutes) time components, there is no potential for the Project to exceed MPCA thresholds. Because the Project does not exceed the MPCA thresholds, the FTA noise impact criteria described previously are more protective than the MPCA standards and have been used to assess and mitigate noise impacts identified within this Supplemental Draft EIS.

Table 5-14 Summary of Noise Impacts by Project City

Building Type	# of Properties Affected (# of Dwelling Units)		Cause of Impact
	Moderate Impact	Severe Impact	
City of Brooklyn Park			
Single-family	1	0	Expansion of CR 103, train bells, and wheel/rail interaction
Multi-family	3 (12 dwelling units)*	0	
Institutional	1	0	
City of Crystal			
Single-family	4	0	Wheel/rail interaction and speed of train
Multi-family	1 (14 dwelling units)*	0	
Institutional	0	0	
City of Robbinsdale			
Single-family	2	0	Wheel/rail interaction and speed of train
Multi-family	0	0	
Institutional	0	0	
City of Minneapolis			
Single-family	11	10	Wheel/rail interaction, train bells
Multi-family	5 (200 dwelling units)*	5 (163 dwelling units)*	
Institutional	1	0	

Source: *Noise and Vibration Technical Report.* Cross-Spectrum Acoustics, Inc. 2023.
*Includes the total number of dwelling units at the affected properties. Additional noise measurements and analysis will be performed to determine potential impacts at each dwelling unit and the reasonable and feasible mitigation measures that would be implemented.

City of Brooklyn Park

The Council modeled noise levels from light rail operations at noise-sensitive residential land uses adjacent to the Project Alignment in the City of Brooklyn Park between N 60th Ave and 93rd Ave N. Moderate noise impacts were identified at four residential properties based on FTA criteria. On the northbound side of the Project Alignment, the potential for a moderate noise impact was identified at a single-family residence because of the proximity of the tracks (i.e., the wheel/rail interaction of the LRVs) and grade crossing bells at 89th Ave N and Maplebrook Parkway N. On the southbound side of the Project Alignment, the potential for moderate noise impacts was identified at three townhomes (each with four dwelling units) between 85th Ave N and 93rd Ave N because of train bells and the

expansion of CR 103. Compared to existing conditions, outdoor noise levels would be expected to increase by up to 2.1 dB in this area.

The Council modeled noise levels at seven noise-sensitive institutional land uses in the City of Brooklyn Park. Except for Berean Baptist Church, noise impacts would not be expected to result from the Project. Based on FTA criteria, a moderate impact was identified at Berean Baptist Church (with a 5.7 dB increase) due to train bells and the expansion of CR 103.

City of Crystal

The Council modeled noise levels at residential properties adjacent to the Project Alignment between the CPKC rail line and N 60 Ave in the City of Crystal. Based on FTA criteria, the Council identified moderate noise impacts at five residential properties. The potential for a moderate noise impact was identified at one multifamily residence with 14 dwelling units because of the proximity of the tracks (wheel/rail interaction) and the train bells at the Bass Lake Rd crossing and the Bass Lake Rd Station. The potential for moderate impacts was identified at four single-family residences between the CPKC rail line and N 47th Ave because of the proximity of tracks (wheel/rail interaction) and the speed of the train. Compared to existing conditions, outdoor noise levels would be expected to increase by up to 3.3 dB in this area.

The Council modeled noise levels at the Crystal Medical Center. No noise impacts are expected to result from Project implementation at this institution.

City of Robbinsdale

The Council modeled noise levels at residential properties adjacent to the Project Alignment between N Lowry Ave and 47th Ave in the City of Robbinsdale. Based on FTA criteria, the Council identified moderate impacts at two single-family homes located between N 42nd Ave and TH 100 because of the proximity of the tracks (wheel/rail interaction) and the speed of the train. Compared to existing conditions, outdoor noise levels would be expected to increase by up to 2.4 dB in this area. The Council did not identify noise impacts at institutions in the City of Robbinsdale.

City of Minneapolis

The Council modeled noise levels at residential properties adjacent to the alignment between Target Field and 21st Ave N in the City of Minneapolis. Based on FTA criteria, moderate impacts would occur at 16 residential properties, and severe impacts would occur at 15 residential properties, as summarized:

- ***Between N Lowry Ave and N 26th Ave:*** The Council identified seven moderate noise impacts and three severe noise impacts at single-family residences and a moderate noise impact at an apartment building with 46 units. Compared to existing conditions, outdoor noise levels would increase by up to 3.6 dB at these residences due to the proximity of the tracks (wheel/rail interaction), the speed of the train, and a nearby crossover.
- ***Between N 26th Ave and N Knox Ave:*** The Council identified one moderate noise impact at an apartment building with 104 dwelling units. Compared to existing conditions, outdoor noise levels would increase by up to 1.1 dB at this residential property due to the proximity of the tracks (wheel/rail interaction) and train bells at Penn Ave Station.
- ***Between N Knox Ave and N Emerson Ave:*** The Council identified one moderate noise impact at a single-family home and severe noise impacts at seven properties, including one two-family and five single-family homes and an apartment building with 12 dwelling units. Compared to existing conditions, outdoor noise levels at these residences would vary, increasing between 5 dB and 15 dB depending on the location. Existing

noise is relatively low along this segment—recorded at 55 dBA—and the proximity of the tracks (wheel/rail interaction) and bells at N Girard Ave, N Fremont Ave, and N Emerson Ave would cause the noise increase.

- ***Between N Emerson Ave and N Lyndale Ave:*** The Council identified three moderate noise impacts, two at single-family homes and one at a multistory building with 18 apartments. The Council identified two severe noise impacts, one at a single-family home and one at a multistory building with 30 dwelling units. Compared to existing conditions, the increase in outdoor noise levels at these residences would vary, increasing between 3 dB and 15 dB depending on the location. Existing noise is relatively low along this segment—recorded at 55 dBA—and the proximity of the tracks (wheel/rail interaction) and bells at Bryant Ave and Lyndale Ave would cause the noise increase.
- ***Between I-94 and N Lyndale Ave:*** The Council identified two moderate impacts at a single-family and two-family residence and one severe noise impact at a single-family residence. Compared to existing conditions, outdoor noise levels at these residences would vary, increasing between 3 dB and 15 dB depending on the location. Existing noise is relatively low along this segment—recorded at 55 dBA—and the proximity of the tracks (wheel/rail interaction) and the bells at Lyndale Ave would cause the noise increase.
- ***Between Plymouth Ave N and N 8th Ave:*** The Council identified one moderate and two severe noise impacts at three apartment buildings with 30, 10, and 109 dwelling units, respectively. Compared to existing conditions, outdoor noise levels at these residential properties would increase by up to 3.7 dB due to the proximity of the tracks and bells at N 3rd St and N 5th St.

Additional noise monitoring and analysis will be performed as the design advances to determine potential impacts. Monitoring and analysis will determine whether mitigation measures would be cost effective based on noise mitigation criteria at individual dwelling units within multifamily properties (see Section 5.6.4).

