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File:	Moorhead I-94 & 20th Street Interchange Analysis	Date:	October 18, 2023

Reference: Existing Conditions Memorandum

EXISTING CONDITIONS INVENTORY

PROJECT BACKGROUND

The interchange of Interstate 94 (I-94) with 20th Street/MSAS 126 is a half diamond interchange located in the City of Moorhead, Clay County, Minnesota. I-94 is an Interstate freeway running east and west through Moorhead, connecting Fargo and other cities North Dakota to cities through central Minnesota including the Twin Cities metropolitan area. 20th Street is a minor arterial running north and south through Moorhead and is one of the primary routes connecting I-94 to Moorhead's central business district and residential communities south and north of I-94. Currently, the interchange only serves trips to and from Fargo via a westbound on-ramp and eastbound off-ramp. Trips to and from the east can only be served at adjacent interchanges such as U.S. Highway 75 (US 75)/8th Street and 34th Street.

The Fargo-Moorhead Metropolitan Council of Governments (Metro COG) has proposed a study of the interchange to identify feasible alternatives to convert it into a full access interchange to alleviate potential capacity concerns at adjacent interchanges and improve connectivity within Moorhead and the region. Metro COG contracted Stantec to perform the interchange analysis to conceptualize interchange layouts and determine the preferred alternative that fulfills the needs of the interchange while remaining within site constraints. This technical memorandum summarizes the existing conditions inventory for the interchange. Further analysis of the existing conditions and interchange alternatives will be conducted and documented in the final report.

STUDY AREA

The primary study area for this project consists of the I-94 and 20th Street interchange including the existing ramp terminal intersections and freeway weaving segments. Due to its proximity, the Moorhead Travel Information Center/Rest Area located off the eastbound lanes of I-94 is also included in the primary study area. A secondary study area was also included in the project and includes the adjacent interchanges of I-94 with 8th Street/US 75, Main Avenue/I-94 Business, and 34th Street, as well as nearby adjacent intersections and the surrounding collector and arterial roadway network.

The study area and extents are shown in Appendix A.

EXISTING INTERCHANGE GEOMETRICS

The I-94 and 20th Street interchange is a half diamond interchange with a westbound on-ramp in the northwest quadrant and an eastbound off-ramp in the southwest quadrant. From Metro COG's GIS roadway

Reference: Existing Conditions Memorandum

database, I-94 is classified as an interstate, 20th Street is classified as a minor arterial, and 28th Avenue, the adjacent frontage road on the north side of I-94, is classified as a collector¹.

I-94 is a four-lane divided freeway with 12-foot through lanes, 4-foot inside shoulders, and 10-foot outside shoulders and has a speed limit of 55 mph. South of the interchange, 20th Street is briefly a four-lane undivided roadway then adds a two-way left-turn lane (TWLTL) 400 feet south of the southern ramp terminal intersection. This section has 11- and 12-foot through lanes, a 12-foot TWLTL, and curb and gutter. North of the interchange, 20th Street is a three-lane section with 12-foot through lanes, a 12-foot TWLTL, and curb and gutter. The transition from three lanes to four lanes occurs at the 20th Street overpass, with the southbound outside through lane added as a second receiving lane for the single through lane at the north ramp terminal intersection and the northbound inside through lane converting to a dedicated left turn lane after the south ramp terminal intersection. The speed limit along all of 20th Street is 30 mph. 28th Avenue is a two-lane roadway with 12-foot lanes and a speed limit of 30 mph. 20th Street has a right-of-way width of 80 feet.

The westbound on-ramp has a length of approximately 1,030 feet, a lane width of 15 feet, and a 5-foot inside shoulder. The westbound on-ramp enters I-94 as a weave section connecting through to the adjacent US 75 interchange with a marked length of approximately 2,600 feet and a lane width of 12 feet. The eastbound off-ramp has a length of approximately 1,690 feet, a lane width of 16 feet, and 4-foot shoulders. The eastbound off-ramp originates from I-94 as a weave section connecting from the adjacent US 75 interchange with a marked length of approximately 1,970 feet and a lane width of 12 feet.

