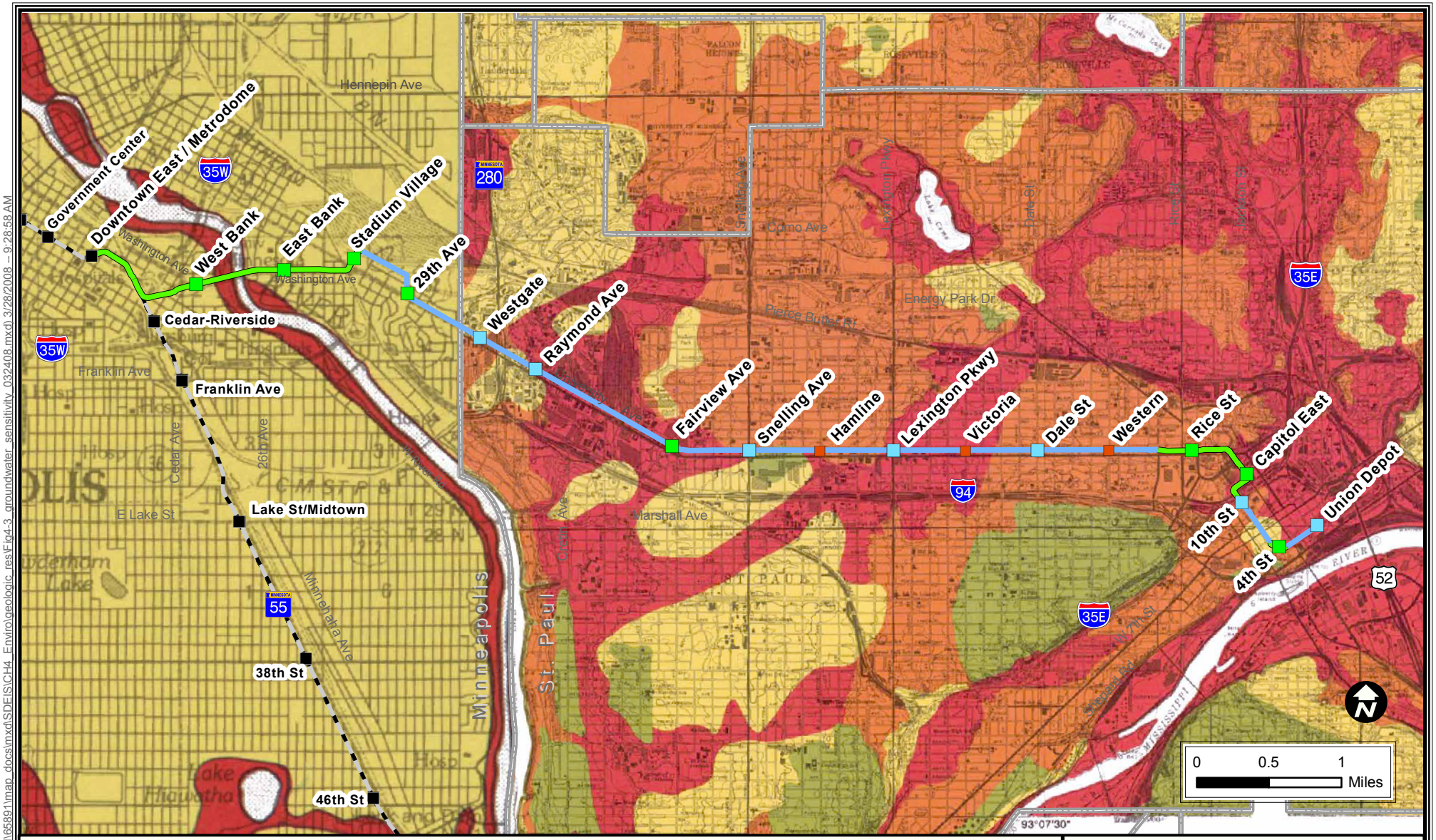


CCLRT Station

- Identical to DEIS
- Changed from DEIS
- Future infill station

CCLRT Alignment Status

- Identical to DEIS
- Changed from DEIS
- HLRT station
- Hiawatha Light Rail

Hennepin County Legend*

MATRIX FOR SUSCEPTIBILITY OF THE WATER TABLE		DEPTH TO WATER TABLE < 10 FEET	DEPTH TO WATER TABLE ≥ 10 FEET
MATERIALS IN UNSATURATED ZONE	OUTWASH, OTHER SANDY DEPOSITS, ORGANIC MATERIAL	VH	H
	SANDY LOAM TILL, LAKE SAND AND SILT	H	M
	LOAMY TILL, CLAY LOAM TILL LAKE SILT AND CLAY	M	L

Ramsey County Legend*

SENSITIVITY RATINGS

Estimated travel time for water-borne contaminants at the land surface to reach the water-table system

VH — Very high: Hours to months	M — Moderate: Years to decades
H — High: Weeks to years	L — Low: Decades to a century

*Hennepin and Ramsey County Groundwater Pollution Sensitivity has been mapped according to different standards.

Figure 4.1-3

Groundwater Pollution Sensitivity

Metropolitan Council

Central Corridor Light Rail Transit

Map Document: (N:\GISProj\MetCouncil\65891\map_docs\mxd\SDEIS\CH4_Enviro\geologic_resFig4-3_groundwater_sensitivity_032408.mxd) 3/28/2008 -- 9:28:58 AM

Data Sources: LMIC, Metropolitan Council, Mn/DOT, Hennepin SWCD, and Ramsey SWCD

4.1.2.6 Soil Resources

The Study Area includes approximately 20 soil map units, (NRCS, 2005 and 2006) (Figure 4.1-4). The following provides a summary of the five primary soils that may be affected by the Central Corridor LRT Project:

- **Urban Land/Urban Soil Complex**—This soil map unit makes up the majority of the Central Corridor LRT Study Area and is the primary soil crossed by the Central Corridor LRT Project. This soil classification is generally characterized as highly disturbed because of human activities. Much of the soils have been altered through grading, paving, excavation, or fill.
- **Chetek Sandy Loam**—The Chetek series consists of very deep, somewhat excessively drained soils which are shallow-to-sandy outwash. They formed mostly in loamy alluvium and in the underlying sandy and gravelly outwash. Typically, they are on outwash plains and stream terraces, but some are on moraines or kame terraces. Permeability is moderate or moderately rapid in the loamy mantle and rapid or very rapid in the sandy outwash. Slopes range from 0 to 45 percent.
- **Dorset Sandy Loam**—The Dorset series consists of very deep, somewhat excessively drained soils formed in a thin loamy mantle and in underlying sandy and gravelly outwash sediments. They are on outwash plains, valley trains, stream terraces, and moraines. They have moderately rapid permeability in the upper mantle and rapid permeability in the lower sediments. Slopes range from 0 to 35 percent.
- **Hubbard Loamy Sand**—The Hubbard series consists of very deep, excessively drained soils that formed in sandy glacial outwash on outwash plains, valley trains, and stream terraces. Slopes range from 0 to 35 percent.
- **Sandberg Loamy Coarse Sand**—The Sandberg Series consists of very deep, excessively drained soils that formed in coarse or moderately coarse glacial outwash sediments or glacial beach deposits with or without a thin loamy mantle. These soils are on outwash plains, glacial lake beaches, stream terraces valley trains, and glacial moraines. Permeability is moderately rapid or rapid in the upper part and very rapid in the lower part. Slopes range from 0 to 45 percent.

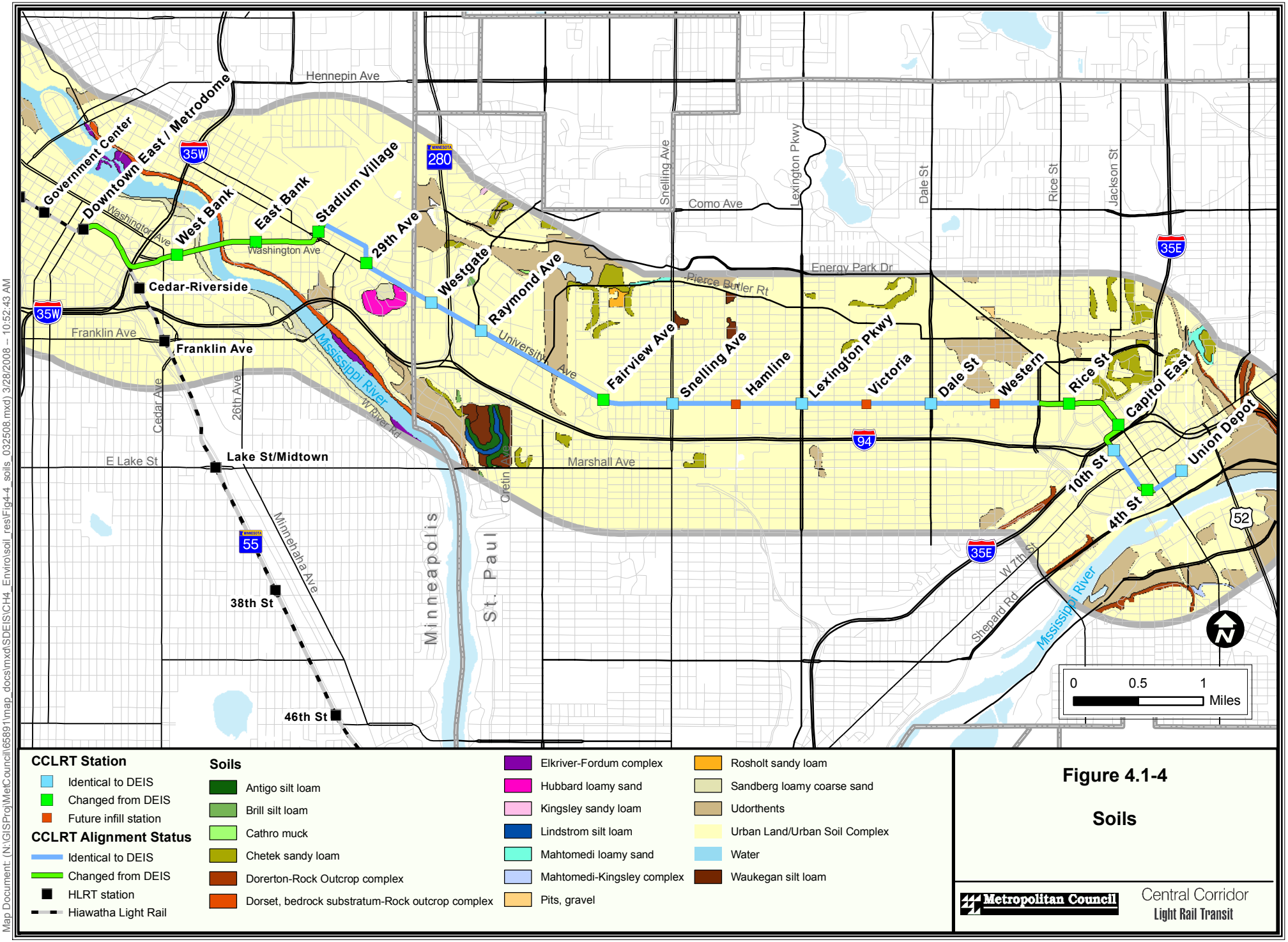


Figure 4.1-4

Soils

Metropolitan Council

Central Corridor Light Rail Transit

Map Document: (N:\GISProj\MetCouncil\65891\map_docs\mxd\SDEIS\CH4_Enviro\soil_resFig4-4_soils_032508.mxd) 3/28/2008 -- 10:52:43 AM

Data Sources: LMIC, Metropolitan Council, Mn/DOT, Hennepin and Ramsey County Soil Surveys

4.1.3 Long-Term Effects

4.1.3.1 No-Build Alternative

There are no impacts anticipated as a result of the No-Build Alternative.

4.1.3.2 Key Project Elements

None of the proposed Key Project Elements, including the Washington Avenue Bridge resurfacing, would have long-term effects on the geology or groundwater resources within the Central Corridor LRT Study Area.

The existing soil resources within the Key Project Element activities are mostly disturbed and covered with pavement or other impervious surfaces. The existing surfaces that are not paved or impervious are, nonetheless, highly disturbed. No long-term impact to soil resources is anticipated.

4.1.4 Short-Term Construction Effects

4.1.4.1 Geology

The proposed Key Project Elements would not result in short-term construction impacts on the geology of the Central Corridor LRT Study Area.

Project construction activities relating to the Key Project Elements could affect the groundwater because of contamination from accidental spills of petroleum products or hazardous substances which migrate from the ground surface or other point-of-release to the water table. Potential impacts will be reviewed in more detail during final design.

4.1.4.2 Groundwater

As indicated in the EPA comments on the AA/DEIS and SDEIS Notice of Intent, the project may have short-term impacts on groundwater. Impacts relating to construction dewatering will be temporary. Local potable water is supplied by the municipalities. Impacts from construction dewatering to the surface and groundwater sources for potable supply will be insignificant, if any occur at all. Key project areas where dewatering may occur include all sites selected for TPSS, and the following:

- Downtown St. Paul
  - Vehicle Maintenance and Storage Facility
  - Downtown St. Paul Alignment and Station Modifications
- Capitol Area
  - Capitol Area Station
- Midway East
  - Future Stations at Western, Victoria, and Hamline
- University/Prospect Park
  - University of Minnesota (U of M) Alignment

Contamination to the groundwater from construction related spills is most likely to impact the water table in areas of high sensitivity as identified in Section 4.1.2.3. Several key project elements are located within areas of high sensitivity. Therefore, spills relating to construction

at the following project planning segments have the potential to impact groundwater resources:

- Downtown St. Paul
  - Vehicle Maintenance and Storage Facility
  - Downtown St. Paul Alignment and Stations
  - Traction Power Substations
- Capitol Area
  - Capitol Area Alignment and Stations
  - Traction Power Substation
- Midway East
  - Future Station at Victoria
  - Traction Power Substations

When detailed construction activities have been identified, further consideration will be given to potential spill impacts and BMPs to be used during resurfacing of the Washington Avenue Bridge.

4.1.4.3 Soils

Short-term construction impacts to soil resources are limited to those Key Project Elements that would disturb unpaved or permeable surfaces. Construction activities may further degrade soils through compaction and erosion. Potential impacts will be reviewed in more detail during final design.

4.1.5 Mitigation

4.1.5.1 Geology

The proposed Key Project Elements would not impact the geology in the Central Corridor LRT Study Area; therefore, no mitigation is proposed. Prior to construction, additional geotechnical data would be collected through soil borings, particularly in areas where stations and the Vehicle Maintenance and Storage Facility are proposed. This data would assist with the development of detailed design and construction plans.

4.1.5.2 Groundwater

Potential impacts to the local groundwater relating to the Key Project Elements would be mitigated by employing the following steps:

- Limiting the amount and duration of dewatering activities.
- Employing engineering controls and safety measures as described in Section 4.8 to limit spills of petroleum or hazardous substances that could potentially impact groundwater, particularly in areas identified as having high sensitivity to pollution.
- Final design and permitting will include the development of a Stormwater Pollution Prevention Plan and spill prevention plan for the project.

4.1.5.3 Soils

BMPs, such as sub-soiling in compacted areas and establishment of permanent vegetation in areas where erosion may be a concern, would be used to mitigate construction impacts to soil resources

4.2 Water Resources

The Key Project Elements are not expected to have long-term impacts on the Mississippi River, surface water quality, floodplains or wetlands. Proposed activities on the Washington Avenue Bridge will not alter the course, current, or cross-section of the river.

Short-term impacts related to construction activities may generate sediment laden stormwater within the construction area. BMPs will be used to minimize potential impacts. No short-term construction effects to the Mississippi River floodplain or floodway are anticipated because the Central Corridor LRT will use the existing Washington Avenue Bridge and will not be located within the designated floodplain in Downtown St. Paul.

No wetlands or public waters are located within the Central Corridor LRT Study Area; therefore, no short- or long-term impacts to water resources are anticipated.

4.2.1 Legal and Regulatory Context

The majority of the land within the Central Corridor LRT Study Area is urban and is comprised of existing roadway or transit right-of-way, which are constructed of primarily impervious surfaces. The following agencies regulate water resources within the Study Area:

- United States Army Corps of Engineers (COE)
- National Park Service (NPS)
- Minnesota Pollution Control Agency (MPCA)
- Minnesota Department of Natural Resources (DNR)
- Mississippi Watershed Management Organization (MWMO)
- Capitol Region Watershed District (CRWD)
    - City of Minneapolis
    - City of St. Paul

These agencies are responsible for review and permitting of surface water related issues resulting from construction of the proposed project.

4.2.1.1 United States Corps of Engineers

Navigable waters are regulated under Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 USC 403) and Section 404 of the Clean Water Act (CWA) (33 USC 1344). The RHA regulates work involving a change in the course, current, or cross-section of navigable waters, including wetlands.

Impacts to wetlands are regulated by several agencies under the CWA if they are connected or adjacent to "navigable waters" of the United States. Section 404 of the CWA requires a permit to be issued by the COE (or a delegated state agency) prior to the placement of any dredged or fill material into any waters of the United States, including wetlands. Section 401 of the CWA requires the affected state to issue a water quality certification, or a waiver, for each Section 404 permit.

4.2.1.2 National Park Service

The Central Corridor LRT Study Area includes a river crossing that is within the federal Mississippi National River and Recreation Area (MNRRA) and within the state Mississippi River Critical Area (MRCA). The federal MNRRA Program works in partnership with the state MRCA Program. The DNR, the Metropolitan Council, and the NPS work together to protect and preserve this corridor.

In 1988, Congress designated 72 miles of the Mississippi River and 4 miles of the Minnesota River as the MNRRA. A *Comprehensive Management Plan* developed for the MNRRA adopts and incorporates the MRCA Program, Shoreland Management Program, and other applicable state and regional land use management programs (16 USC Chapter 1 Subchapter CXI). The MNRRA plan addresses preservation, recreation, conservation, and development. The plan regulates activities within the area to protect important historic, cultural, or aesthetic values or natural systems. The NPS administers this program.

4.2.1.3 Minnesota Pollution Control Agency

The MPCA establishes water quality standards for the Mississippi River and conducts periodic water quality and biological monitoring. Water quality standards are implemented primarily through National Pollution Discharge Elimination System (NPDES) permits issued to dischargers by the member states (MN Statute 115; MN Rule 7050). The MPCA and City of Minneapolis review draft NPDES permits.

The MPCA reviews COE permits and is responsible for issuing Section 401 water quality certification.

4.2.1.4 Minnesota Department of Natural Resources

In 1976, the State declared the Mississippi River corridor through the Twin Cities Metropolitan Area to be a critical area, requiring each municipality to develop plans and regulations for its protection. According to Executive Order (EO) No. 79-19, issued according to the Critical Area Act of 1973 (Minn. Stat. Ch. 116G) the MRCA classification within the Central Corridor LRT Study Area is “Urban Diversified District.”

EO No. 79-19 states that “lands and waters within [the Urban Diversified District] shall be used and developed to maintain the present diversity of commercial, industrial, residential, and public uses of the lands, including the existing transportation use of the river; to protect historical sites and areas, natural scenic and environmental resources; and to expand public access to and enjoyment of the river.” New development within this district is allowed if it is compatible with these goals. The DNR is charged with administering this program.

Wetlands are regulated by the DNR if they are identified as public waters or public waters wetlands. Public waters are all waterbasins and watercourses that meet the criteria set forth in Minn. Stat., Section 103G.005, subd. 15, and that are identified on Public Water Inventory (PWI) maps and lists authorized by Minn. Stat., Section 103G.201. Proposed impacts to these types of wetlands would require a permit from the DNR.

The DNR also requires cities to adopt zoning regulations to protect the environmental quality of surface waters and the natural and economic value of shoreline areas, and to provide for wise use of such waters. Minneapolis and St. Paul have designated the Shoreline Zoning District boundary, which includes the area within 300 feet of the ordinary high water of the Mississippi River.

4.2.1.5 Cities of Minneapolis and St. Paul

The cities regulate water quality through their building plan reviews which have sediment and erosion control requirements. On behalf of the Federal Emergency Management Agency (FEMA), the cities also regulate activities that may impact floodplains. Stormwater Pollution Prevention Plans (SWPPPs) are required for projects that disturb more than 1 acre under the NPDES permit program.

Floodplains are regulated under EO 11988, signed on May 24, 1977, by President Jimmy Carter. This EO requires all federal agencies to evaluate and, to the extent possible, avoid adverse impacts to floodplain areas which may result from actions they administer, regulate, or fund. EO 11988 specifically requires floodplain impacts to be considered in the preparation of EIS for major federal actions. FEMA, under the National Flood Insurance Program (NFIP) as authorized according to the National Flood Insurance Act of 1968 (as amended), has the authority to regulate floodplains and floodways. The cities of Minneapolis and St. Paul administer these regulations, including activities such as construction, excavation, or deposition of materials in, over, or under waters which may affect flood stage, floodplain, or floodway boundaries.

The 100-year flood is used by the NFIP as the standard for floodplain management and to determine the need for flood insurance. The boundary of this floodplain is defined by the flood elevation that has a one-percent chance of being equaled or exceeded each year.

