



Appendix F

Supporting Technical Reports

F.5 Preliminary Floodplain Impacts and Mitigation Strategies



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METRO Blue Line LRT Extension (BLRT)

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Subject: Preliminary Floodplain Impacts and Mitigation Strategies

1.0 Introduction

1.1 Project Location

The METRO Blue Line LRT Extension (BLRT) project will extend light rail passenger service from the Target Field Station in Minneapolis to Oak Grove Parkway/101st Avenue N in Brooklyn Park. The project corridor is approximately 13 miles and runs through the cities of Minneapolis, Golden Valley, Robbinsdale, Crystal, and Brooklyn Park. The project has been divided into six segments corresponding with municipal boundaries where possible, which have been labeled according to city. The portion within Brooklyn Park has been further divided into two segments: Brooklyn Park 1, which is the northernmost segment, and Brooklyn Park 2.

Roughly eight miles of the proposed project will be constructed within the existing BNSF Railway corridor. However, most of the Minneapolis segment is located within the median of TH 55 (Olson Memorial Highway), and portions of the two Brooklyn Park segments are within the median of CSAH 103 (West Broadway Avenue). The proposed project also includes the construction and/or reconstruction of affected roadways, construction of station platforms, several park-and-ride facilities, and an operations and maintenance facility (OMF).

Hennepin County is in the preliminary design phase of a portion of CSAH 103 (West Broadway Avenue) that coincides with a portion of the Brooklyn Park 1 segment. A separate environmental assessment worksheet (EAW) and preliminary stormwater design have been completed for the Hennepin County project, which incorporates the floodplain and wetland impacts and stormwater treatment best management practices (BMPs) required to treat runoff from the BLRT Extension project. These have been documented in the EAW and in supporting technical memoranda.

1.2 Purpose

This *Floodplain Technical Memorandum* has been prepared in support of the BLRT Extension project Final Environmental Impact Statement (Final EIS). The objective of this memorandum is to evaluate the BLRT Extension project's potential impacts to floodplains within the study area and to identify potential mitigation measures. This includes the following:

- Identify regulatory requirements that will set forth mitigation standards that are specific to floodplain management.
- Identify potential mitigation areas that would be used to compensate for the floodplain impacts along the BLRT Extension project corridor.



This report contains qualitative and quantitative design recommendations for the BLRT Extension project corridor that will be used by the consultant team preparing the Final EIS and will provide information on how the project would meet the various regulatory requirements.

1.3 Data Collection

The Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) and the Flood Insurance Rate Maps (FIRMS) for Hennepin County (panel numbers 27053C0182E, 27053C0201E, 27053C0203E, 27053C0212E, 27053C0214E, and 27053C0352E) dated September 4, 2004, were used to identify floodplains and floodways within the BLRT Extension project corridor. The floodplains within the project area are associated with Bassett Creek, Grimes Avenue Pond, North Rice Pond, Shingle Creek, and the Century Channel Ponds. Note that the latter two water bodies fall within the purview of the CSAH 103 (West Broadway Avenue) EAW.

All floodplain elevations were adjusted from National Geodetic Vertical Datum 1929 (NGVD 29) to North American Vertical Datum 1988 (NAVD 88) by adding 0.20 feet to the NGVD 29 elevations. FEMA 100-year floodplain and floodway GIS shapefiles were downloaded from the DNR floodplain/floodway file transfer site and used to determine the impacts of the BLRT Extension project. The floodplain and floodway areas are shown on **Figures 1 to 12** in Appendix A. The DNR shapefiles had the following discrepancies:

- Century Channel Ponds 7 and 8 (DNR Wetland #559W) and a portion of the Shingle Creek floodplain had been omitted from the digitized GIS shapefile. These floodplain shapes were added by Engineering Services Consultant (ESC) team, based on the LiDAR contours below the adjusted 100-year floodplain elevations listed in FIS 27053CV001A. These areas are shown on **Figures 9 and 10** in Appendix A.
- The City of Brooklyn Park is in the process of applying for a Letter of Map Revision (LOMR) from FEMA for a portion of the Shingle Creek floodplain on the west side of CSAH 103 (West Broadway Avenue), adjacent to the creek crossing. It is assumed that the LOMR will be approved, and the annotated DFIRM and hydraulic modeling prepared for the LOMR was used to determine the floodplain impacts at this location. The GIS shapefiles will be updated to reflect the LOMR once it has been approved.
- The floodplain boundary for Pond 5, which is located in the northeast quadrant of 93rd Avenue N and CSAH 103 (West Broadway Avenue), has also changed. The 610 Commerce Site was recently constructed at this location, and it is unknown at this time if the floodplain elevation has been altered. Based upon discussions with City Staff, a LOMR was not submitted for the impact to the floodplain of Pond 5, but based on aerial imagery, it is clear that the boundary shown on the FIRM is no longer accurate due to locations of buildings and parking lots.

2.0 Regulatory Environment

Regulatory and permitting authority for floodplain impacts falls to the Local Government Unit (LGU), which is typically the municipality. Watershed management organizations (WMOs) also regulate floodplain impacts to waters within their jurisdictional authority. In addition to the LGUs and WMOs, FEMA and the DNR play a role in floodplain management and impacts to water resources within the study area. These include:

- Federal Emergency Management Agency (FEMA)
- Minnesota Department of Natural Resources (MnDNR)
- Mississippi Watershed Management Organization (MWWO)
- Bassett Creek Watershed Management Commission (BCWMC)
- Shingle Creek and West Mississippi Watershed Management Commissions (SCWMC and WMWMC, or SCWM WMC when referred to in reference to their joint watershed management plan)
- City of Minneapolis



- City of Golden Valley
- City of Robbinsdale
- City of Crystal
- City of Brooklyn Park

2.1 Federal Emergency Management Agency

FEMA, under the National Flood Insurance Program (NFIP) has the authority to regulate floodplains and floodways. Executive Order (EO) 11988 requires all federal agencies to evaluate and, to the extent possible, avoid adverse impacts to floodplain areas which may result in action they administer, regulate, or fund. EO 11988 specifically requires floodplain impacts to be considered in the preparation of environmental documents. This document identifies that the following four areas must be adequately addressed in the Final EIS:

- 1) No significant potential for interruption of a transportation facility which is needed for emergency vehicles or provides a community's only evacuation route.
- 2) No significant impact on natural or beneficial floodplain values.
- 3) No significant increased risk of flooding will result.
- 4) Will the project support and/or result in incompatible floodplain development?

These four areas are addressed in the 'Floodplain Impacts and Mitigation' section of this memo.

Executive Order 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, was implemented on January 30, 2015. The EO 13690 amends EO 11988 and states that the floodplain shall be:

- 1) The elevation and flood hazard area that result from using a climate-informed science approach that uses the best-available, actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding based on climate science. This approach will also include an emphasis on whether the action is a critical action as one of the factors to be considered when conducting the analysis.
 - a. This could mean using flow rates based on the new precipitation intensity-duration-frequency curves, called Atlas 14, or using flows based on regression equations using more recent stream gage data. However, according to the FAQ section of the National Oceanic Atmospheric Administration (NOAA) website (<http://www.nws.noaa.gov/oh/hdsc/FAQ.html#1.5>), Atlas 14 volumes are "based on the assumption of stationary climate." It appears that the project's use of Atlas 14 precipitation frequencies would not qualify as a climate-informed science approach based on NOAA guidance.
- 2) The elevation and flood hazard area that result from using the freeboard value, reached by adding an additional two feet to the base flood elevation for non-critical actions and by adding an additional three feet to the base flood elevation for critical actions. The term 'critical action' shall mean any activity for which even a slight chance of flooding would be too great.
- 3) The area subject to flooding by the 0.2 percent (500-year) annual chance flood.
- 4) The elevation and flood hazard area that results from using any other method identified in an update to the Federal Flood Risk Management Standard (FFRMS).

The ESC team and the Final EIS team met with the Federal Transit Authority to discuss which of the above options would be most appropriate for the BLRT extension project to use. Based on that meeting, as well as a conversation with the Metropolitan Planning Organization, the BLRT Extension project is using Option 2, Noncritical Action (100-year elevation plus two feet of freeboard) to determine the elevation of the roadway profile, which will ensure the intent for resilient infrastructure in EO 13690 is met.



Rivers and streams for which FEMA has prepared detailed engineering studies may have designated floodways. The floodway is the area of the floodplain that must remain free from obstruction so that the 100-year flood can be conveyed downstream. Placing fill or buildings in the 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 storage volume to offset the lost floodway storage. Similarly, activities in the floodplain that reduce flood storage capacity are also restricted and would require compensatory storage volume. A project in a floodway must be reviewed to determine if the project will increase flood heights. An engineering analysis must be conducted before a permit can be issued. The community's permit file must have a record of the results of this analysis, which is in the form of a No-Rise Certification. The No-Rise certification must be supported by technical data and signed by a registered professional engineer.

2.2 Minnesota Department of Natural Resources

On behalf of FEMA, the MnDNR, and the local government units (i.e., the cities and watershed management organizations) also regulate activities that may impact floodplains, including activities such as construction, excavation, or deposition of materials over, or under waters that may affect flood stage, floodplain, or floodway boundaries.

The MnDNR has developed regulatory standards for floodplain development within the State. Local government units must, at a minimum, adopt these standards. The requirement for allowing fill within the flood fringe is that it generally cannot:

- Increase the 100-year flood elevation more than 1/2 foot above the preexisting, natural unobstructed condition, or
- Increase the 100-year flood elevation if the filling would negatively impact existing floodplain development (even if the increase would be less than 1/2 foot)

The floodplain requirements of each community and WMO located along the project corridor meet or exceed the guidance provided by the MnDNR.

2.3 Local Government Units

The project is located within the Bassett Creek Water Management Commission, Mississippi Watershed Management Organization, the Shingle Creek and West Mississippi Water Management Commission; and within the Cities of Minneapolis, Golden Valley, Crystal, Robbinsdale, and Brooklyn Park. Each of these cities and WMOs has rules and ordinances that address floodplain impacts and mitigation. Please see the Regulatory Matrix in Appendix B for more details on the floodplain regulations that pertain to this project.

2.3.1 Mississippi Watershed Management Organization

The MWMO manages waters within its boundaries through its Watershed Management Plan that was amended in 2011. This plan complies with the water resource protection requirements under Minnesota Statutes 103A through 103G in conformance with Minnesota Rules Chapters 8410 and 8420. The communities within the boundaries include parts of Lauderdale, Minneapolis, St. Anthony, and St. Paul, as well as property owned by the Minneapolis Park and Recreation Board (MPRB).

The MWMO does not issue permits or provide approval letters for construction projects, but works with the member communities to ensure the implementation of its standards. MWMO's floodplain standards are that public roadways shall not flood when adjacent to stormwater storage basins or subsurface stormwater management BMPs designed to store the 100-year event.



2.3.2 Bassett Creek Water Management Commission

The BCWMC manages waters within its boundaries through its 2015 – 2025 Watershed Management Plan. This Plan complies with the water resource protection requirements under Minnesota Statutes 103A through 103G in conformance with Minnesota Rules Chapters 8410 and 8420. The BCWMC is governed by a Joint Powers Agreement that is held between the watershed organization and the member communities that are located within the boundaries of the WMO. The member municipalities include Crystal, Golden Valley, Medicine Lake, Minneapolis, Minnetonka, New Hope, Plymouth, Robbinsdale, and St. Louis Park.