The north and south ramp terminal intersections operate under signal control, with the north intersection consisting of the westbound on-ramp and 28th Avenue east of 20th Street and the south intersection consisting of the eastbound off-ramp only. The signals are interconnected along 20th Street with the 12th Avenue and Main Avenue signals. The intersection with 28th Avenue west of 20th Street is approximately 190 feet north of the north ramp terminal intersection, operates under side-street stop control, and is right-in right-out (RIRO) only. Signal timings for the ramp terminal intersections and for the 30th Avenue intersection were provided by the City of Moorhead and will be used in initial project analyses. The intersection with 28th Avenue west of 20th Street is approximately 190 feet north of the north ramp terminal intersection, operates under side-street stop control, and is right-in right-out (RIRO).

There are several accesses in the vicinity of the interchange that may be impacted by the layout or construction activities for this project. South of the interchange on 20th Street, there are two accesses serving Triumph Lutheran Brethren Church and a doctor's office on the west side approximately 280 and 440 feet south of the south ramp terminal intersection, with the northern access being RIRO only. North of the interchange on 20th Street, there is one access serving M-State on the west side approximately 640 feet north of the north ramp terminal intersection. Another access for M-State is located on the north side of 28th Avenue approximately 600 feet west of 20th Street. On 28th Avenue east of 20th Street, Ken's Sanitation and Recycling and Gavilon Fertilizer have three accesses located on the north side approximately 260, 500, and 560 to the east of the intersection.

The Moorhead Travel Information Center/Rest Area is located approximately 1,600 feet east of 20th Street on the eastbound side of I-94 with the off-ramp located approximately 2,220 feet east of the 20th Street interchange eastbound off-ramp. The on-ramp exiting the rest area begins approximately 1,350 feet east of the rest area off-ramp and enters I-94 as a weave section connecting to the Main Avenue and 34th Street interchanges. The off-ramp diverge taper is 240 feet long and the weave section is marked at 5,090 feet long extending fully to the 34th Street off-ramp, with the Main Avenue ramp beginning at approximately 2,230 feet.

¹ Metro COG GIS Roadway Database

Reference: Existing Conditions Memorandum

The rest area has separate loops for passenger car and combination truck traffic leading to their designated parking areas.

Functional classifications for the roadways in the interchange area are shown in Appendix B. Existing interchange geometrics and traffic signal timings are shown in Appendix C.

EXISTING ACTIVE TRANSPORTATION FACILITIES

Pedestrian and bicycle facilities are present in the interchange area. Sidewalk is present along the west side of 20th Street between 24th Avenue and 30th Avenue. The sidewalk is five feet wide, is separated from the back of curb, and shares the bridge with 20th Street as it passes over I-94. Shared use paths are present along 20th Street between adjacent streets and along the south side of 28th Avenue east of 20th Street. The shared use paths are ten feet wide and separated from the back of curb. The shared use path along 20th Street has a dedicated bridge over I-94. 28th Avenue west of 20th Street has painted on-street bicycle lanes. Marked crosswalks are present at both ramp terminal intersections with one crossing the eastbound off-ramp at the south intersection and three crossing the westbound on-ramp, the south leg of 20th Street, and 28th Avenue at the north intersection. These crossings have Accessible Pedestrian Signal (APS) pushbuttons and pedestrian signal phases. Appendix D shows existing bicycle and walking paths and routes within the corridor's vicinity.

A 'Parks and Trails Framework' was developed in the 2045 Fargo-Moorhead Transportation Plan to create a network of parks, pathways, and trails throughout Moorhead. The transportation plan outlines the goal to create complete streets with improved traffic flow and safer pedestrian facilities. I-94 creates a barrier for active transportation users where there are limited crossing opportunities, therefore future improvements to the 20th Street interchange should maintain and enhance pedestrian and bicycle safety and connectivity within the community, especially in the vicinity of Minnesota State Community and Technical College (M-State) which may potentially generate a high number of active transportation trips.

MATBUS is the transit provider in the Fargo-Moorhead metro area and has one fixed route that enters the interchange area. Route 5 serves destinations in southern Moorhead and circles around M-State, crossing I-94 on 20th Street in both directions. The route travels eastbound on 28th Avenue and turns right onto 20th Street, serving a sheltered bus stop across from M-State approximately 560 feet west of 20th Street adjacent to the westbound on-ramp. The route runs on 30-minute headways from about 6:00 AM to 10:00 PM on weekdays and 7:00 AM to 10:00 PM on Saturdays. MATBUS routes and timetables are shown in Appendix E. Local school bus routes also run through the interchange area that utilize 28th Avenue.