Rivers and streams where FEMA has prepared detailed engineering studies may have designated floodways. For most waterways, the floodway is defined as the area where floodwaters are likely to run deepest and fastest (FEMA, 2007). It is the area of the floodplain that should be reserved (kept free of obstructions) to allow floodwaters to move downstream. Placing fill or buildings in a floodway may block the flow of water and increase flood elevations. Such activities in the floodway are generally restricted and require mitigation in the form of compensatory volume to offset lost floodway storage.

4.2.1.6 Mississippi Watershed Management Organization and Capitol Region Watershed District

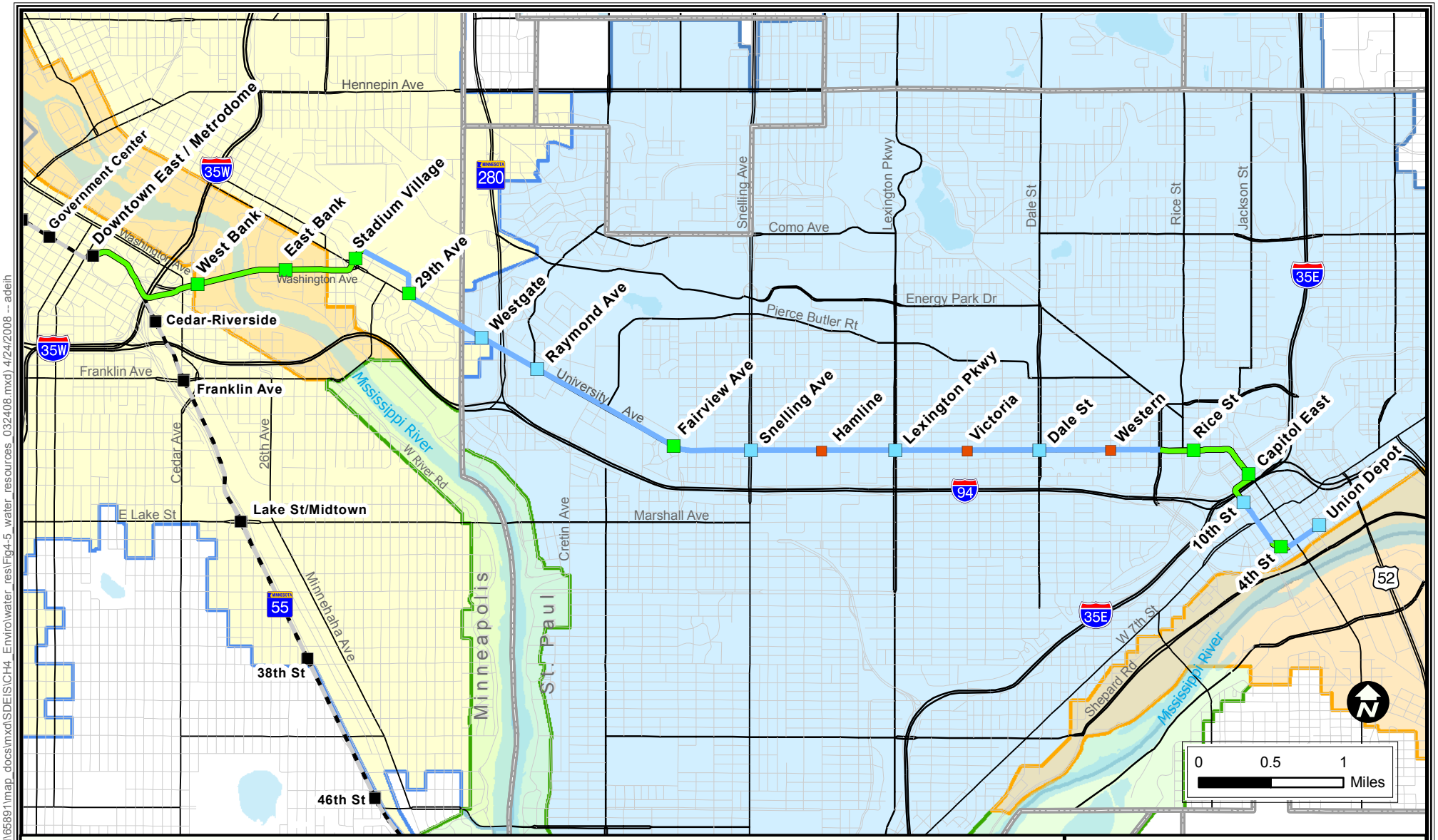
The Mississippi Watershed Management Organization (MWMO) boundaries extend from Downtown Minneapolis to Highway 280. The Capitol Region Watershed District (CRWD) boundary extends from Highway 280 to Downtown St. Paul (Figure 4.2-1). The MWMO and the CRWD are direct tributaries to the Mississippi River. The MWMO and CRWD are responsible for construction permitting as it pertains to stormwater runoff and ensuring that new construction projects meet the goals and requirements established by the watersheds. For example, these two agencies will ensure that BMPs, as outlined in the NPDES permit, are used to limit sediment and particulate runoff during construction activities.

4.2.2 Methodology

The Study Area for water resource evaluation includes an area 500 feet on either side of the Central Corridor LRT Study Area. Surface waters were identified using U.S. Geological Survey quadrangle maps, the U.S. Fish and Wildlife Service National Wetland Inventory (NWI), the Department of Natural Resources PWI maps (USDOI, 1997; USFWS, 1974 -1988; DNR, 2003), and a brief “windshield survey.” Flood Insurance Rate Maps (FIRMs) were used to identify floodplains and floodways within the Study Area.

4.2.3 Existing Conditions

The Study Area is mostly urbanized and highly altered as compared to pre-settlement conditions. The land is characterized by commercial, industrial, or residential development.



CCLRT Station

- Identical to DEIS
- Changed from DEIS
- Future infill station

CCLRT Alignment Status

- Identical to DEIS
- Changed from DEIS
- HLRT station
- Hiawatha Light Rail

MNRRA/MRCA

- Urban Diversified District
- Urban Open Space District
- Capitol Region Watershed District (CRWD)
- Mississippi Watershed Management Organization (MWMO)

Figure 4.2-1

Water Resources

Metropolitan Council

Central Corridor Light Rail Transit

Map Document: (N:\GISProj\MetCouncil\65891\map_docs\mxd\SDEIS\CH4_Enviro\water_res\Fig4-5_water_resources_032408.mxd) 4/24/2008 -- adeih

Data Sources: LMIC, Metropolitan Council, Mn/DOT

Due to the developed nature of the Study Area, limited surface water resources exist. Historic wetlands have been modified or eliminated and natural stream courses have been rerouted into a network of channels, culverts, and storm sewers. The Mississippi River is the only surface water identified within the Study Area.

The NPS and DNR oversee the MNRRA and MRCA, respectively. These boundaries overlap and are shown in Figure 4.2-2.

Currently, surface water runoff travels through a storm sewer system and discharges directly into the Mississippi River. Treatment of surface water runoff is limited, and only occurs when new development or redevelopment is required to install BMPs.

4.2.3.1 Mississippi River Basin

The Mississippi River segment included in the Study Area extends between the Upper and Lower St. Anthony Falls Lock and Dams (approximately river mile 854) in Downtown Minneapolis, to the riverfront in the City of St. Paul (approximately river mile 839). The river segment in this area is typically characterized as a narrow channel surrounded by steep limestone bluffs.

The river has been used for commercial and industrial purposes since the late 1820s. The pre-settlement character of this segment of the Mississippi River has been altered by timber processing operations, residential development along the river flats, aggregate mining along the upper portions of the river bluffs, coal and petroleum products storage, as well as removal of river islands. This segment was altered drastically to facilitate barge traffic and to accommodate the extensive milling operations of the late 1820s to 1930s in the St. Anthony Falls area.

This segment of the Mississippi is still used for commercial barges and recreation. Commercial shipping barges number in excess of 2,500 per year, and haul primarily coal, aggregates, steel, and road salt. Excel Energy maintains a hydroelectric generating facility in the St. Anthony Fall's area. There are three locks and dams operated by the COE within this segment of the river: Lock and Dam Number One, Upper St. Anthony Falls Lock and Dam, and Lower St. Anthony Falls Lock and Dam.

4.2.3.2 Floodplains and Floodways

Floodway and l00-year floodplain boundaries for the Study Area are shown on Figure 4.2-2. Designated l00-year floodplains are present along the Mississippi River at the Washington Avenue Bridge and Downtown St. Paul.

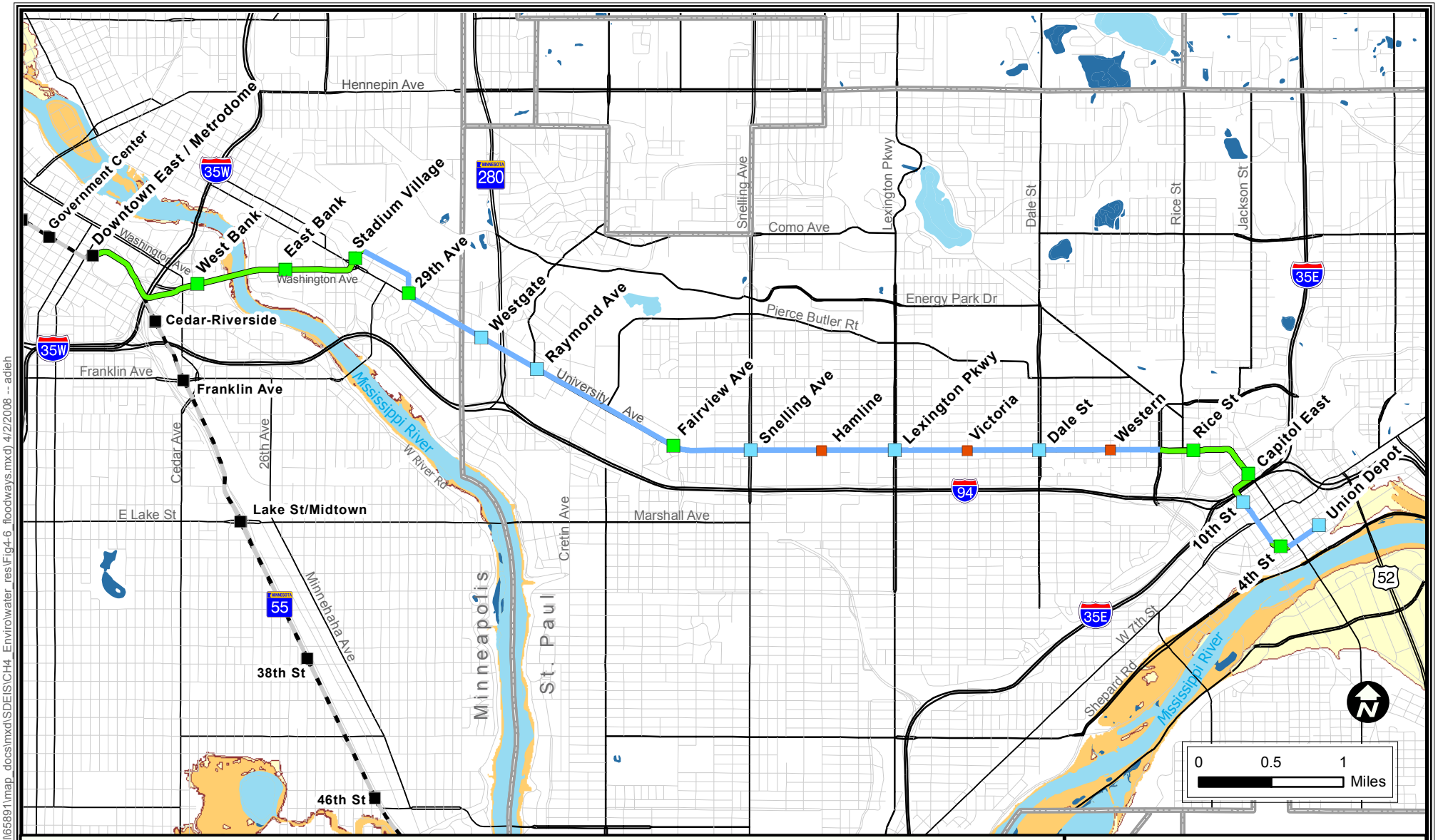
4.2.3.3 Wetlands and Public Waters

The Mississippi River is identified as a DNR public water (Figure 4.2-2). The Mississippi River crossing at the Washington Avenue Bridge is located within the MWMO. There are no other defined public waters or wetlands within the Study Area.

4.2.4 Long-Term Effects

4.2.4.1 No-Build Alternative

There are no impacts anticipated as a result of the No-Build Alternative.



CCLRT Station
- Identical to DEIS
- Changed from DEIS
- Future station

CCLRT Alignment Status
- Identical to DEIS
- Changed from DEIS
- HLRT station
- Hiawatha Light Rail

FEMA Floodplain
- 100 year
- 500 year

NWI
- Lacustrine
- Palustrine

DRAFT

Figure 4.2-2

Floodplains and NWI

Metropolitan Council

Central Corridor Light Rail Transit

Map Document: (N:\GISProj\MetCouncil\65891\map_docs\mxd\SDEIS\CH4_Environ\water_resFig4-6_floodways.mxd) 4/2/2008 -- adieh

Data Sources: LMIC, Met Council, Mn/DOT, USFWS, FEMA

4.2.4.2 Key Project Elements

The Key Project Elements are not expected to have long-term impacts on the Mississippi River. The current project definition does not include any construction activities within the river or on the banks of the river. Rather, all construction activities would take place on the bridge deck. Proposed activities on the Washington Avenue Bridge will not alter the course, current, or cross-section of the river or its floodplain.

All of the Key Project Elements will involve installation of impervious surface, which has the potential to generate additional stormwater. However, the proposed construction activities will take place, for the most part, within existing impervious surfaces. Thus, the net increase in impervious surface and surface water runoff is expected to be negligible as compared to existing conditions. No long-term effects to surface water runoff are anticipated; however, potential impacts will be reviewed in more detail during final design.

4.2.5 Short-Term Construction Effects

Because of the developed nature of the Study Area, the proposed construction activities are not expected to substantially alter the current drainage patterns of the watersheds. All storm drainage systems located within the Study Area are designed to accommodate runoff from the existing developed conditions. All stormwater runoff in both watersheds within the Study Area has been piped and flows directly into the Mississippi River.

Construction activities in pervious areas, such as grass boulevards or lawns, would result in creation of additional impervious surfaces. Additional stormwater runoff, in conjunction with construction disturbance, may result in the generation of sediment laden stormwater within the construction area. This sediment laden stormwater runoff, if drained into a conduit leading to the Mississippi River, has the potential to affect water quality in the Mississippi River.

The City of Minneapolis will require the reconstruction of existing storm sewer structures as necessary to allow for the proposed project's construction, but will not require additional stormwater runoff treatment.

The City of St. Paul may require upgrades to the existing storm sewer system to provide additional treatment for stormwater runoff within the proposed construction limits. It is anticipated that the upgrades would primarily be in the form of sump manholes and possibly grit chambers.

No short-term construction effects to the Mississippi River floodplain or floodway are anticipated because the Central Corridor LRT will use the existing Washington Avenue Bridge and will not be located within the designated floodplain in Downtown St. Paul. Potential impacts will be reviewed in more detail during final design.

No wetlands or public waters are located within the Central Corridor LRT Study Area and so no short-term impacts are expected.

4.2.6 Mitigation

As indicated by EPA comments on the AA/DEIS and SDEIS Notice of Intent, the project will require coordination and permitting from local, state and federal water resource agencies. Development of permit applications will be completed during the final design phase of the project. The proposed project will comply with applicable state, federal, and local regulations, and will install BMPs to control and minimize erosion shall be used to minimize potential impacts to surface water resources. These practices would be installed prior to

grading activities and would be kept in good working order for the duration of the project. The project would be monitored under grading permits issued by the CRWD. The cities of St. Paul and Minneapolis would also be issuing permits and inspecting BMPs.

4.3 Biota and Habitat

This section discusses the existing biota and habitat, including vegetation, wildlife, and aquatic habitat.

The proposed Central Corridor LRT Project encompasses relatively few natural areas. Former native ecosystems that supported substantial vegetation and wildlife habitat have been replaced with mostly impervious surfaces and buildings. Although the ability of the Central Corridor LRT Study Area to support native species is limited, areas exist within the Study Area that provide habitat for species adapted to urban environments and for species adapted to aquatic environments. However, based on this analysis and the effects anticipated to result from the proposed project, no long-term impacts are anticipated.

4.3.1 Legal and Regulatory Context

The Migratory Bird Treaty Act of 1918 (16 USC 703-712) governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. Such actions are prohibited unless authorized under a valid permit. This law applies to migratory birds native to the U.S. and its territories. It does not apply to non-native migratory birds or resident species that do not migrate on a seasonal basis.

In general, aquatic habitat is protected by the DNR through the public waters permit. The DNR Protected Water Permit and Crossing License reviews ensure that bridge construction or reconstruction is not detrimental to significant fish and wildlife habitat (including, but not limited to, obstructing the movement of game fish or disrupting fish spawning) or protected vegetation. Any anticipated adverse effects require implementation of feasible and practical measures to mitigate effects.

4.3.2 Methodology

Public Land Survey Records from 1853 to1856, interpreted by Frances Marschner *(Minnesota County Biological Survey Map Series No.7,* 1994) were reviewed to identify the vegetation present prior to urbanization. Aerial photos were reviewed to identify locations where potential natural habitat was/is present. One area of natural habitat was identified; a windshield survey was conducted on January 10, 2008, to identify existing habitat and biota along the Mississippi River corridor near the Washington Avenue Bridge.

4.3.3 Existing Conditions

Vegetation cover types correspond to plant associations and structural habitat components that provide essential life requisites such as food, shelter, and nesting sites for wildlife. The quality of the vegetative cover plays a significant role in determining the inhabiting wildlife.

4.3.3.1 Vegetation

Public Land Survey Records show that the original vegetation in the Central Corridor LRT Study Area consisted primarily of scattered trees and groves of scrubby oaks with some brush and thickets. This cover type no longer exists within the Study Area, which today is mostly urbanized, and primarily occupied by man-made impervious surfaces such as high-density residential areas, streets, highways, and parking lots.

Existing vegetation within the Central Corridor LRT Study Area is predominantly associated with mowed lawns, urban parkland, and green space along the Mississippi River corridor. Lawns and urban parkland areas are typically composed of maintained bluegrass, cultivated flowers, trees, and shrubs.

The most significant natural habitat within the Central Corridor LRT Study Area is located along the Mississippi River near the Washington Avenue Bridge in Minneapolis. The following section summarizes the existing biota and habitat in this area.

West Bank – South of Washington Avenue Bridge

This location is composed of a highly disturbed, wooded bluff located between West River Road and the U of M West Bank Campus. A minimally maintained prairie restoration site is located in the floodplain between the Mississippi River and the east side of West River Road.

Historically, the wooded bluff area was occupied by housing known as the "Bohemian Flats," and later by the Minneapolis Barge Terminal with coal and other storage along the river flats. Consequently, the area exhibits a highly disturbed vegetative community with young (less than 40 years), mixed age, floodplain forest species such as cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), hackberry (*Celtis occidentalis*), and silver maple (*Acer saccharinum*), with a few burr oaks (*Quercus macrocarpa*) located at the top of the bluff next to the U of M West Bank Campus. Common buckthorn is prevalent in the understory of the bluffs. A survey conducted in 2001 recorded white snakeroot (*Ageratina altissima*) as being the dominant herbaceous groundcover species. Deadfall is present throughout the site, especially in the gently sloping and flat lower terrace areas. A spring or seep is located approximately 250 feet from the existing Washington Avenue Bridge.

In this area, the banks of the Mississippi River are stabilized by a corrugated metal retaining wall. According to the Minneapolis Park and Recreation Board, the floodplain between the Mississippi River and West River Road was planted as a prairie restoration in the mid-1990s. The floodplain has received minimal vegetative maintenance since the prairie restoration, and is currently managed by the Minneapolis Park and Recreation Board as an unmowed park area (MSPRB, 2008).

West Bank – North of Washington Avenue Bridge

This location is composed of a highly disturbed, wooded bluff located along the West Bank of the U of M campus. The U of M built subsurface access and roads into the bluff. A small area adjacent to the bridge was planted with prairie species and the floodplain is being used as a staging area for the reconstruction of the I-35W bridge.

Woody species adjacent to the bridge are limited to a few relatively young (likely less than 30 years) cottonwood and green ash trees. At the base of the bridge on the west side of West River Road, smaller elm (*Ulmus spp.*), green ash (*Fraxinus pennsylvanica*), and cottonwood (*Populus deltoides*) are scattered throughout the area planted with prairie species. The remainder of the bluff is composed of an unmaintained thicket of young (typically less than 4-inch diameter at breast height) ash, cottonwood, and box elder (*Acer negundo*) that grow among scattered, slightly older (likely less than 30 years) floodplain forest trees.

The floodplain area north of the bridge is currently the staging ground for the study and storage of broken components of the I-35W bridge. Access to the staging ground is currently restricted by a chain link fence.

East Bank

The Mississippi River bluffs adjacent to the Washington Avenue Bridge are characterized by 20 to 30 vertical feet of exposed bedrock that is subtended by a talus slope approximately 20 feet high. Young (likely less than 20 years), widely scattered elm, box elder, and

cottonwood trees grow on the talus slope near the river bank. Springs are present along the bluff line of the East Bank within the Study Area.