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

2.3.3 Shingle Creek and West Mississippi Watershed Management Commissions

The SCWMC and WMWMC are two separate WMOs; however, they plan and conduct business jointly, managing waters within its boundaries. Each is governed by a Joint Powers Agreement that is held between the watershed organization and the communities/members that are located within the boundaries of the WMOs. The communities within the boundaries include parts of Brooklyn Center, Brooklyn Park, Crystal, Maple Grove, Minneapolis, New Hope, Osseo, Plymouth, Robbinsdale, and Champlin.

The SCWMC WMC manages waters through its Third Generation Watershed Management Plan, which was adopted in 2013. This Plan complies with the water resource protection requirements under Minnesota Statutes 103A through 103G in conformance with Minnesota Rules Chapters 8410 and 8420.

The SCWMC WMC's rules address floodplain alteration within the watershed. No person or political subdivision shall alter or fill land below the 100-year critical flood elevation of any public waters, public waters wetland, or other wetland without first obtaining an approved project review from the Commission. Floodplain alteration or filling shall not cause a net decrease in flood storage capacity below the projected 100-year critical flood elevation unless it is shown that the proposed alteration or filling, together with the alteration or filling of all other land on the affected reach of the waterbody to the same degree of encroachment as proposed by the applicant, will not cause high water or aggravate flooding on other land and will not unduly restrict flood flows. The SCWMC WMC also requires compensatory storage for floodplain fill.

The SCWMC WMC also requires approval of a project review of any new or improved crossing of Shingle Creek. The crossings shall retain adequate hydraulic capacity based on the hydraulic model of the creek, not adversely affect water quality, represent the "minimal impact" solution to a specific need with respect to all reasonable alternatives, and allow for future erosion, scour, and sedimentation maintenance considerations.

2.3.4 City of Minneapolis

The City of Minneapolis' Floodplain Overlay District Ordinance (Chapter 551) includes regulations for managing land uses in the mapped floodplain. The ordinance states that linear projects within the floodplain shall be designed to minimize the increases in flood elevations and shall be compatible with local comprehensive floodplain development plans. Protection to the regulatory flood protection elevation (RFPE) shall be provided where failure or interruption of public facilities would result in danger to public health or safety where facilities are essential to



orderly functioning of the area. Conditional uses in the Floodway District are allowed provided such uses shall have a low flood damage potential, shall not cause an increase in the stage of the regional flood, or cause an increase in flood damages in the reach(es) affected.

2.3.5 City of Golden Valley

The City of Golden Valley's Floodplain Management Zoning Overlay District Ordinance (Section 11.60) states that linear projects may be located in the floodplain provided they are designed to minimize increases in flood elevation and are compatible with the BCWMC Management Plan. These uses can cause no increase in stage to the 100-year flood within the floodway and cannot increase the floodplain elevation by more than 1/2 foot in a designated Zone A or AE where a floodway has not been designated. Protection to the RFPE shall be provided where failure or interruption of these public facilities would endanger the public health or safety or where such facilities are essential to the orderly functioning of the area.

2.3.6 City of Robbinsdale

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

2.3.7 City of Crystal

The City of Crystal's Floodplain Overlay Ordinance (Chapter 515.61) states that no structure, fill (including for roads and levees), deposit, obstruction, storage of materials or equipment, or other uses may be allowed as a conditional use in the floodway that will cause any increase in the stage of the 100-year regional flood or cause an increase in flood damages in the reach(es) affected. Floodplain development shall not adversely affect the hydraulic capacity of the channel and adjoining floodplain of any tributary watercourse or drainage system where a floodway or other encroachment limit has not been specified on the Official Zoning Map.

2.3.8 City of Brooklyn Park

The City of Brooklyn Park has adopted zoning regulations to manage land uses in the mapped floodplain. These regulations include the minimum federal and state regulations, which are enforced in the 1-percent chance (100-year) floodplain that is mapped on the Flood Insurance Rate Map (FIRM) for Brooklyn Park. The Brooklyn Park ordinance requires that no fill, excavation, or storage of materials or equipment that obstruct flows or increase flood elevations will be permitted within the flood fringe or floodway.

3.0 Floodplain Impacts and Mitigation

There are several floodplains within the project area that will be impacted by the construction of the BLRT Extension project. Floodplain impacts were estimated based on a conceptual (10 percent) design of the project corridor. The floodplain impacts may be revised as the design for the project progresses, but they are not expected to increase. The following sections include a summary of the impacts and identify potential on-site floodplain storage mitigation areas that have been preliminarily evaluated for the project. **Table 1, Floodplain Impacts by Water Body**, provides a summary of the floodplain impacts throughout the corridor.



Table 1. Floodplain Impacts by Water Body

Water Body	Type of Encroachment	Length (ft)	Volume of Floodplain Impact (cy)
Bassett Creek	Longitudinal	5,310 ⁽¹⁾	16,800
Grimes and North Rice Ponds	Transverse	1,200 ⁽²⁾	200
Shingle Creek	Transverse	(3)	(3)
Setzler Pond	Transverse	(3)	(3)
DNR Wetland #559W	Transverse	(3)	(3)

(1) Impacts listed are on the east and west sides of the BLRT guideways.

(2) Impacts listed include the bridge piers and the south abutment.

(3) See [West Broadway EAW](#) for detailed floodplain fill impacts (see www.hennepin.us/westbroadway for a link to the EAW).

3.1 Bassett Creek

3.1.1 Affected Environment

The Bassett Creek Main Stem is located on the west side of the BNSF Railway and BLRT corridor through TWRP from south of TH 55 (Olson Memorial Highway) to Bassett Creek Drive, within portions of the Minneapolis and Golden Valley segments. The East Channel of Bassett Creek is located on the east side of the existing BNSF Railway corridor, and is connected by existing culverts that cross the existing Canadian Pacific (CP) and BNSF Railway corridors. There is also a flood control structure located on Bassett Creek on the north side of TH 55 (Olson Memorial Highway). This structure is not expected to be impacted by the project. See **Figures 2 and 3** for the location.

The ESC team received the FEMA-approved HEC-2 models for Bassett Creek from the MnDNR, and from Ferris Chamberlain, who did the last updates to the modeling for the United States Army Corps of Engineers (USACE) in the late 1990s. The model sets were identical, and are the basis of the 100-year floodplain and floodway boundaries shown on the FIRMs for Bassett Creek, which are the regulated boundaries for the creek. The creek's large floodplain includes both a conveyance element as well as a large storage element due to the flood control structure. As such, the floodway extents in TWRP were "administratively determined" by the Bassett Creek Flood Control Commission, the MnDNR, the City of Golden Valley, and FEMA as part of a management "envelope" to limit development within areas necessary for flood control.

The ESC team converted the models into HEC-RAS to create duplicate-effective models, which will be corrected to match existing conditions once all the survey data has been collected. The proposed conditions model will be refined as the project design progresses.

3.1.2 Proposed Conditions

As part of the BLRT Extension project, the existing BNSF track will be shifted to the western 50 feet of the existing 100 foot rail corridor. This will result in impacts to the Bassett Creek floodplain. An access road will be constructed on the west side of the proposed BNSF track from TH 55 (Olson Memorial Highway) to Theodore Wirth Parkway. Due to poor soils and wetlands, the access road has been eliminated from Theodore Wirth Parkway to the northern end of the Golden Valley segment. Westbound TH 55 (Olson Memorial Highway) will be realigned to the north to accommodate the BLRT guideway, extending into the area adjacent to the East Channel Bassett Creek. A retaining wall is proposed to limit the amount of fill placed into the area near the upstream end of the culvert crossing the highway.



The preliminary floodplain strategy has been to include impacts and mitigation for the access road, which is generally where potential expansion of the BNSF Railway would occur. The existing culverts that convey the East Channel Bassett Creek under the BNSF Railway corridor will be reconstructed to accommodate the freight and LRT tracks. The existing culvert that conveys the East Channel Bassett Creek will be studied for capacity to determine if it needs to be reconstructed. The cross-sections from the HEC-RAS models have been compared against LiDAR data for the area and are very similar. The ESC team conducted a sensitivity analysis in the HEC-RAS models by incorporating the potential floodplain fill from the proposed project. The sensitivity analysis resulted in no increase to the 100-year water surface elevation. This is understandable given the large size of the floodplain relative to the project impacts, and that the floodplain elevation is controlled by both the flood control structure at TH 55 (Olson Memorial Highway) and the overflow provided by a low point in TH 55 (Olson Memorial Highway).

The total proposed floodplain fill within the Bassett Creek floodplain, is 16,800 cubic yards. These include impacts to the Main Stem and East Channel Bassett Creek between TH 55 (Olson Memorial Highway) and Bassett Creek Drive. A floodplain mitigation area has been identified within TWRP, between Bassett Creek Main Stem and the BLRT and BNSF Railway corridor. The City of Minneapolis owns an easement over the mitigation area, as well as other areas within TWRP. The mitigation would include excavation of adjacent ground below the 100-year floodplain elevation to provide compensatory floodplain storage for the fill placed within the floodplain. The mitigation site will be designed in collaboration with MPRB and the City of Minneapolis. See **Figure 2** for the location of the potential floodplain mitigation area.

3.2 Grimes and North Rice Ponds

3.2.1 Affected Environment

Grimes and North Rice Ponds are located within the BCWMC north of Golden Valley Road in the City of Robbinsdale. The existing BNSF Railway corridor transects the Grimes and North Rice Ponds, which discharge to Bassett Creek Main Stem. The BNSF track is located on embankment between the two ponds, and is located above the 100-year floodplain elevation. The floodplain boundary shown on the FIRM includes portions of residential properties and roadways on the north side of Grimes Pond. The City Engineer confirmed that these areas are within the 100-year floodplain.

3.2.2 Proposed Conditions

The BLRT Extension project will result in widening of the existing corridor. The BLRT guideway will be constructed on a new bridge due to poor soils, and in order to reduce floodplain impacts. The BNSF track will remain on the current embankment. There will be minor floodplain fill at the south end of the bridge and from the bridge piers.

3.3 Shingle Creek

3.3.1 Affected Environment

The 100-year floodplain and floodway associated with Shingle Creek crosses the BLRT Extension project at the existing culvert crossing at CSAH 103 (West Broadway Avenue). The mapped floodplain is wider on the upstream (west) and downstream (east) ends of the crossing than it is immediately at the crossing. As mentioned previously, the City of Brooklyn Park is in the process of obtaining a LOMR approval for this area, which reduces the floodplain extents on the upstream side of the culvert to account for fill that was placed within the property directly adjacent to CSAH 103 (West Broadway Avenue) on the south side of Shingle Creek and a floodplain mitigation area that was constructed on the opposite side of the Creek from the impacted property.



3.3.2 Proposed Conditions

As part of a separate project, Hennepin County will be reconstructing CSAH 103 (West Broadway Avenue) from approximately Candlewood Drive N to approximate northbound station 2651+15. The BLRT corridor will be located within the median of the CSAH 103 (West Broadway Avenue) corridor. A separate Environmental Assessment Worksheet (EAW) has been prepared for the CSAH 103 (West Broadway Avenue) project, and includes information on the floodplain impacts within that project area. There are no floodplain impacts to Shingle Creek associated with the BLRT Extension project. See the CSAH 103 (West Broadway Avenue) EAW for more information on the impacts and mitigation associated with that project.