EXISTING INTELLIGENT TRANSPORTATION SYSTEMS

There are no existing intelligent transportation systems (ITS) in the vicinity of the interchange or along I-94 through Moorhead.

EXISTING BRIDGES

There are three bridges within the interchange area. Information about each bridge is shown in the following sections:

- **Bridge No. 14811: 20th Street (MSAS 126) over I-94** – This bridge was built in 1973, is 231.5 feet long and 59 feet wide. The bridge carries four lanes of vehicle traffic and includes a raised sidewalk on the west side. The detour route length is four miles. The condition ratings from the current Structure Inventory Report are shown below. The underclearance rating of 5 is a due to the providing less vertical clearance (16.1 feet) than the current minimum standard of 16'-6".

Reference: Existing Conditions Memorandum

+ NBI CONDITION RATINGS +	
Deck	7
Superstructure	8
Substructure	7
Channel	N
Culvert	N
+ NBI APPRAISAL RATINGS +	
Structure Evaluation	6
Deck Geometry	6
Underclearances	5
Waterway Adequacy	N
Approach Alignment	8

- **Bridge No. 14530: Pedestrian Bridge over I-94** – This bridge was built in 1995, is 232 feet long and 12.3 feet wide. The bridge carries a 10-foot wide shared-use path over I-94. The condition ratings from the current Structure Inventory Report are shown below. This bridge provides 16.8 feet of vertical clearance over I-94, slightly less than the current standard of 17'-4" for pedestrian bridges.

+ NBI CONDITION RATINGS +	
Deck	8
Superstructure	8
Substructure	8
Channel	N
Culvert	N
+ NBI APPRAISAL RATINGS +	
Structure Evaluation	8
Deck Geometry	N
Underclearances	6
Waterway Adequacy	N
Approach Alignment	N

- **Bridge No. 9477: Burlington Northern Santa Fe (BNSF) Railroad over I-94** – This bridge was built in 1960, is 238 feet long, and 18.5 feet wide. The bridge carries the Burlington Northern Santa Fe (BNSF) East Breckenridge-South Moorhead Line single track over I-94. The condition ratings from the current Structure Inventory Report are shown below. The underclearance rating of 4 is a due to the providing less vertical clearance (16.1 feet) than the current minimum standard of 16'-6".

Reference: Existing Conditions Memorandum

+ NBI CONDITION RATINGS +	
Deck	7
Superstructure	6
Substructure	7
Channel	N
Culvert	N
+ NBI APPRAISAL RATINGS +	
Structure Evaluation	6
Deck Geometry	N
Underclearances	4
Waterway Adequacy	N
Approach Alignment	N

The Structure Inventory Reports for the three bridges are included in Appendix F.

EXISTING UTILITIES AND DRAINAGE

In the vicinity of the interchange, overhead transmission power lines are present along the south side of I-94, on the south side of the eastbound off-ramp, and along the east side of 20th Street. This set of power lines connects to a sub-station adjacent to the eastbound off-ramp approximately 800 feet west of 20th Street. An additional overhead service power line runs parallel to 20th Street east of the railroad. Signal hardware is present in the interchange area to service the ramp terminal intersection signals. Various underground utilities are also present in the interchange area, including power lines, communications lines (fiber optic, telephone, and cable), petroleum pipelines, and water supply lines, particularly around the west ramp terminal intersection in the northwest quadrant.

Lighting is present along 20th Street consisting of luminaires with a spacing ranging from approximately 110 to 210 feet and luminaires at the ramp terminal intersections. No lighting is present immediately near the railroad or shared-use path crossings.

A water tower is located near the interchange in the northeast quadrant of the westbound on-ramp intersection east of Ken’s Sanitation and Recycling.

20th Street and the overpass have an urban drainage system with curb and gutter and catch basins that flows into the interchange area and to County Ditch 30 north of I-94 and the ditch south of I-94, or to the urban storm sewer systems north and south of the interchange. Drainage along the I-94 mainline in the interchange area flows into a storm sewer system and to a lift station in the southeast quadrant of the interchange, where it flows into the south ditch. Outside the interchange area, I-94 flows into the ditches through culverts.