The Council modeled noise levels at 17 institutional land uses in the City of Minneapolis and identified the potential for one moderate noise impact at the Faith Tabernacle Gospel Fellowship International, where outdoor noise levels would be expected to increase by up to 5.1 dB due to the proximity of the tracks (wheel/rail interaction).

5.6.3.2 Construction-Phase (Short-Term) Impacts

Short-term noise impacts would be associated with 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.

Build Alternative

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, a nighttime construction mitigation plan would be developed if nighttime construction were necessary. 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 would extend to about 380 feet from the construction site.

5.6.4 Avoidance, Minimization, and/or Mitigation Measures

Where noise would exceed FTA moderate or severe impact criteria, the Council would provide noise mitigation measures consistent with FTA guidance and the Council's noise mitigation policy. Under this policy and the FTA guidance, potential mitigation measures will be considered for severe noise impacts when reasonable, feasible, and

cost effective. Based on the Council's policy, certain "moderate" category impacts also qualify for mitigation, where the existing noise level is 65 dBA Ldn or higher; or where there is a 3 dB increase in noise over the existing noise level.

The first step in determining appropriate mitigation will be to evaluate measures at the source of the noise (i.e., the light rail system) and then at the receiver (i.e., the sensitive land use). Where noise level increases are related to crossover tracks (which are used by trains to move between parallel tracks), relocation of the crossover and special trackwork or implementation of crossovers designed to eliminate wheel impacts would be explored to reduce the noise made by the steel wheels traversing the gap between the tracks. If source treatments are not sufficient to mitigate the impact, the Council would conduct appropriate indoor data collection, monitoring, and analysis to evaluate the effectiveness of sound insulation at affected properties where the existing building does not already achieve sufficient exterior-to-interior reduction of noise levels. Sound walls or barriers would not be feasible due to site characteristics and space constraints.

Sound insulation programs are developed to reduce the interior noise levels in sleeping and living quarters in residential and institutional uses to within the guidelines set by the United States Department of Housing and Urban Development. Under these guidelines, interior noise levels for residential land uses should not exceed an Ldn of 45 dBA, and a form of fresh air exchange must be maintained. Sound insulation is typically used on older dwellings with single-paned windows or in buildings with double-paned windows that are no longer effective because of leakage. Sound insulation would not reduce exterior noise levels. Additional monitoring and analysis will be performed to identify the specific number of dwelling units that may be subject to moderate or severe impacts.

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. Additional details are discussed in the *Noise and Vibration Technical Report* in Appendix A-5.

5.7 Vibration and Ground-Borne Noise

This section describes the existing vibration in the study area and potential vibration impacts from the Project. Additional details about regulatory context and methodology and analysis of the Project alignment and design options considered are presented in the *Noise and Vibration Technical Report* in Appendix A-5.

5.7.1 Regulatory Context and Methodology

Vibration has been assessed in accordance with guidelines specified in FTA's *Transit Noise and Vibration Impact Assessment Manual*.[3] Refer to the *Noise and Vibration Technical Report* in Appendix A-5 for additional details about vibration measurement procedures, equipment, regulatory context, and methodology, including definitions and criteria for evaluating vibration.

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.

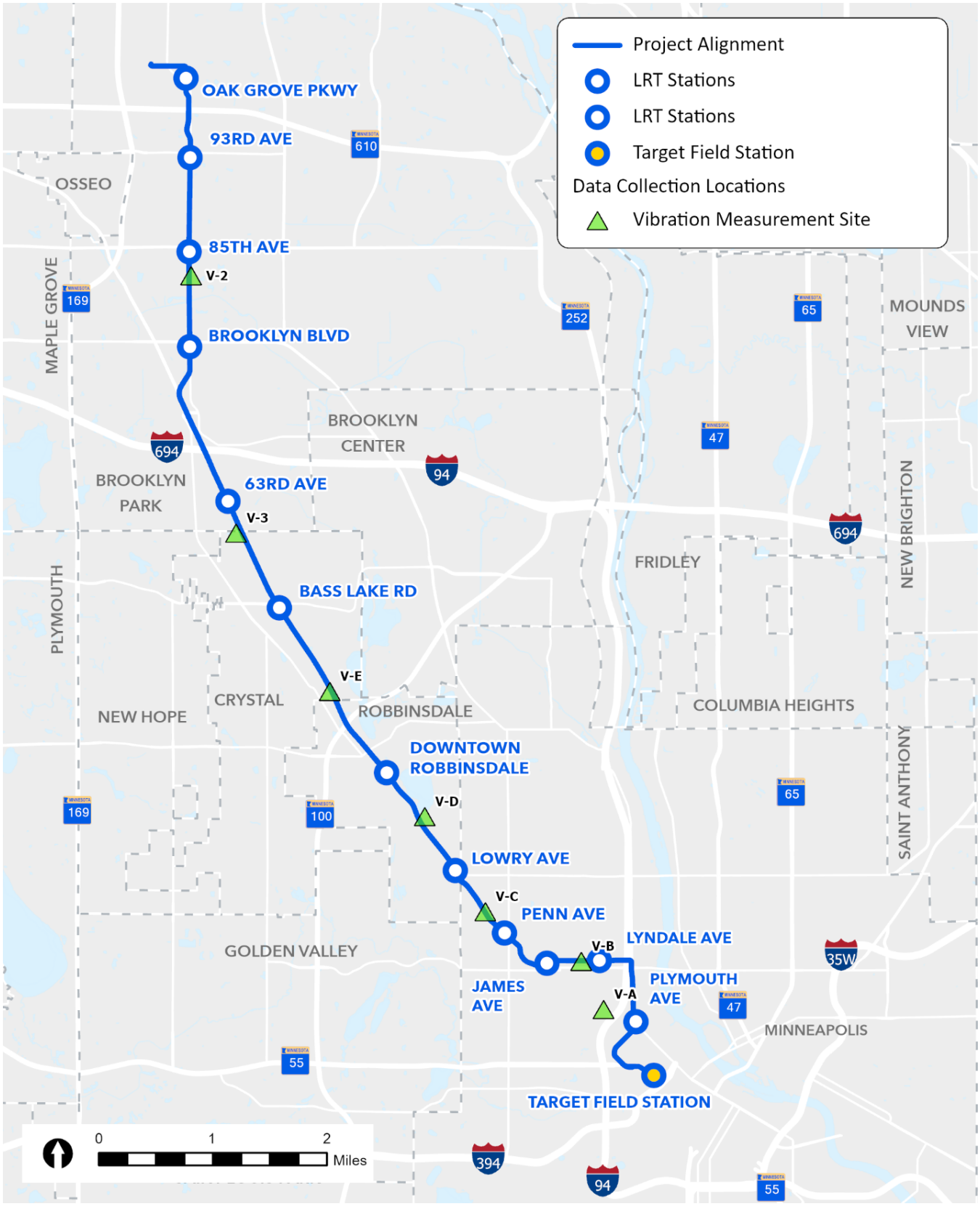
5.7.2.1 Vibration-Sensitive Land Uses

Vibration-sensitive land uses are identified from aerial photographs, Project drawings, 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* in Appendix A-5.