4.3.3.2 Wildlife

Potential wildlife habitat includes the wooded banks of the Mississippi River and the maintained urban parklands and lawns along the Central Corridor LRT Study Area. Potential habitat provided by urban parkland and lawns generally includes maintained bluegrass with planted flowers, trees and shrubs associated with parks, the State Capitol grounds, and residential, commercial or industrial lots. The highly urbanized nature of the surrounding land and maintenance regimens (i.e. mowing) of many of the lawns and parklands in the Study Area limit the wildlife habitat potential for native species. It is still possible; however, that species adapted to urban environments may be present within the Study Area, especially near the woodlands along the Mississippi River bluffs.

The river corridor and associated natural areas provide habitat for urban wildlife such as deer, raccoons, and small mammals. This portion of the Mississippi River is located along a continental flyway for migratory birds. Studies conducted in the late 1990s in less urbanized areas downstream of the Study Area documented occurrences of 152 species of birds within the Mississippi River gorge between the Ford Bridge (river mile 848) and the Soo Line Bridge near 26th Street (MWMO, 2007). Although songbirds, hawks, owls, and waterfowl may reside in Mississippi River corridor habitat within the Study Area, the habitat adjacent to the Washington Avenue Bridge has been highly disturbed and likely provides habitat for fewer avian species than in the more natural downstream area.

4.3.3.3 Aquatic Habitat

The structure of a water body (i.e., sandy vs. rocky, stagnant vs. dynamic, shady vs. sunny) and the quality of water determines the aquatic habitat and inhabiting species.

Mississippi River aquatic habitat in the Central Corridor LRT Study Area is degraded due to the surrounding urban land uses. Common aquatic species data were not available for the Study Area. About 8 miles upstream from the Washington Avenue Bridge, however, data indicate that walleye, catfish, crappie, sunfish, small mouth bass, drum, and carp can be found. Data indicate that similar species can be found about 5 miles downstream from the Washington Avenue Bridge. Most of these species are expected to inhabit or travel through the Study Area (AA/DEIS, 2006).

4.3.4 Long-Term Effects

4.3.4.1 No-Build Alternative

No adverse impacts are anticipated as a result of the No-Build Alternative.

4.3.4.2 Key Project Elements

The Key Project Elements would have little to no long-term effect on biota and habitat in the Central Corridor LRT Study Area because the elements are located in areas that are highly developed. The Central Corridor LRT Project is expected to use the existing Washington Avenue Bridge infrastructure; no work is expected to be required within the river or associated aquatic and terrestrial habitat. The Maintenance and Storage Facility site in St. Paul would be constructed within and area that is currently developed, and would not impact habitat associated with the River. Thus development of the project is not expected to cause

negative long-term effects to biota and habitat within or associated with the Mississippi River. Potential impacts will be reviewed in more detail during final design.

4.3.5 Short-Term Construction Effects

4.3.5.1 Vegetation

The Key Project Elements would have minimal negative short-term construction effects on vegetation. Impacts are expected to be limited to the edges of developed, urban green areas, which are primarily composed of mowed lawns and planted non-native vegetation.

4.3.5.2 Wildlife

Due to the highly urban nature of the Central Corridor LRT Study Area, no negative short-term construction effects to wildlife would be caused by the Key Project Elements. Likewise, the Washington Avenue Bridge infrastructure improvements would not impact wildlife because all work would be limited to the superstructure. The noise level and types of activities would be typical for an urban environment, and would have little or no impact on local wildlife populations.

4.3.5.3 Aquatic Habitat

The Washington Avenue bridge work would include resurfacing to accommodate tracks and overhead power. No negative short-term construction effects to aquatic habitat are expected to be associated with this type of activity. None of the other Key Project Elements have potential to directly affect aquatic habitat.

4.3.6 Mitigation

Because expected impacts to potential habitat due to Key Project Elements are primarily limited to maintained lawn areas, no mitigation would be required for effects to vegetation or wildlife species. As indicated by EPA comments on the AA/DEIS and SDEIS Notice of Intent, the project will required the installation of construction BMPs to protect aquatic and terrestrial habitats. The CRWD and cities of Minneapolis and St. Paul will require development of grading permit applications prior to approval to proceed with construction. These permits would protect surface water resources that discharge into aquatic habitats associated with the Mississippi River.

4.4 Threatened and Endangered Species

This section discusses potential effects to federal and state-listed threatened and endangered species. Consultation with the U.S. Fish and Wildlife Service (USFWS) and DNR indicate that no impacts would occur to listed species.

4.4.1 Legal and Regulatory Context

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

Minnesota's endangered species law (MN Statute 84.0895) and associated rules (MN Rules 6212.1800-.2300) regulate the taking, importation, transportation, and sale of state endangered or threatened species. The DNR administers the state listed rare, threatened, and endangered (RT&E) species.

4.4.2 Methodology

In 2001, consultation was initiated with the DNR and the USFWS regarding rare, threatened, or endangered species documented within approximately a half-mile of the proposed Central Corridor LRT Project. In DNR and USFWS letters dated April 16, 2001, and August 24, 2001, respectively, the agencies responded that the Central Corridor LRT Project is not likely to affect any known occurrences of state or federally protected species.

In January 2008, consultation was reinitiated with the DNR and the USFWS to confirm that the proposed changes to the AA/DEIS LPA would not affect any rare, threatened, or endangered species. The DNR and the USFWS were asked to comment on the potential presence of documented species within one mile of the proposed Central Corridor LRT Project. As part of this consultation, the DNR was asked to review the 2007 Natural Heritage Information System (NHIS) for an area within one mile of the proposed alignment. Copies of DNR and USFWS responses are included in Appendix E.

For the purposes of the long-term, short-term, and mitigation sections, the potential area of affect includes the area within 500 feet of the project.

4.4.3 Existing Conditions

The 2007 NHIS documents no federally listed T&E species, but found 12 occurrences of state listed RT&E species or natural communities within one mile of the proposed alignment. These records represent seven distinct state listed sensitive species: one bird, one fungus, three mollusks, one reptile, and one spider (Table 4-3). Many of these species are associated with the Mississippi River and its surrounding habitat.

Table 4-3 State Listed T&E Species within the Study Area

Scientific Name	Common Name	Last Observation Date	State Status	Federal Status	Habitat
Falco peregrinus	Peregrine Falcon	2005	T	--	Open country near cliffs, along rivers, urban areas
Psathyrella rhodospora	a species of fungus	1999	E	--	Dead or dying deciduous trees
Elliptio dilatata	Spike (mollusk)	2000	SC	--	Substrate within moving water
Ligumia recta	Black Sandshell (mollusk)	2004	SC	--	Substrate within moving water
Quadrula nodulata	Wartyback (mollusk)	2002	E	--	Substrate within moving water
Elaphe vulpina	Eastern Fox Snake	1939	--	--	Woodland and woodland edges, prairies, lowland meadows, and rocky outcroppings near rivers
Marpissa grata	a jumping spider	1978	SC	--	Natural areas, likely near water

Source: Minnesota Dept. of Natural Resources: Natural Heritage Database, March 2008

4.4.4 Long-Term Effects

4.4.4.1 No-Build Alternative

No adverse impacts are anticipated as a result of the No-Build Alternative.

4.4.4.2 Key Project Elements

Activities proposed for the Key Project Elements would not directly impact the habitat of the above listed RT&E species. Thus, no negative long-term effects are expected to occur (See Appendix E for USFWS and DNR correspondence).

4.4.5 Short-Term Construction Effects

No short-term effects to RT&E species are anticipated.

4.4.6 Mitigation

The Key Project Elements would have no negative effects to federal and state RT&E. Thus, no mitigation would be required.

4.5 Air Quality

This section describes and evaluates existing conditions of air quality in the Central Corridor LRT Study Area and discusses potential impacts to resources from the project.

Table 4-4 provides a summary of the analysis completed for this SDEIS. Where possible, each of the Key Project Elements was evaluated with respect to the impact on traffic, and its subsequent potential impact on air quality. As part of this evaluation, and in identifying the five worst-case intersections for the SDEIS, one intersection modeled within the AA/DEIS was eliminated and replaced with another intersection. Background data were updated to include the most recent three years of monitoring data available.

Overall, the Key Project Elements are expected to have minimal long- and short-term air quality impacts. These minimal impacts would be due to motor vehicles idling at intersections affected by project construction and operation at park and ride lots. The Central Corridor LRT project was considered in an Amendment (September 27, 2006) to Appendix K of Metropolitan Council's 2004 *Transportation Policy Plan* to the 1990 Clean Air Act Amendments. The analysis described in the appendix of that document resulted in a Conformity Determination that the projects within (including the Central Corridor LRT project) meet all relevant regional emissions analysis and budget tests. The plan conforms to the relevant sections of the Federal Transportation Conformity Rule and to the applicable sections of the Minnesota State Implementation Plan for air quality. (Met Council, amended 2006)

4.5.1 Legal and Regulatory Context

Air quality is typically evaluated, either qualitatively or quantitatively, as part of the National Environmental Policy Act (NEPA) review process for large projects that receive federal funding or approvals. The level and type of such analyses are selected commensurate with the potential for adverse air quality impacts due to construction or operation of the project.

Table 4-4 Summary of Air Quality Impacts

Planning Segment	Key Project Elements								
	Hiawatha/ Central Connection	U of M Alignment	Future Infill Stations	Capitol Area Alignment/ Stations	Downtown St. Paul Alignment/ Stations	Traction Power Substations	Three-car Platforms	Vehicle Maintenance and Storage Facility	Washington Avenue Bridge
Downtown St. Paul	N/A	N/A	N/A	N/A	No additional analysis anticipated	No impacts anticipated	No additional analysis anticipated; Minimal additional impacts	No impacts anticipated	N/A
Capitol Area	N/A	N/A	N/A	No additional analysis anticipated	N/A	No impacts anticipated	No additional analysis anticipated; Minimal additional impacts	N/A	N/A
Midway East	N/A	N/A	No impacts anticipated	N/A	N/A	No impacts anticipated	No additional analysis anticipated; Minimal additional impacts	N/A	N/A
Midway West	N/A	N/A	N/A	N/A	N/A	No impacts anticipated	No additional analysis anticipated; Minimal additional impacts	N/A	N/A
University/ Prospect Park	N/A	No additional analysis anticipated	N/A	N/A	N/A	No impacts anticipated	No additional analysis anticipated; Minimal additional impacts	N/A	N/A
Downtown Minneapolis	No impacts anticipated	N/A	N/A	N/A	N/A	No impacts anticipated	No additional analysis anticipated; Minimal additional impacts	N/A	No impacts anticipated

NA- Not Applicable. Indicates that the Key Project Element is not relevant to the particular planning segment.

4.5.1.1 Criteria Air Pollutants

In compliance with the requirements of the Federal Clean Air Act (CAA) of 1970 and the Clean Air Act Amendments (CAAA) of 1977 and 1990, the Environmental Protection Agency (EPA) promulgated and adopted the National Ambient Air Quality Standards (NAAQS) to protect public health, safety, and welfare from known or anticipated effects of six criteria pollutants. These criteria pollutants are ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$) and lead (Pb). Table 4-5 lists the NAAQS for these pollutants in micrograms per cubic meter ($\mu g/m^3$) and, in some cases, parts per million (ppm).

Table 4-5 National Ambient Air Quality Standards

Averaging		NAAQS	
Contaminant	Period	Primary $\mu g/m^3$	Secondary $\mu g/m^3$
Carbon Monoxide (CO)	8-hour[a]	10,000 (9 ppm)	10,000
	1-hour[a]	40,000 (35 ppm)	40,000
Sulfur Dioxide (SO_2)	Annual	80 (0.03 ppm)	--
	24-hour[a]	365 (0.14 ppm)	--
	3-hour[a]	--	1,300 (0.5 ppm)
	1-hour[a, e]	1,300 (0.5 ppm)	
Nitrogen Dioxide (NO_2)	Annual	100 (0.05 ppm)	100
Ozone (O_3)	8-hour[b] (2008)	0.075 ppm	0.075 ppm
	8-hour[b] (1997)	0.08 ppm	0.08 ppm
PM_{10}	Annual[e]	50	50
	24-hour[a]	150	150
$PM_{2.5}$[d]	Annual[d]	15	15
	24-hour[c]	35 65[e]	35 65[e]
Lead (Pb)	Three-month (calendar quarter)	1.5	--

Source: USEPA, National Primary and Secondary Ambient Air Quality Standards (40 CFR 50).

Notes:

a Not to exceed more than once per year, per monitor location, averaged over a 3-year period.

b The 8-hour ozone standard is met if the fourth highest 8-hour ozone concentration, averaged over 3 years, is not greater than 0.075 ppm. This is a new standard in 2008. The 1997 standard (0.08 ppm)—and the implementation rules for

that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 standard to the 2008 standard.

c In September 2006 EPA revised the 24-hour PM2.5 standard from 65 µg/m3 to 35 µg/m3, but the previous standard is currently applicable until EPA completes the attainment designation and implementation process. During any 12 consecutive months, 98 percent of the values shall not exceed 35 µg/m3 under the new standard, and 65 µg/m3 under the currently applicable standard. Minnesota has retained the 65 µg/m3 standard.

d Spatial average standard, applied by EPA over a neighborhood scale.

e A Minnesota standard only.

The CAAA requires all states to submit a list identifying those air quality regions, or portions thereof that meet or exceed NAAQS or cannot be classified because of insufficient data. Portions of air quality control regions that are shown by monitored data or air quality modeling to exceed NAAQS or any criteria pollutant are designated “nonattainment” areas for that pollutant. The CAAA also establishes time schedules for the states to attain NAAQS.

4.5.1.2 Air Toxics

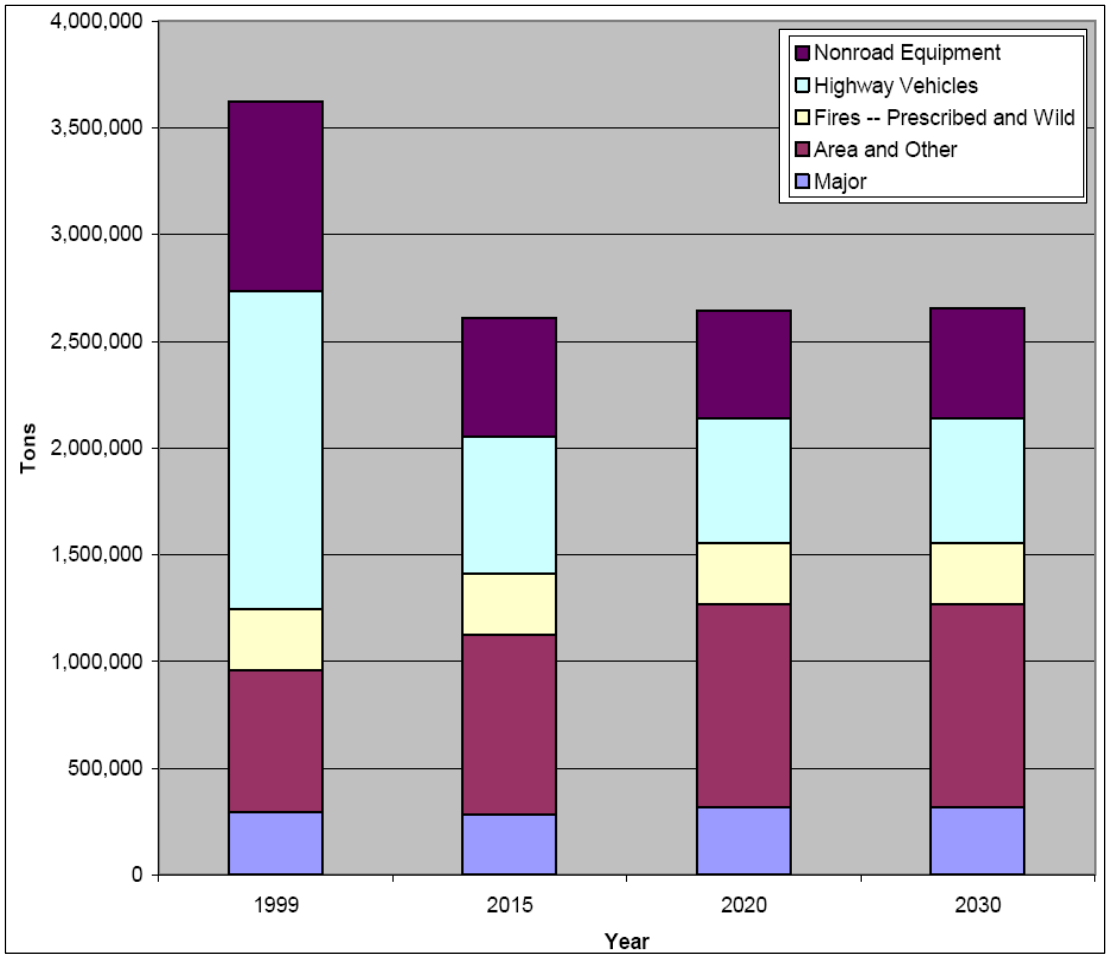
In addition to the criteria air pollutants for which there are NAAQS, the EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries). FHWA has prepared guidance (FHWA, 2006) on the analysis of mobile source air toxics (MSATs) for highway projects. In this guidance, FHWA recommends either no analysis, qualitative analysis, or quantitative analysis, depending on the magnitude of the project-related traffic. Although this guidance is not directly applicable to this (non-highway) project, air toxics are addressed qualitatively.

MSATs are a subset of the 188 air toxics defined by the CAA. MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear and from impurities in oil or gasoline (EPA, 2000).

EPA is the lead federal agency for administering the CAA and has certain responsibilities regarding the health effects of MSATs. EPA issued a *Final Rule for the Control of Hazardous Air Pollutants from Mobile Sources* (Federal Register, February 26, 2007, Volume 72, Number 37). This rule was issued under the authority of Section 202 of the CAA. In its rule, the EPA examined the impacts of existing and newly promulgated mobile source emission control and fuel quality programs on emissions of MSATs including the final rule referenced above. EPA predicts that even with an 88 percent increase in VMT between 1999 and 2030, these control programs will reduce on-highway emissions of MSATs (not including diesel PM) nationwide by approximately 60 percent as shown in Figure 4.5-1.

According to EPA estimates, the lifetime cancer risk from all sources of air pollution ranges from one to 25 cases per million people in rural areas, and 25 to 50 cases per million people in urban areas. These risks compare to an overall lifetime cancer risk from all causes of 330,000 cases per million people. Although little is known about the existing levels of MSATs near roadways in the Central Corridor LRT Study Area, it is apparent, based on the nationwide reductions forecast by EPA, that MSAT concentrations and associated risks should generally decline in coming decades, even with substantial traffic growth.

FIGURE 4.5-1 SOURCE CATEGORIES OF MOBILE SOURCE AIR TOXIC EMISSIONS, 1999 TO 2030.



Source: Regulatory Impact Analysis, Control of Hazardous Air Pollutants from Mobile Sources, EPA Publication EPA420-R-07-002, February 2007

Note: Does not include diesel particulate matter. The terms "major stationary source" and "major emitting facility" mean any stationary facility or source of air pollutants which directly emits, or has the potential to emit, 100 tons per year (tpy) or more of any air pollutant.

4.5.1.3 Local Regulatory Setting

Transportation air quality conformity is a CAAA requirement that calls for EPA, U.S. Department of Transportation (USDOT), and various regional, state and local government agencies to integrate the air quality and transportation planning processes. Transportation air quality conformity supports the development of transportation plans, programs and projects that enable areas to meet and maintain NAAQS for O_3, PM and CO. Transportation plans, programs and projects have to support, and must be in conformity with, the State Implementation Plan (SIP) for achieving NAAQS.

Under Section 176(c) of the CAA [42 U.S. Code (USC) Section 7670(c)], federal agencies such as FTA are prohibited from engaging in, supporting in any way, providing financial assistance for, licensing or permitting, or approving any activity that does not conform to an

approved SIP. Because the proposed project is located in a maintenance area, FTA is responsible for ensuring that projects conform to the SIP. A "conforming" project is defined as one that conforms to the SIP objectives of eliminating or reducing the severity and number of violations of NAAQS and achieving expeditious attainment of those standards.

4.5.2 Methodology

The three most recent complete calendar years of data available (2004-2006) were obtained from EPA's on-line AirData database (EPA, 2008). For some pollutants, monitoring data applicable to the proposed project are not available. Sources used were local monitoring data from Hennepin and Ramsey counties. If these sources did not have available data, then monitoring data from the nearest possible data collection site were used.

4.5.3 Existing Conditions

4.5.3.1 Air Quality Levels and Compliance

The Central Corridor LRT Study Area is located in Ramsey and Hennepin counties, which have been designated as maintenance areas for CO and SO_2 by EPA. A portion of Ramsey County has also been designated as a maintenance area for PM_{10} by EPA. The maintenance designations are applied to areas that were previously designated as nonattainment areas, but now attain the NAAQS. Maintenance areas must have an EPA-approved plan in place to ensure that they do not revert to nonattainment status. Because of the maintenance designations for CO and PM_{10}, the transportation air quality conformity rule (40 CFR 93, Subpart A) applies to the region.