EXISTING FREIGHT, EMERGENCY SERVICES, AND RAILROAD

I-94 is a major interstate highway that serves regional, national, and international freight truck traffic, particularly between the Midwest, western U.S., and Canadian Prairies. 20th Street serves as an unofficial harvest truck route in the fall and serves businesses with frequent heavy vehicle activity, including Ken’s Sanitation and Recycling, Gavilon Fertilizer, and the Anheuser-Busch Malt Plant.

Reference: Existing Conditions Memorandum

Some emergency services are present in the vicinity of the interchange. The Moorhead Fire Department Southside Fire Station is located on 20th Street near the intersection with 24th Avenue. Along with other city emergency services, 20th Street is a primary route to access areas of Moorhead south of I-94. With few alternate I-94 crossings, maintenance of traffic during construction will be essential to maintain access to emergency services. Additionally, 20th Street is identified as a primary snow emergency route and thus will be prioritized in maintaining operations during snow events. A map of snow emergency routes is shown in Appendix G.

An active freight railway runs parallel to 20th Street approximately 120 feet east of the centerline. The railway crosses I-94 with a dedicated bridge and crosses 28th Avenue and its adjacent shared use path with an at-grade crossing. This crossing has vehicle and pedestrian warning gates and vehicle channelization. The railway is identified as the East Breckenridge-South Moorhead Line in the Moorhead Subdivision operated by BNSF under their Twin Cities Division. An estimated eight trains use this line in a 24-hour period with a maximum speed of 60 mph at the 28th Avenue crossing. Two crashes were reported at this crossing location in the past 20 years. One crash occurred in 2005 involving a combination truck and the most recent crash occurred in 2008 involving a light pickup truck. Both crashes resulted only in property damage. Railway crossing data and crash data is shown in Appendix H.

TRAFFIC DATA

Historic average annual daily traffic (AADT) volumes within the interchange area were obtained from MnDOT's Traffic Mapping Application and are shown in Table 1.

Table 1 – Historic Average Annual Daily Traffic (AADT) Volumes ²	
Count Location	AADT (Year)
I-94 Mainline West of Interchange Ramps	56,808 (2021)
I-94 Mainline East of Interchange Ramps	38,816 (2021)
20 th Street South of Interchange Ramps	22,815 (2021)
20 th Street North of Interchange Ramps	14,400 (2017)
Eastbound Off-ramp	4,367 (2021)
Westbound On-ramp	4,901 (2021)
28 th Avenue East of 20 th Street	8,527 (2021)
28 th Avenue West of 20 th Street	1,500 (2019), 980 (2020)

Turning movement counts were collected by Stantec using video collected by Metro COG for the two ramp terminal intersections of the interchange. Video was collected for 24 hours on Thursday, May 4, 2023. Counts were collected during the AM (7:00 – 9:00 AM), mid-day (11:00 AM – 1:00 PM), and PM (4:00 – 6:00 PM) in 15-minute intervals to determine the peak hour volumes of the two intersections. Counts included vehicle classes sorted by passenger cars/light duty pickup trucks, single-unit trucks, and combination trucks. Volumes were balanced between the two intersections. Pedestrian and bicycle counts were also collected using the same video data. These counts were taken over 24 hours in 15-minute intervals to determine the number of pedestrians and bicycles on each side of 20th Street (on the sidewalk and shared-use path) and their direction of travel. In 24 hours, 36 pedestrians and 28 bicycles used the sidewalk on the west side of 20th Street and 29

² <https://www.dot.state.mn.us/traffic/data/tma.html>

Reference: Existing Conditions Memorandum

pedestrians and 54 bicycles used the shared-use path on the east side. Peak hour turning movement counts, pedestrian and bicycle counts, and detailed raw count data is shown in Appendix I.

To estimate the 2023 AADT of the ramp terminal intersection legs listed in Table 1, factors were developed by comparing the 2021 AADT to peak hour turning movement counts that were collected by Metro COG on Tuesday, September 14, 2021. This calculation accounted for variability throughout the year by applying seasonal adjustment factors obtained by MnDOT³ of 0.93 for September and 0.97 for May. For 20th Street north of the interchange ramps, since the AADT was calculated for 2017, an additional growth factor was applied to estimate 2021 AADT at a growth rate of 0.84% per year. Table 2 shows the estimated 2023 AADT of the ramp terminal intersection legs. Detailed AADT estimation calculations are shown in Appendix I. The significant volume difference between 2021 and 2023 estimated AADT on 20th Street north of I-94 is likely due to the 20th Street rail grade separation project completed in 2022. The slight volume decrease between 2021 and 2023 for the eastbound off-ramp is likely due to variation in travel or commuting patterns resulting from the later stages of the COVID-19 pandemic.

