Interchange Justification Report

Interstate 29 at 85th Street- Exit 74

Sioux Falls, SD

SEH No. 132589

October 1, 2018

Prepared by: Short Elliott Hendrickson Inc.

Executive Summary

The Interchange Justification Report (IJR) for the Interstate 29 and 85th Street - Exit 74 outlines the purpose, need and technical evaluation of the proposed new interchange in accordance with current FHWA requirements.

In 2010, the City of Sioux Falls and SDDOT initiated an I-29 Corridor Study to determine if it was feasible and reasonable to coordinate a new local service interchange near the I-29/I-229 System Interchange. Results of that study indicated the most technically feasible location for a new access to I-29 was the 85th Street corridor. Other options included the 57th Street and 69th Street corridors which were dismissed as not feasible to implement. The study did conclude an overpass of I-29 at the 69th Street corridor was feasible. Since completion of that study the SDDOT has completed system capacity improvements to the I-29 and I-229 corridors. In addition, the South Dakota Department of Transportation (SDDOT) has completed an Environmental Assessment (EA) for the 85th Street overpass of I-29.

The primary need for the proposed I-29 and 85th Street interchange has been identified as:

- Transportation Demand – construct an interchange that will be consistent with the City/MPO's long range transportation plan and support the high growth development demands that are planned in the study area.
- Limited access – improve access opportunities to the freeway to best support the local roadway network, balancing traffic demands throughout the network versus funneling to only currently available freeway access locations.
- Economic Development – allow the region to capitalize on a major development opportunity, creating the ability to maximize land use potential which is contingent on improved access and system capacity.
- Safety – improved freeway access and overall system capacity lead to improved safety for all users.

In the latest MPO Long Range Transportation Plan (LRTP) update (2015) targeted development areas within the region have shifted more to the southwest part of the region and over recent years there has been significant development occurring on the southern fringe of Sioux Falls, including within the study area. Based on updated land development plans for the region, many portions of the study area are projected to develop to urban-scale development densities providing substantial employment opportunities in the office, retail, medical sectors, as well as moderate to high density housing development. Without new access from I-29 for this area, mobility to and through this high demand development area will decline as traffic volumes increase, congestion worsens and safety concerns rise.

Through the technical evaluation of traffic forecasting, capacity analysis for freeway and arterial networks and alternative interchange configurations; the most technically feasible interchange configuration at 85th Street is proposed as a Diverging Diamond Interchange (DDI). The configuration also includes a connector ramp from southbound I-229 to the 85th St. exit ramp and a braided exit ramp from southbound I-29. Estimated construction cost for this interchange in 2016 dollars is approximately $23M. Future interstate improvements needed to mitigate the impacts of a new interchange, including adding auxiliary lanes once full build-out of the development area is recognized, are estimated at $5M. Future local arterial improvements will also be needed to support development growth with or without the proposed interchange, as detailed in the report.

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Interchange Justification Report

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Prepared by Short Elliott Hendrickson Inc. (SEH) for the 85th Street Business Joint Venture (85th St. JV) in cooperation with the Federal Highway Administration (FHWA), the South Dakota Department of Transportation (SDDOT), the City of Sioux Falls, the City of Tea, and Lincoln County, SD.

1.0 Introduction

The 85th St. JV in cooperation with the FHWA, SDDOT, City of Sioux Falls, City of Tea and Lincoln County has initiated an assessment of the proposed interchange on Interstate 29 (I-29) in Lincoln County, South Dakota.

This interchange justification report (IJR) is the culmination of several steps that have been completed to document the benefits and impacts associated with the proposed new interstate access. This document was completed following the outline provided in the FHWA August 2010 *Interstate System Access Informational Guide* and meets the requirements of the *Access to the Interstate System* policy printed in the Federal Register on August 27, 2009.

1.1 Background

In 2010, the City of Sioux Falls and SDDOT initiated an I-29 Corridor Study to determine if it was feasible and reasonable to coordinate a new local service interchange near the I-29/I-229 System Interchange.

Proposed alternatives were centered on the ability to maintain acceptable mainline and arterial traffic operations while providing a safe traveling environment and managing access in support of regional economic development opportunities.

The study evaluated alternatives including access at 85th Street, 57th Street, and 69th Street. It was deemed that the 57th Street and 69th Street access locations were not reasonable and/or feasible to construct access to I-29. The 69th Street corridor was deemed feasible for construction of an overpass.