The current air quality conformity determination for the project area is the Conformity Determination for the 2007-2010 Transportation Improvement Program for the Twin Cities Metropolitan Area (MCES, September 2006). The Central Corridor LRT Project is included in the current air quality conformity determination, and therefore, no project-specific regional emissions analysis is needed under Transportation Conformity rules.

Air quality data from the monitoring locations nearest the Central Corridor LRT Study Area are summarized in Table 4-6 to Table 4-11.

All of the monitoring data shown in the following tables indicate compliance with Minnesota and NAAQS.

Table 4-6 Monitored Carbon Monoxide (CO)

Year	No. of 1-hour observations	1-hour highest 2nd highest (µg/m³)	1-hour NAAQS/ MN AAQS (µg/m³) [c]	8-hour highest 2nd highest (µg/m³)	8-hour NAAQS/ MN AAQS (µg/m³) [c]
2004	8,713 [a]	3.2	35	1.8	9
2004	8,639 [b]	5.3		3.2	
2005	8,699 [a]	3.3		2.2	
2005	8,406 [b]	5.6		4.3	
2006	8,700 [a]	4.8		2.5	
2006	8,553 [b]	3.3		2.8	

Notes:
[a] Monitor located at 528 Hennepin Avenue, Minneapolis, MN, in Hennepin County.

[b] Monitor located at 1088 West University Avenue, St. Paul, MN, in Ramsey County.
[c] One exceedance of the 1-hour and 8-hour standard is allowed per year.

Table 4-7 Monitored Nitrogen Dioxide (NO_2)

Year	No. of 1-hour observations	Annual (ppm)	NAAQS/ MN (ppm)
2004 [a]	8,760	0.011	
2005 [a]	8,388	0.012	0.05
2006 [a]	8,509	0.010	

Notes:
[a] Monitor located at 2289 County Road J (Anoka County Airport) in Blaine, MN, in Anoka County.

Table 4-8 Monitored Ozone (O_3)

Year	No. of days with data	8-hour highest 4th highest (ppm)	8-hour NAAQS/ MN (ppm)
2004	182 [a]	0.062	0.08
2004	212 [b]	0.064	
2005	183 [a]	0.077	
2005	212 [b]	0.070	
2006	183 [a]	0.072	
2006	181 [b]	0.065	

Notes:
[a] Monitor located at 2660 Fawn Lake (Cedar Creek Natural History), in Anoka County.
[b] Monitor located at 2289 County Road J (Anoka County Airport) in Blaine in Anoka County.

Table 4-9 Monitored Particulate Matter under 10 Microns in Diameter (PM_{10})

Year	No. of 24-hour observations	24-hour highest 2nd highest ($\mu g/m^3$)	24-hour NAAQS/ MN ($\mu g/m^3$) [h]	Annual ($\mu g/m^3$)	Annual MN ($\mu g/m^3$)
2004	58 [a]	50	150	24	50
2004	59 [b]	41		21	
2004	61 [c]	43		18	
2004	59 [d]	51		23	
2004	55 [e]	61		33	
2004	59 [e]	59		31	
2004	360 [f]	90		23	

Year	No. of 24-hour observations	24-hour highest 2nd highest (µg/m3)	24-hour NAAQS/ MN (µg/m3) [h]	Annual (µg/m3)	Annual MN (µg/m3)
2004	59[f]	57		27	
2004	60[g]	49	150	26	50
2005	57[a]	54		23	
2005	58[b]	48		22	
2005	59[c]	43		19	
2005	55[d]	42		22	
2005	57[e]	59		29	
2005	58[e]	63		29	
2005	262[f]	59		23	
2005	51[f]	45		26	
2005	59[g]	56	150	24	50
2006	59[a]	38		21	
2006	58[b]	43		22	
2006	59[c]	43		20	
2006	57[d]	44		23	
2006	57[e]	56		27	
2006	56[e]	70		28	
2006	270[f]	49		23	
2006	59[g]	50		26	

Notes:

[a] Monitor located at 302 2nd Avenue in Minneapolis, MN, in Hennepin County.

[b] Monitor located at 4646 Humboldt Avenue North in Minneapolis, MN, in Hennepin County.

[c] Monitor located at 5005 Minnetonka Boulevard (City Hall) in St. Louis Park, MN, in Hennepin County.

[d] Monitor located at 1038 Ross Avenue in St. Paul, MN, in Ramsey County.

e Monitor located at 1450 Red Rock Road in St. Paul, MN, in Ramsey County.

[f] Monitor located at 555 Cedar Street in St. Paul, MN, in Ramsey County.

[g] Monitor located at 12179 University Avenue in St. Paul, MN, in Ramsey County.

[h] One exceedance of the 24-hour standard is allowed per year.

Table 4-10 Monitored Particulate Matter under 2.5 Microns in Diameter ($PM_{2.5}$)

Year	No. of 24-hour observations	24-hour (µg/m³) 98th percent[b]	24-hour NAAQS/ MN (µg/m³)	Annual (µg/m³)	Annual NAAQS/ MN (µg/m³)
2004	58[a]	27	65/35	9.3	15
2004	119[b]	27		8.3	
2004	116[c]	29		9.0	
2004	11[d]	21		7.3	
2004	59[e]	26		8.8	
2004	32[f]	20		6.8	
2004	114[g]	26		8.8	
2004	106[h]	27		8.8	
2004	54[i]	23		9.9	
2004	113[i]	28		10.8	
2004	57[j]	27		10.3	
2004	111[j]	35		10.8	
2004	59[k]	24		9.0	
2004	118[k]	25		8.7	
2005	60[a]	27		10.0	
2005	116[b]	28		10.0	
2005	118[c]	30		10.3	
2005	60[e]	24		10.2	
2005	57[f]	26		10.0	
2005	109[g]	28		10.0	
2005	111[h]	30		10.1	
2005	51[i]	28		12.0	
2005	119[i]	31		12.2	
2005	53[j]	23		11.0	
2005	109[j]	28		11.8	
2005	58[k]	27		10.7	
2005	118[k]	30		10.3	
2006	58[a]	30		9.9	
2006	115[b]	22		8.5	
2006	118[c]	19		8.6	
2006	59[e]	27		9.6	

Year	No. of 24-hour observations	24-hour (µg/m³) 98th percent[b]	24-hour NAAQS/ MN (µg/m³)	Annual (µg/m³)	Annual NAAQS/ MN (µg/m³)
2006	61[f]	24		9.4	
2006	106[g]	22		9.2	
2006	122[h]	21		9.0	
2006	58[i]	25		11.1	
2006	119[i]	23		10.6	
2006	58[j]	31		10.8	
2006	118[j]	23		10.2	
2006	58[k]	25		9.8	
2006	122[k]	24		9.1	

Notes:
[a] Monitor located at 143 13th Avenue Northeast in Minneapolis in Hennepin County.
[b] Monitor located at 7020 12th Avenue South in Minneapolis in Hennepin County.
[c] Monitor located at 2727 10th Street in Minneapolis in Hennepin County.
[d] Monitor located at MSP Airport Building 6301 in Hennepin County.
[e] Monitor located at 1616 Buchanan Street in Minneapolis in Hennepin County.
[f] Monitor located at 6040 28th Avenue South (MSP Airport) in Minneapolis in Hennepin.
[g] Monitor located at 4646 Humboldt Avenue North in Minneapolis in Hennepin County.
[h] Monitor located at 5005 Minnetonka Boulevard in St. Louis Park in Hennepin County.
[i] Monitor located at 1450 Red Rock Road in St. Paul in Ramsey County.
[j] Monitor located at 555 Cedar Street in St. Paul in Ramsey County.
[k] Monitor located at 1540 East 6th Street in St. Paul in Ramsey County.
[l] Compliance is determined at the 98th percentile.

Table 4-11 Monitored Sulfur Dioxide (SO_2)

Year	No. of 1-hour observations	1-hour H2H	1-hour MN AAQS [b]	3-hour H2H	2-hour NAAQS [b]	24-hour H2H	24-hour NAAQS/ MN AAQS [b]	Annual	Annual NAAQS/ MN AAQS
		(ppm)							
2004	8,713 [a]	0.134	0.5	0.108	0.5	0.060	0.14	0.004	0.03
2005	8,655 [a]	0.095		0.065		0.025		0.003	
2006	8,694 [a]	0.060		0.052		0.030		0.002	

Notes:
[a] Monitor located at 528 Hennepin Avenue in Minneapolis in Hennepin County.
[b] One exceedance of the 1-hour, 3-hour and 24-hour standard is allowed per year.

4.5.4 Long-Term Effects

As indicated in the EPA comments on the AA/DEIS and SDEIS Notice of Intent, the project must consider potential impacts to air quality. The following provides a preliminary analysis

based on available data. Detailed air quality modeling and analysis will be completed during the next phase of the project when more detailed information is available.

4.5.4.1 No-Build Alternative

There are no impacts anticipated as a result of the No-Build Alternative.

4.5.4.2 Key Project Elements

The following provides a preliminary evaluation of potential for long-term impacts based on a review of the March 2008 traffic data produced by Synchro, a software application used to perform intersection capacity analyses and optimize traffic signal timing. The Central Corridor LRT Project is included in the current air quality conformity determination, and therefore, no project-specific regional analysis is needed under Transportation Conformity rules.

Detailed air quality modeling using the available Synchro data has not been completed at this time. Rather, the long- and short-term effects presented in this section are based on Synchro data, assumptions about potential changes to traffic patterns and delay times (two-car to three-car change) that would increase on the order of 4 to 5 seconds.

For detailed air quality analysis, the Central Corridor AA/DEIS identified five intersections with the worst level of service (LOS) and highest volumes in the Central Corridor LRT Study Area. The intersections identified were University Avenue and Snelling Avenue; University Avenue and Lexington Parkway; University Avenue and Marion Street; University Avenue and Rice Street, and; University Avenue and Robert Street. The AA/DEIS reported that no impacts greater than National Ambient Air Quality Standards (NAAQS) were found.

Review of the revised Synchro traffic data indicates that the first four intersections remain among the intersections with the worst LOS and highest volumes in the Central Corridor LRT Study Area. However, based on the latest Synchro data, the fifth intersection to be analyzed should be Robert Street and 12th Street, rather than University Avenue and Robert Street.

The Key Project Elements are discussed below by planning segment; two of the Key Project Elements would affect all of the planning segments. These elements are the locations of TPSS and three-car platforms at each station.

Traction Power Substations

The proposed TPSS sites would not have any impact on traffic, and therefore, no additional impacts on air quality are anticipated.

Three-car Platforms

The increase in station platform length to accommodate three-car trains would not have any impact on traffic, and therefore, no additional impact on air quality due to traffic. Three-car trains would increase delay at all intersections within the Central Corridor LRT Study Area for a length of time equivalent to the time required for an additional car to clear an intersection. This delay is expected to have no impact on the five intersections to be analyzed for air quality, as all intersections would be affected equally. Impacts of this delay at all intersections, including the five worst intersections to be analyzed, would cause slightly greater impacts on air quality. No Synchro data detailing the amount of delay or traffic impact associated with the actual function of three-car trains were available to review because all Synchro data were modeled assuming two-car trains. However, it is anticipated that any additional impact to air quality as a result of three-car trains would be minimal.

Downtown St. Paul

Downtown St. Paul Alignments and Stations

The revised alignment, which proposes a combined station at the diagonal of 4th Street and Cedar Street, is expected to have no greater air quality impacts than the proposed AA/DEIS alignment. Synchro data that were reviewed do not indicate that intersections in the area affected by this element should be among the five intersections to be analyzed for the air quality analysis.

Vehicle Maintenance and Storage Facility

The proposed Vehicle Maintenance and Storage Facility is not anticipated to have impacts on intersection delay to a degree that would change the selection of the five intersections to be analyzed for air quality. No Synchro data detailing the amount of delay or traffic impact associated specifically with this element were available to review. However, it is anticipated that any additional impact to air quality as a result of the Vehicle Maintenance and Storage Facility would be minimal.

Capitol Area

Capitol Area Alignment and Stations

The Capitol Area Alignment and Stations would have no additional impact on traffic than the alternatives included in the AA/DEIS, and therefore, have no additional impact on air quality due to traffic. The intersections affected by this element are among the five intersections to be analyzed for air quality, and the element's impact on air quality will be evaluated. However, it is anticipated that impacts on air quality resulting from this element would be considered to be similar to those under the AA/DEIS alignment.

Midway East

Future Infill Stations at Hamline Avenue, Victoria Street, and Western Avenue

The future infill stations, which were not included in the AA/DEIS, would not have any impact on traffic, and therefore, no additional impact on air quality would occur due to traffic.

Midway West

No impacts are anticipated.

University/Prospect Park

U of M Alignment (At-grade Transit/Pedestrian Mall)

The proposed U of M at-grade alignment would have no greater air quality impacts than those anticipated by the AA/DEIS alignment. Synchro data, which were reviewed for this element, do not indicate that intersections in the area affected by this project element would be among the five worst-case intersections to be analyzed for the air quality. As a result of this project element, several intersections in the immediate area would be closed to automobile traffic, thus reducing air quality impacts due to automobiles at those intersections. Based on the currently available Synchro data, traffic that would move to other intersections as a result of the closed intersections would not cause those intersections to be among the five intersections to be analyzed for the air quality. Bus traffic would remain at intersections in the area affected by this element, but would decrease in number from existing conditions; their impact to air quality would be expected to decrease.

Washington Avenue Bridge

The proposed modifications to the Washington Avenue Bridge do not impact traffic operations, as compared to the AA/DEIS LPA, and therefore, have no additional impacts on air quality due to traffic.

Downtown Minneapolis

Hiawatha/Central Corridor LRT Connection

The revised Hiawatha/Central Corridor LRT connection would not have greater air quality impacts than those anticipated for the AA/DEIS alignment. Synchro data indicate that intersections in the area affected by this element would not be among the five intersections to be analyzed for the air quality.

4.5.5 Short-Term Construction Effects

The potential for short-term impacts to air quality as a result of construction emissions exists for all the Key Project Elements. Impacts would be the same for all Key Project Elements, and would be related to emissions from construction equipment, fugitive dust from exposed soils, and emissions from traffic interruption or detours.

4.5.6 Mitigation

Project-related construction equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, will not be operated until repairs or adjustments have been made. Temporary impacts from fugitive dust will be minimized or avoided by using best management practices (BMPs). These BMPs may include, but are not limited to, applying water to exposed soils, limiting the extent and duration of exposed soil, and limiting the amount of idle time for construction equipment.

Final mitigation plans will be developed during final design, after the detailed impact analysis has been completed.

4.6 Noise

This section describes the potential impacts due to changes in noise levels as a result of the Key Project Elements. The analysis is based on limited information because detailed noise modeling has not been completed. As identified in the EPA comments on the AA/DEIS and SDEIS Notice of Intent, wheel squeal and other noise issues will be discussed in detail during the next phase in the environmental review process

According to the analysis discussed below, the Central Corridor LRT Project would not result in long-term noise impacts Short-term impacts, related to construction, would be mitigated to the extent practicable.

4.6.1 Human Perception Levels

Noise is typically defined as unwanted or undesirable sound. Sound travels through the air as waves of minute air pressure fluctuations, caused by vibration. In general, sound waves travel away from the noise source as an expanding spherical surface. The energy contained in a sound wave is spread over an increasing area as it travels away from the source, resulting in a decrease in loudness at greater distances from where the noise source occurs.

The intensity of a sound is determined by how much the sound pressure fluctuates above and below the atmospheric pressure and is expressed in units of decibels. The decibel (dB) scale used to describe sound is a logarithmic scale that accounts for the large range of sound pressure levels in the environment. By using this scale, the range of normally encountered sound can be expressed in values between 0 and about 140 decibels.

Sound-level meters measure the actual pressure fluctuations caused by sound waves and record separate measurements for different frequency ranges. Most sounds consist of a broad range of sound frequencies. Several frequency-weighting systems have been used to develop composite decibel scales that approximate the way the human ear responds to sound levels. The A-weighted decibel (dBA) scale is most widely used for this purpose. Typical A-weighted noise levels for various types of sound sources are summarized in Table 4-12.

Table 4-12 Weighted Noise Levels and Human Response

Sound Source	dBA	Response Descriptor
Carrier deck jet operation	140	Limit of amplified speech
	130	Painfully loud
Jet takeoff (200 feet) Auto horn (3 feet)	120	Threshold of feeling and pain
Riveting machine Jet takeoff (2,000 feet)	110	
Shout (0.5 foot) New York subway station	100	Very annoying
Heavy truck (50 feet) Pneumatic drill (50 feet)	90	Hearing damage (8-hour exposure)
Passenger train (100 feet) Helicopter (in-flight, 500 feet) Freight train (50 feet)	80	Annoying
Freeway traffic (50 feet)	70	Intrusive
Air conditioning unit (20 feet) Light auto traffic (50 feet)	60	
Normal speech (15 feet)	50	Quiet
Living room, bedroom, library	40	
Soft whisper (15 feet)	30	Very quiet
Broadcasting studio	20	
	10	Just audible
	0	Threshold of hearing

Source: CEQ 1970

Varying noise levels are often described in terms of the equivalent sound level (Leq). Equivalent noise levels are used to develop single-value descriptions of average noise exposure over stated periods of time. The 1-hour Leq values over a 24-hour period are oftentimes used to calculate cumulative noise exposure in terms of the Day-Night noise Level (Ldn). The Ldn is the A-weighted Leq for a 24-hour period with an added 10 dBA penalty imposed on noise that occurs during the nighttime hours (between 10 p.m. and 7 a.m.) where sleep interference might be an issue.

The logarithmic nature of decibel scales is such that individual decibel ratings for different noise sources cannot be added directly to give the noise level for the combined noise source. For example, two noise sources that produce equal decibel ratings at a given location will produce a combined noise level that is 3 dBA greater than either sound alone. When two noise sources differ by 10 dBA, the combined noise level will be 0.4 dBA greater than the louder source alone.

People generally perceive a 10-dBA increase in a noise level as a doubling of loudness. For example, a 70-dBA sound will be perceived by an average person as twice as loud as a 60-dBA sound. People generally cannot detect differences of 1 dBA to 2 dBA between noise sources. Under ideal listening conditions, differences of 2 dBA or 3 dBA can be detected by some people. A 5-dBA change would probably be perceived by most people under normal listening conditions.

When distance is the only factor considered, sound levels from isolated point sources of noise typically decrease by about 6 dBA for every doubling of distance from the noise source. When the noise source is a continuous line (for example, vehicle traffic on a highway), noise levels decrease by about 3 dBA for every doubling of distance away from the source.

Noise levels at different distances can also be affected by factors other than the distance from the noise source. Topographic features and structural barriers that absorb, reflect, or scatter sound waves can increase or decrease noise levels. Atmospheric conditions (wind speed and direction, humidity levels, and temperatures) can also affect the degree to which sound is attenuated over distance.

Reflections off topographical features or buildings can sometimes result in higher noise levels (lower sound attenuation rates) than would normally be expected. Temperature inversions and wind conditions can also diffract and focus a sound wave to a location at considerable distance from the noise source. As a result of these factors, the existing noise environment can be highly variable depending on local conditions.

4.6.2 Evaluation Criteria

The FTA has its own procedures and guidelines for assessing noise impacts (Transit Noise and Vibration Impact Assessment, FTA May, 2006). The noise descriptors most often used for transit noise evaluations are the A-weighted sound level (dBA), the equivalent sound level (Leq), and the day-night sound level (Ldn). The FTA impact criteria are used in this SDEIS to estimate existing noise levels and future noise impacts from transit operations The land use classifications applicable to transit projects are shown in Table 4-13.

Table 4-13 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land-Use Category	Noise Descriptor (dBA)	Description of Land-Use Category
1	Outdoor Leq(h)[a]	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as national historic landmarks with substantial outdoor use.
2	Outdoor Ldn	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor Leq(h)[a]	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls, fall into this category. Places for meditation or study associated with cemeteries, monuments, and museums, as well as certain historic sites, parks, and recreational facilities, are also included.

Source: FTA 2006

[a] Leq for the noisiest hour of transit-related activity during hours of noise sensitivity.

There are two levels of noise impact included in the FTA criteria. The level of impact affects whether noise mitigation is implemented.

- **Severe Impact –** Severe noise impacts are considered "significant" (as defined in NEPA). Noise mitigation is normally specified for areas with severe impacts unless there is no practical method of mitigating the impact.
- **Moderate Impact –** In this range, other project-specific factors are considered to determine the magnitude of the impact and the need for mitigation. Other factors can include the predicted increase over existing noise levels, the types and number of noise-sensitive land uses affected, existing outdoor-indoor sound insulation, and the cost-effectiveness of mitigating noise to more acceptable levels.

The FTA noise impact criteria are shown in Table 4-14. The first column shows the existing noise exposure and the remaining columns show the additional noise exposure from the Central Corridor LRT Project activity that would cause either a moderate or severe impact for a given land use category.