Table 2 – Historic Average Annual Daily Traffic (AADT) Volumes		
Count Location	Historic AADT (Year), Est.	2023 Estimated AADT
20 th Street South of Interchange Ramps	22,815 (2021)	24,810
20 th Street North of Interchange Ramps	14,400 (2017), 14,900 (2021)	19,530
Eastbound Off-ramp	4,367 (2021)	4,190
Westbound On-ramp	4,901 (2021)	5,100
28 th Avenue East of 20 th Street	8,527 (2021)	8,750

ORIGIN-DESTINATION DATA

Origin-destination data obtained from Metro COG’s Streetlight subscription will be used to determine the travel patterns of local traffic, particularly between the adjacent interchanges. Future volume analysis will include examining origin-destination data and determining the traffic volumes to and from the east that adjust their route from an adjacent interchange to the newly opened eastern ramps at 20th Street. More details on this data will be included in subsequent project analyses and reports.

CRASH DATA

A review of the crash data for the interchange area over a five-year period from 2018 through 2022 was completed. Crash data was obtained from the MnDOT crash database using the Minnesota Crash Mapping Analysis Tool (MnCMAT2). Data was obtained for the two ramp terminal intersections and for a section of the I-94 mainline which constitutes the influence area of the interchange and rest area ramps. The mainline was divided into two segments based on AADT volumes. The first segment (west segment) begins at the start of the weave area at the US 75 east ramps 3,900 feet west of 20th Street and ends at the merge point of the 20th Street westbound on-ramp, equaling approximately 0.55 miles. The second segment (east segment) begins at the westbound on-ramp merge point and ends at the end of the weave area at the Main Avenue ramps 4,400 feet east of 20th Street, equaling approximately 1.03 miles. These segments capture weaving behavior between adjacent interchanges. While outside the primary study area, due to its proximity, the RIRO

³ https://www.dot.state.mn.us/traffic/data/reports/vc/Seasonal_Adjustment_Factors.pdf

Reference: Existing Conditions Memorandum

intersection of 28th Street west of 20th Street was also examined for crashes, but no crashes were reported there between 2018 and 2022.

Crashes were reviewed for accuracy, which included verifying the crash type, vehicle directions, and relation to intersections and segments. A summary of reported crashes is provided in Table 3 and discussed in more detail below. MnDOT crash data and a map of the segments and crashes are included in Appendix J.

Between 2018 and 2022, there were no reported pedestrian or bicycle related crashes in the vicinity of the interchange. It is important to note that it can be difficult to identify crash trends for transportation modes other than vehicles, such as pedestrians and bicycles. Additionally, many pedestrian/bicycle crashes go unreported. Therefore, the absence of reported pedestrian/bicycle crashes in a five-year period of crash data does not necessarily indicate safe conditions for these users.

Table 3 – Interchange Area Crash Data, 2018 – 2022						
	Number of Crashes					
	Fatal	Personal Injury*			Property Damage	Total Crashes
		Type A	Type B	Type C		
<i>Segments</i>						
I-94 Mainline West Segment	0	0	2	5	43	50
I-94 Mainline East Segment	1	1	6	2	37	47
<i>Intersections</i>						
20 th St & 28 th Ave WB on-ramp	0	0	0	1	10	11
20 th St & EB off-ramp	0	0	0	2	6	8

*Personal Injury Crashes include Type A (Serious Injury), Type B (Minor Injury), and Type C (Possible Injury).

The five-year crash and severity rates for each segment and intersection were compared to the five-year statewide average rates and the five-year critical rates for similar segments and intersections. Locations with crash or severity rates above the critical rates are generally considered in need of safety improvements. The crash rate is expressed in crashes per million vehicle miles traveled (MVMT) and per million entering vehicles (MEV) for segments and intersections, respectively. The severity rate is expressed in fatal and serious injury crashes per 100 million vehicle miles traveled (100 MVMT) and per 100 million entering vehicles (100 MEV) for segments and intersections, respectively. The results are shown in Table 4. Crash calculation sheets are also included in Appendix J.