Therefore, the I-29 Corridor Study (Exit 73 through Exit 77) Final Report evaluated alternative options for the 85th Street interchange and surrounding arterial improvements. The study concluded that the most technically feasible concept for the 85th Street interchange would include a diamond interchange with a braided southbound I-29 ramp and a connector ramp from I-229 to 85th Street.

In 2015 and 2016, the SDDOT completed projects along both I-29 and I-229 that added capacity through this project study area.

The SDDOT recently completed an environmental assessment of a proposed 85th Street overpass.

1.2 Purpose

Proposed alternatives will need to achieve the appropriate balance for the transportation system. This includes maintaining acceptable mainline and arterial traffic operations in conjunction with providing a safe traveling environment and managing access needs in support of regional economic development growth.

Existing interstate access to and from the arterial roadway network is limited for an urbanized area with a high level of demand for additional development growth. Providing managed access is critical to both the freeway safety and operations as well as to the economic development in the project area.

Existing access along the freeway sections of I-29 and I-229 for the study area were developed in accordance with the minimum spacing requirements per the American Association of State Highway and Transportation Officials (AASHTO) and exist at the I-29/Highway 106 (Tea) interchange, the I-29/41st Street interchange, and the I-229/Louise Avenue interchange. Spacing between the Highway 106 (Tea) and 41st Street local access points along I-29 is approximately four (4) miles, with the I-29 and I-229 system interchange located midway between these two accesses. In built-out portions of Sioux Falls, interchanges are generally provided at the minimum allowed spacing of one mile.

1.3 Location

The proposed interstate access location is between the Tea/CR 106 interchange (Exit 73) and the system interchange of I-29 and I-229 (Exit 75). The proposed 85th Street interchange would be Exit 74 on I-29.

The 85th Street interchange is located in Lincoln County, approximately 1-mile south of Sioux Falls. Figure 1 shows the location of the proposed Exit 74 and through the studied arterial intersections, the project study area limits.

Due to the limited interstate access and underdeveloped supporting arterial network surrounding the 85th Street area, the project limits were extended well beyond the immediate interchange area.

The project area limits extend to include CR 106 on the south, 41st Street to the north, CR 111/Tea-Ellis Road to the west, and CR 117/Louise Avenue to the east; an approximate 11 square mile influence area. The influence area is bound by the three closest service interchanges directly abutting the system interchange. Figure 2 represents the interchange area in relation to CR 106 and I-229.

The study area is included in the regional transportation plan (see Appendix K) with a majority of the existing project area largely undeveloped agriculture land with light pockets of residential. Identified as a growth area in the transportation plan, future land use is expected to see significant growth in commercial and residential with corresponding strong growth in population and employment projections.

The study area is located within the transportation planning area of the Sioux Falls Metropolitan Planning Organization (MPO), represented by the Urbanized Development Commission (UDC) of the South Eastern Council of Governments (SECOG). As a designated MPO, there is an ongoing transportation planning process in the Sioux Falls Metropolitan Planning Area and the study area. This study is being completed within the context of those ongoing regional transportation planning efforts. Recommendations that require federal actions, federal funds or regionally significant projects would be integrated into the Long Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP) prior to completing adoption of the recommendations.