3.4 Century Channel Ponds

3.4.1 Affected Environment

The Century Channel Ponds include Setzler Pond, DNR Wetland #559W, and Pond 5. Historically, these basins were part of Century Channel, which now consists of a series of wetlands, ponds, and culverts also known as Edinbrook Channel that discharge to Mattson Brook east of CSAH 103 (West Broadway Avenue), and ultimately to the Mississippi River. The Century Channel Ponds were added to the Hennepin County FIS and FIRM through a LOMR in the early 2000s. Setzler Pond is located in the northwest quadrant of the intersection of 89th Avenue N and CSAH 103 (West Broadway Avenue). DNR Wetland #559W is located between 92nd Avenue N and Setzler Parkway, and is bisected by CSAH 103 (West Broadway Avenue). Pond 5 of the Century Channel Ponds is located in the northeast quadrant of CSAH 30 (93rd Avenue N) and CSAH 103 (West Broadway Avenue).

3.4.2 Proposed Conditions

There are no floodplain impacts to Setzler Pond or DNR Wetland #559W associated with the BLRT Extension project. See the CSAH 103 (West Broadway Avenue) EAW for more information on the impacts and mitigation impacts associated with that project. The Pond 5 floodplain was recently impacted by development, and it is unknown at this time if the floodplain elevation or boundary has been altered.

3.5 Impact Analysis

This project will not result in any significant floodplain impacts for the following reasons:

- 1) No significant interruption or termination of a transportation facility which is needed for emergency vehicles or provides a community's only evacuation route.
 - a. All major roadways, including TH 55 (Olson Memorial Highway) and CSAH 103 (West Broadway Avenue), and BLRT guideway grades will be designed to be two feet above the 100-year floodplain elevation, in order to be in compliance with EO 13690.
- 2) No significant adverse impact on natural and beneficial floodplain values should result from this project.
 - a. No fisheries impacts are anticipated. Construction operations in the creeks will not occur during fish spawning and migration periods.
 - b. The wetland impacts and mitigation are discussed in a separate wetland technical memorandum.
 - c. No threatened or endangered plants or animals have been identified in the floodplains.
 - d. Appropriate turf establishment and erosion control measures will be used.
- 3) No significant increased risk of flooding will result.
 - a. No significant change in 100-year water surface elevations is anticipated as a result of the BLRT Extension project. Hydraulic analysis indicates that the proposed fill within the Bassett Creek floodplain will not result in an increase to the 100-year floodplain elevation, and a 'No-Rise Certificate' will be completed, which states that there will be no rise in the floodplain elevation.
- 4) This project should not result in any incompatible floodplain development.



- a. The LGUs and WMOs located throughout the corridor have floodplain ordinances that regulate floodplain development. The ordinances conform to the MnDNR Floodplain Management guidelines. No new access to a floodplain area is being created by the BLRT Extension project.

4.0 Conclusion

The *Floodplain Technical Memorandum* has been prepared in support of the Final EIS for the BLRT Extension project. The memorandum includes a summary of the regulatory environment for floodplain management within the project area, a summary of the proposed floodplain impacts from the project, and identifies potential floodplain mitigation areas within the project corridor. **Figures 1 through 12** in Appendix A show the locations of the floodplains, proposed impacts, and potential mitigation sites. The information in the memorandum will be used by the consultant team preparing the Final EIS and will provide information on how the project would meet various regulatory requirements.



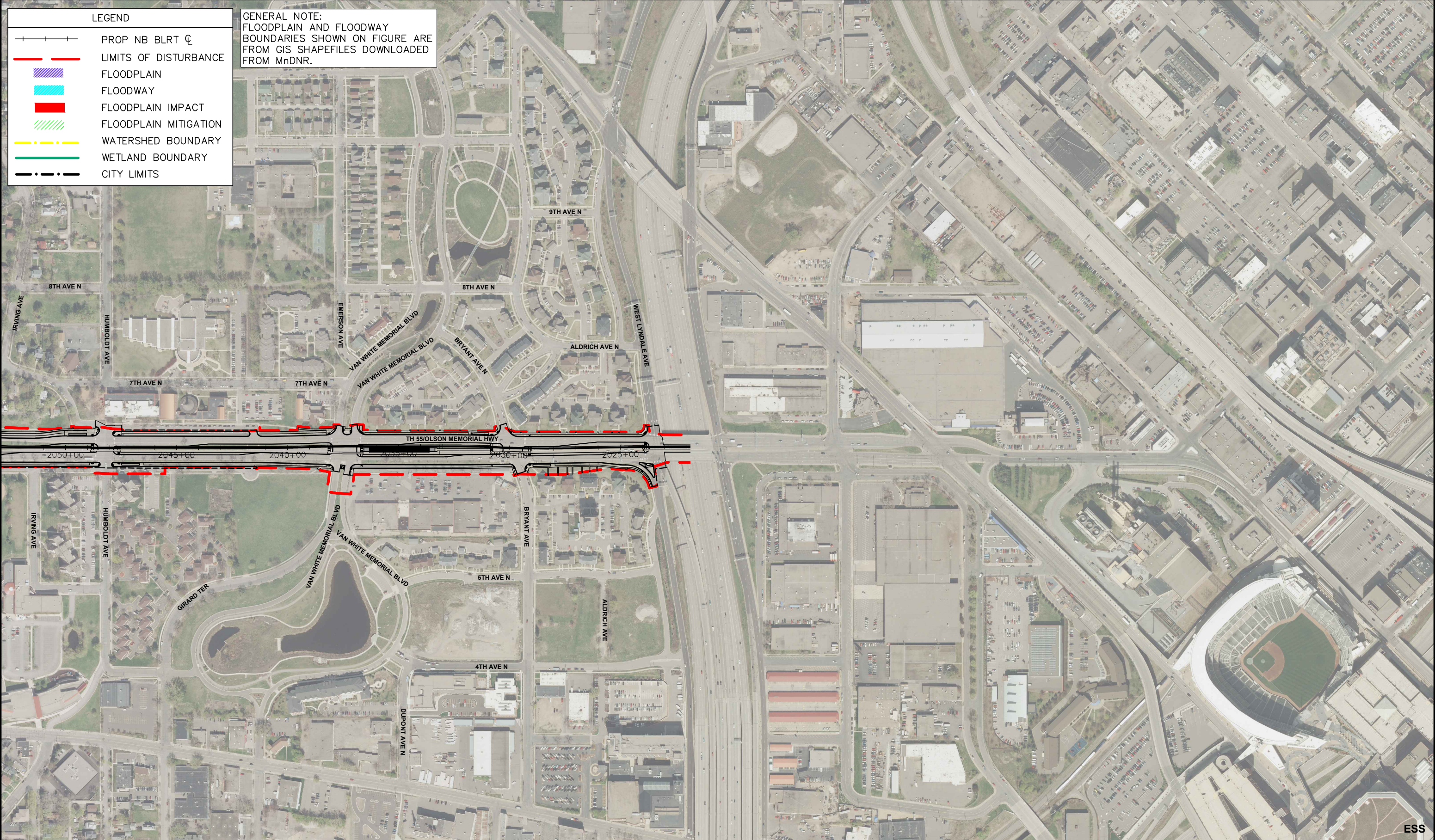
Technical Memorandum

METRO Blue Line LRT Extension (BLRT)

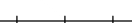








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APPENDIX A. FLOODPLAIN FIGURES

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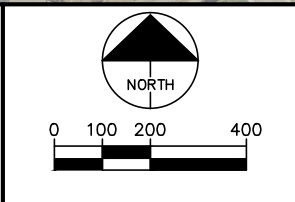
-  PROP NB BLRT C
-  LIMITS OF DISTURBANCE
-  FLOODPLAIN
-  FLOODWAY
-  FLOODPLAIN IMPACT
-  FLOODPLAIN MITIGATION
-  WATERSHED BOUNDARY
-  WETLAND BOUNDARY
-  CITY LIMITS

GENERAL NOTE:
FLOODPLAIN AND FLOODWAY
BOUNDARIES SHOWN ON FIGURE ARE
FROM GIS SHAPEFILES DOWNLOADED
FROM MnDNR.



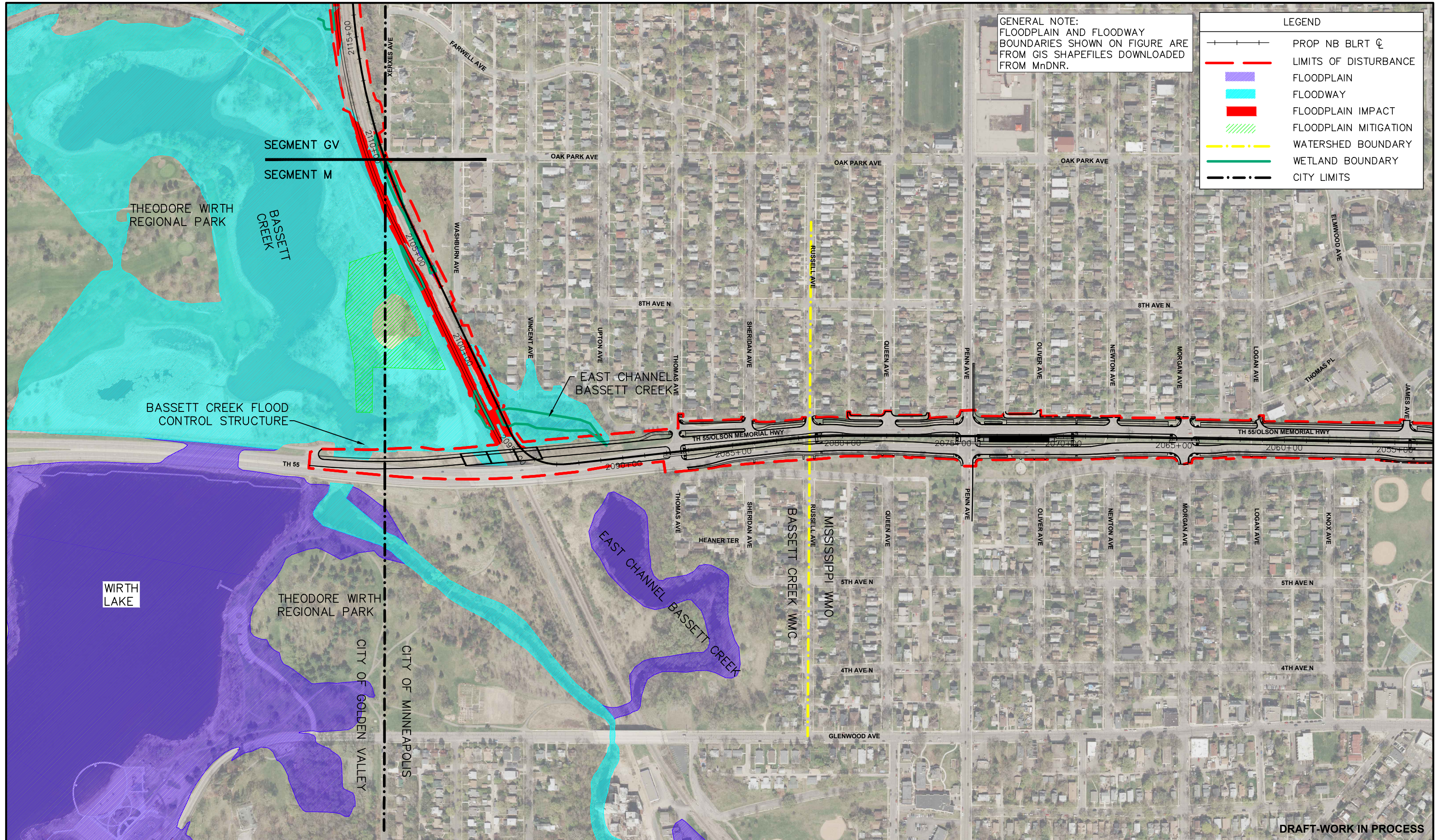
BLUE LINE LRT EXTENSION
FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
FIGURE 1 OF 12