5.7.2.2 Vibration Measurements

A series of vibration measurements were collected along the Project Alignment to understand existing vibration levels. Locations for collection of vibration measurements are shown in Figure 5-26. Seven vibration monitoring sites have been identified for the Project. One location, the Capri Theater, is identified where both noise and vibration measurements were collected. The location of vibration measurement V-A was selected to be representative of all the alignment options considered between Target Field Station and Lyndale Station. The criteria for a detailed vibration assessment and specific information regarding instrumentation, procedures, analysis methods, and measurement locations are described the *Noise and Vibration Technical Report* in Appendix A-5.

Figure 5-26 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-term (operating-phase) and short-term (construction-phase) vibration impacts from the No-Build and Build Alternatives. Vibration assessment analysis results are presented in Table 5-15. A tabulation of vibration impacts in each municipality along the Alignment for each sensitive receptor group, Project vibration levels, the impact criteria, and potential vibration impacts are presented in the *Noise and Vibration Technical Report* in Appendix A-5. The results include the total number of dwelling units with vibration impacts for each location and figures showing locations of vibration impacts.

Special land use categories include radio stations and theaters. The Capri Theater is a special land use category, and there is no vibration impact. The Project plans to conduct additional data collection at this site, which will explore potential for ground-borne noise impacts resulting from vibration; the results will be presented in the Supplemental Final EIS.

Table 5-15 Summary of Vibration Impacts by Project City

City	Number of Vibration Impacts[a]
Brooklyn Park	0
Robbinsdale	0
Crystal	0
Minneapolis	28

Source: *Noise and Vibration Technical Report.* Cross-Spectrum Acoustics, Inc. 2023.
[a] The impact numbers represent the total number of dwelling units (including apartments and other multifamily buildings), not the number of buildings impacted.

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.

Build Alternative

Detailed information about long-term vibration impacts, including impacted locations, is summarized in the *Noise and Vibration Technical Report* in Appendix A-5. Most of the vibration impacts are projected to occur on 21st Ave N in the City of Minneapolis. The summary includes noise and vibration analysis for the Build Alternative and presents results from the previous design options considered as well.

The location of the vibration impacts for institutional land uses in the City of Minneapolis along the 21st Ave N and East of I-94 to Washington Ave options are shown in Figure 5-15 in the *Noise and Vibration Technical Report* in Appendix A-5. The vibration impacts are due to the proximity of the tracks to the sensitive receptors. In most cases, the tracks are within 25 feet of the locations identified with vibration impacts.

5.7.3.2 Construction-Phase (Short-Term) Impacts

Short-term vibration impacts would be associated with 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.

Build Alternative

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. 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 of the *Noise and Vibration Technical Report* in Appendix A-5). Information about the construction vibration impact assessment is provided in the *Noise and Vibration Technical Report* in Appendix A-5.

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. Vibration mitigation material can include ballast mats, resilient rail fastener, and other materials. Detailed information regarding vibration mitigation is provided in Section 6.2.1 of the *Noise and Vibration Technical Report* in Appendix A-5. 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 about common vibration mitigation measures is provided in the *Noise and Vibration Technical Report* in Appendix A-5.

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 and Build Alternatives. The analysis completed for this section was conducted in coordination with the United States Fish and Wildlife Service (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 Project 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. The purpose of these regulations is to aid in the recovery and conservation of imperiled species (species in decline) 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. See the *Biological Environment Technical Report* in Appendix A-5 for additional context and methodology for endangered and threatened species, wildlife habitat, migratory birds, and 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 Natural Heritage Information System (NHIS) database, which includes known occurrences of State- and federally listed species. The Council also used the USFWS Information for Planning and Consultation (IPaC) system to review whether the Project Alignment intersected the range of any federally listed species. Both services were queried in February 2023 and would require updated reviews prior to Project construction. Results of the database queries are presented in Table 5-16 and Table 5-17. Additional details about species, wildlife habitat, migratory birds, and noxious weeds are presented in the *Biological Environment Technical Report* in Appendix A-5.

Table 5-16 State-Listed Species Documented in the Study Area

Common Name	Scientific Name	Status	Notes
Water willow	*Decodon verticillatus*	State Special Concern	Herbaceous plant; is not likely present in the study area because of a lack of habitat. It is not discussed further.
Least darter	*Etheostoma microperca*	State Special Concern	Small fish; is not likely present in the study area because of a lack of habitat. It is not discussed further.
Peregrine falcon	*Falco peregrinus*	State Special Concern	Bird; is not likely present in the study area and is not discussed further. Additional discussion included in Migratory Birds (below).
Black sandshell	*Ligumia recta*	State Special Concern	Freshwater mussel; is not likely present in the study area because there are no suitable waterways or creeks to support it. It is not discussed further.
Rock pocketbook	*Arcidens confragosus*	Endangered	Freshwater mussel; is not likely present in the study area because there are no suitable waterways or creeks to support it. It is not discussed further.
Wartyback	*Quadrula nodulata*	Threatened	Freshwater mussel; is not likely present in the study area because there are no suitable waterways or creeks to support it. It is not discussed further.
Blanding's turtle	*Emydoidea blandingii*	State Threatened	Semi-aquatic turtle; may be present in the study area. This species is discussed further in Section 5.8.4.2.

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

Table 5-17 Federally Listed Species Documented in the Study Area

Common Name	Scientific Name	Status	Notes
Northern long-eared bat	*Myotis septentrionalis*	Endangered	Forested areas throughout Minnesota could be used for summer roosting habitat. Species is discussed further in Section 5.8.4.2.
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. Species is discussed further in Section 5.8.4.2.
Higgins eye	*Lampsilis higginsii*	Endangered	Freshwater mussel; habitat is not present in the study area; therefore, the Higgins eye is not likely present in the study area. This species is not discussed further.
Snuffbox mussel	*Epioblasma triquetra*	Endangered	Freshwater mussel; habitat is not present in the study area; therefore, the snuffbox mussel is not likely present in the study area. This species is not discussed further.
Winged mapleleaf	*Quadrula fragosa*	Endangered	Freshwater mussel; habitat is not present in the study area; therefore, the winged mapleleaf is not likely present in the study area. This species is not discussed further.
Monarch butterfly	*Danaus plexippus*	Candidate	Open meadow habitat in the study area contains milkweeds where monarchs could lay their eggs. During the breeding season, monarchs lay their eggs on their milkweed host plant. Milkweeds are present within the study area. Species is discussed further in Section 5.8.4.2. Consultation with USFWS under Section 7 of the Endangered Species Act is not required for candidate species like the monarch butterfly.