Table 4-14 FTA Noise Impact Criteria

Existing Noise Exposure, Leq or Ldn (dBA)	Project Noise Impact Exposure, Leq or Ldn (dBA)					
	Category 1 or 2 Sites [a]			Category 3 Sites [a]		
	No Impact	Moderate Impact	Severe Impact	No Impact	Moderate Impact	Severe Impact
<43	<Ambient+10	52–58	>Ambient+15	<Ambient+15	Ambient+15–20	>Ambient+20
43	<52	52–58	>58	<57	57–63	>63
44	<52	52–58	>58	<57	57–63	>63
45	<52	52–58	>58	<57	57–63	>63
46	<52	53–59	>58	<57	58–64	>64
47	<53	53–59	>59	<58	58–64	>64
48	<53	53–59	>59	<58	58–64	>64
49	<53	54–59	>59	<58	59–64	>64
50	<54	54–59	>59	<59	59–64	>64
51	<54	54–60	>60	<59	59–65	>65
52	<54	55–60	>60	<60	60–65	>65
53	<55	55–60	>60	<60	60–65	>65
54	<55	55–61	>61	<60	60–66	>66
55	<55	56–61	>61	<61	61–66	>66
56	<56	56–62	>62	<61	61–67	>67
57	<56	57–62	>62	<62	62–67	>67
58	<57	57–62	>62	<62	62–67	>67
59	<58	58–63	>63	<63	63–68	>68
60	<58	58–63	>63	<63	63–68	>68
61	<59	59–64	>64	<64	64–69	>69
62	<59	59–64	>64	<64	64–69	>69
63	<60	60–65	>65	<65	65–70	>70
64	<61	61–65	>65	<66	66–70	>70
65	<61	61–66	>66	<66	66–71	>71
66	<62	62–67	>67	<67	67–72	>72
67	<63	63–67	>67	<68	68–72	>72
68	<63	63–68	>68	<68	68–73	>73
69	<64	64–69	>69	<69	69–74	>74
70	<65	65–69	>69	<70	70–74	>74
71	<66	66–70	>70	<71	71–75	>75
72	<66	66–71	>71	<71	71–76	>76
73	<66	66–71	>71	<71	71–76	>76
74	<66	66–72	>72	<71	71–77	>77
75	<66	66–73	>73	<71	71–78	>78

Existing Noise Exposure, Leq or Ldn (dBA)	Project Noise Impact Exposure, Leq or Ldn (dBA)					
	Category 1 or 2 Sites [a]			Category 3 Sites [a]		
	No Impact	Moderate Impact	Severe Impact	No Impact	Moderate Impact	Severe Impact
76	<66	66–74	>74	<71	71–79	>79
77	<66	66–74	>74	<71	71–79	>79
>77	<66	66–75	>75	<71	71–80	>80

Source: FTA 2006

[a] Land-Use Categories and Metrics for Transit Noise Impact Criteria, for a description of land use categories 1, 2, and 3 as shown in Table 4-15

4.6.3 Methodology

Noise impacts associated with the Key Project Elements for the proposed Central Corridor LRT Project were evaluated using the FTA General Noise Assessment procedures for Category 2 and Category 3 land uses. Operational characteristics associated with the project were taken from the Noise and Vibration Technical Report prepared for the AA/DEIS (KM Chng Environmental, Inc. 2002) and included the following:

- 198 trips during the day (7 a.m.–10 p.m.)
- 60 trips during the night (10 p.m.–7 a.m.)
- 16 trips during peak hours (7 a.m.–9 a.m., 4 p.m. 6 p.m.)
- Three cars per transit train operating at an average speed of 30 miles per hour (mph). This assumption conservatively over-estimates LRT noise in many portions of the project corridor.
- Continuously welded track

Using FTA sound energy reference levels for fixed-guideway transit facilities, noise levels at 50 feet from the centerline of the alignment were calculated as follows:

- 1-hour Leq: 61 dBA
- Daytime Leq: 60 dBA
- Nighttime Leq: 57 dBA
- Ldn: 45 dBA

Stationary sources evaluated in the analysis included:

- TPSS
- Future stations
- Vehicle Maintenance and Storage Facility

Reference levels and other FTA guidelines were used to assess noise impacts associated with the Key Project Elements.

4.6.4 Existing Conditions

Potentially noise-sensitive land uses in the project corridor were identified based on aerial photography, visual surveys, and available land use information. Based on this review, Category 2 (residential) and Category 3 (institutional) noise-sensitive land uses were identified where noise impacts attributable to the Key Project Elements could be an issue.

Existing noise levels in the project corridor were characterized by taking 24-hour noise measurements at representative sites in the alignment corridor between February 4 and February 13, 2008. Measurement sites were selected to represent a range of existing noise conditions throughout the corridor. In general, traffic noise was the dominant source of noise at all monitoring locations throughout the Central Corridor LRT Study Area. The general location of each measurement site is shown in Figure 4.6-1.

Existing ambient noise levels are summarized in Table 4-15. Monitored noise levels were typical of urban environments where the dominant source of noise was traffic on nearby roads.

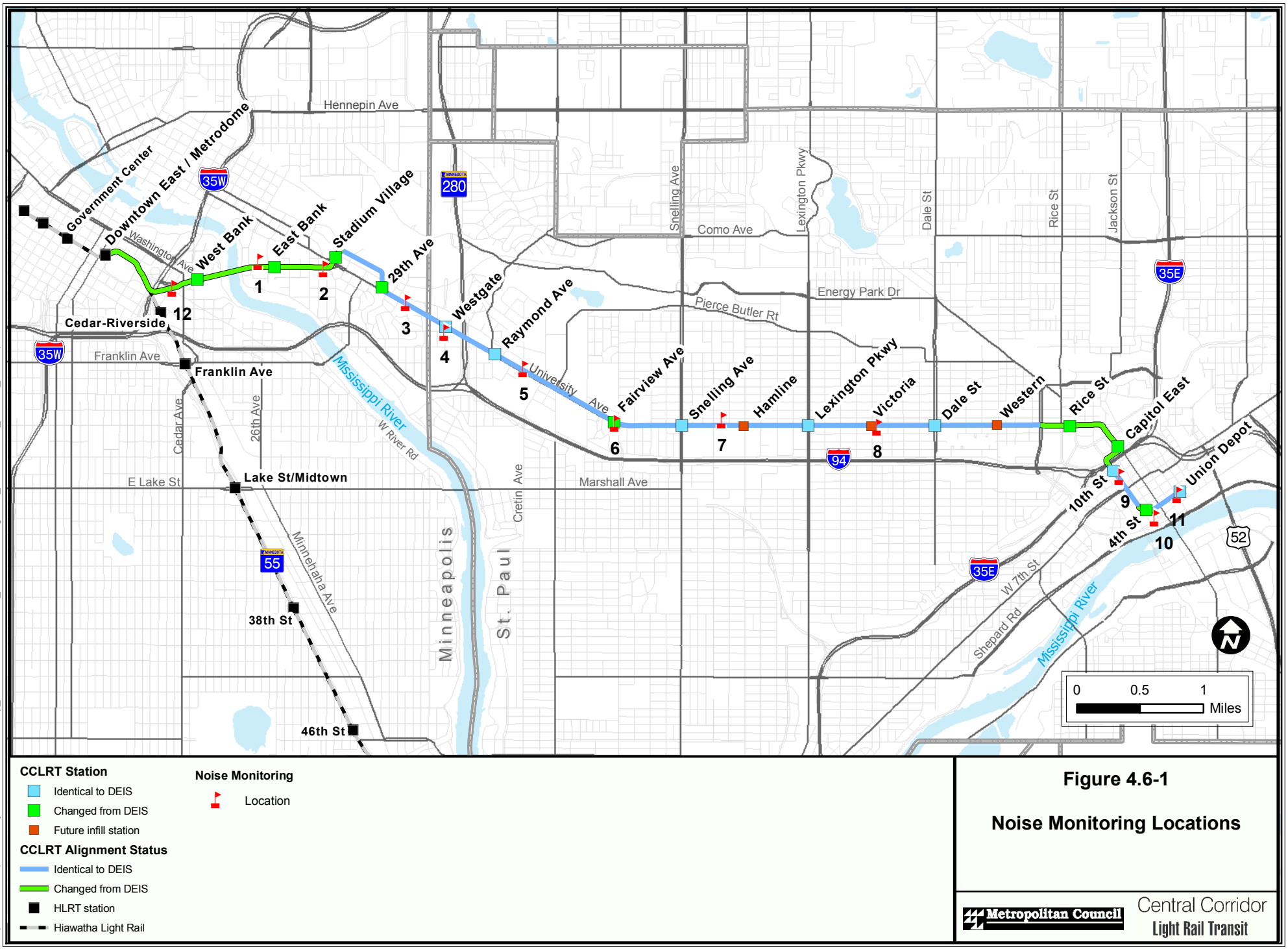


Figure 4.6-1

Noise Monitoring Locations

Metropolitan Council

Central Corridor Light Rail Transit

Data Sources: LMIC, Metropolitan Council, Mn/DOT, HDR

Supplemental Draft Environmental Impact Statement

Map Document: (N:\GISProj\MetCouncil\658911\map_docs\mxd\SDEIS\CH4_Enviro\noise\Fig4-6-1_NoiseMonitor_032608_cs.mxd) 4/25/2008 -- csers

Table 4-15 Summary of Existing Ambient Noise Measurement Results

Monitoring Location	Location Description (approx. distance to transit centerline)	Start of Measurement (time)	Duration (hours)	Noise Level (dBA)	
				LDN	24-hour LEQ
ML-1	U of M Mall (180 ft)	2/12/2008 (7:50 a.m.)	24	62	57
ML-2	Dinnaken House, 900 Washington Ave SE (45 ft.)	2/12/2008 (8:05 a.m.)	24	70	66
ML-3	Thomas Pyne Residence, 3125 University Ave. SE (80 ft.)	2/04/2008 (12:00 p.m.)	24	74	71
ML-4	Berry Street Condos, 808 Berry St. (250 ft.)	2/12/2008 (8:25 a.m.)	24	63	59
ML-5	2223 Partnership LLC, 2233 University Ave. W (80 ft.)	2/12/2008 (8:45 a.m.)	24	68	63
ML-6	Episcopal Homes, 490 Lynnhurst Ave. E (95 ft.)	2/05/2008 (8:14 a.m.)	24	67	65
ML-7	Sharon Burt Residence, 1428 Sherburne Ave. (230 ft.)	2/12/2008 (8:45 a.m.)	24	63	59
ML-8	Gregory Habisch Residence, 838 University Ave. W (75 ft.)	2/13/2008 (2:03 p.m.)	24	66	65
ML-9	Central Presbyterian Church, 500 Cedar St. (50 ft.)	2/06/2008 (4:00 p.m.)	24	77	70
ML-10	Wellstone Elementary School, 65 Kellogg Blvd. (55 ft.)	2/13/2008 (1:40 p.m.)	24	74	69
ML-11	Union Depot, Sibley Ave. & 4th Street (40 ft.)	2/13/2008 (1:25 p.m.)	24	68	63
ML-12	Residential Area, Cedar-Riverside & 16th Ave. S. (400 ft.)	2/13/2008 (2:32 p.m.)	24	64	59

Source: HDR Noise Analysis, March 2008

4.6.5 Long Term Effects

Detailed noise analysis will be conducted for the Final EIS. The following provides a summary of the anticipated impacts.

4.6.5.1 No-Build Alternative

No impacts to ambient noise are anticipated as a result of the No-Build Alternative.

4.6.5.2 Key Project Elements

Noise impacts were determined by estimating the noise level associated with the Key Project Elements and comparing that noise exposure to threshold impacts as shown in Table 4-14. If the noise level associated with a Key Project Element did not meet or exceed the impact thresholds specified in Table 4-14, no noise impacts associated with that element would occur. If no noise levels were measured sufficient to establish existing noise levels for a Key Project Element, ambient noise was estimated in accordance with FTA guidelines. Table 4-16, below, summarizes noise issues associated with the Key Project Elements.

Table 4-16 Summary of Noise Issues due to Key Project Elements

Key Project Elements	Effects on Noise
Three-Car Platforms	No effect on analysis results in AA/DEIS
Traction Power Substations (14 locations)	No noise impacts as defined by FTA
Downtown St. Paul Alignment and Stations	No noise impacts as defined by FTA
Vehicle Maintenance and Storage Facility	No noise impacts as defined by FTA
Capitol Area Alignment and Stations	No noise impacts as defined by FTA
Future Infill Stations (Hamline, Victoria, or Western)	No noise impacts as defined by FTA
U of M Alignment	No effect on analysis results in AA/DEIS
Washington Avenue Bridge	No noise impacts as defined by FTA
Hiawatha/Central LRT Connection	No noise impacts as defined by FTA

Source: HDR Noise Analysis, March 2008

Three-Car Platforms

Three-car platforms, as described in Section 2.3, would not have any greater noise effects than those described in the AA/DEIS.

Traction Power Substations (14 locations)

Fourteen TPSS are proposed for the project. Unenclosed TPSS produce a noise level of about 40 to 50 dBA at a distance of about 100 feet from the facility. The proposed TPSS would be enclosed and lined with acoustical materials, which would reduce noise levels by at least 5 dBA. Existing noise levels in the project area, shown in Table 4-15, range from 57-74 dBA. Therefore TPSS noise levels in the 35-45 dBA range would not cause or contribute to a noise impact as defined by FTA.

Downtown St. Paul

Downtown St. Paul Alignment and Stations

For the 4th and Cedar Streets Station, the 24-hour Leq in downtown St. Paul ranged from 63 dBA (ML-11) to 70 dBA (ML-9). The estimated Leq associated with the operating transit system is about 61 dBA, which is less than the FTA impact criteria for Category 2 or Category 3 land uses.

For the Wacouta Mid-Block Alternative, the operational characteristics of the transit system would remain unchanged and there would be no substantial changes to the acoustic environment as a result of this alternative. There would be no noise impacts according to the FTA noise impact guidelines.

For the Broadway Alternative, extending the alignment east to Broadway Street and then south would not change the acoustic environment associated with the project. There would be no impacts according to the FTA noise impact guidelines.

Vehicle Maintenance and Storage Facility

Land uses around the proposed Vehicle Maintenance and Storage Facility site are mostly commercial and industrial with some scattered residential housing. In addition, there are several large parking lots located north of Kellogg Boulevard and east of TH 52.

Existing noise sources in the vicinity of the proposed Vehicle Maintenance and Storage Facility site include traffic on Warner Road, TH 52, and Kellogg Boulevard. In addition, the BNSF Railway is adjacent to Warner Road. The nearest residential housing is north of the proposed Vehicle Maintenance and Storage Facility on Kellogg Boulevard, just west of TH 52. Traffic noise dominates the acoustic environment in this area.

Based on FTA guidelines for estimating existing noise exposure in the absence of site-specific noise measurements, the existing noise level in the vicinity of the proposed Vehicle Maintenance and Storage Facility site was conservatively estimated to be 65 dBA (FTA, 2006). Unlike the main LRT lines, trains would use the tracks associated with the proposed Vehicle Maintenance and Storage Facility infrequently. Most of the activities that are likely to occur at the Vehicle Maintenance and Storage Facility would occur during daytime hours. The estimated noise level at about 200 feet from the proposed Vehicle Maintenance and Storage Facility would be about 58 dBA. With an estimated existing noise level of 65 dBA (FTA guidelines), the 58 dBA noise level associated with the Vehicle Maintenance and Storage Facility would not result in noise impacts according to FTA guidelines.

Capitol Area

Capitol Area Alignment and Stations

Traffic is the dominant source of noise in the Capitol Area. On University Avenue, between Marion Street and Robert Street, the average daily traffic volume (ADT) ranges from about 17,000 to 20,000 vehicles per day. On Marion Street the ADT ranges from about 11,000 to 16,000 vehicles per day north and south of University Avenue, respectively. The 24-hour Leq on University Avenue ranged from about 63 dBA (ML-5) to 71 dBA (ML-3). Between Marion Street and Robert Street the nearest residences are on Sherburne Avenue, about 350 feet north of University Avenue. Relocating the alignment to the south side of University Avenue in this area, a Key Project Element, would have no impact under the FTA guidelines.

As described in Section 2.3, the Rice Street station would be relocated to the east side of the intersection and the Capitol East Station would be moved 1 block south on Robert Street just north of 12th Street.

The FTA General Noise Assessment guidelines provide no reference levels for evaluating transit stations as stationary noise sources. In practice, however, transit trains approach station platforms and slow to a stop while passengers board and alight. The noise generated by this transit operation would be minor and would not contribute to the overall noise environment, which is dominated by traffic on University Avenue. Relocating the transit stations within the same general noise environment would not create additional noise impacts.

Midway East

Future Infill Stations (Hamline Avenue, Victoria Street, or Western Avenue)

The noise impacts associated with future infill stations at Hamline Avenue Victoria Street, or Western Avenue would be the same as those described for the Rice Street and Capitol East stations (above). A transit station at one of these locations would not create additional transit-related noise impacts.

Midway West

No noise impacts beyond those identified in the AA/DEIS have been identified.

University/Prospect Park

No noise impacts beyond those identified in the AA/DEIS have been identified.

U of M Alignment

The At-Grade Transit/Pedestrian Mall at the U of M campus begins about 100 feet north of Washington Avenue. The acoustic environment in the vicinity of the proposed pedestrian mall is dominated by vehicle and bus traffic. The proposed LRT through the U of M campus would replace the vehicle traffic with the LRT, which is generally quieter than standard automobiles. Thus, this element would not create additional noise impacts beyond those identified in the AA/DEIS, and has the potential to reduce noise levels in the long-term.

The potential exists for traffic noise levels to increase in other areas of the U of M campus where traffic would be redistributed due to the closure of Washington Avenue. Many of the roadways in the vicinity of the U of M campus are designed for low traffic volumes and low speeds. As the general public becomes more aware and accustomed to the closure of Washington Avenue, it is reasonable to expect the redistribution of traffic to stabilize and utilize roadways and routes that are best suited for potential traffic increases.

Washington Avenue Bridge

As described in Section 2.3, modifications would be made to the Washington Avenue Bridge to accommodate the proposed transit system. Due to the high volume of traffic currently on the bridge (about 18,800 vehicles per day) and absence of nearby Category 2 land uses, no transit-related noise impacts would be associated with the bridge element.

Downtown Minneapolis

Hiawatha/Central LRT Connection

The proposed change to the Hiawatha/Central LRT Connection would locate the proposed alignment to within 150 to 200 feet of the nearest residences on Riverside Avenue. The LEQ at the nearest residences under this alternative would be about 56 dBA and would not result in transit-related noise impacts.

4.6.6 Short-Term Construction Effects

Construction of the tracks, stations, TPSS, maintenance facilities, and the associated parking facilities would result in the generation of noise from construction equipment. Construction noise varies greatly depending on the construction process, type and condition of equipment used and the layout of the construction site.

Table 4-17 summarizes noise emissions from some of the construction equipment that could be used for this project. Impacts from construction noise depend on the sensitivity of the

noise receptor, the magnitude of noise during each construction phase, the duration of the noise, the time of day the noise occurs, and the distance from the construction activities.

Table 4-17 Construction Equipment Noise Emission Levels

Equipment	Typical Noise Levels (dBA)[a]
Backhoe	80
Bulldozer	85
Compactor	82
Compressor	81
Concrete Mixer	85
Concrete Pump	82
Crane, Derrick	88
Crane, Mobile	83
Generator	81
Grader	85
Jack Hammer	88
Loader	85
Pile Driver	101
Pneumatic Tool	85
Rock Drill	98

Source: FTA Noise and Vibration Impact Assessment (2006)
[a] At 50 ft. from source

The potential for construction noise impacts varies by location and land use. Commercial and industrial land uses, which adjoin the majority of the alignment, should not be affected by construction noise. For residential land uses, the potential for temporary noise impacts from daytime construction would be limited to locations directly adjacent to the alignment. Noise impacts from nighttime construction, however, would be much more extensive, which emphasizes the importance of avoiding nighttime construction near residential areas.

4.6.7 Mitigation

4.6.7.1 Long-Term

No long-term noise impacts have been identified, and so no mitigation is proposed.

4.6.7.2 Short-Term

Construction activities would be carried out in compliance with all applicable local noise regulations. Noise control measures would be included in the construction specification documents to ensure compliance with all federal and state guidelines and noise limits. These specifications generally require contractors to use properly maintained and operated equipment, including the use of exhaust mufflers according to the equipment manufacturer's specifications.

Noise control measures that could be used for the proposed project include the following:

- Avoiding nighttime construction in residential neighborhoods

- Using specially quieted equipment with enclosed engines and/or high performance mufflers
- Locating stationary construction equipment as far as possible from noise sensitive sites
- Constructing noise barriers, such as temporary walls or piles of excavated material between noisy activities and noise-sensitive receivers
- Re-routing construction-related truck traffic along roadways which would cause the least disturbance to residents
- Avoiding impact pile driving near noise-sensitive areas, where possible. Drilled piles or the use of other non-impact piling methods are quieter alternatives where the geological conditions permit their use. If impact pile drivers must be used, their use could be limited to periods between 8:00 a.m. and 5:00 p.m. on weekdays.

4.7 Vibration

4.7.1 Human Perception Levels

Ground-borne vibration can be a serious potential concern for residents near a transit system. The effects of ground-borne vibration include perceptible movement of building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds.