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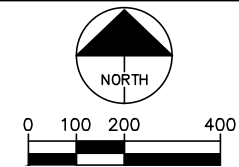
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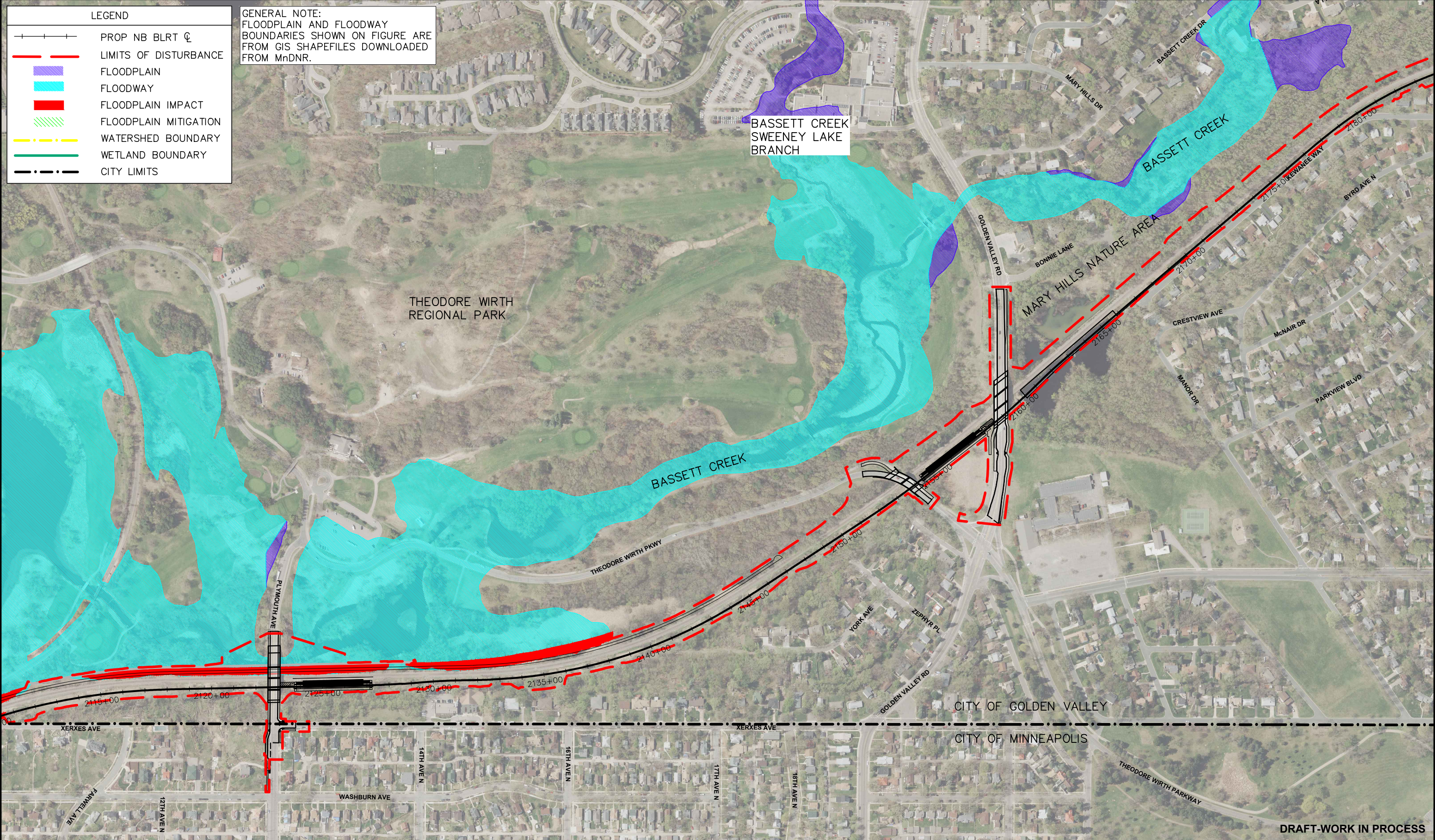
BLUE LINE LRT EXTENSION

FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
FIGURE 2 OF 12

10/7/2015



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LEGEND

- PROP NB BLRT C
- LIMITS OF DISTURBANCE
- FLOODPLAIN
- FLOODWAY
- FLOODPLAIN IMPACT
- FLOODPLAIN MITIGATION
- WATERSHED BOUNDARY
- WETLAND BOUNDARY
- CITY LIMITS

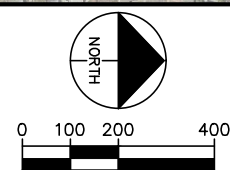
GENERAL NOTE:
FLOODPLAIN AND FLOODWAY
BOUNDARIES SHOWN ON FIGURE ARE
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BLUE LINE LRT EXTENSION

FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
FIGURE 3 OF 12

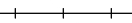








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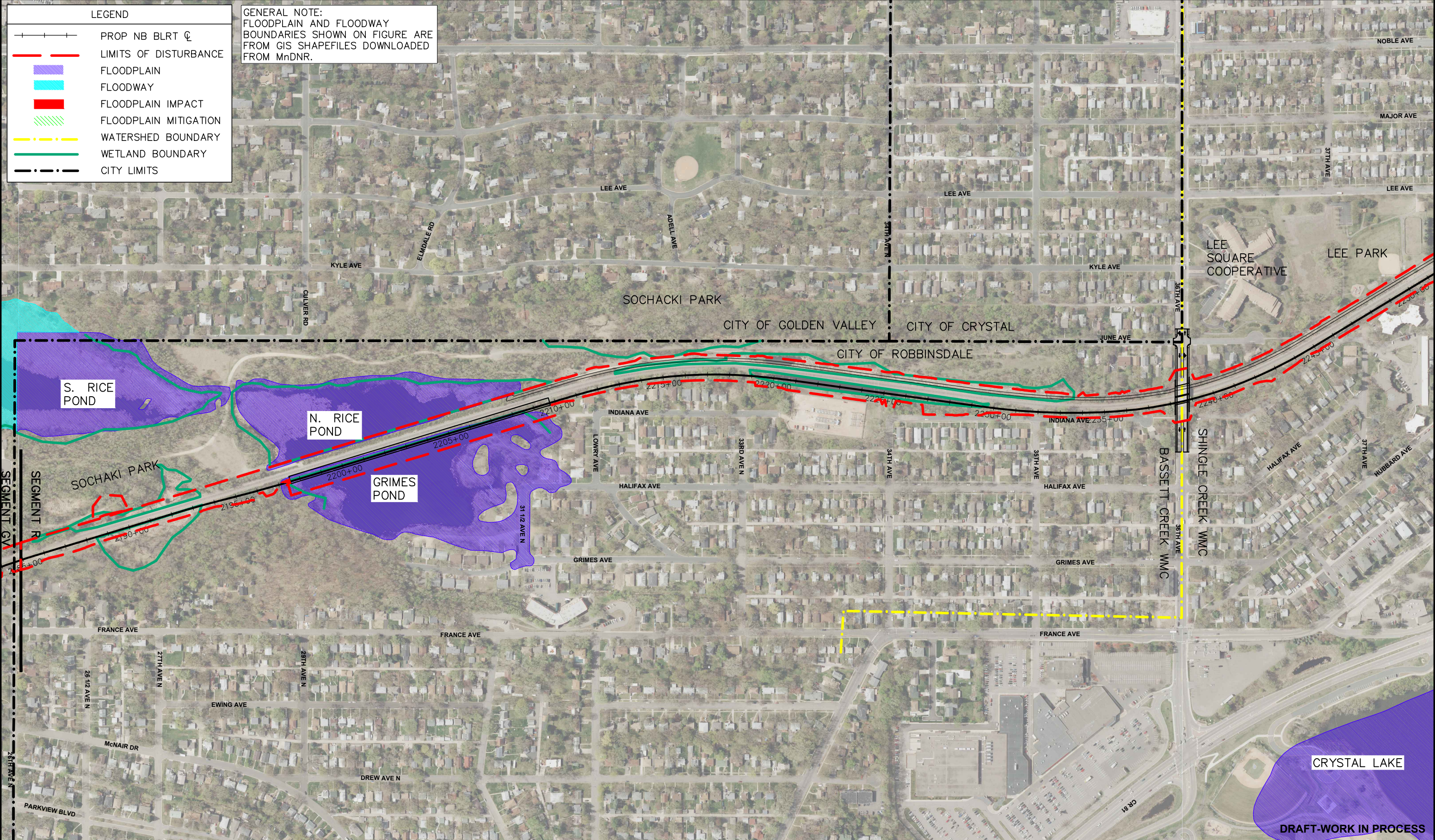
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LEGEND

-  PROP NB BLRT C
-  LIMITS OF DISTURBANCE
-  FLOODPLAIN
-  FLOODWAY
-  FLOODPLAIN IMPACT
-  FLOODPLAIN MITIGATION
-  WATERSHED BOUNDARY
-  WETLAND BOUNDARY
-  CITY LIMITS

GENERAL NOTE:
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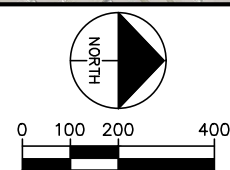