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

5.8.2.2 Wildlife Habitat

The following sections summarize general and significant habitats within the study area; more detailed descriptions are provided in the *Biological Environment Technical Report* in Appendix A-5.

General Habitat

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

Significant Terrestrial and Aquatic Habitats

The Minnesota Land Cover Classification System (MLCCS)[4] was used to identify mapped Regionally Significant Ecological Areas (RSEAs) and Regional Ecological Corridors.

The MLCCS identified 55.73 acres of RSEAs north of TH 610 in the City of Brooklyn Park (Figure 5-27) and a smaller area farther south adjacent to Shingle Creek (Figure 5-28). Data collected during the 2022 field visits were used to verify and update sites identified by the MLCCS (Table 5-18).

Figure 5-27 Detail of Regionally Significant Ecological Areas Near the Oak Grove Pkwy Station Area

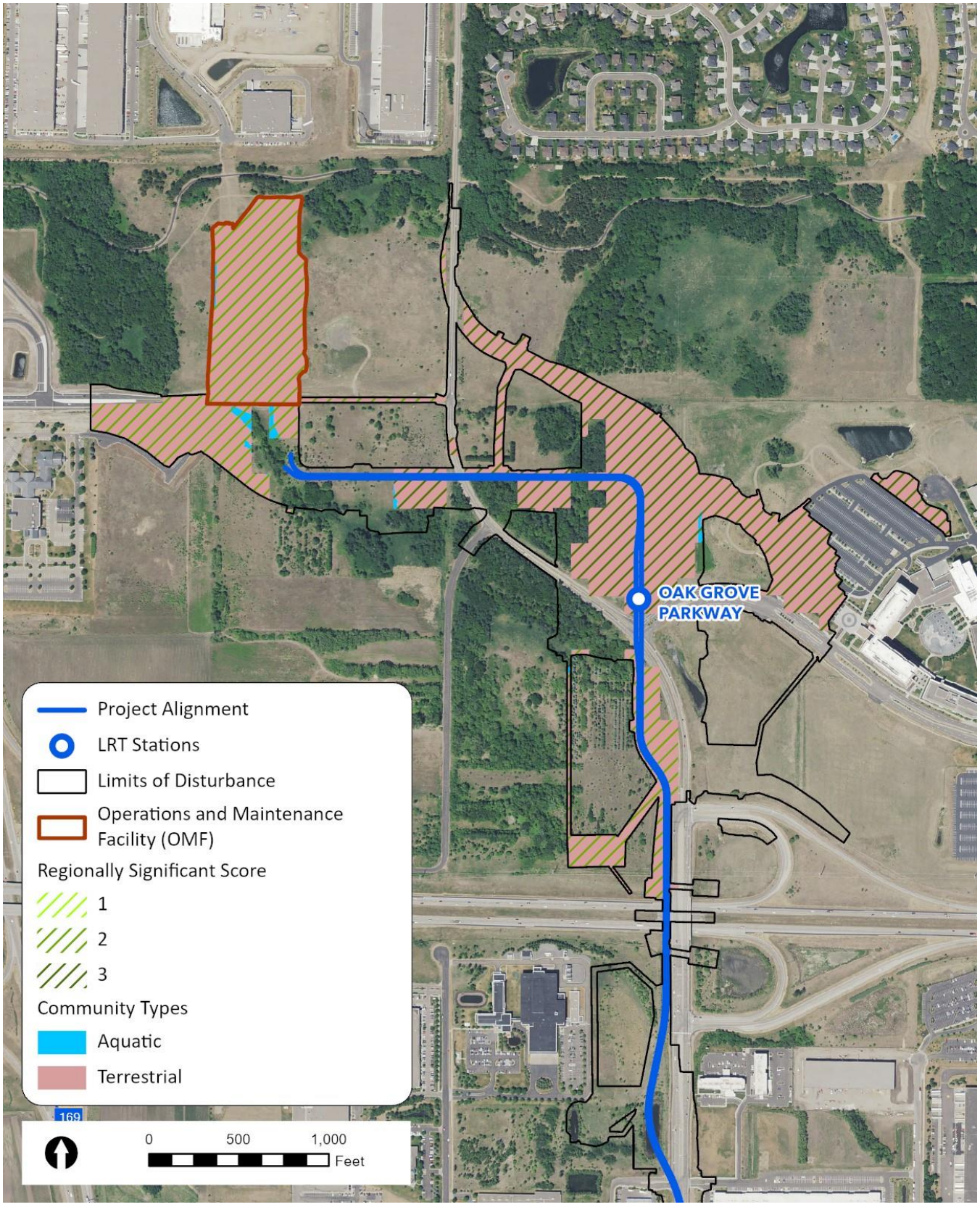


Figure 5-28 Detail of Regionally Significant Ecological Areas Near the Brooklyn Blvd Station Area