Reference: Existing Conditions Memorandum

Table 4 – Crash Rates 2018 – 2022						
Location	Crash Rates (per MVMT/MEV)			Severity Rates (per 100 MVMT/100 MEV)		
	Observed Crash Rate	Average Statewide Crash Rate*	Critical Crash Rate**	Observed Severity Rate	Average Statewide Severity Rate*	Critical Severity Rate**
<i>Segments</i>						
I-94 Mainline West Segment	0.877	0.944	1.280	0.000	0.592	2.780
I-94 Mainline East Segment	0.641	0.944	1.240	2.727	0.592	2.430
<i>Intersections</i>						
20 th St & 28 th Ave WB on-ramp	0.263	0.592	0.910	0.000	0.824	3.820
20 th St & EB off-ramp	0.161	0.592	0.880	0.000	0.824	3.480

*Average crash rates based on crash rates from MnDOT 2016-2020 Intersection and Section Toolkits.

**Critical crash rates give an indication of the statistical significance of the crash rate. Locations with a crash rate above the critical crash rate are considered to be in need of safety improvements because there is a high probability that conditions at this location are contributing to the higher crash rate.

The predominant crash patterns, trends, and types of crashes were identified and are summarized below:

- The observed crash rates for the I-94 segments and ramp terminal intersections were all below the critical crash rates for similar segments and intersections. Only the east segment of the I-94 mainline had a severity rate that was above the critical rate due to one fatal and one serious injury crash.
- The fatal crash occurred on the east segment of the mainline and involved two combination trucks and an SUV where one truck lost the ability to brake and rear ended the SUV into the other truck. The SUV occupants were killed in the crash. The serious injury crash involved a single vehicle rollover at high speeds following a police chase while the driver was under the influence of alcohol.
- Out of 97 reported crashes on the mainline, run off road/single vehicle crashes (59) were the most common crash type. Other crash types include rear end crashes (24) and sideswipe crashes (14). Ten mainline crashes were likely related to vehicles entering or exiting the highway within the weave sections, mostly between 20th Street and US 75 and resulting only in possible injury and property damage.
- There was a higher concentration of rear end crashes on the mainline segment west of 20th Street, some of which were related to traffic congestion and backups that are known to frequently occur in the westbound direction in the area of the I-94 bridge over the Red River.

Reference: Existing Conditions Memorandum

- There were 19 total intersection related crashes at the two ramp terminal intersections. The most common crash type at the intersections were rear end crashes (10). Other crash types include angle crashes (5), sideswipe crashes (3), and one head-on crash. Two rear-end crashes and one angle crash resulted in possible injury.

LAND USE AND ZONING

Existing zoning surrounding the interchange includes parcels in the northeast quadrant zoned as Regional Commercial (RC) and Heavy Industrial (HI), in the northwest quadrant as Institutional (INS), in the southeast quadrant as Residential Low Density 1 and 2 (RLD1 & RLD2), and in the southwest quadrant as Institutional (INS), Community Commercial (CC), and Residential High Density 1 (RHD1).

Existing land use occupying the parcels is generally consistent with zoning, with a Ken's Sanitation and Recycling, Gavilon Fertilizer, and the Anheuser-Busch Malt Plant in the northeast quadrant, M-State in the northwest quadrant, a single-family and duplex home neighborhood in the southeast quadrant, and Triumph Lutheran Brethren Church, commercial properties, and multi-family apartment buildings in the southwest quadrant. Future land use highlighted in the 'City of Moorhead 2022 Comprehensive Plan' is also generally consistent with existing land use and zoning. Existing zoning and future land use is shown in Appendix K.

Additionally, the Moorhead Travel Information Center/Rest Area located off the eastbound lanes of I-94 is approximately 1,600 feet east of 20th Street. The rest area allows travelers entering Minnesota to stop for restrooms, vending, a picnic area, and tourist information, and has parking for passenger cars and combination trucks. Traffic volumes entering and exiting the rest area were collected on Tuesday, September 14, 2021 in 15-minute intervals. The volumes show in the AM peak hour of rest area traffic 15 entering and 25 exiting vehicles with 32-33% heavy vehicles and in the PM peak hour 20 entering and 23 exiting vehicles with 13-15% heavy vehicles. Rest area raw count data is shown in Appendix I.