Figure 1 – Project Location and Study Area

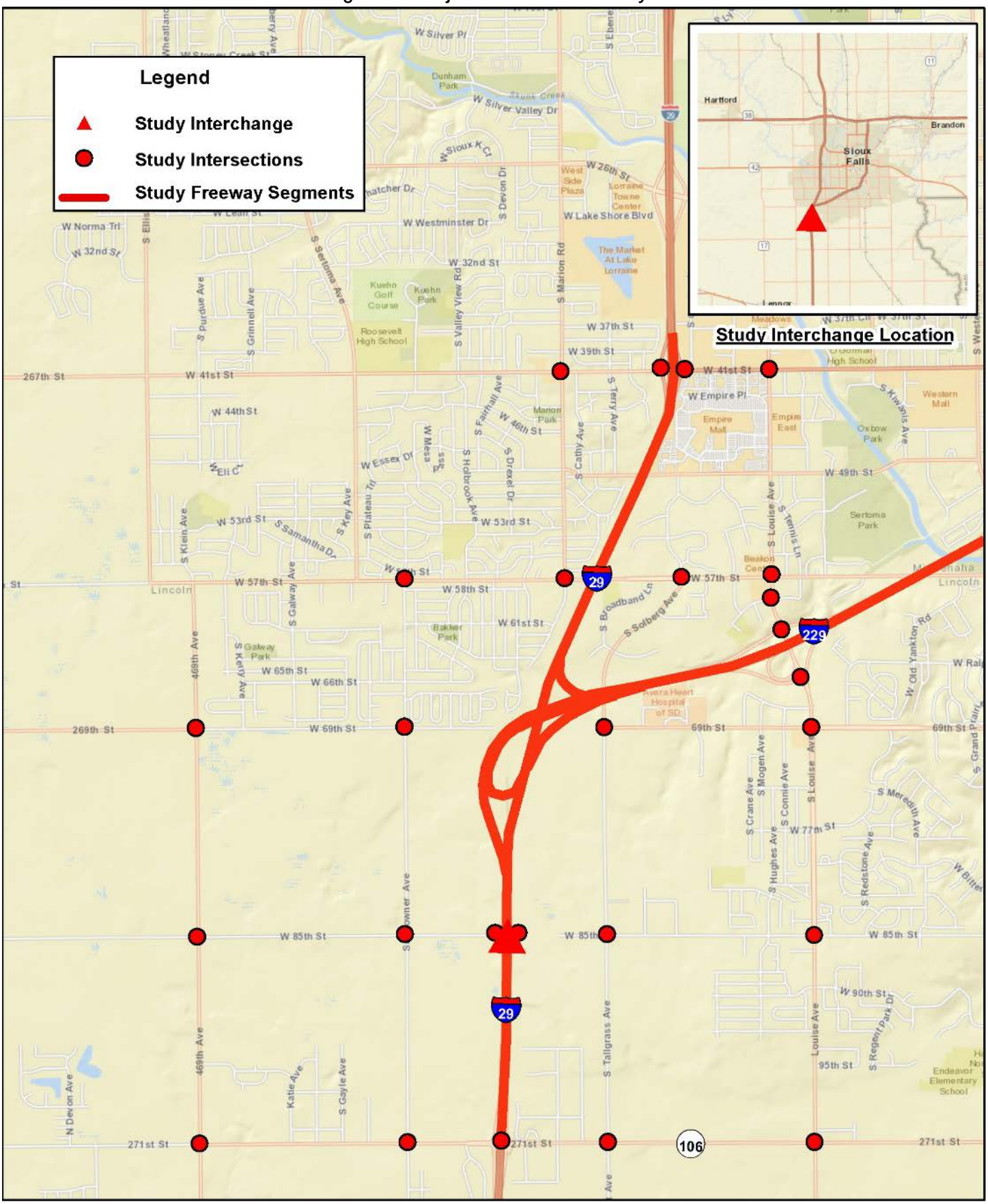
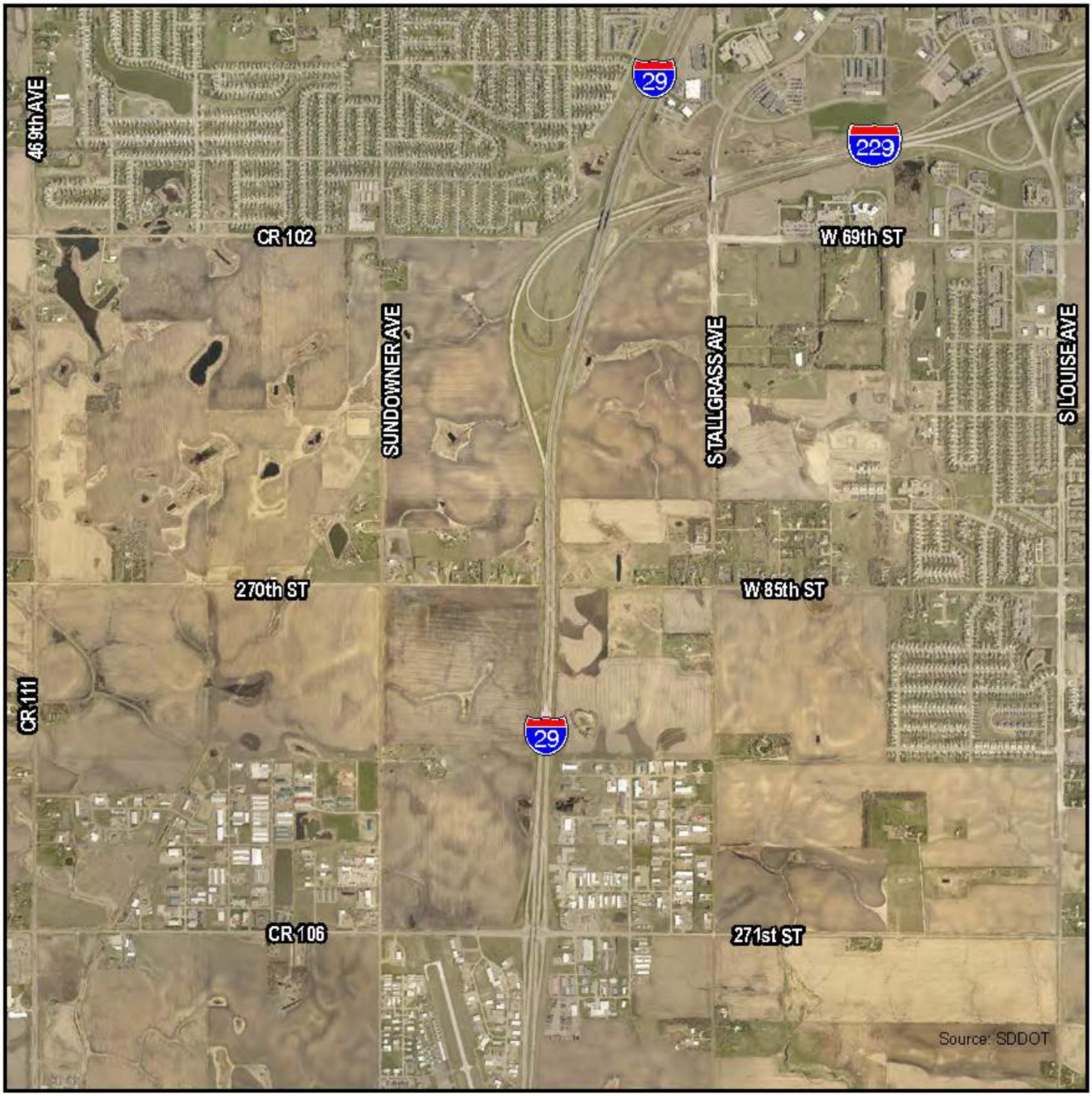