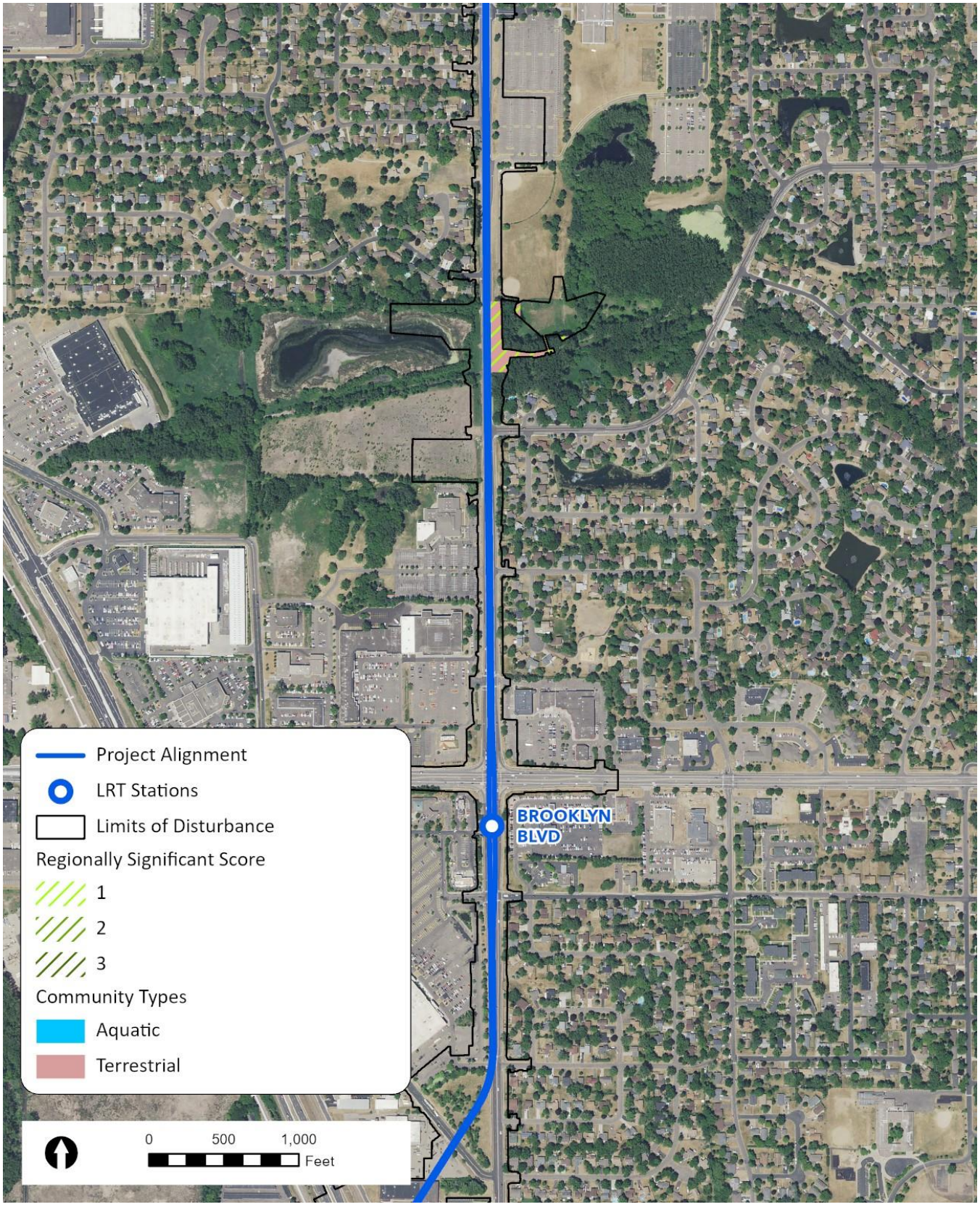


Table 5-18 Regionally Significant Ecological Areas in the Study Area

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).

The notable aquatic habitats summarized in Table 5-18 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 northern long-eared bats (NLEBs), a federally threatened species.

The appended *Biological Environment Technical Report*[5] (provided in Appendix A-5) provides additional information about notable terrestrial and aquatic habitats.

5.8.2.3 Migratory Birds

Many migratory bird species are covered under the Migratory Bird Treaty Act (MBTA). 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. USFWS noted several migratory bird species in species records in the study area. It is likely that these species occurrences are concentrated in the northern, more-vegetated portion of the study area, or near bridges and culverts in the southern portion of the study area.

5.8.2.4 Bald and Golden Eagle Protection Act

Some forested habitats adjacent to aquatic resources could be suitable for bald eagle nesting in and near the Project. During the field investigation in 2022, no nests were observed within the immediate vicinity of the Project.

Bald eagle nest locations change over time, and there is the potential for bald eagles to nest in and near the Project area. Bald eagles are particularly vulnerable during the nesting season from late January to late July. The non-nesting season is from August to mid-January.

5.8.2.5 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 5-19 summarizes noxious plant species within the Project area, their status, and general locations observed during fieldwork.

Table 5-19 Noxious Plant Species in the Study Area

Plant Species	Noxious Status[a]	Notes
Garlic mustard *(Alliaria petiolata)*	RN	Widely present 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	Widely present in the herbaceous, shrub, and tree strata of forested areas throughout the study area
Poison ivy *(Toxicodendron radicans)*	SN	Common in vegetated areas throughout the study area

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

5.8.3 Environmental Consequences

This section identifies the long-term (operating-phase) and short-term (construction-phase) impacts to the biological environment from the No-Build and Build Alternatives.

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.

Build Alternative

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, which are currently classified as federally endangered and proposed endangered species and do not require consultation. The monarch butterfly depends on open meadows where milkweed grows to complete its life cycle.

Table 5-20 summarizes the total extent of and total impacts to forest area/wooded parcels and open meadows with milkweed species in the study area.

Table 5-20 Habitat for Federally Endangered and Threatened Species in Study Area

Habitat Type	Total Size in Study Area (acres)	Impact Size in Study Area (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. Table 5-18 above lists the total impacts to notable terrestrial and aquatic habitats; these impacts are shown in Figure 5-27 and Figure 5-28 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 study area, north of TH 610, where there are currently undeveloped parcels that would be impacted by the Project. Several instances of milkweed in the area north of TH 610 would also be impacted.

While the urban setting and high-traffic roadway are already a notable barrier to turtle crossings along the Project, the introduction of rail may increase risks to turtles. Railroads can trap turtles due to their linear structure and the difficulty that turtles face in navigating the terrain. Turtles might get stuck in the gaps between rail tracks, leading to entrapment and potential hazards such as injury or death. The issue is particularly concerning for slow-moving terrestrial turtles because they may not be able to cross railroad tracks quickly enough.

Migratory Birds

Impacts to migratory birds would be minor and limited to habitat loss within the study area. To avoid impacts to nesting birds, tree clearing would be timed to avoid the nesting season for each bird. Information about nesting seasons for migratory birds is provided in Table 5-21.

Table 5-21 Nesting Season for Migratory Birds Within the 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 (Table 5-19) 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.

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 and Build Alternatives.

No-Build Alternative

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

Build Alternative

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 anticipated because of this Project.

No critical habitats or known occurrences of threatened or endangered species are located in the vicinity of the Build Alternative, 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-term (operating-phase) and short-term (construction-phase) 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 DNR's assessment of all relevant information.

5.8.4.2 Endangered and Threatened Species

Northern Long-Eared Bat

Impacts to the NLEB's 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 "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. A letter was received Jan. 18, 2023, and because no additional correspondence was received within 30 days of that letter, the findings were finalized Feb. 17, 2023. 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 (animal or plant species for which USFWS has sufficient information to propose listing them as endangered or threatened under the federal Endangered Species Act), 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. The Council will explore mitigation strategies to further limit risks to turtles and other wildlife during the Final EIS phase.

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 Project culverts to allow wildlife species to cross tracks. The Council will explore mitigation strategies to further limit risks to wildlife habitat during the Final EIS phase.

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 Project area. Effective measures should be employed with the goal of avoiding impacts to birds and their habitats.

5.8.4.4 Bald and Golden Eagle Protection Act

With ongoing nest reconnaissance and adherence to acceptable permit provisions and seasonal work windows, the Project is not likely to negatively impact the bald eagle.

The Project will comply with the Bald and Golden Eagle Protection Act (16 USC § 668–668d), which prohibits taking, possession, or commerce of these species. Specifications within the construction contracts will state that if an eagle nest is observed during construction, contractors will follow the standards included in the National Bald Eagle Management Guidelines.[6]

While unlikely, if unavoidable impacts to eagles occur during construction, the USFWS may authorize the "take" of eagles where the take is compatible with the preservation of bald and golden eagles, and the take is associated with, but not the purpose, of an activity and cannot be practicably avoided. This type of take is considered "incidental take." The regulation authorizing incidental eagle take permits for bald and golden eagles can be found at 50 CFR § 22.80.

Compensatory mitigation may be required to offset eagle take authorized under an incidental eagle take permit. If mitigation is needed to offset bald eagle take, the standard ratio for mitigation is 1:1.