ENVIRONMENTAL CONSIDERATIONS

Environmental features in the vicinity of the interchange were identified and briefly reviewed to ensure they are considered in the development of alternatives and impacts to them are understood.

Wetlands were identified and classified using the National Wetlands Inventory (NWI) Wetlands Mapper⁴. A Riverine habitat is present to the north of I-94 running east and west starting from the west end of the primary study area, entering a culvert in between the westbound on-ramp and 28th Avenue, and daylighting outside of the study area east on the rest area. A 0.54-acre Freshwater Emergent Wetland habitat is present in the southeast quadrant of the interchange immediately east of the railroad and south of I-94. A 0.35-acre Freshwater Emergent Wetland habitat is present immediately southeast of the off-ramp entering the rest area. Additional Freshwater Pond habitats are present east of the study area along the south side of I-94 and along the south side of 28th Avenue. A map of wetlands is shown in Appendix L.

Floodplains were identified using the FEMA Flood Map Service Center⁵. Most of I-94 in the interchange area and portions of the ramps lie within Flood Zone X 'Other Flood Areas', which describes areas of 0.2% (500 year) annual chance of flood, areas of 1% (100 year) annual chance of flood with average depths of less than one foot or with drainage areas less than one square mile, and areas protected by levees from 1% (100 year) annual chance of flood. A map of floodplain is shown in Appendix L.

⁴ <https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/>

⁵ <https://msc.fema.gov/portal/home>

Reference: Existing Conditions Memorandum

Contaminated sites were identified using the Minnesota Pollution Control Agency (MPCA) What's in My Neighborhood map⁶. Various types of pollutants were identified from active and inactive sites. Construction stormwater pollution was noted for construction activity on I-94, 20th Street, 28th Avenue, and the M-State parking lot expansion/replacement, of which only the M-State site is active. Ken's Sanitation and Recycling was identified for having pollution involving underground tanks, industrial stormwater pollution, and hazardous waste, of which the stormwater is active and the hazardous waste is active, but a minimal quantity generator. MacroSource/Gavilon Fertilizer was identified for having pollution involving aboveground tanks, air quality, industrial stormwater pollution, and toxics reduction, all of which are active. Lastly, several properties on 29th Street adjacent to I-94 and the eastbound off-ramp were identified for having hazardous waste and petroleum remediation as part of a leak site, all of which are inactive.

Apart from the previously identified rest area and shared-use paths along 20th Street and 28th Avenue, there are no parks or recreation areas within the interchange area. Community amenities including schools are limited to M-State in the northwest quadrant of the interchange and the rest area.

Environmental Justice (EJ) categories were examined using the EPA Environmental Justice Screening and Mapping Tool⁷ and data provided by Metro COG. The area in the southwest quadrant of the interchange is above the 50th percentile in populations of people of color, low income, and higher unemployment rate. The area in the southwest quadrant has approximately a 30 percent minority population. The area in the northwest quadrant is above the 50th percentile in populations of low income and age over 64. Maps of EJ areas are shown in Appendix L.

PREVIOUS STUDIES

Several related studies within the primary and secondary study areas were performed prior to the I-94 and 20th Street Interchange Analysis, including the following:

- **TH 75 and 20th Street Corridor Study Report (2008)** – This study identified future improvement needs along 20th Street from Main Avenue to 60th Avenue, including the ramp terminal intersections. The study concluded that the preferred 20th Street cross section through the interchange is a four-lane divided section with continuous median and turn lanes, and the preferred 20th Street interchange layout is a conversion to a full access interchange with a new westbound off-ramp in the northeast quadrant with a 'Button Hook Connection' to 28th Avenue and a new eastbound on-ramp loop in the southwest quadrant, which would not meet MnDOT design standards due to a reduced radius to minimize impacts to surrounding parcels.
- **Moorhead East Growth Area AUAR (2018)** – The AUAR examined future land development scenarios of an over 4,000-acre area of eastern Moorhead Township and southern Dilworth east of 34th Street. While outside the study area of the 20th Street interchange, the development scenarios may influence the forecasted traffic expected to travel through the interchange.
- **2045 Metro Grow: Fargo-Moorhead Metropolitan Transportation Plan (2019)** – This latest long-range transportation plan includes transportation planning strategies to shape the Fargo-Moorhead area transportation network for the next 20 years. While no specific recommendations are made to the 20th Street interchange, the plan generally prioritizes collaborating with MnDOT to improve/

⁶ <https://mpca.maps.arcgis.com/apps/webappviewer/index.html>

⁷ <https://ejscreen.epa.gov/mapper/>

Reference: Existing Conditions Memorandum

preserve uninterrupted traffic flow on I-94 and creating transportation facilities that promote multimodal inclusion.