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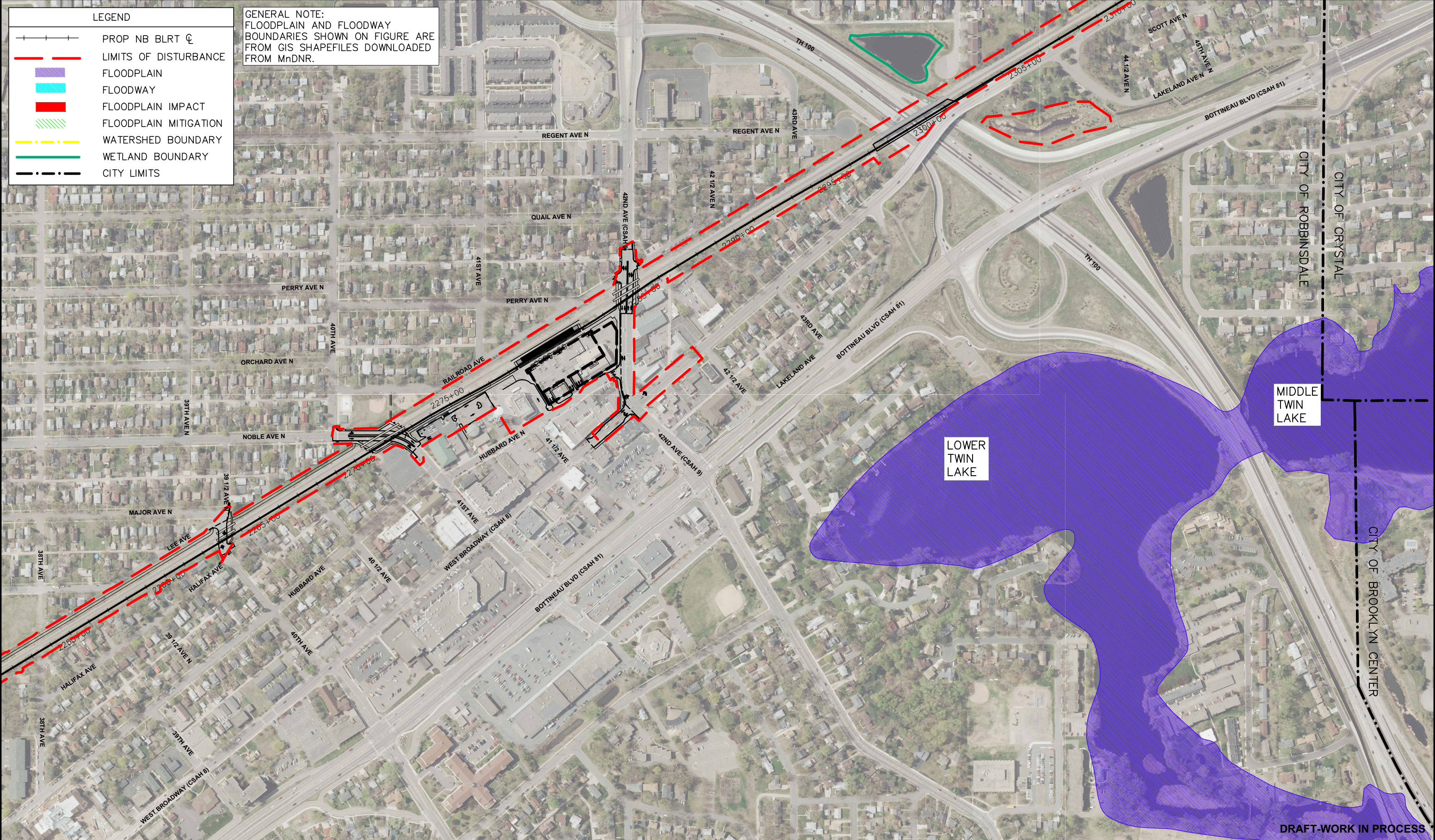


BLUE LINE LRT EXTENSION
FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
FIGURE 4 OF 12

10/7/2015



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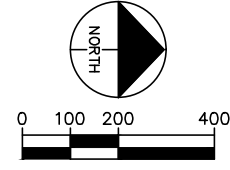
LEGEND	
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	LIMITS OF DISTURBANCE
	FLOODPLAIN
	FLOODWAY
	FLOODPLAIN IMPACT
	FLOODPLAIN MITIGATION
	WATERSHED BOUNDARY
	WETLAND BOUNDARY
	CITY LIMITS

DRAFT-WORK IN PROCESS

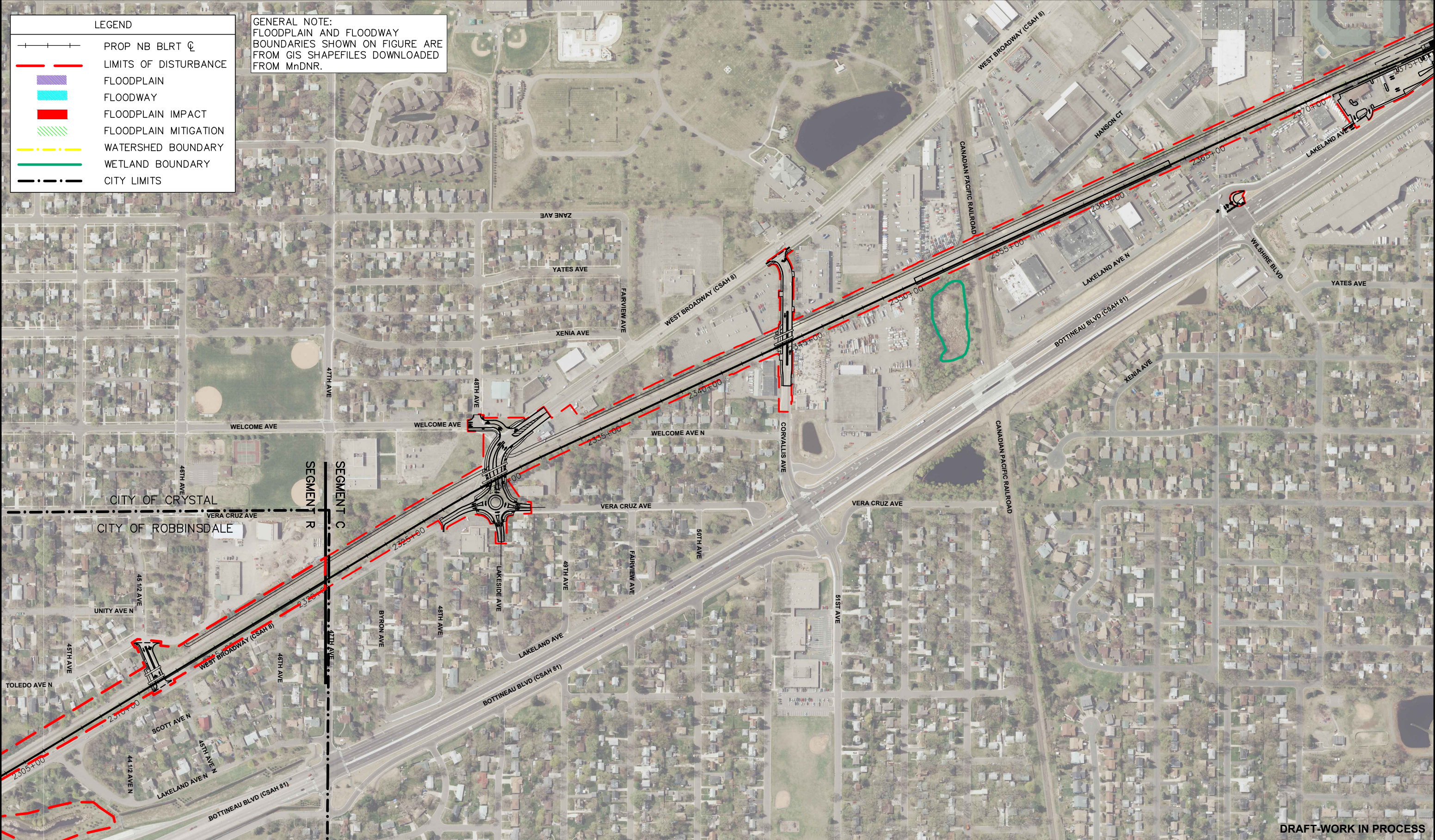


BLUE LINE LRT EXTENSION
 FLOODPLAIN IMPACTS AND MITIGATION STAREGIES
 FIGURE 5 OF 12

10/7/2015



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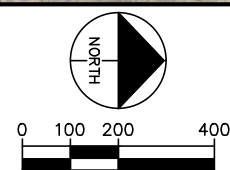


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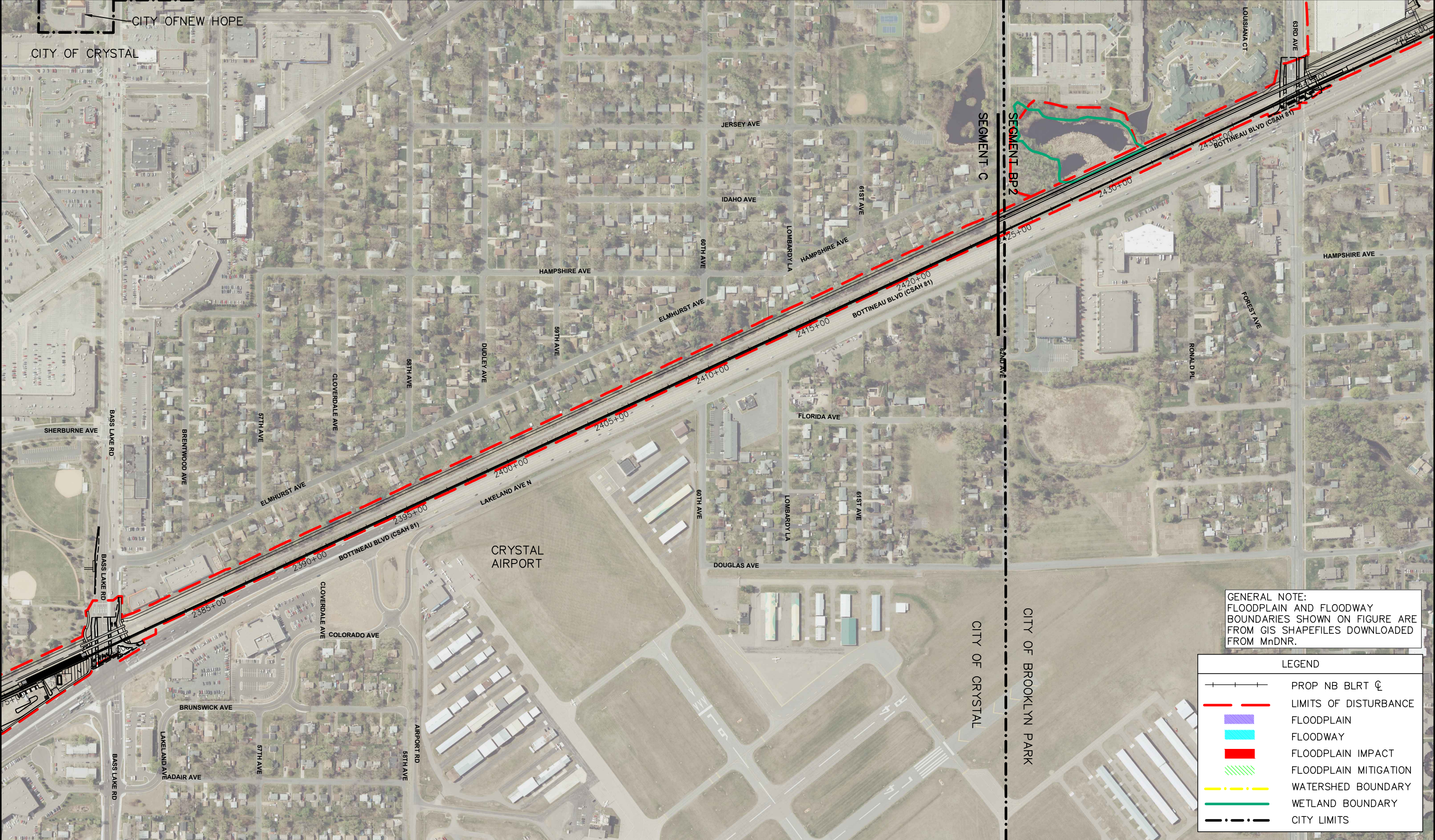


BLUE LINE LRT EXTENSION
 FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
 FIGURE 6 OF 12

10/7/2015



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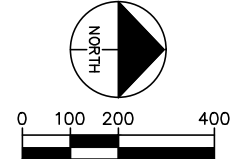
GENERAL NOTE:
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BOUNDARIES SHOWN ON FIGURE ARE
FROM GIS SHAPEFILES DOWNLOADED
FROM MnDNR.