5.8.4.5 Noxious Weeds

Given the urban and highly disturbed nature of the study area, noxious weeds are widespread. 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 and Build Alternatives, 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 evaluated by quantifying changes to impervious surfaces because 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. Refer to Appendix A-5 for additional details about regulatory context and methodology for water quality and stormwater evaluation.

Several agencies in the study area regulate stormwater management within their jurisdictional boundaries. Table 5-22 documents specific stormwater requirements of each of the following agencies with jurisdiction in the study area: BCWMC, SCWMC, WMWMC,[7] MWMO, MPCA, and the Cities of Brooklyn Park, Crystal, Robbinsdale, and Minneapolis.

Table 5-22 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% total phosphorus (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 total suspended solids (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
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.

Organization, Commission, or City	Rate Control	Water Quality	Volume Control
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.

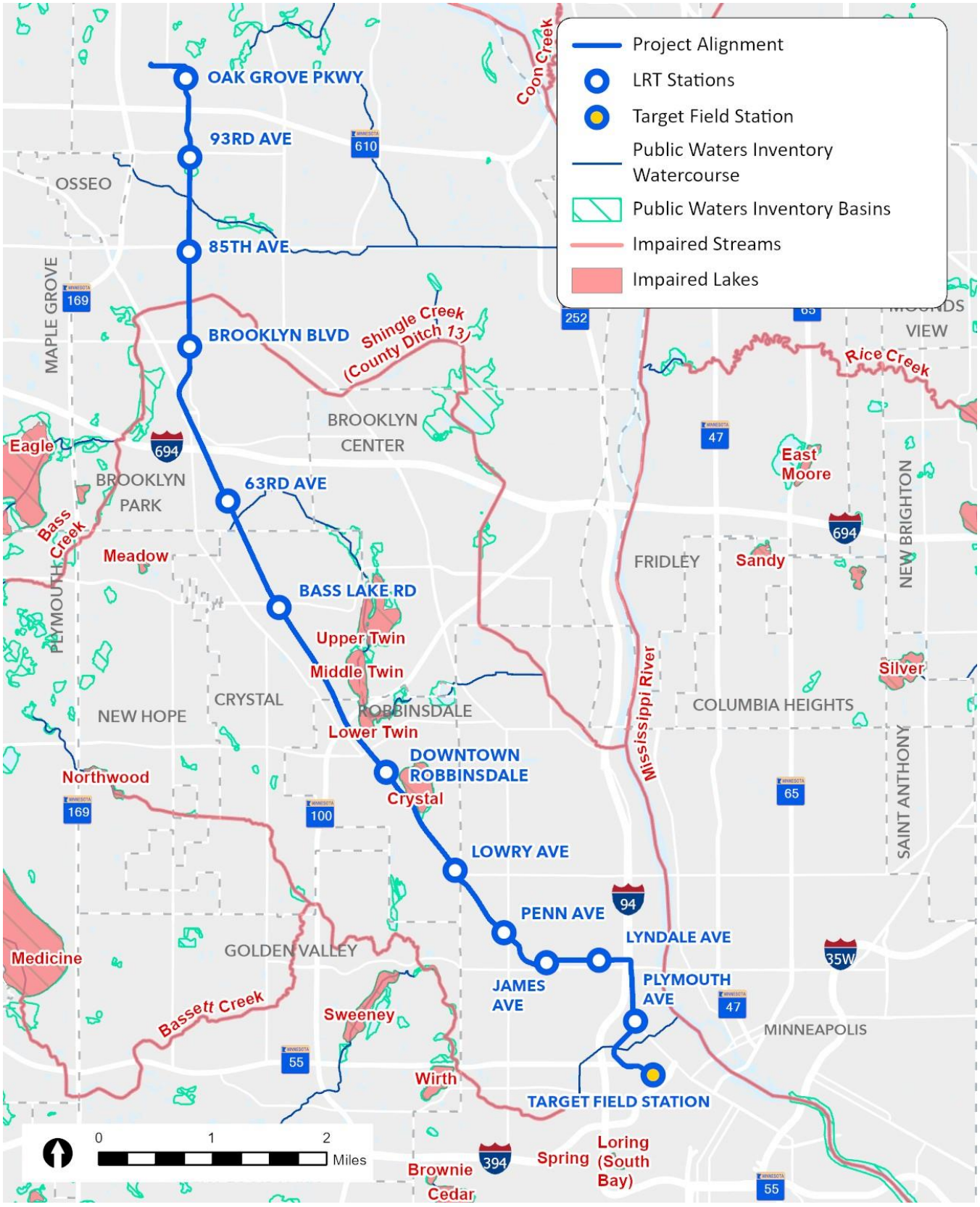
5.9.2 Study Area and Affected Environment

The study area for stormwater is defined as the LOD for the Project and the receiving waters within and immediately adjacent to the LOD. The study area includes impaired waters that are located within 1 mile of the Project and that would receive stormwater discharge from the Project Alignment as per State regulation and as shown in Figure 5-29 and Table 5-23.

The study area is generally urbanized; highly altered compared to natural conditions; and characterized primarily by commercial, industrial, and residential development. Table 5-23 provides specific information on the impairment and total maximum daily load (TMDL) status of water bodies in the study area.

Most 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 5-29 Impaired Waters



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

Table 5-23 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; polychlorinated biphenyls (PCBs) in fish tissue; perfluorooctane sulfonic acid (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. TMDL projects; available online at https://www.pca.state.mn.us/business-with-us/total-maximum-daily-load-tmdl-projects.

5.9.3 Environmental Consequences

This section identifies the long-term (operating-phase) and short-term (construction-phase) impacts to water quality and stormwater from the No-Build and Build Alternatives.

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.

Build Alternative

The Project would increase the impervious area within the LOD (Table 5-24). 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 drainpipes) 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 5-24 Increase in Impervious Surface

Build Alternative	Existing Impervious Area (acres)	Proposed Impervious Area (acres)	Increase in Impervious (acres)
No-Build	197.3	197.3	0.0
City of Brooklyn Park	80.9	128.0	44.5
City of Crystal	30.3	34.4	4.0
City of Robbinsdale	38.2	43.0	4.8
City of Minneapolis	55.7	59.5	3.8

Source: Impervious coverage quantities were calculated by SEH based on conceptual engineering plans developed by Kimley-Horn Associates (February 2024).

5.9.3.2 Construction-Phase (Short-Term) Impacts

Short-term impacts are associated with activities for the No-Build or Build Alternative.

No-Build Alternative

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

Build Alternative

Construction activities associated with 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.

5.9.4 Avoidance, Minimization, and/or Mitigation Measures

Permits, reviews, and approvals from regulatory agencies described above would be required prior to Project construction. Regulatory requirements include the development of Stormwater Pollution Prevention Plans (SWPPPs) as part of the NPDES permitting process, which include long-term (operating-phase) and short-term (construction-phase) mitigation measures to preserve water quality and offset potential impacts associated with Project construction. Plans include structural and nonstructural 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. Table 5-25 includes a summary of potential stormwater BMPs.