Vibration consists of rapidly fluctuating motions. However, human response to vibration is a function of the average motion over a longer (but still short) time period, such as one second. The root mean square (RMS) amplitude of a motion over a one second period is commonly used to predict human response to vibration. For convenience, decibel notation is commonly used to describe vibration relative to a reference level. In this document, vibration decibels (VdB) relative to a reference of 10^{-6} inches per second (1 µin/sec) are used.

In contrast to airborne noise, ground-borne vibration is not a phenomenon that most people experience everyday. The background vibration level in residential areas is usually 50 VdB or lower—well below the threshold of perception for humans, which is around 65 VdB. Most perceptible indoor vibration is caused by sources within a building such as the operation of mechanical equipment, movement of people, or slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads.

4.7.2 Vibration Criteria

The FTA recognizes three land use categories for assessing vibration impacts:

4.7.2.1 Land Use Category 1 – High Vibration Sensitivity

This category includes buildings where low ambient vibration is essential for the operations within the building. These levels may be well below levels associated with human annoyance. Typical Category 1 land uses are vibration-sensitive research and manufacturing, hospitals, and university research operations.

4.7.2.2 **Land Use Category 2 – Residential**

This category covers all residential land uses and any building where people sleep, such as hotels and hospitals. No differentiation is made between different types of residential areas. This is primarily because ground-borne vibration and noise are experienced indoors and building occupants have, practically, no means to reduce their exposure. Even in a noisy urban area, the bedrooms often will be quiet in buildings that have effective noise insulation and tightly closed windows. Consequently, an occupant of a bedroom in a noisy urban area is just as likely to be sensitive to ground-borne noise and vibration as someone in a quiet suburban area.

4.7.2.3 Land Use Category 3 – Institutional

This category includes schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference. Although it is appropriate to include office buildings in this category, it is not appropriate to include all buildings that have office space.

Some special land uses, such as concert halls, television and recording studios, and theaters can be very sensitive to vibration and ground-borne noise, but do not fit into any of

these three categories. The FTA has defined special vibration levels for these land uses. Examples of a special land use include the Minnesota Public Radio (MPR) Building located at 480 Cedar Street in St. Paul, the nearby Church of Saint Louis King of France and Central Presbyterian Church, and certain research facilities at the U of M.

The FTA ground-borne vibration impact criteria for land use categories 1, 2, and 3, as well as special land uses, are shown in Table 4-18.

Table 4-18 FTA Ground-borne Vibration Impact Criteria

Land Use Category	Ground-borne Vibration Impact Levels (VdB re 1 micro inch/second)		
	Frequent Events [a]	Occasional Events [b]	Infrequent Events [c]
Category 1	65	65	65
Category 2	72	75	80
Category 3	75	78	83
Recording Studios	65	65	65

Source: HDR Noise Analysis, March 2008

a "Frequent Events" are defined as more than 70 vibration events of the same source per day. Most rapid transit projects, including the Central Corridor LRT Project, fall into this category.

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

c "Infrequent Events" are defined as fewer than 30 vibration events of the same source per day. Most commuter rail branch lines fall into this category.

4.7.3 Methodology

The FTA General Vibration Assessment methodology was used to evaluate the potential for vibration impacts resulting from the Key Project Elements. The General Vibration Assessment uses generalized data to develop a curve of vibration level as a function of distance from the track. The vibration levels at specific buildings are estimated from the curve, and by applying adjustments to account for factors such as track support system, vehicle speed, type of building, and track and wheel condition.

The purpose of the General Assessment is to provide a relatively simple method of developing estimates of the overall levels of ground-borne vibration and noise that can be compared to the FTA impact acceptability criteria shown in Table 4-18. Where there is the potential for vibration impacts to occur, a detailed analysis should be undertaken during final design of the selected project alternative to accurately define the level of impact and design mitigation measures.

The adjustment factors that are known to have, or are suspected of having, a significant influence on the levels of ground-borne vibration and noise include the operational characteristics of the transit vehicles, the physical parameters of the transit facility, the geology, and the receiving buildings. The following assumptions related to these factors were used in the vibration analysis:

- The ground surface vibration levels calculated in the analysis used an average operational speed of 30 mph

- The LRT vehicles are assumed to have wheels that are in good condition, without flats or corrugations that can increase vibration levels. Therefore, no adjustments were made for flat or worn wheels
- The LRT vehicles are assumed to have relatively soft primary suspensions (vertical resonance frequency of less than 15 Hz) as is the case with the majority of new North American LRT systems
- LRT track will be new, continuously welded rail in good condition, and without wearing or corrugations that can increase vibration
- The Vehicle Maintenance and Storage Facility is likely to have special track work features such as crossovers. However, because operational speeds within the maintenance yards are expected to be very low (less than 5 mph), these features are not expected to be substantial sources of vibration.
- The geological analysis conducted in support of the AA/DEIS does not indicate the presence of shallow bedrock or soil types in the vicinity of the project that would result in more efficient vibration propagation than normal. No vibration adjustments were made for soil type.
- The FTA general vibration assessment recommends a 2 VdB reduction in vibration levels per floor in the first five above-grade floors of an affected building; and a 1 VdB reduction in vibration levels per floor in the fifth to tenth floors above grade. These reductions were adopted and used in the vibration impact analysis.

4.7.4 Existing Conditions

No vibration monitoring in the vicinity of the Key Project Elements was performed during this phase of work. Vibration monitoring was conducted in the Central Corridor LRT Study Area in 2001 for the Noise and Vibration Technical Report prepared for the AA/DEIS (KM Chng Environmental, 2002). Selected vibration monitoring results from 2001, which occur in the vicinity of Key Project Elements, are summarized in Table 4-19.

Table 4-19 Existing Vibration Levels in the Central Corridor LRT Corridor

Receptor		Area	Type[a]	FTA Cat.	Measurement Results[b]			Nearest Key Project Element
No.	Description and Location				Date	Avg.	Peak	
N2	Hennepin County Medical Center, 6th Street	Minneapolis	Other	2	11/6/01	54	63	Downtown Minneapolis/Hiawatha Connection Alignment
N3	Boynton Health Service, Church & Washington	U of M Campus	Other	2	11/8/01	56	64	U of M Alignment
N9	Institution, State Capitol	St. Paul	NR	3	11/7/01	52	59	Capitol Area Alignments
N10	Residence, 4th Street and Robert Street	St. Paul	Res.	2	11/9/01	48	54	Downtown St. Paul Alignments

Source: KM Chng Environmental, 2002

[a] Receptor types include residential (Res.), non-residential (NR), and other receptor types (Other), e.g. hotels and parks).

[b] Average ambient vibration levels (avg.) and maximum observed levels (Peak) are reported in VdB re 1µin/sec.

These background vibration levels are still considered indicative of background vibration levels in the vicinity of the project. The area between downtown St. Paul and downtown Minneapolis has been highly urbanized for many decades and significant new sources of vibration in these areas are not expected to have been developed since the measurements were taken in 2001.

The data presented in Table 4-19 shows that peak vibration levels at the monitoring locations is typically lower than the FTA category 1 impact threshold of 65 VdB. The results indicate that background vibration levels in the project area are typically below the threshold of perception for humans.

The locations of the Key Project Elements included in this analysis are close to locations where FTA Category 1 land uses occur. In addition to these vibration-sensitive land uses, there are also specialized uses including U of M laboratories that house vibration-sensitive equipment, the Minnesota State Capitol complex, the Minnesota Department of Health and Agriculture laboratories along Robert Street, MPR, the nearby Church of Saint Louis King of France and Central Presbyterian Church, as well as some historic and listed properties in the vicinity of certain Key Project Elements.

4.7.4.1 University of Minnesota

The U of M was contacted to gather information on the location of specialized vibration-sensitive equipment located in university buildings near the Central Corridor LRT Study Area. Based on the information received from U of M, five buildings were identified as having vibration-sensitive equipment. These are:

- Amundson Hall, 421 Washington Avenue SE, which houses the Chemical Engineering and Materials Sciences Department

- Nils Hasselmo Hall, 312 Church Street SE, which houses the Biomedical Engineering Department (this building has the most vibration-sensitive research equipment on the U of M campus)
- The EECS Building, 200 Union Street SE, which houses the Electrical and Computer Engineering Department
- Weaver Densford Hall, 308 Harvard Street SE, which houses some Biochemistry, Biophysics and Molecular Biology laboratories; and the School of Nursing laboratories
- Jackson Hall, 321 Church Street SE, which houses the Department of Physiology and Integrative Biology

These five vibration-sensitive receptors are located on both sides of Washington Avenue in the U of M campus area, adjacent to the proposed Washington Avenue LRT alignment.

Subsequent to the U of M's initial identification of potential vibration sensitive receptors, one additional building—Diehl Hall, located at 505 Essex Street SE, which houses laboratories used by the Department of Urologic Surgery—was identified. This receptor is located approximately 600 feet from the proposed Central Corridor LRT alignment. Based on the data evaluated to date, it is unlikely that this building would experience vibration levels that would cause impacts to vibration-sensitive equipment or experiments.

4.7.4.2 Minnesota State Capitol Area Complex

The Central Corridor LRT Project team coordinated with representatives from the Minnesota Department of Administration, to explain the proposed Central Corridor LRT route in detail, and to discuss potential noise and vibration issues. The Minnesota State Capitol Building houses recording and broadcast facilities that are potentially vibration-sensitive. Laboratory facilities used by the Minnesota Department of Agriculture and the Department of Health, located along Robert Street, are also potentially vibration-sensitive. The design and construction of the laboratories building, however, accounted for the proposed Central Corridor LRT and the potential ground-borne vibration it may introduce to this portion of the project area.

4.7.4.3 Minnesota Public Radio and nearby Historic Churches

The MPR building, located at 480 Cedar Street, in St. Paul, houses uses that are potentially vibration-sensitive, such as recording studios, and is adjacent to the proposed downtown St. Paul alignment. Two historic churches exist in the immediate vicinity of the MPR facility: the Church of Saint Louis King of France and the Central Presbyterian Church.

4.7.4.4 Historic Resources

Several historic resources were identified in the Noise and Vibration Technical Report (KM Chng Environmental, 2002) prepared in support of the AA/DEIS. Some of these historic resources are located near to the Key Project Elements being considered in this document. These are:

- Minnesota Linseed Oil & Paint Company Building (determined eligible)
- Fire Station G, Engine House 5 (Mixed Blood Theatre) (determined eligible)
- West River Parkway (contributing to eligible Grand Rounds)

- Washington Avenue Bridge (determined eligible)
- East River Parkway (contributing to eligible Grand Rounds)
- University of Minnesota Campus Mall Historic District (determined eligible)
- University of Minnesota Old Campus Historic District (The Knoll) (listed)
- Prospect Park Water Tower (listed)
- Tower Hill Park (listed)
- University-Raymond Historic District (determined eligible)
- KSTP Production Studios & Transmission Tower (determined eligible)
- Fire Station No. 25 (determined eligible)
- Great Lakes Coal and Dock Company Office Building (determined eligible)
- Minnesota Transfer Railway Company including Main Line, yard A, University Ave. bridge, round house and leads (determined eligible)
- Minnesota Transfer Railway Company University Avenue Bridge(determined eligible)
- Krank Building (Iris Park Place) (listed)
- Porky's Drive-in Restaurant (determined eligible)
- Griggs Cooper & Company Sanitary Food Manufacturing Plant (determined eligible)
- Saint Paul Casket Company Factory (determined eligible)
- Brioschi-Minuti Company Building (determined eligible)
- Fire Station No. 18 (determined eligible)
- Owens Motor Company Building (determined eligible)
- Ford Motor Company Building (determined eligible)
- Norwegian Evangelical Lutheran Church (determined eligible)
- State Capitol Mall Historic District (determined eligible)
- Minnesota State Capitol (listed)
- Minnesota Historical Society Building (listed)
- State Capitol Power Plant (determined eligible)
- Central Presbyterian Church (listed)
- St. Louis King of France Church and Rectory (determined eligible)
- St. Agatha's Conservatory of Music and Fine Arts (listed)
- St. Paul Athletic Club (determined eligible)
- Minnesota Building (determined eligible)
- Pioneer Press Building (listed)
- First National Bank Building (determined eligible)
- Endicott Building (listed)

- Lowertown Historic District (listed)
- St. Paul Union Depot (listed)

According to the FTA, it is extremely rare for vibration from train operations to cause building damage, even minor cosmetic damage. However, there is sometimes concern about damage to fragile historic buildings located near the right-of-way. Even in these cases, damage is unlikely except when the track will be very close to the structure.

For analyzing effects to historic properties by the Key Project Elements, the Area of Potential Effect (APE) and status of historic properties in the APE were updated. Please see Section 3.4 for the description of the APE and the list and status of identified properties.

All of the above named historic resources are located near the proposed Central Corridor LRT alignment.

4.7.5 Long-Term Effects

4.7.5.1 No-Build Alternative

No impacts are anticipated as a result of the No-Build Alternative.

4.7.5.2 Key Project Elements

System-wide elements are discussed below, with a focus on the Central Corridor LRT planning segments following.

Traction Power Substations

TPSS are being evaluated at a number of locations throughout the Central Corridor LRT Study Area. TPSS are not anticipated to be substantial sources of vibration. No vibration impacts are anticipated to occur from the placement of TPSS in the Central Corridor LRT Study Area.

Three-Car Platform

Because the FTA vibration impact criteria do not take into account the absolute duration of an impact, and because most LRT passbys are relatively short-duration events, the level of impact will not differ with the addition of an additional LRT vehicle. No additional vibration impacts are anticipated.

Downtown St. Paul

Diagonal at 4th/Cedar Street

The potential for vibration impacts exists at the MPR building on the corner of Cedar Street and 7th Street, adjacent to the alignment, because this building contains vibration sensitive uses such as recording studios.

No additional vibration impacts are anticipated from the LRT cutting diagonally across the 4th Street/Cedar Street block.

Wacouta Mid-Block Alternative

Under the Wacouta Mid-Block Alternative, the potential for vibration impacts exists at the five-story apartment building located immediately to the east of the proposed alignment on Kellogg Boulevard between Wacouta Street and Wall Street. The estimated vibration level could be 72 VdB (the residential FTA impact threshold) or more on the first two floors of the apartment building.

Broadway Alternative

Under the Broadway Alternative, the potential for vibration impacts exists at the Lowertown Commons apartment building located at 255 Kellogg Boulevard. The estimated vibration level could be 72 VdB (the residential FTA impact threshold) or more on the first two floors of the apartment building.

The Lowertown Commons apartment building has been identified as a historic resource. However, the Lowertown Commons building is not considered to be fragile, so cosmetic or structural damage is not anticipated.

Vehicle Maintenance and Storage Facility

Activities performed at the Vehicle Maintenance and Storage Facility are not anticipated to be sources of vibration substantial enough to cause vibration impacts at neighboring properties.

Capitol Area

Capitol Area Alignment and Stations

SDEIS preparers met with representatives of the Capitol Area and toured buildings in the Capitol area to identify vibration-sensitive facilities in this portion of the project area. The tour identified potentially vibration-sensitive facilities in the Minnesota Department of Agriculture/Department of Health Laboratory facilities next to the Freeman Building (on North Robert Street). The tour also identified recording and broadcast facilities in the Capitol Building. Operating speeds along North Robert Street would be very low, with resulting vibration levels also predicted to be very low. The recording and broadcast facilities in the Capitol Building are located far enough away from the LRT line, that vibration levels that reach impact thresholds are unlikely. No vibration impacts are anticipated at properties adjacent to the Capitol Area Alignment.

Midway East

Future Infill Stations

Future infill stations at Hamline Avenue, Victoria Street, and Western Avenue are not anticipated to add to operational vibration levels beyond those produced by the LRT vehicles operating under normal conditions. Additional infill stations on University Avenue may actually reduce operational vibration below that described in the AA/DEIS, because additional stations will require LRT vehicles to slow down and stop more frequently that assumed in the AA/DEIS. Lower speeds would result in reduced vibration.

No vibration impacts are anticipated to occur from the location of additional stations on University Avenue.

Midway West

No vibration impacts beyond those described in the AA/DEIS are anticipated at properties adjacent to the LRT Alignment.

University/Prospect Park

University of Minnesota Alignment

Under the U of M At-Grade Transit/Pedestrian Mall, the potential for vibration impacts exists at certain buildings housing sensitive scientific equipment in the U of M campus along Washington Avenue. Specifically, the results of the general assessment identify the potential

for vibration impacts at Weaver Densford Hall (308 Harvard Street), Amundson Hall (421 Washington Avenue); and Jackson Hall (321 Church Street).

The estimated LRT vibration levels could cause vibration of 65 VdB or more on the first four floors of Weaver Densford Hall, the first four floors of Amundson Hall, and the first three floors of Jackson Hall.

Washington Avenue Bridge

Modifications would be made to the Washington Avenue Bridge to accommodate the proposed transit system. No vibration impacts are anticipated at properties adjacent to the Washington Avenue Bridge.

Downtown Minneapolis

Hiawatha/Central LRT Connection

No vibration impacts are anticipated at properties adjacent to the Hiawatha/Central LRT Connection Alternative.

4.7.6 Short-Term Construction Effects

Construction activity can result in varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings founded on surficial soils in the vicinity of the construction site respond to these vibrations, with varying results ranging from no perceptible effects at the lowest levels, low rumbling sounds, and perceptible vibrations at moderate levels, and slight damage at the highest levels.

Ground vibrations from construction activities do not often reach the levels that can damage structures, but they can achieve the audible and perceptible ranges in buildings very close to the site. A possible exception is the case of fragile buildings, many of them old, where special care must be taken to avoid damage. The construction vibration criteria include special consideration for such buildings. The construction activities that typically generate the most severe vibrations are blasting and impact pile-driving.

At this stage of design, there is insufficient information available to define specific construction vibration impacts; however, the potential for vibration impacts associated with construction activities exists adjacent to vibration-sensitive land uses. Construction methods will dictate the potential for vibration impacts and will be documented in the FEIS.

The proposed LRT track alignment in downtown St. Paul runs adjacent to the MPR building where vibration-sensitive recording studios are located. Also located in this portion of the project area are the Church of Saint Louis King of France and Central Presbyterian Church. Although the proposed LRT track alignment would also be close to the Minnesota Department of Agriculture and Department of Health laboratories on North Robert Street and portions of the laboratory facility are vibration-sensitive, the Central Corridor LRT was taken into consideration in the design of the building. Therefore vibration impacts due to Central Corridor LRT are unlikely. In addition, the proposed LRT track alignment in the U of M campus along Washington Avenue runs adjacent to several vibration-sensitive research laboratories.

4.7.7 Mitigation

4.7.7.1 Operational Vibration Mitigation

The purpose of vibration mitigation is to minimize the adverse effects that the project's ground-borne vibration would have on sensitive land uses. Because ground-borne vibration is not as common as problems such as environmental noise, the mitigation approaches have not been as well defined. In some cases it has been necessary to develop innovative approaches to control the impact. Among the successful examples are the floating-slab systems that were developed for the San Francisco and Toronto rapid transit systems.

The importance of adequate wheel and rail maintenance in controlling levels of ground-borne vibration cannot be overemphasized. Problems with rough wheels or rails can increase vibration levels by as much as 20 dB in extreme cases, negating the effects of even the most effective vibration control measures. When there are ground-borne vibration problems with existing transit equipment, the best vibration control measure often is to implement new or improved maintenance procedures.

Assuming that the track and vehicles are in good condition, the options for further reductions in the vibration levels fit into one of seven categories:

- Maintenance procedures
- Location and design of special track work
- Vehicle modifications
- Changes in the track support system
- Building modifications
- Adjustments to the vibration transmission path
- Operational changes

Further discussion on potential mitigation measures is contained in the *Central Corridor Draft Supplemental Environmental Impact Statement Vibration Technical Memorandum.* During final design and detailed vibration impact and mitigation analysis, these mitigation options will be important when evaluating potential vibration impacts to sensitive receptors and will be documented in the FEIS.

4.7.7.2 Construction Vibration Mitigation

Where there is the potential for construction vibration impacts, construction vibration mitigation measures focus on consideration of equipment location and processes, as follows:

- Design considerations and project layout:
  - Route heavily-loaded trucks away from residential streets, if possible. Select streets with fewest homes if no alternatives are available.
  - Operate earth-moving equipment on the construction lot as far away from vibration-sensitive sites as possible.

- Sequence of operations:
  - Phase demolition, earth-moving and ground-impacting operations so as not to occur in the same time period. Unlike noise, the total vibration level produced could be significantly less when each vibration source operates separately.
  - Avoid nighttime activities. People are more aware of vibration in their homes during the nighttime hours.

- Alternative construction methods:
  - Avoid impact pile-driving where possible in vibration-sensitive areas. Drilled piles or the use of a sonic or vibratory pile driver causes lower vibration levels where the geological conditions permit their use.
  - Select demolition methods not involving impact, where possible. For example, sawing bridge decks into sections that can be loaded onto trucks results in lower vibration levels than impact demolition by pavement breakers, and milling generates lower vibration levels than excavation using clam shell or chisel drops.
  - Avoid vibratory rollers and packers near sensitive areas.