LEGEND	
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	LIMITS OF DISTURBANCE
	FLOODPLAIN
	FLOODWAY
	FLOODPLAIN IMPACT
	FLOODPLAIN MITIGATION
	WATERSHED BOUNDARY
	WETLAND BOUNDARY
	CITY LIMITS



BLUE LINE LRT EXTENSION
FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
FIGURE 7 OF 12

10/7/2015



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LEGEND

	PROP NB BLRT C
	LIMITS OF DISTURBANCE
	FLOODPLAIN
	FLOODWAY
	FLOODPLAIN IMPACT
	FLOODPLAIN MITIGATION
	WATERSHED BOUNDARY
	WETLAND BOUNDARY
	CITY LIMITS

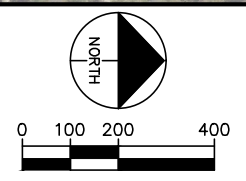
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DRAFT-WORK IN PROCESS

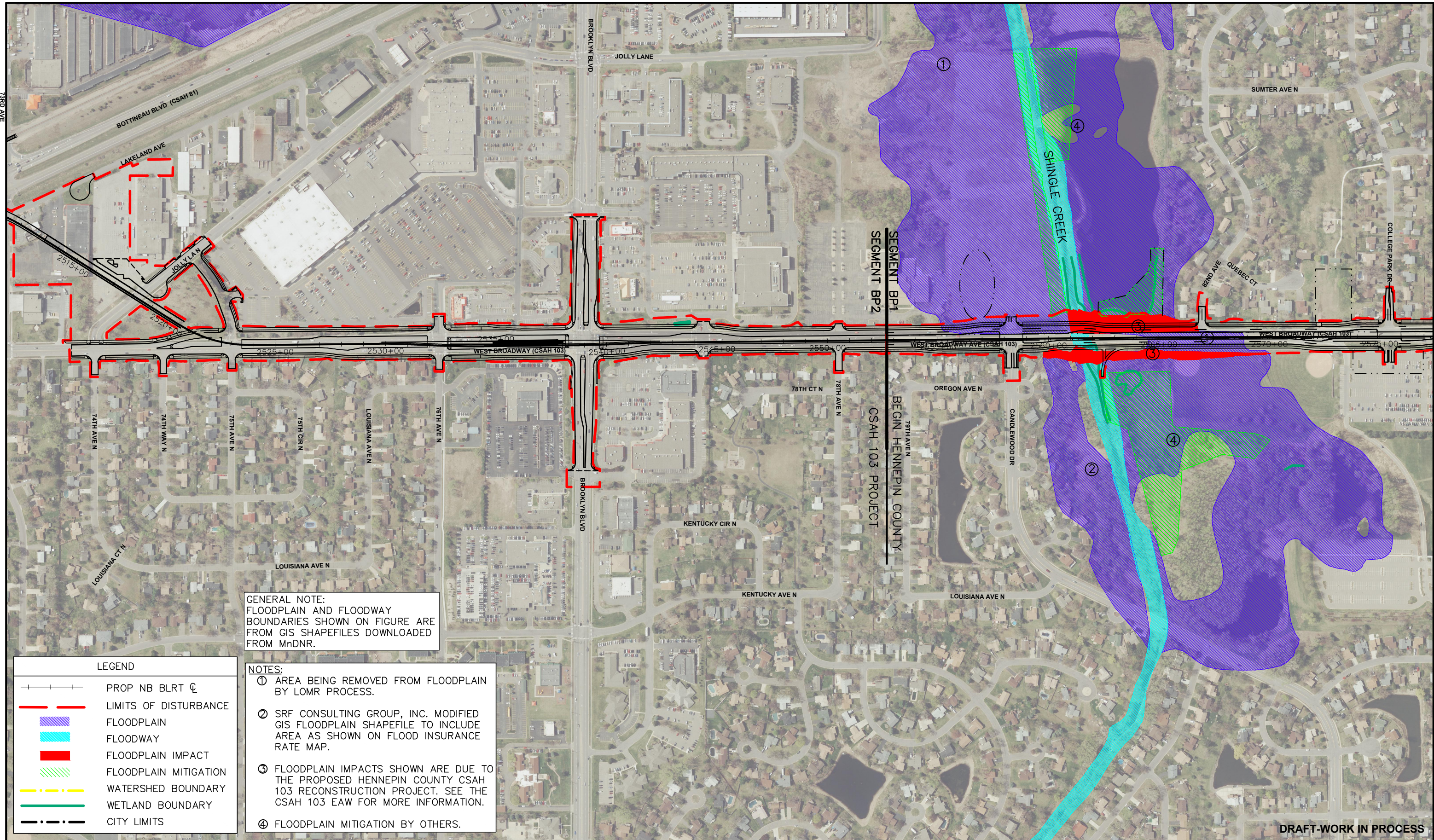


BLUE LINE LRT EXTENSION
 FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
 FIGURE 8 OF 12

10/7/2015



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GENERAL NOTE:
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 FROM GIS SHAPEFILES DOWNLOADED
 FROM MnDNR.

LEGEND	
	PROP NB BLRT C
	LIMITS OF DISTURBANCE
	FLOODPLAIN
	FLOODWAY
	FLOODPLAIN IMPACT
	FLOODPLAIN MITIGATION
	WATERSHED BOUNDARY
	WETLAND BOUNDARY
	CITY LIMITS

- NOTES:
- ① AREA BEING REMOVED FROM FLOODPLAIN BY LOMR PROCESS.
 - ② SRF CONSULTING GROUP, INC. MODIFIED GIS FLOODPLAIN SHAPEFILE TO INCLUDE AREA AS SHOWN ON FLOOD INSURANCE RATE MAP.
 - ③ FLOODPLAIN IMPACTS SHOWN ARE DUE TO THE PROPOSED HENNEPIN COUNTY CSAH 103 RECONSTRUCTION PROJECT. SEE THE CSAH 103 EAW FOR MORE INFORMATION.
 - ④ FLOODPLAIN MITIGATION BY OTHERS.

DRAFT-WORK IN PROCESS

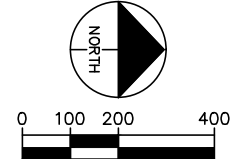


BLUE LINE LRT EXTENSION

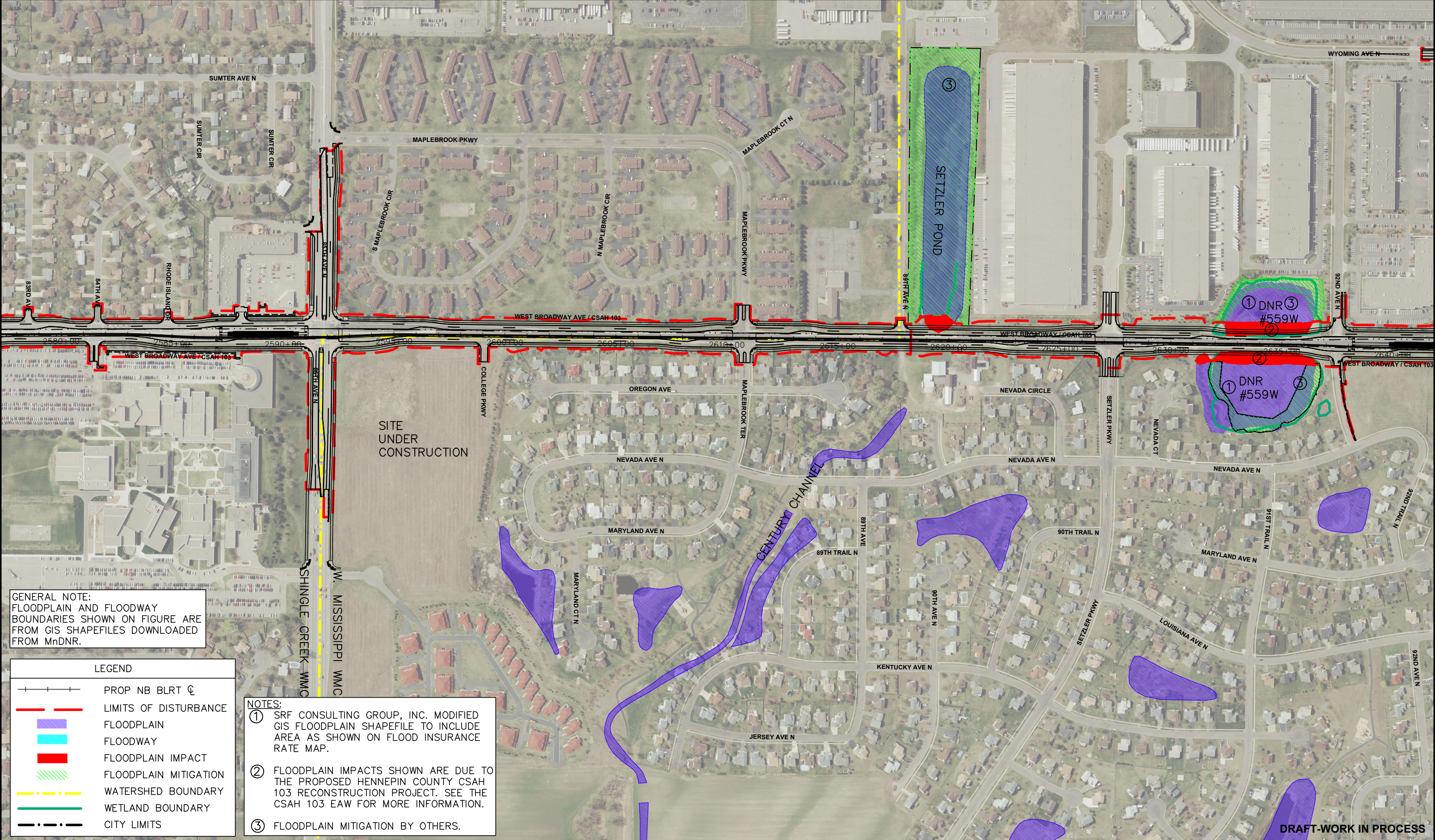
FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES

FIGURE 9 OF 12

10/7/2015



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GENERAL NOTE:
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 BOUNDARIES SHOWN ON FIGURE ARE
 FROM GIS SHAPEFILES DOWNLOADED
 FROM MnDNR.

LEGEND	
	PROP NB BLRT ☐
	LIMITS OF DISTURBANCE
	FLOODPLAIN
	FLOODWAY
	FLOODPLAIN IMPACT
	FLOODPLAIN MITIGATION
	WATERSHED BOUNDARY
	WETLAND BOUNDARY
	CITY LIMITS

- NOTES:
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 - ② FLOODPLAIN IMPACTS SHOWN ARE DUE TO THE PROPOSED HENNEPIN COUNTY CSAH 103 RECONSTRUCTION PROJECT. SEE THE CSAH 103 EAW FOR MORE INFORMATION.
 - ③ FLOODPLAIN MITIGATION BY OTHERS.