Table 5-25 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.

Construction-Phase (Short-Term) Mitigation Measures

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 an 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.

Appendix A-5 provides additional details about the existing air quality in the study area and analyzes the air quality impacts of the No-Build and Build Alternatives 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.

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 Clean Air Act (CAA) of 1970 and the Clean Air Act Amendments (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. Refer to Appendix A-5 for additional details about regulatory context and methodology for air quality and GHG emissions evaluation.

5.10.2 Study Area and Affected Environment

The study area for evaluating air quality effects from the Project was established in accordance with MPCA guidance. The analysis performed includes consideration of carbon monoxide (CO) and mobile-source air toxics (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.

5.10.3 Environmental Consequences

This section identifies the long-term (operating-phase) and short-term (construction-phase) impacts to air quality and GHG emissions from the No-Build and Build Alternatives.

5.10.3.1 Operating-Phase (Long-Term) Impacts

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 and Build Alternatives.

No-Build Alternative

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

Build Alternative

The following sections describe long-term air quality and greenhouse gas emissions impacts from the Build Alternative.

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 (areas that do not meet the National Ambient Air Quality Standards [NAAQS]) but were found to be in attainment (areas meeting the NAAQS) 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.

Greenhouse Gases and Climate Change

Transportation is the largest contributor to GHG emissions in the State, accounting for approximately 25 percent of the State's GHG emissions.[8] This Project would provide additional public transportation service and contribute to the VMT reductions outlined in the latest SMTP, *Minnesota GO*.[9] 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.

For this Project specifically, GHG emissions were calculated by multiplying the VMT of each type of vehicle by the carbon dioxide (CO_2) emission factors taken from the New and Small Starts Evaluation and Rating Process Final Policy Guidance[10] based on projected carbon dioxide equivalent (CO_2e) emission factors for the planning horizon for the Project (2040).

Table 5-26 shows the estimated VMT reduction for both the current and horizon conditions (miles from trips that change from private vehicle to transit) and the reduction of VMT per new transit customer. VMT forecast reduction is due to network changes, including addition of transitway investments and supporting service changes.

Table 5-26 Anticipated VMT Reduction for the Build Alternative

Model	Scenario	Daily Reduction in VMT Over No-Build	New Transit Riders	Daily Reduction in VMT per New Rider
Pre-COVID-19-Pandemic Model (2019)	Current Year	-76,800	8,000	-9.6
Post-COVID-19-Pandemic Model (2022)	Current Year	-49,100	4,900	-10.0
Blended	Current Year	-51,900	5,200	-10.0
Pre-COVID-19-Pandemic Model (2040)	Horizon Year	-84,300	8,800	-9.6
Post-COVID-19-Pandemic Model (2045)	Horizon Year	-39,700	4,000	-9.9
Blended	Horizon Year	-62,000	6,400	-9.7

Source: VMT were calculated through Twin Cities Regional STOPS model and forecast (February 2024). For additional details about the STOPS model methodology, see Chapter 3, subsection 3.1.1.

Note: VMT is calculated with the Twin Cities Regional STOPS model and forecast and will continue to be refined with model updates as the Project advances. Updated VMT analysis will be presented in the Supplemental Final EIS.

Table 5-27 shows emissions of transportation-related GHG, expressed as CO_2e, for both the current and horizon year for the Project. The total CO_2e emissions factor for light-duty passenger vehicle emissions is 355.69 grams per VMT.[11] See Chapter 3, subsection 3.1.1 for additional details.

The Project would decrease transportation-related GHG emissions in the metropolitan area by up to 5,500 metric tons (MT) of GHG compared to the transportation-related GHG emissions with the No-Build Alternative.

Table 5-27 Emissions for Equivalent Passenger Vehicle per Regional Emissions Model (MT CO_2e)

Model	Scenario	Daily	Annual
Pre-COVID-19-Pandemic Model	Current Year	-27	-9,971
Post-COVID-19-Pandemic Model	Current Year	-17	-6,374
Blended	Current Year	-18	-6,738
Pre-COVID-19-Pandemic Model	Horizon Year	-30	-10,944
Post-COVID-19-Pandemic Model	Horizon Year	-14	-5,154
Blended	Horizon Year	-22	-8,049

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 State Implementation Plans (SIPs) demonstrate how states with nonattainment and maintenance areas would meet federal air quality standards. However, the final rules regarding transportation projects require that all such projects be part of a Long-Range Transportation Plan (LRTP) that conforms with air quality standards. The Project is included in the 2040 TPP; FHWA and FTA found that the 2040 TPP is in conformity in March 2015. Therefore, no regional modeling analysis is required. However, federally and State-funded projects are still subject to isolated intersection-level, or "hot-spot," analysis requirements.

Hot-Spot Screening for Carbon Monoxide

CO is assessed by evaluating the worst-operating (hot-spot) intersections in the Project area. Refer to Appendix A-5 for additional details about hot-spot screening.

Table 5-28 lists recent (2022) monitored CO concentrations at Twin Cities Metropolitan Area 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 Motor Vehicle Emissions Simulator (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 5-28 Monitored 2022 Carbon Monoxide Concentrations vs. NAAQS

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

Source: EPA, 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.