- **US 10/75 Corridor Study (2020)** – This study developed context sensitive solutions for US 75 north of I-94, the concurrent route section in downtown Moorhead, and US 10 east of downtown. While the study does not cover 20th Street, the recommendations for these two major corridors may influence future traffic patterns on 20th Street and at the interchange.
- **Interstate Operations Analysis Report (pending completion in 2023)** – This report covers a high-level study of interstate operations in the Fargo-Moorhead area to identify prioritized improvements to improve safety, traffic operations, and mobility, including along I-94 through Moorhead. The study identifies that the 20th Street interchange may have local access and connectivity needs that warrant conversion to a full access interchange and selected the interchange to be a mid-term project to occur concurrently with the I-94 reconstruction and expansion to a six-lane freeway facility. Forecast traffic volumes from this study developed using the Advanced Traffic Analysis Center's (ATAC) 2045 Fargo-Moorhead Travel Demand Model (TDM) and accounting for conversion of the 20th Street interchange to full access will be used in the I-94 and 20th Street Interchange Analysis for estimating operational performance of the developed interchange alternatives.

CONCLUSIONS

The following is a summary of conclusions drawn from the Existing Conditions Inventory:

- The purpose of the I-94 & 20th Street Interchange Analysis is to determine the preferred alternative from a list of feasible alternatives to convert the interchange into a full access interchange, alleviating potential capacity concerns at adjacent interchanges and improving connectivity within Moorhead and the region.
- The existing interchange is a half diamond interchange with a westbound on-ramp and eastbound off-ramp that serves traffic to and from Fargo. I-94 is a four-lane freeway and 20th Street is four lanes south of the interchange and three lanes to the north. The ramp terminal intersections are signalized. The existing ramps connect to I-94 via weaving section that continues to the adjacent US 75 interchange. The northern ramp terminal intersection includes 28th Avenue on its eastern leg. A BNSF railroad is adjacent to 20th Street 120 feet to the east. A shared-use path is also adjacent to 20th Street and passes over I-94 on a dedicated bridge and 20th Street has an adjacent sidewalk.
- The Moorhead Travel Information Center/Rest Area is approximately 1,600 feet east of 20th Street. The on-ramp exiting the rest area connects with I-94 via a weaving section that continues to the adjacent Main Avenue and 34th Street interchanges.
- Peak hour vehicle turning movement counts and 24-hour bicycle and pedestrian counts were collected for 2023. They will be used in further operational analysis and will be compared to the 2021 counts collected by Metro COG. Rest area entry and exit volume counts were also collected in 2021. 2045 forecast traffic volumes developed in the pending Interstate Operations Analysis Report using the Fargo-Moorhead TDM will be used to estimate full access interchange volumes. Origin-destination data from Streetlight will also be examined.
- Crash data collected between 2018 and 2022 was reviewed for the mainline and for the ramp terminal intersections of the 20th Street interchange. Observed crash rates were all below the critical

Reference: Existing Conditions Memorandum

rates for similar segments and intersections except for the mainline segment east of the ramps, which had a severity rate that was above the critical rate due to one fatal and one serious injury crash occurring. These crashes were likely not attributable to interchange traffic. Ten mainline crashes were likely related to ramp traffic entering and exiting the mainline at the weaving sections, mostly between 20th Street and US 75 and resulting in lower severity crashes. The most common crash type at the ramp terminal intersections was rear-end, followed by angle. Although no pedestrian or bicycle crashes were reported, this does not indicate safe conditions for these users.

- Adjacent zoning and land uses to the interchange are a mixture of commercial, industrial, institutional, and residential. Some environmental features were identified that may weigh into the consideration of alternatives and construction, including wetlands, contaminated sites, and adjacent community amenities.

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Attachment: Appendices