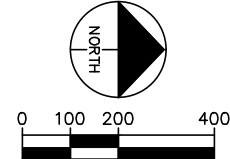
DRAFT-WORK IN PROCESS



BLUE LINE LRT EXTENSION

FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
 FIGURE 10 OF 12

10/7/2015

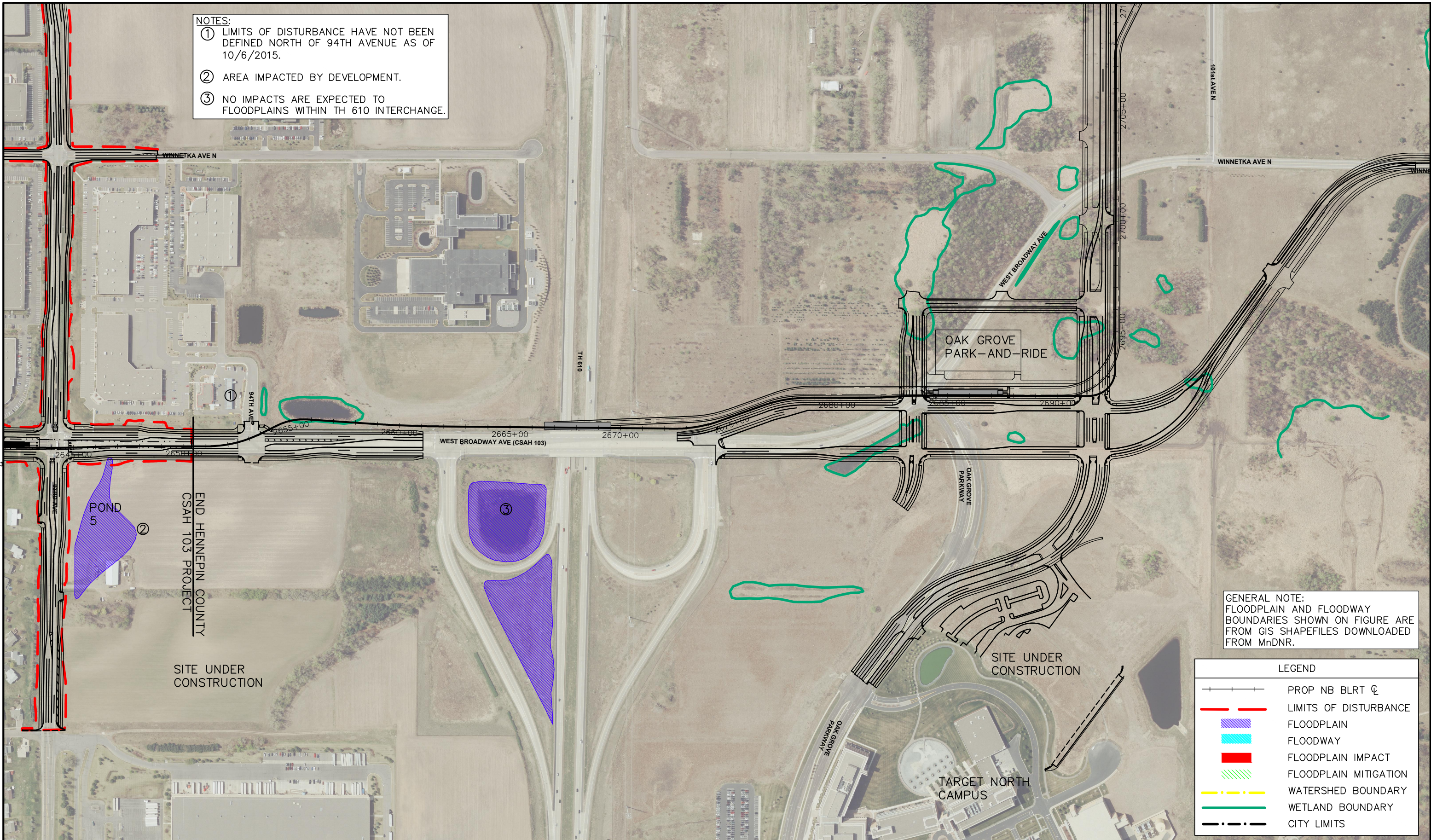


NOTES:

- ① LIMITS OF DISTURBANCE HAVE NOT BEEN DEFINED NORTH OF 94TH AVENUE AS OF 10/6/2015.
- ② AREA IMPACTED BY DEVELOPMENT.
- ③ NO IMPACTS ARE EXPECTED TO FLOODPLAINS WITHIN TH 610 INTERCHANGE.

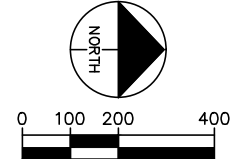
GENERAL NOTE:
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LEGEND	
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	LIMITS OF DISTURBANCE
	FLOODPLAIN
	FLOODWAY
	FLOODPLAIN IMPACT
	FLOODPLAIN MITIGATION
	WATERSHED BOUNDARY
	WETLAND BOUNDARY
	CITY LIMITS



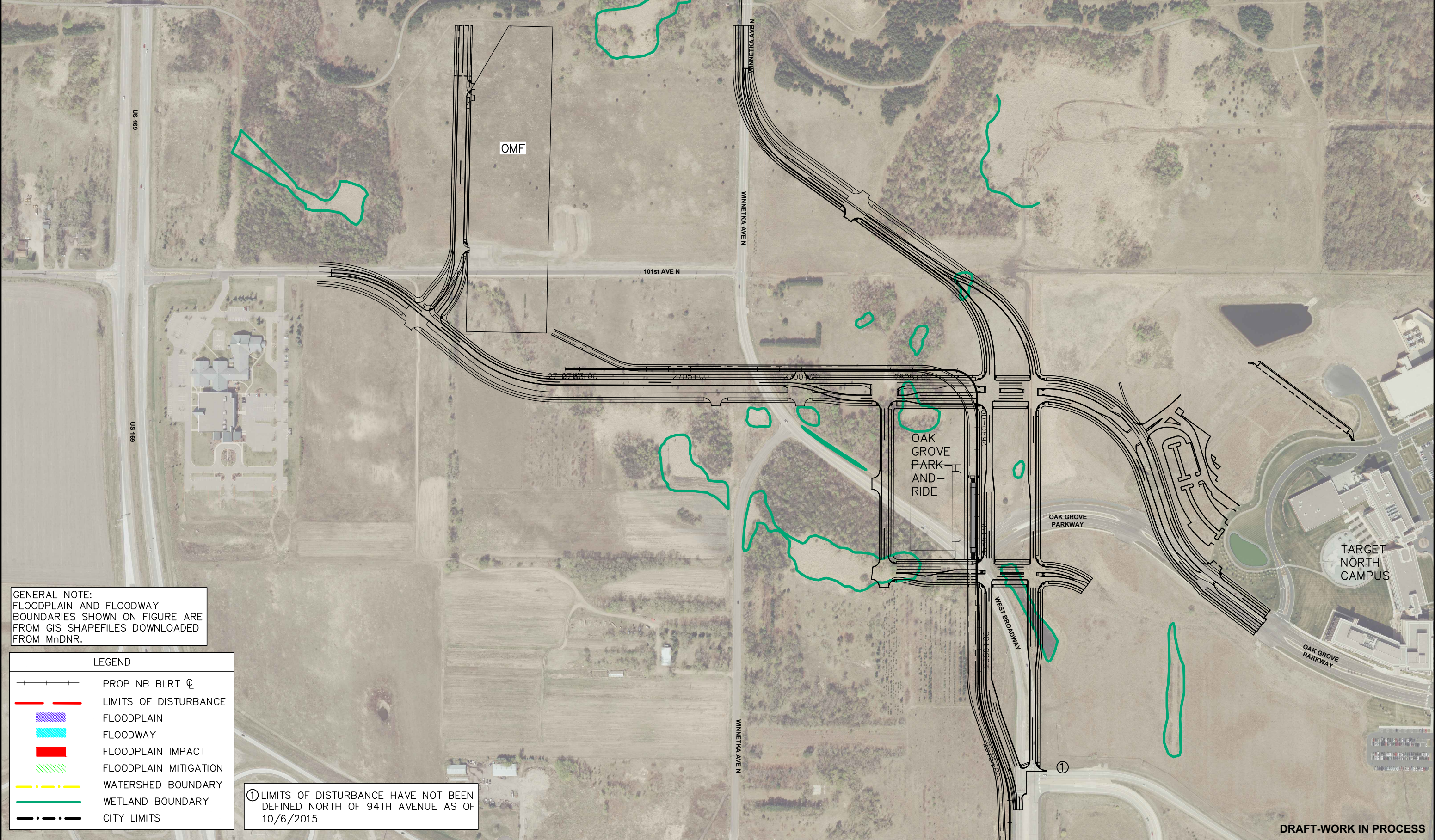
BLUE LINE LRT EXTENSION
FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
FIGURE 11 OF 12

10/7/2015



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GENERAL NOTE:
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 BOUNDARIES SHOWN ON FIGURE ARE
 FROM GIS SHAPEFILES DOWNLOADED
 FROM MnDNR.

LEGEND	
	PROP NB BLRT C
	LIMITS OF DISTURBANCE
	FLOODPLAIN
	FLOODWAY
	FLOODPLAIN IMPACT
	FLOODPLAIN MITIGATION
	WATERSHED BOUNDARY
	WETLAND BOUNDARY
	CITY LIMITS

① LIMITS OF DISTURBANCE HAVE NOT BEEN
 DEFINED NORTH OF 94TH AVENUE AS OF
 10/6/2015

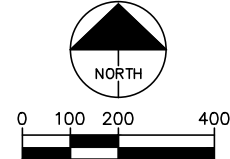
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BLUE LINE LRT EXTENSION

FLOODPLAIN IMPACTS AND MITIGATION STRATEGIES
 FIGURE 12 OF 12

10/7/2015





Technical Memorandum

METRO Blue Line LRT Extension (BLRT)

5514 West Broadway Avenue, Suite 200, Crystal, MN 55428 www.bluelineext.org

APPENDIX B. SUMMARY OF REGULATORY CRITERIA

Blue Line LRT Extension
 Water Resources - Regulatory Matrix - DRAFT
 2/5/2015
 Revised 10/5/2015