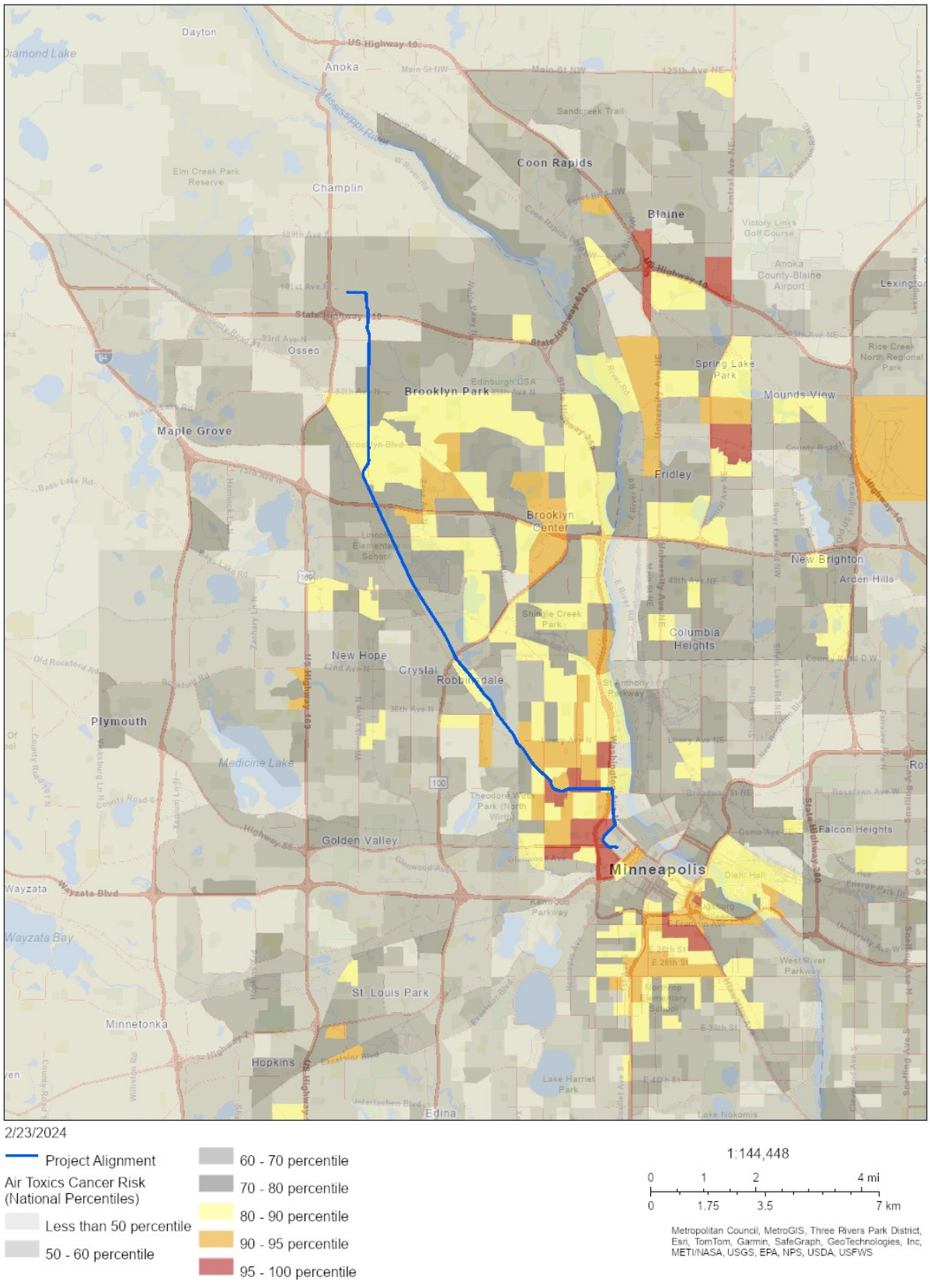
[a] ppm = parts per million, which is a commonly used dimensionless measure of small levels or concentrations of pollutants.

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

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.[12] These air toxic cancer-risk drivers are a concern for the Project 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 5-30) highlights the disparity that exists in this area.

Figure 5-30 Air Toxics Cancer Risk



Source: EPA, 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.

Qualitative MSATs Analysis

With the No-Build and Build Alternatives, MSAT emissions would likely be lower than present levels in the design year (2040) because of EPA's national control programs, which are projected to reduce annual MSAT emissions by 72 percent between 1999 and 2050. 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.

5.10.3.2 Construction-Phase (Short-Term) Impacts

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. Implementation of BMPs (such as using energy-efficient construction equipment and vehicles and limiting equipment and vehicle idling time during construction) would reduce GHG and particulate emissions from construction activities.

No-Build Alternative

The No-Build Alternative would not alter air quality conditions in the absence of construction for this Project.

Build Alternative

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. Increased traffic would temporarily increase emissions and concentrations of air pollutants near homes and businesses because of detours during construction.

BMPs described in Section 5.10.4 would notably reduce concentrations of air pollutants 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 demonstrates that air pollutant concentrations during the operating phase of the Project would not exceed the NAAQS; therefore, no mitigation measures are necessary.

5.10.4.2 Construction-Phase (Short-Term) Mitigation Measures

Given the scattered, intermittent, and temporary nature of construction activities, exceedances of ambient air quality standards during the construction phase of the Project are not anticipated. However, the contractor would implement a series of BMPs during construction to control dust. 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.

Construction would cause an unavoidable temporary increase in GHG emissions because of emissions from construction equipment exhaust.

5.11 Energy

This section reports estimated changes in regional energy consumption due to the No-Build and Build Alternatives.

5.11.1 Regulatory Context and Methodology

The analysis results are reported in British thermal units (Btu) per mile as calculated from the VMT reported for each option by the Twin Cities Regional Travel Demand Model.

The energy impact of the Project was determined by comparing the total energy consumption of the Project to that of the No-Build Alternative. Refer to Appendix A-5 for additional details about regulatory context and methodology for energy evaluation.

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.

5.11.3 Environmental Consequences

This section identifies the long-term (operating-phase) and short-term (construction-phase) impacts to energy from the No-Build and Build Alternatives.

5.11.3.1 Operating-Phase (Long-Term) Impacts

To calculate energy impacts from the build, the change in VMT from Table 5-29 were multiplied by the light-duty passenger vehicle Btu value from Table 5-26.

Table 5-29 Energy Impacts from Equivalent Passenger Vehicles (MMBtu[a])

Scenario	2022 East of I-94	2045 East of I-94
Daily	(352.37)	(384.56)
Annual	(128,616.22)	(140,365.57)

Source: STOPS model and forecast (February 2024).
[a] MMBtu = 1 million British thermal units.

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.

Build Alternative

The Build Alternative 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.

5.11.3.3 No-Build Alternative

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

Build Alternative

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 5-30 describes potential construction-phase energy usage from the Project.

Table 5-30 Construction-Phase Estimated Energy Usage

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 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.

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] Geologic Atlas of Hennepin County (Minnesota Geological Survey 1989).
[2] 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.
[3] 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.
[4] Minnesota Land Cover Classification System (MLCCS 2008).

[5] *Biological Environment Technical Report* (Metropolitan Council 2023).
[6] United States Fish and Wildlife Service, *National Bald Eagle Management Guidelines.* May 2007. National Bald Eagle Management Guidelines.
[7] Referred to as SCWM WMC when referencing their joint watershed management plan.
[8] Minnesota Pollution Control Agency, *Greenhouse gas emissions in Minnesota 2005–2020* (Minneapolis: Minnesota Pollution Control Agency, 2022) Greenhouse gas emissions in Minnesota 2005–2020 (state.mn.us).
[9] MnDOT, *Statewide Multimodal Transportation Plan* (Minneapolis, Minnesota: MnDOT, 2022) Minnesota GO :: Statewide Multimodal Transportation Plan.
[10] Federal Transit Administration, *New and Small Starts Evaluation and Rating Process Final Policy Guidance* (New Jersey: FTA 2013) New and Small Starts Evaluation and Rating Process Final Policy Guidance (trb.org).
[11] Metro Transit. Passenger and Commercial Transportation Methodology Table 5 (Minneapolis Minnesota, 2018), Passenger and Commercial Transportation Methodology.
[12] Environmental Protection Agency, *1999 National-Scale Air Toxics Assessment* (EPA, 1999) 1999 National-Scale Air Toxics Assessment | Technology Transfer Network Air Toxics Web site | U.S. EPA.