At this stage of design, there is insufficient information available to define specific construction vibration mitigation measures. However, a vibration mitigation plan will be developed and documented in the FEIS and implemented during the final design and construction phases of the project. The objective of the plan would be to minimize construction vibration damage using all reasonable and feasible means available. The plan would provide a procedure for establishing thresholds and limiting vibration values for potentially affected structures based on an assessment of each structure's ability to withstand the loads and displacements due to construction vibrations. The plan would also include the development of a vibration monitoring plan during final design and the implementation of a compliance monitoring program during construction.

4.8 Hazardous/Regulated Materials

The purpose of this section is to evaluate the potential for soil and/or groundwater contamination within or immediately adjacent to the Central Corridor LRT Study Area in relation to the Key Project Elements addressed in this SDEIS. As noted in the AA/DEIS, impacts related to the project connection to the Hiawatha LRT are for that portion of the Hiawatha/Central Corridor LRT connection east of the Downtown East/Metrodome station. This impact analysis does not attempt to measure the hazardous material impacts at the contaminated sites themselves. It does attempt to evaluate the impact of site contaminants that have the potential to migrate through the soil or groundwater from nearby sites to the project alignment or structure locations.

Several known contaminated sites would be affected to varying extents by the Key Project Elements. In a few instances, track alignment, stations or other project structures may be located on or very near a known site. In most of the corridor, it is anticipated that the Key Project Elements would encounter, to varying degrees, contaminants migrating from outside of the corridor. Thus, it is recommended that Phase II Investigative Work be conducted and an action plan for remediation be developed to address potential impacts for project construction, material storage sites, and contractor staging areas to be included in the FEIS. Table 4-20 provides a summary of the hazardous/regulated materials investigation.

Table 4-20 Summary of Hazardous/Regulated Materials Evaluation

Planning Segment	Key Project Elements								
	Hiawatha/ Central Connection	U of M Alignment	Future Infill Stations	Capitol Area Alignment/ Stations	Downtown St. Paul Alignment/ Stations	Traction Power Substations	Three-car Platforms	Vehicle Maintenance and Storage Facility	Washington Avenue Bridge
Downtown St. Paul	N/A	N/A	N/A	N/A	Construction impacts likely	Construction impacts likely	Construction impacts likely	Construction impacts likely	N/A
Capitol Area	N/A	N/A	N/A	Construction impacts likely	N/A	Construction impacts likely	Construction impacts likely	N/A	N/A
Midway East	N/A	N/A	Construction impacts likely	N/A	N/A	Construction impacts likely	Construction impacts likely	N/A	N/A
Midway West	N/A	N/A	N/A	N/A	N/A	Construction impacts likely	Construction impacts likely	N/A	N/A
University/ Prospect Park	N/A	Construction impacts likely	N/A	N/A	N/A	Construction impacts likely	Construction impacts likely	N/A	N/A
Downtown Minneapolis	No impact anticipated	N/A	N/A	N/A	N/A	No impact anticipated	No impact anticipated	N/A	No impact anticipated

Notes: N/A, not applicable, indicates that the Key Project Element does not occur in the Planning Segment.

4.8.1 Preliminary Site Identification

The AA/DEIS identified a total of 316 sites that were considered to have a potential impact to the project right-of-way and project construction. Those sites were ranked as High, Medium or Low potential for impact based on a preliminary review of available information. From that review, 4 sites were ranked as High potential, 6 sites ranked as Medium potential and 153 ranked as Low potential for contamination. The 10 high and medium potential sites were recommended in the AA/DEIS for further Phase II investigation.

A Phase I Environmental Site Assessment (ESA) was performed on the Central Corridor LRT Study Area, excluding the downtown Minneapolis portion, in October 2007. This assessment initially identified a total of 1,070 sites that could potentially affect the Central Corridor LRT Study Area. That assessment was made based on a review of geological, historical, and regulatory information for the Central Corridor LRT Study Area and a field reconnaissance of the Central Corridor LRT Study Area. Of this total, 222 were considered to be of High potential impact. Of these 222 sites, 87 sites were selected for review of their MPCA files based on their proximity to the project alignment, likelihood for impact by project construction and need for additional rights of way. These 87 sites were assessed for future Phase II ESA investigations using additional MPCA file review, additional site research information and the development of project design information. Based on this review, 42 of the 87 sites are proposed to be carried forward for Phase II level impact assessment in the FEIS, as listed in Table 4-21 and Figure 4.8-1.

The ten sites listed in the AA/DEIS for additional investigation were all included in the list of 87 sites for MPCA file review, additional review of related MPCA files, resource map study, and field reconnaissance. Based on this additional assessment, 5 of the 10 sites are proposed to be carried forward (and are included as part of the 42 sites discussed above) for Phase II assessment and are included in Table 4-21.

Table 4-21 Preliminary List of Hazardous/Regulated Material Sites Recommended for Phase II Assessment

Phase I Site ESA ID	Site Name	Site Address	Listing Source
61	Russel Grader Mfg.	2221 University Ave., Minneapolis	Added Review[1]
64	University Tech. Ctr./Etc.	2331 University Ave., Minneapolis	Added Review[1]
72	Kempf Paper	2525 4th St. SE, Minneapolis	Added Review[1]
74	Group Health	2829 University Ave., Minneapolis	Phase I ESA
79	Reichhold Chemical	601 25th Ave. SE, St. Paul	AA/DEIS
140	Bonded Transmission	1790 University Ave., St. Paul	Phase I ESA
164	Harcross Chemicals	584 No. Fairview Ave., St. Paul	AA/DEIS
184	1919 University Avenue	1919 University Avenue, St. Paul	AA/DEIS
218	Spruce St. Center	1600 University Ave., St. Paul	Phase I ESA
227	Mowery Company	University Avenue, Pascal St. to Sherburne Ave., St. Paul	AA/DEIS
287	Amoco Service Station 5016	1111 University Ave., St. Paul	Phase I ESA
324	State of MN., Travel Management	610 No. Robert St., St. Paul	Added Review[1]
325	State of Minnesota Grounds Maint./Revenue	635 No. Robert St., St. Paul	Phase I ESA
380	Diamond Products/Gillette Co.	310 East 5th St. , St. Paul	Phase I ESA
429	U of M Studio Arts Building	216, 21st Ave. So., Minneapolis	Phase I ESA
486	Old Bank Building	Snelling & University Ave., St. Paul	Phase I ESA
541	Archer Daniels Midland	419 29th Ave. SE, St. Paul	AA/DEIS
581	Peavy Elevators	800 23rd Avenue, Minneapolis	Phase I ESA
606	Executive Car Care	1825 University Avenue, St. Paul	Phase I ESA
644	University Strip Mall	458-476 Lexington Pkwy., St. Paul	Added Review[2]
672	U.S. Army Corps of Engrs.	190 5th St. East, St. Paul	Phase I ESA

Phase I Site ESA ID	Site Name	Site Address	Listing Source
698	Former Clark Station	19th Ave. So. & Wash. Ave., Minneapolis	Phase I ESA
713	St. Paul Port Authority	2625 University Ave., St. Paul	Phase I ESA
739	MN Dept. of Revenue	139 East 12th St., St. Paul	Phase I ESA
741	U.S. Postal Service Bldg	180 E. Kellogg Blvd., St. Paul	Phase I ESA
743	Former East Kellogg Train Depot	Kellogg Blvd. at Broadway & Wall Avenues, St. Paul	Phase I ESA
744	Johnson's Garage/Former Wells Fargo property	271 E. Kellogg Blvd., St. Paul	Phase I ESA
760	CSM	Terr. Road & Westgate Ave., St. Paul	Phase I ESA
761	Westgate Holdings	Univ. Ave. & TH 280, St. Paul	Phase I ESA
762	Dakota Bank	1581 University Ave., St. Paul	Added Review[2]
764	MN Dept. of Revenue	East 14th St. & Jackson St., St. Paul	Added Review[1]
775	U of M, Coffman Mem. Union	300 Wash., Ave., Minneapolis	Phase I ESA
776	U of M, Northrop Ped. Bridges	300 Block, Wash. Ave., Minneapolis	Phase I ESA
779	Gopher Football Stadium site	University Ave. & Oak St., Minneapolis	Phase I ESA
781	Gopher Oil	201, 25th Ave. SE & 2418 University Ave., Minneapolis	Phase I ESA
782	Motley By-Pass area	Huron & 4th Streets, Minneapolis	Phase I ESA
783	Former Peking Garden Site	2324 University Ave. Se, Minneapolis.	Phase I ESA
797	Saxon Ford Auto Body	195 University Ave., St. Paul	Phase I ESA
799	Unidale Mall/Unidale Mall [2]	544-612 University Ave., St. Paul	Phase I ESA
804	Robert St. Office Bldg.	Robert St./Columbus/MLK Blvd. St. Paul	Phase I ESA
805	Former Union Depot Property	200-500 E. Kellogg Blvd., St. Paul	Phase I ESA
809	Former rail Yard	Kellogg Blvd. and TH 52, St. Paul	Phase I ESA

Source: HDR Analysis, 2008

[1] Phase I ESA medium priority site added to list based on added review
[2] Phase I ESA low priority site added to the list based on added review

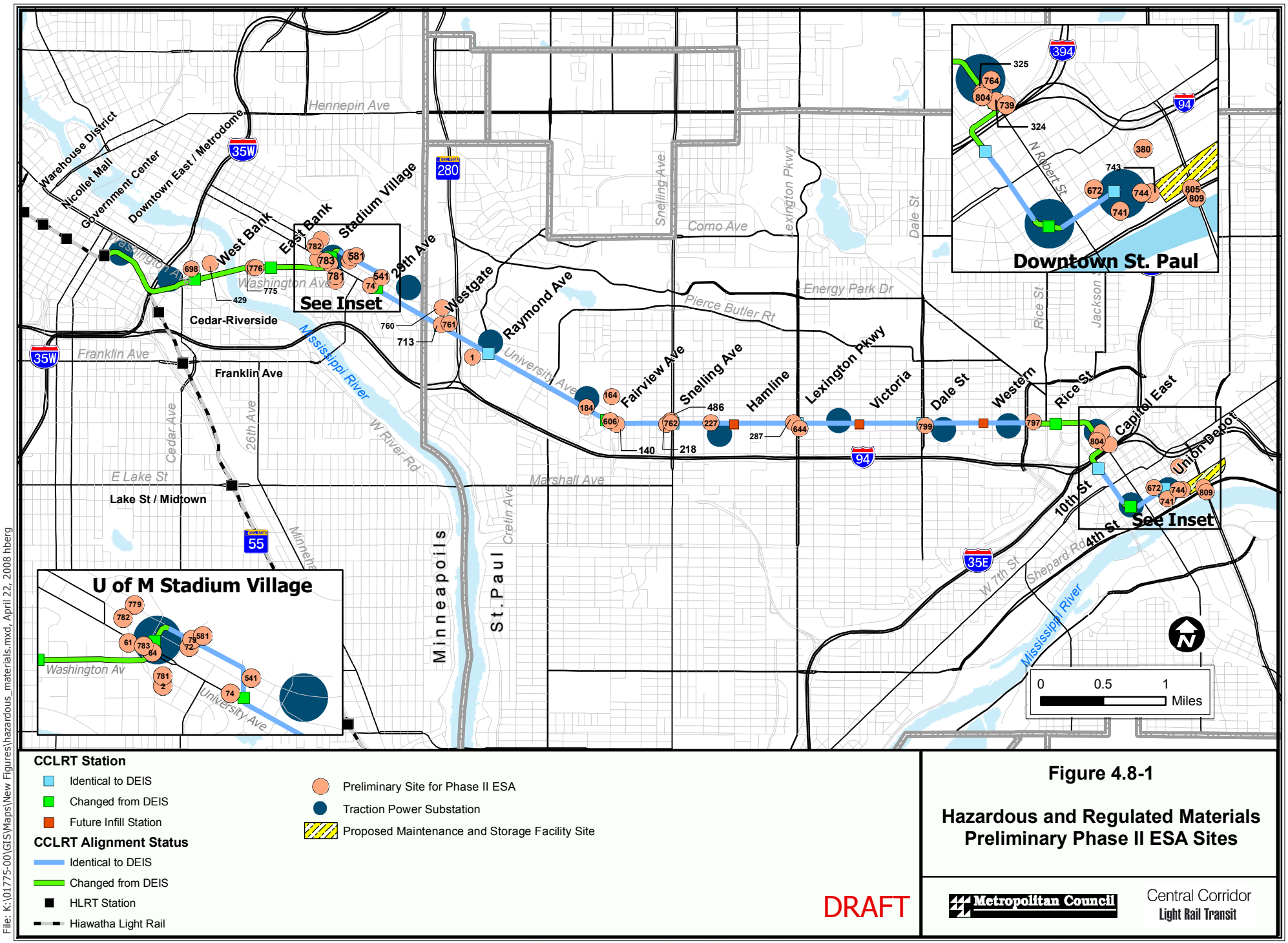


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Figure 4.8-1

Hazardous and Regulated Materials Preliminary Phase II ESA Sites

DRAFT

Metropolitan Council

Central Corridor Light Rail Transit

Data Sources: LMIC, Met Council, Mn/DOT, Phase I Environmental Site Assessment - Peer Engineering

4.8.2 Impact Assessment Methodology

Each of the sites carried forward for further evaluation in the SDEIS were prioritized for potential soil and/or groundwater impacts at project excavation or drilling sites. Several known sites within or near the project corridor are not expected to affect project construction or future operations. The remaining sites were prioritized based on recorded soil and groundwater contaminants at or very near project features or the possibility that groundwater flows or levels could affect project excavation or foundation drilling. See Figure 4.8-1 Preliminary Phase II ESA Sites for the hazardous material sites close to the Key Project Elements.

Hazardous materials impacts may be direct or indirect. Activities that directly disturb or affect the contaminate source are termed direct impacts. Indirect impacts occur outside the limits of the contaminated site, where construction activities encounter contaminated media that have migrated from the site of the release. Because the alignment of the Central Corridor LRT Project lies on city streets, most impacts are expected to be indirect, although direct impacts for the Vehicle Maintenance and Storage Facility or TPSS are possible, depending on the final location of construction.

As in the AA/DEIS, the potentially contributing contaminant sites were initially ranked as follows:

- **No Impact—**After a thorough Phase I ESA and subsequent review of all available agency files and other site information together with a field site visit, no project impact from the site is expected. This presumption is based on distance from the contaminant site to closest project excavation, drilling, storage sites and staging areas; documented past contaminant removal and agency site closure actions and depth to groundwater in relation to expected track bed, structure excavation and drilling activities.
- **Low priority—**The site was a location where hazardous materials or petroleum products may have been stored or used. However, based on the Phase I ESA, the completed AA/DEIS and subsequent files and field review, there is no known contamination associated with the property. Continuous monitoring of subsurface construction activities in the vicinity of these sites will ensure proper handling of any unexpected contaminants emanating from these sites.
- **Medium Priority—**These sites are known to have, or have had, soil and/or groundwater contamination, but current information indicates that contamination is being remediated, does not require remediation, or that continued monitoring is required. Medium priority sites typically include all contaminant release sites that have been investigated, remediated and closed by the MPCA, underground and above ground tank sites with no history of leaks, spill sites and vehicle repair sites. With a few exceptions, potential impacts from these sites can be managed by continuous monitoring during construction excavation and drilling operations.
- **High Priority—**These sites include all sites with a high potential for contamination at the site. In some cases, groundwater contamination may have escaped the boundaries of the site. The sites include all active and inactive MPCA designated Voluntary Investigative Cleanup (VIC) sites, Minnesota Environmental Response and Liability Act (MERLA-State Superfund) sites, all active or inactive dump sites, and all active leaking underground storage tank (LUST) sites. Field investigation of soil and groundwater at the project alignment and structures will need to be made to identify and remediate any contributing contamination from several of these sites.

4.8.3 Long-Term Effects

4.8.3.1 No-Build Alternative

No impacts are anticipated as a result of the No-Build Alternative.

4.8.3.2 Key Project Elements

No long-term effects are anticipated for the Central Corridor LRT Project, because the Key Project Elements would not produce hazardous materials or regulated wastes. The collection and disposal of oils, grease and other waste materials generated during vehicle maintenance and repair activities would be accomplished in accordance with recognized industry BMPs for rail transit maintenance facilities.

4.8.4 Short-Term Construction Effects

Construction impacts include time and expense of identifying, testing, removing, transporting and disposal of contaminated materials to properly licensed facilities. Project construction could also be affected through contact with contaminated groundwater during excavation or drilling activities.

In addition to impacts to construction, there are potential exposures to people. Site workers may be exposed through contact (physical, ingestion or inhalation) with newly exposed contaminants. Related long-term impacts could occur if long-term removal of contaminated groundwater is required to support future project operation. Exposure passersby would likely be limited to exposure through inhalation of contaminant vapors emanating from newly exposed contaminants. Public contact through physical contact with or contaminant ingestion would be prevented through the use of site access barriers. Discussion of potential short-term construction effects for each of the Key Project Elements is presented below.

4.8.4.1 Downtown St. Paul Alignments and Stations

None of the known contaminants sites in the downtown St. Paul area would be directly affected by any of the downtown alternative alignments. However, because the slope of the water table generally runs from the higher elevation at Kellogg Boulevard southward toward the Mississippi River, it is possible that contaminants migrating from sites 741, 743 or 744 could be encountered at one or more of the alignments. There is a remote possibility that station and track construction in front of the existing Union Depot might encounter contamination migrating from site 672 (Army Corps of Engineers).

4.8.4.2 Capitol Area Alignment and Stations

The relocation of the Capitol East station to Robert Street may directly affect the Medium potential site 324 located at 610 North Robert Street, which is very near the proposed LRT station. Station and adjacent track excavation would likely encounter contaminants from sites 324, 325 and 804 and possibly from sites 739 and 764. Relocation of the Rice Street Station from the west side of Rice Street to the east side of the intersection reduces the probability of potential impact from High priority site 797 (Former Saxon Ford Auto Body).

4.8.4.3 Additional Infill Stations at Western Avenue, Victoria Street, and Hamline Avenue

The construction of an LRT infill station at Hamline Avenue might encounter contaminants migrating from the Mowery Impoundment site (Phase I High potential site 227) located west of Hamline Avenue. Construction of a station at that site, however, would not directly impact the Mowery site.

4.8.4.4 U of M Alignment and Stations

Construction excavation and drilling for the East Bank station may directly impact site 776 (U of M Northrop Pedestrian Bridges). Contaminants from sites 775 and 776 would likely be encountered during rail and station construction in this immediate area.

The alignment along 23rd Avenue could directly affect the High priority former Peking Garden site (783), which has been at least partially remediated in support of University Street realignments for the East Gateway District renewal project. Construction of the track alignment and station along East Washington Avenue and 23rd Street would likely encounter soil contaminants from sites 61, 64, 74, 79, 781, 782, 783 and 779 (new TCF Bank Stadium site) although some of these sites have been at least partially remediated in support of East Gate District street improvements and construction of the stadium.

4.8.4.5 Washington Avenue Bridge

None of the sites selected for impact assessment are expected to be affected by any of the modifications to accommodate light rail features. Similarly, and given their distance from the bridge, any contamination from those sites is not expected to affect any modifications to the bridge.

4.8.4.6 Hiawatha/Central LRT Connection

Given the distances from the connection alignment and topographical considerations, any potential contamination from sites 429 and 698 is not expected to affect construction of the proposed alignment.

4.8.4.7 Three-Car Platforms

Potential impacts to hazardous/regulated material sites from an approximate 100-foot extension of the station platforms will depend on the proximity of the station platform to nearby contaminant sites.

- From a review of preliminary station siting plans, it is possible that Medium priority site 324 could be affected by the Capitol East Station. Whether the station provides for a two- or three-car platform, construction at the station site may also encounter contaminants emanating from sites 324, 325, 739, 764 and 804. No incremental impact from a three-car station platform is expected.
- In the event that infill LRT stations are constructed at Western Avenue, Victoria Street, and Hamline Avenue, only a station platform extension at Hamline Avenue might incrementally be affected by site 227, which is located just to the west. The site is very unlikely to be directly affected by station construction.
- Platform extensions at the Dale Street Station, Lexington Parkway Station, Snelling Avenue Station, and Fairview Avenue Station may be minimally affected by site 799 at Dale Street, site 287 at Lexington Parkway, site 762 at Snelling Avenue, and site 606 at Fairview Avenue. No incremental impacts are expected for platform extensions at Raymond, Westgate, and 29th Avenues.
- Given the area distribution of contaminated sites throughout the U of M complex and the impacts already predicted at the Stadium Village and East Bank stations, attempts to assign incremental impacts resulting from platform extensions would be highly subjective. No incremental impact to a platform at the West Bank Station is expected.

4.8.4.8 Vehicle Maintenance and Storage Facility

The proposed Vehicle Maintenance and Storage Facility at the Kellogg Boulevard may directly affect sites 805 and 809. Given its location down-gradient from site 380 (Diamond Products), the Vehicle Maintenance and Storage Facility may also encounter contaminants migrating from sites 380, 743 and 744.

4.8.4.9 Traction Power Substations

Downtown St. Paul

Construction of TPSS could directly affect sites 741 and 744 or could be indirectly affected by these sites, depending on the final site location. TPSS may also be indirectly affected by migrating contaminants from sites 672 to the northwest and 380 to the northeast. TPSS construction in the North Downtown area of St. Paul wound not encounter contaminants from any known sites in or near that area.