RFPE = Regulatory Flood Protection Elevation ⁽²⁾

Requirements Summary								
Organization	Applies to	Rainfall Data	Rate Control	Water Quality (1)	Volume Control	Floodplain/Flood Control Requirements	Plan Review Process	Comments
MWMO MWMO Watershed Management Plan 2011-2021, dated May 10, 2011	Segment M	TP-40 or "subsequent revisions"	Match pre-development rates for 2-, 10-, and 100-year; may be restricted to less than pre-development rates when the capacity of the downstream conveyance system is limited	Remove 90% TSS from 95th percentile daily rainfall total (1.17 in. over 24 hrs) over entire project area, or Alternate Compliance which involves payments and/or credits and is summarized in MWMO standards document	Includes statement: placeholder for future volume standard by ~ 2013	Public Roadway Condition - roadway shall not flood when adjacent to stormwater storage basin or subsurface stormwater management BMP designed to store the 100-year event. Freeboard requirement set by road authority. Alternative - minimum freeboard requirement above the 100-year HWL may be calculated as the height determined by adding depth of volume of runoff received by BMP from two-year event over the BMP.	The MWMO works with the member communities to ensure the implementation of its standards. The MWMO recommends members adopt its ordinance-ready MWMO Standards language into their local ordinances.	Note in the Standards Section that the MWMO will be working with agencies and its member organizations over the next 2.5 years to review or determine new water quality and volume standards.
BCWMC BCWMC 2015-2025 Watershed Management Plan, dated September 2015	Segment GV and Segment R	Atlas 14	Match existing rates for 2-, 10-, and 100-year events	Meet MIDS performance goals FOR LINEAR PROJECTS: Retention of whichever is greater: - 0.55 in from new or fully reconstructed areas or -1.1 in from the net increase in impervious areas If the MIDS performance goal is not feasible and/or is not allowed for a proposed project, then the project must implement the MIDS flexible treatment options, as shown in the MIDS Design Sequence Flow Chart	Meet MIDS performance goals FOR LINEAR PROJECTS: Retention of whichever is greater: - 0.55 in from new or fully reconstructed areas or -1.1 in from the net increase in impervious areas If the MIDS performance goal is not feasible and/or is not allowed for a proposed project, then the project must implement the MIDS flexible treatment options, as shown in the MIDS Design Sequence Flow Chart	Prohibits new structures or improvements in the floodplain, which would be subject to damage by the 100-year flood, including basements, public utilities, and streets. Where streets, utilities, and structures currently exist below the 100-year floodplain, BCWMC encourages member cities to remove these features as development/redevelopment allows. Projects within the floodplain must maintain no net loss to floodplain storage and no increase in flood level at any point along the trunk system. Prohibits expansion of existing non-conforming land uses within floodplain unless fully flood-proofed. OLD REQUIREMENTS DOC: Filling will generally not be allowed within the floodplain. Proposals to fill within the established floodplain must obtain BCWMC approval and must provide compensating storage and/or channel improvement so that the flood level shall not be increased at any point along the trunk system due to the fill	BCWMC reviews development/redevelopment proposals after project receives preliminary review by municipality indicating general compliance with existing local water management plan. Complex projects may require additional review time. All submittals involving floodplains, Bassett Creek trunk system, appropriations, variances, underground wet vaults or other alternative BMPs are presented at the BCWMC meetings.	Requirements for Improvements and Development Proposals' document has not been updated to match the revised standards in the 2015 Draft plan.

Requirements Summary								
Organization	Applies to	Rainfall Data	Rate Control	Water Quality (1)	Volume Control	Floodplain/Flood Control Requirements	Plan Review Process	Comments
SCWMC SCWMC Rules and Standards, dated April 2013	Segment C, Segment BP2, and Segment BP1	Atlas 14	Match existing rates for 2-, 10-, and 100-year events	Remove 60% of P and 85% of TSS Use NURP ponds or infiltrate all site runoff from 1.3-inch event NURP pond dead storage requirement is runoff from 2.5-inch storm event over the contributing drainage area Linear projects that create one acre or more of new impervious surface must meet all Commission requirements for the net new impervious surface .	1-inch of runoff from impervious surfaces. Linear projects that create one acre or more of new impervious surface must meet all Commission requirements for the net new impervious surface .	Floodplain alteration/filling shall not cause a net decrease in flood storage capacity below the 100-year critical flood elevation unless it is shown that the proposed alteration or filling, together with the alteration or filling of all other land on the affected reach to the same degree of encroachment will not cause high water or aggravate flooding on other land and will not unduly restrict flood flows.	The Commission reviews proposed land development and redevelopment projects affecting water resources. Projects are reviewed in accordance with the management standards and policies of the SCWMC and recommendations are made to the member City in which the project is located. It is the City's responsibility to enforce the Commission's recommendations. Linear projects that create one acre or more of new impervious surface must meet all Commission requirements for the net new impervious surface . Projects impacting wetlands where Commission is LGU must be reviewed regardless of size. Plans for developemtn within the 100-year floodplain as defined by the FIS must be reviewed.	
MPCA (via NPDES permit issued 8/1/2013) As of 2/5/2015, the impaired and special waters within 1 mile of corridor include: Shingle Creek Upper Twin Lake Middle Twin Lake Lower Twin Lake Crystal Lake Bassett Creek Mississippi River	All segments	N/A	N/A	Water quality volume of 1-inch of runoff from new impervious surfaces must be retained on site. If infiltration is prohibited, must use other methods of volume reduction and the water quality volume (or remainder if some volume reduction is achieved) must be treated by a wet sedimentation basin, filtration system, regional ponding or equivalent methods prior to discharge of stormwater to surface waters. If use wet sedimentation pond to provide treatment, dead storage requirement is 1800 cubic feet per acre of surface area drained.	Retain on site 1-inch of runoff from new impervious surfaces. If infiltration is prohibited, must use other methods of volume reduction and the water quality volume (or remainder if some volume reduction is achieved) must be treated by a wet sedimentation basin, filtration system, regional ponding or equivalent methods prior to discharge of stormwater to surface waters. NOTE: infiltration BMPs are prohibited when soil infiltration rates are > 8.3 in/hr unless the soil is amended to slow it down. See permit for other conditions that prohibit infiltration.	N/A	SWPPP must be submitted to MPCA for review if the project size is 50 acres or more and will discharge to special or impaired waters. Application and SWPPP must be submitted at least 30 days before the start of the construction activity.	The General Permit used to develop this matrix expires on 8/1/2018. It will be necessary to verify how any proposed changes in the permit would apply to this project.
Minnesota B3 Guidelines	OMF and park-and-ride buildings in all segments		Match runoff rates for the native soil and vegetation conditions for 2- and 10-year, 24 hr design storms	Remove 80% of post development TSS Remove 60% of post development TP	Retain 1.1 inches from all new or redeveloped impervious	N/A	N/A	Minimize the negative impacts of the project, both on and off site, by maintaining a more natural hydrologic cycle through infiltration, evapotranspiration, and reuse.

Requirements Summary								
Organization	Applies to	Rainfall Data	Rate Control	Water Quality (1)	Volume Control	Floodplain/Flood Control Requirements	Plan Review Process	Comments
<p>City of Minneapolis</p> <p>Email from Jeremy Strehlo, dated 1/23/15</p> <p>Minneapolis Floodplain Overlay District Ordinance (Chapter 551.540)</p> <p>Minneapolis Erosion and Sediment Control and Drainage Ordinance (Chapter 52)</p> <p>Minneapolis Stormwater Ordinance (Chapter 54)</p>	Segment M		<p>Maintain discharge rates at or below the existing rates.</p> <p>May be restricted to less than existing rates when the capacity of the downstream conveyance system is limited</p>	Remove 70% TSS	N/A	<p>Linear projects within the floodplain shall be designed to minimize increases in flood elevations and shall be compatible with local comprehensive floodplain development plans.</p> <p>Protection to the RFPE shall be provided where failure or interruption of public facilities would result in danger to public health or safety where facilities are essential to orderly functioning of the area.</p> <p>Conditional uses in Floodway District allowed provided such uses shall have a low flood damage potential, shall not cause an increase in the stage of the regional flood or cause an increase in flood damages in the reach(es) affected.</p>	<p>Must submit application and obtain approval for Storm Water Management Plan from the city engineer. Requirements are included in Chapter 54.70 of City Code.</p>	
City of Golden Valley	Segment GV		Must meet BCWMC standards.	Must meet BCWMC standards.	Must meet BCWMC standards.	<p>Linear projects may be located in the floodplain provided they are designed to minimize increases in flood elevation and are compatible with the BCWMC Management Plan. These uses can cause no increase in stage to the 100-year flood within the floodway and cannot increase the floodplain elevation by more than 1/2 foot in a designated Zone A or AE where a floodway has not been designated. Protection to the RFPE shall be provided where failure or interruption of these public facilities would endanger the public health or safety or where such facilities are essential to the orderly functioning of the area.</p>	<p>See BCWMC plan review process for information on stormwater management review.</p> <p>Floodplain alteration permit will be submitted to the City, which will then submit the information to the DNR Commissioner and BCWMC for review.</p>	

Requirements Summary								
Organization	Applies to	Rainfall Data	Rate Control	Water Quality (1)	Volume Control	Floodplain/Flood Control Requirements	Plan Review Process	Comments
City of Robbinsdale Robbinsdale 2030 Comprehensive Plan - Appendix IIIA Storm Water Management Plan	Segment R		Must meet SCWMC and BCWMC standards.	Must meet SCWMC and BCWMC standards.	Must meet SCWMC and BCWMC standards.	No structure, fill (including for roads and levees),..., or other uses may be allowed as a conditional use in the floodway that will cause any increase in the stage of the 100-year regional flood or cause an increase in flood damages in the reach(es) affected. Floodplain developments shall not adversely affect the hydraulic capacity of the channel and adjoining floodplain of any tributary watercourse or drainage system where a floodway or other encroachment limit has not been specified on the Official Zoning Map.	See SCWMC and BCWMC plan review process for stormwater management. Floodplain Alteration - must submit application for review to the City's Zoning Administrator and obtain all necessary State and Federal permits.	
City of Crystal 2009 Local Surface Water Management Plan and Land Use and Planning Ordinance	Segment C		Existing rates for 2-, 10-, and 100-year events; accelerated channel erosion will not occur as a result of the proposed land disturbing or development activity.	Detention facilities should have permanent pond surface area = to 2% of impervious area draining to pond, or 1% of entire area draining to pond, whichever is greater; Or as an alternative, the volume of permanent pool shall be equal to or greater than the runoff from a 2.0-inch rainfall for the fully developed site. Sequencing of preferred treatment options: infiltration, flow attenuation by using open space, stormwater retention, stormwater detention	LSWMP includes text that the City's ordinances need to be revised to include volume control standard that is in line with most restrictive between SCWMC and MPCA as it relates to discharge to impaired waters.	No structure, fill (including for roads and levees),..., or other uses may be allowed as a conditional use in the floodway that will cause any increase in the stage of the 100-year regional flood or cause an increase in flood damages in the reach(es) affected. Floodplain developments shall not adversely affect the hydraulic capacity of the channel and adjoining floodplain of any tributary watercourse or drainage system where a floodway or other encroachment limit has not been specified on the Official Zoning Map.	SCWMC and BCWMC review projects that fall within the watershed review authority. Crystal forwards development plans to the applicable watershed when received at the City.	
City of Brooklyn Park Email from Kevin Larson (City), dated 2/4/14 Flood Hazard Area Overlay Ordinance (152.510)	Segment BP1 and Segment BP2		Must meet SCWMC standards.	Must meet SCWMC standards.	Must meet SCWMC standards.	Railroad tracks, roads, and bridges must be elevated above the regulatory flood protection elevation where failure of facilities would result in danger to public healthy/safety or where facilities are essential to orderly function of area. None of these uses shall increase flood elevations. No fill, excavation, or storage of materials or equipment that obstruct flows or increase flood elevations will be permitted.	Must submit application to City Manager. SCWMC will review projects that fall within watershed review authority.	

(1) Wet stormwater pond design should follow the guidelines in the MPCA Stormwater Manual for dead storage depth, side slopes, and benches.

(2) Refers to an elevation 1 foot (minimum) above the 100-year flood plus any stage increase due to the designation of flood fringe areas. In Minnesota, the floodplain management ordinances (local regulations) require that the elevation of the surface of the lowest floor of a dwelling be at or above the regulatory flood protection elevation. Local regulations will also require the top of the access road elevations to be within 2 feet of the flood protection elevation.

All regulatory entities will have requirements for erosion and sediment control and at a minimum will refer back to the NPDES requirements.