Capitol Area

The construction of TPSS could affect sites 325, 804 and 764 if built on or nearby. TPSS construction itself could be indirectly affected by contaminants in the vicinity of those sites.

Midway East

The TPSS sites are not expected to be affected by known contaminant sites unless a TPSS is constructed in the very western portion of the Dale Street Study Area, where it might be affected by migrating contaminants from site 799 (Unidale Mall). A TPSS constructed in the northern portion of the Study Area west of Hamline Avenue could encounter contaminants from the Mowery & Company Impoundment site (site 227).

Midway West

Indirect impacts due to migrating contaminants from sites 164 and 184 may occur. A TPSS site in the northeast quadrant of the intersection of Raymond and University Avenues could directly affect site 607 (US Bank). No other sites would likely be affected nor would they affect TPSS construction within the search area.

University/Prospect Park

A TPSS within the eastern portion of the U of M complex would not likely directly affect any sites selected for further investigation. However, construction could indirectly encounter contaminants from several sites including 61, 64, 72, 79, 581, 779, 781, 782 and 783. A TPSS within the prescribed East Bank Station area would not likely affect any known contaminant sites nor would it be materially affected by known site contamination.

Downtown Minneapolis

The TPSS constructed in this segment is not likely to directly or indirectly be affected by known contaminant sites.

4.8.5 Mitigation

Potential hazardous and regulated material sites that may be encountered by the project have been identified in the Phase I ESA and through subsequent MPCA file review and field research. Phase II environmental assessments will be conducted for specific impact locations. The analysis will include preparation of investigative work plans, field geotechnical investigations, contaminant sampling and testing, and recommendations for proper removal and disposal. An application will be made to enroll the project into the MPCA Voluntary

Investigation and Clean-up (VIC) and /or Voluntary Petroleum Investigation and Clean-up (VPIC) Brownfields (Petroleum Remediation) programs upon initiation of Phase II studies.

Upon Metropolitan Council and MPCA approval of the Phase II work plans, cleanup of identified contamination will commence in concert with project excavation and or drilling activities. All clean-up activity will be conducted with prior MPCA approval and in accordance with the approved Site Safety and Health Plan and continuously monitored by certified inspectors. A final report will be prepared to document all removal and disposal activity.

Given the wide distribution of contaminated sites within and adjacent to the Central Corridor LRT Study Area, it is reasonable to expect that previously undocumented soil or groundwater contamination may be encountered during construction. A Site Contingency Plan will be prepared prior to the start of construction to account for the discovery of unknown sites. This plan will outline procedures for initial contaminant screening, soil and groundwater sampling, laboratory testing, removal, transport and disposal at licensed facilities. All contamination removed and disposed will be in accordance with this plan, monitored by certified inspectors, and documented in final reports for submittal to the Metropolitan Council and MPCA.

4.9 Electromagnetic Fields and Utilities

This section provides general information regarding existing electromagnetic fields (EMF) and utilities and identifies potential effects that may result from the Proposed Central Corridor LRT Project.

For electromagnetic fields (EMF) and interference (EMI), this section describes the environmental setting and existing conditions for potential EMF and EMI as they relate to the Central Corridor LRT Project. These issues were not addressed in the AA/DEIS.

For utilities, the intent of this section is not to identify every utility in the Central Corridor LRT Study Area, but to address the larger utilities issues. The existing conditions and the potential impacts of this section have been revised from the AA/DEIS to reflect the project revisions. The vast majority of the alignment continues to have the same utility impacts that were identified in the AA/DEIS. Lastly, this section discusses potential mitigation efforts for affected utilities.

Table 4-22 provides a brief summary of the identified potential effects to existing electromagnetic fields and utilities from the Key Project Elements.

Table 4-22 Summary of potential impacts from Key Project Elements to Electromagnetic Fields and Utilities

Planning Segment	Key Project Elements								
	Hiawatha/ Central Connection	U of M Alignment	Future Infill Stations	Capitol Area Alignment/ Stations	Downtown St. Paul Alignment/ Stations	Traction Power Substations	Three-car Platforms	Vehicle Maintenance Facility	Washington Avenue Bridge
Downtown St. Paul	N/A	N/A	N/A	N/A	Potential area of EMF/I concern	Additional information required	No impacts anticipated	No impacts anticipated	N/A
Capitol Area	N/A	N/A	N/A	Potential area of EMF/I concern; Water, Sewer, H/C Pipelines Capitol Utilities	N/A	Additional information required	No impacts anticipated	N/A	N/A
Midway East	N/A	N/A	No impacts anticipated	N/A	N/A	Additional information required	No impacts anticipated	N/A	N/A
Midway West	N/A	N/A	N/A	N/A	N/A	Additional information required	No impacts anticipated	N/A	N/A
University/ Prospect Park	N/A	Potential area of EMF/I concern; Water, Sewer, Gas	N/A	N/A	N/A	Additional information required	No impacts anticipated	N/A	N/A
Downtown Minneapolis	Water, Gas	N/A	N/A	N/A	N/A	Additional information required	No impacts anticipated	N/A	No impacts anticipated

Notes: N/A, not applicable, indicates that the Key Project Element does not occur in the Planning Segment.

4.9.1 Legal and Regulatory Context

4.9.1.1 4.9.1.1 Electromagnetic Fields

Neither the federal government nor the State of Minnesota has set standards for EMF exposure and/or interference levels for electrical equipment. Federal guidelines are under consideration by the U.S. Food and Drug Administration, Federal Communications Commission, U.S. Department of Defense and the EPA.

4.9.1.2 4.9.1.2 Utilities

MnDOT, by agreement with the Metropolitan Council will be responsible for relocation of utilities for the project. Private utilities will be required to relocate at their own expense in accordance with Minnesota Rules 8810.3300, subpart 3.

4.9.2 Methodology

4.9.2.1 4.9.2.1 EMF

The effects of EMFs associated with the Central Corridor LRT project were assessed based upon the review of relevant literature and the identification of locations with sensitive electronic equipment.

4.9.2.2 4.9.2.2 Utilities

Key Project Elements, which had been revised from the AA/DEIS, were reviewed for impacts to utilities. Existing service lines estimated to lie within the planimetric limits (generally 10 feet from the proposed track centerline) were considered part of a “Utility Review Zone.”

Further review is needed to determine if the service lines within a “Utility Review Zone” would be affected by the project. Additional utility depth information and further design information would be needed for this determination. The utility information discussed below primarily concerns service lines found to be within a “Utility Review Zone.”

4.9.3 Existing Conditions

4.9.3.1 Electromagnetic Fields

EMI derives from the presence of unwanted EMF, which are produced by voltages and currents wherever wires distribute electric power and wherever electrical equipment is used. EMF levels decrease with distance away from operating equipment or away from current-carrying electric lines.

The Metropolitan Council has been in contact and coordination with MPR, CAAPB, and U of M staff to identify the location of research equipment that might be sensitive to EMI. To date, several meetings and site tours have been conducted to identify such equipment. This coordination effort will continue and will be documented and disclosed in the FEIS.

The key determinants of EMF/EMI potential are comprised of the following:

- Magnitude of electric currents and voltages used by the vehicles
- Mass and size of the ferromagnetic material in the vehicle (for “moving metal” fields)
- Proximity of sensitive receptors to the transit corridor

- Pattern of current and voltage time variations
- Spatial configuration of the conductors supplying electric power
- The quantity of traffic
- The degree of EMF/EMI isolation required by sensitive receptors

The areas of concern identified thus far in the project development process and design are based on the coordination that has taken place to date with key project stakeholders. These areas include the MPR broadcast location on Cedar Street in St. Paul, various state government research offices in the Capitol Area and research facilities that contain sensitive equipment in Nils Hasselmo Hall at the U of M along Washington Avenue.

4.9.3.2 Existing Utilities

Extensive public and private utilities are within the project area. Public utilities primarily consist of water, sewer and traffic service lines. Private utilities include gas, electricity, district heating and communication services. The location and general distribution of existing major utilities within the study area are described below.

Water Service

The City of Minneapolis Department of Water Works provides water, and owns and maintains water distribution service from the Minneapolis Multimodal Station to Emerald Street Southeast, near the proposed Westgate Station. According to City of Minneapolis engineering drawings, last revised on February 14, 2001, the publicly owned watermains along the proposed project typically range in size from 6 to 20-inches in diameter. However, a 46-inch watermain crosses the alignment near the proposed West Bank Station between Nineteenth Avenue South and Twentieth Avenue South. Service to buildings is privately owned and ranges from 3/4 to 8-inches in diameter. According to City of Minneapolis personnel, depending on the diameter, watermains in Minneapolis may be buried up to 7.5-feet below ground surface (bgs) to reduce the possibility of freezing.

St. Paul Regional Water Services provides water, and owns and maintains distribution service along the proposed project area from Emerald Street Southeast to the east end of the proposed project. Engineering drawings, revised between January 1997 and August 2000, were provided by St. Paul Regional Water Services personnel. These drawings depict publicly-owned watermains typically ranging from 4 to 36-inches in diameter along this portion of the proposed project. Service to buildings is privately owned and ranges between 3 and 8-inches in diameter. There are no water treatment plants, pump stations or water storage facilities located along the proposed Central Corridor LRT alignment.

Sewer Service

The City of Minneapolis Department of Public Works owns and maintains sanitary and storm sewer service lines from the Minneapolis Multimodal Station to Emerald Street Southeast. According to engineering drawings provided by the City of Minneapolis and last revised in May 1997; sanitary and storm sewers parallel and intersect the proposed alignment numerous times. These sewers range from 8-inches to 14-feet in diameter and vary in depth.

The Metro Waste Commission maintains an 8-foot by 8-foot interceptor tunnel, which crosses the proposed alignment at Cedar Avenue. This tunnel has an invert depth of approximately 90 feet.

The City of St. Paul Department of Public Works also owns and maintains sanitary and storm sewer service along the proposed project area from the Westgate Station to the east end of the proposed project. Engineering drawings provided by the City of St. Paul, depict the location and size of the sanitary and storm sewers, which range from 8-inches to 13-feet in diameter and vary in depth. In Minneapolis and St. Paul, wastewater treatment facilities are owned and operated by the Twin Cities Metropolitan Council. None are located within the proposed project area.

Traffic Service Lines

The City of Minneapolis, Hennepin County Public Works, and MnDOT have existing utility lines for traffic signalization and lighting within the project area. Utility lines for the Hiawatha LRT, owned by Metro Transit, are also within the project area.

Communication Service Lines

A variety of existing communication utility lines are within the proposed Central Corridor LRT alignment. Telephone, cable-television, and internet services are provided by these lines, which parallel and cross the proposed alignment numerous times.

Qwest Communications International, Inc. (Qwest) was identified in the AA/DEIS to provide the majority of long distance and local communication service to all exchanges within the project area.

Since the AA/DEIS, additional communication utility owners have also been identified. Service lines maintained by American Fiber Systems, AT&T, AT&T Local Services, Callnet Technology Services, Centurytel Solutions, COMCAST, Global Crossing, MCI, Valspar, Time Warner Telecom, U of M, and Wiltel Communications have been indicated within the project area. Further information is needed to determine if CNCS and Sprint Long Distance lines are located within the project area.

Gas Lines

Center Point Energy, formerly Minnegasco, provides natural gas service along the proposed project area within the Minneapolis City limits. Drawings were provided by Reliant Energy Minnegasco personnel on January 8, 2002. These drawings identify subsurface gas transmission lines that parallel and intersect the proposed LRT alignment. The lines range in size from 2 to 24-inches in diameter and vary in pressure from 10 to 175-pounds per square inch. The only major natural gas pipeline designed for pressure of more than 275 pounds per square inch is located between Cedar Avenue and Nineteenth Avenues South.

Xcel Energy provides gas service along the proposed project within the St. Paul city limits. Drawings were provided by LRT personnel with Xcel Energy on January 11, 2002. The drawings identify Xcel Energy's subsurface gas transmission lines that parallel and intersect the proposed project. The lines range in size from 5/8 to 16-inches in diameter.

Electric Lines

Xcel Energy provides electrical service within the proposed project area. Drawings provided by Xcel Energy personnel on January 11, 2002 identify the electric transmission lines that intersect and parallel the proposed project. East of the proposed Rice Street Station the lines are typically buried; west of the Rice Street Station the lines are typically overhead. No electrical substations were identified in the drawings.

Other Existing Pipelines

According to information provided by the Office of Pipeline Safety, no major hazardous liquid or petroleum product pipelines are located along the proposed project.

District Energy St. Paul, Inc. and its affiliate District Cooling St. Paul, Inc. maintain heating and cooling distribution systems in downtown St. Paul. Hot water pipelines parallel and intersect portions of the proposed project on University Avenue, Cedar Street, and 4th Street. Chilled water pipelines parallel and intersect the proposed alignment at Cedar Street and 4th Street. Pipelines for both distribution systems are shallow. Chilled water pipelines are typically 30-inches in diameter and are buried 4-feet bgs. Hot water pipelines are typically buried 6-feet bgs. Meetings have been held with District Energy and a list of issues has been developed for consideration in the next phase of LRT design.

A U of M-owned steam pipeline crosses within the Washington Avenue Bridge. This pipeline is located above the roadway bridge on the underside of the pedestrian level.

Existing Pedestrian Tunnels

A pedestrian tunnel system is located in the Capitol Area near downtown St. Paul. This system is addressed in Section 6.3 Other Transportation Impacts. A pedestrian tunnel owned by the U of M is located under Washington Avenue at Union Street.

4.9.4 Long-Term Effects

4.9.4.1 No-Build Alternative

No impacts are anticipated as a result of the No-Build Alternative.

4.9.4.2 Key Project Elements

Long-term effects of EMF/EMI will be documented and disclosed in the FEIS.

No long-term impacts to utilities would occur as a result of the Key Project Elements, because all utilities will be relocated and services maintained.

4.9.5 Short-Term Construction Effects

4.9.5.1 EMF

Short-term construction effects of EMF/EMI will be documented and disclosed in the FEIS.

4.9.5.2 Utilities

The potential for short term impacts to utility lines largely depends on the depth of the existing utilities. In general, underground utilities that parallel the proposed Central Corridor LRT alignment for some distance may need to be relocated. Manholes, valves, vaults, hydrants, etc. located within the construction area would generally be relocated or access restricted. All overhead or subsurface utility crossings, where physical conflicts occurred, would be relocated. In addition, construction of station facilities, traction power supply systems, as well as civil construction (roads, sidewalks, walls, traffic signals, etc.) would have site specific impacts. Significant impacts to Xcel Energy lines, as well as communication lines, are not expected. Potential major utility impacts are identified below.

Before discussing the Key Project Elements by section, one of the elements, three-car platforms, would have similar impacts in all of the segments. No additional utility impacts have been identified as a result of the increase in station platform length. Utility impacts from the two-car platforms proposed for the AA/DEIS LPA would be similar to those that are now proposed for three-car platforms.

Traction Power Substations

The thirteen proposed Traction Power Substation (TPSS) sites have the potential to impact existing site utilities. Further utility impact assessment for these sites would require additional information regarding the proposed TPSS.

Downtown St. Paul

Downtown St. Paul Alignments/Stations

The revised alignment which proposes the 4th and Cedar Streets Station is expected to reduce the utility impacts that were associated with the AA/DEIS LPA alignment. Existing public and private utilities located along Cedar Street between 5th Street and 4th Street and along 4th Street between Cedar Street and Minnesota Street are no longer expected to be affected.

Vehicle Maintenance Facility Site

Existing utility information for the vehicle maintenance facility site in St. Paul is not complete; however, no known major impacts are expected at this site.

Capitol Area

Capitol Area Alignment/Stations

The changed alignment in the Capitol Area planning segment is expected to have impacts similar to the AA/DEIS alignment. Public and private utilities would be affected.

Public water, storm and sanitary sewer lines maintained by St. Paul would be affected.

District Energy's large heating and cooling pipelines would likely be affected, but not substantially. The shallow district heating and cooling distribution systems service 75 percent of the downtown St. Paul area. The modified AA/DEIS LPA alignment is not proposed to extend more than 2-feet bgs in these locations.

Several utility lines at the southwest quadrant of Robert Street and University Avenue would be affected. Within this area is the main power distribution and shop. These impacts are considered to be similar to those that would be encountered under the AA/DEIS LPA alignment.

Midway East

Future Infill Stations

No new impacts have been identified with installation of the underground infrastructure for the proposed future in-fill stations, which were not included in the AA/DEIS.

Midway West

With the exception of the TPSS, no impacts in addition to those disclosed in the AA/DEIS are anticipated.

University/Prospect Park

U of M Alignment

The proposed U of M at-grade alignment is expected to reduce several utility impacts found with the tunnel alignment considered in the AA/DEIS. The proposed at-grade alignment is still expected to cause impacts to public water, public sewer and private utilities.

The AA/DEIS LPA alignment identified an impact to a large 96-inch sanitary sewer at Oak Street near the proposed Stadium Village Station. This impact would be reduced or eliminated with the use of the proposed at-grade alignment instead of a tunnel alignment.

Impacts to large storm drainage pipes under Oak Street and also along the U of M Transitway are expected to be greatly reduced or eliminated with the proposed changes to the AA/DEIS LPA alignment. These existing pipes are owned by the City of Minneapolis. Major impacts to drainage and possible reconstruction were previously considered with the tunnel alignment.

A potentially large impact to the existing U of M pedestrian tunnel under Washington Avenue near Union Street was not discussed in the AA/DEIS. This impact would no longer be a concern with the proposed change to an at-grade alignment.

Potential impacts are expected to be reduced for a 48″ watermain crossing Washington Avenue near Ontario Street. This watermain is owned by the City of Minneapolis and would likely have required relocation if a tunnel alignment was used instead of the proposed change to an at-grade alignment.

The Central Corridor LRT project has the potential to impact an existing pipeline for natural gas transmission owned by Center Point Energy. This potential conflict was identified in the AA/DEIS. This transmission line intersects the proposed project at Oak Street Southeast. These 24-inch diameter lines transmit natural gas at approximately 175-pounds of pressure.

Washington Avenue Bridge

No service line impacts are expected as a result of the proposed modifications to the Washington Avenue Bridge.

Downtown Minneapolis

Hiawatha/Central Corridor LRT Connection

The revised Hiawatha/Central Corridor LRT connection would have fewer utility impacts than the AA/DEIS LPA alignment, because the revised track alignment departs from Washington Street further east than the AA/DEIS LPA alignment. This change would eliminate many of the utility impacts anticipated west of I-35W.

The AA/DEIS identified a potential impact to a 46-inch subsurface watermain owned by the City of Minneapolis Water Works. This watermain crosses the alignment near the proposed West Bank Station between 19th Avenue South and 20th Avenue South. This impact may still be anticipated. The diameter of this line indicates that the depth may only be 3-feet bgs. Relocation of this line may be needed in order to construct a depressed platform at this location.

The connection has the potential to impact an existing pipeline for natural gas transmission owned by Center Point Energy. This impact was identified in the AA/DEIS. This transmission line intersects the proposed project at 19th Avenue South. These 24-inch diameter lines transmit natural gas at approximately 175-pounds of pressure.

4.9.6 Mitigation

4.9.6.1 EMF

Appropriate mitigation strategies will be documented and disclosed in the FEIS.

4.9.6.2 Utilities

Further information such as proposed elevations, proposed clearances, and depth of existing utilities is needed to determine the impacts this project would pose to existing utilities. Appropriate mitigation strategies will be disclosed and documented in the FEIS.

The areas of concern identified thus far in the project development process and design are based on the coordination that has taken place to date with key project stakeholders. These areas include the MPR broadcast location on Cedar Street in St. Paul, various state government research offices in the Capitol area and research facilities that contain sensitive equipment in Nils Hasselmo Hall at the University of Minnesota along Washington Avenue.

4.10 Energy

This section presents the potential effects of the Central Corridor LRT Project on transportation related energy consumption in the Central Corridor LRT Study Area.

4.10.1 Methodology

Regional energy consumption is based on regional vehicle miles traveled (VMT) that are derived from the Metropolitan Council travel demand model. Transit operating consumption is defined as the energy used for vehicle propulsion, operation of stations and ancillary facilities, and the maintenance of transit vehicles and track systems. The energy impacts of the proposed LRT system are determined by comparing total energy consumption of the LRT alignment with the Baseline Alternative.

4.10.2 Long-term Effects

4.10.2.1 No-Build Alternative

The AA/DEIS reported the direct energy consumption for the No-Build Alternative as 148,157,348 million British Thermal Units (BTUs) annually based on output from the Metropolitan Council 2020 Regional Travel Model.

4.10.2.2 Key Project Elements

The Key Project Elements being evaluated in this SDEIS are not expected to significantly increase energy consumption as compared to the information provided in the AA/DEIS. A more detailed analysis of energy consumption will be completed and disclosed in the FEIS.

4.10.3 Short-Term Construction Effects

Construction related activities would be localized and would not be expected to impact regional energy consumption.

4.10.4 Mitigation

Mitigation requirements will be evaluated and determined based on the more detailed FEIS evaluation.