Figure 2 – Existing Configuration



2.0 Methodology

This Interchange Justification Report (IJR) demonstrates that the action associated with implementing the proposed project does not have any fatal flaws. Demonstrating that no fatal flaws exist does not endorse the action, but rather allows for the conclusion that the identified access alternatives are not flawed from the perspective of traffic operations and safety, as required by FHWA. Fatal flaws would include a proposed interchange justification that:

- Does not provide full access to a public roadway
- Would negatively impact interstate facility traffic operations and cannot be reasonably mitigated
- Would negatively impact interstate facility/cross street safety and cannot be reasonably mitigated
- Conflicts with, or is inconsistent with, local and regional plans
- Would create the potential for environmental consequences which could not be mitigated

This IJR was developed with oversight from FHWA, SDDOT and other project partners following the criteria outlined in the Methods and Assumptions (M&A) document for the study. The final M&A document is attached in Appendix B.

The traffic analysis was completed using procedures and methodologies found in the 2010 Highway Capacity Manual (HCM). Traffic operations analysis was completed using the Highway Capacity Software (HCS) which uses the procedures defined in the HCM.

This IJR document is organized in accordance with section 3.5.3 of FHWA's *Interstate Systems Access Information Guide*, August 2010.

3.0 Existing Conditions

The study area for this IJR is bounded by CR 106 on the south, 41st Street to the north, CR 11/Tea-Ellis Road to the west, and Louise Avenue to the east. Within the approximate 11 square mile study area, the transportation system is comprised of the entire range of the regional functional classification from local streets through interstate routes.

3.1 Demographics

The existing project area has limited freeway access and the land use is mainly agricultural in nature. The I-29 / I-229 System Interchange provides the connection between I-29 and I-229 and the closest service interchange is Exit 73, CR 106 on the south end of the project area.

As shown in Figures 3 and 4 below, the interchange area currently is located in an area on the urban fringe of Sioux Falls. The project area is expected, due to development demands, to transition from agricultural to urban commercial. Currently the outer fringe of the northeast quadrant is primarily a commercial office employment area and the northwest quadrant is primarily a residential area. The southeast and southwest quadrants are primarily agricultural pending future development.

Figure 3 – Existing Households by TAZ

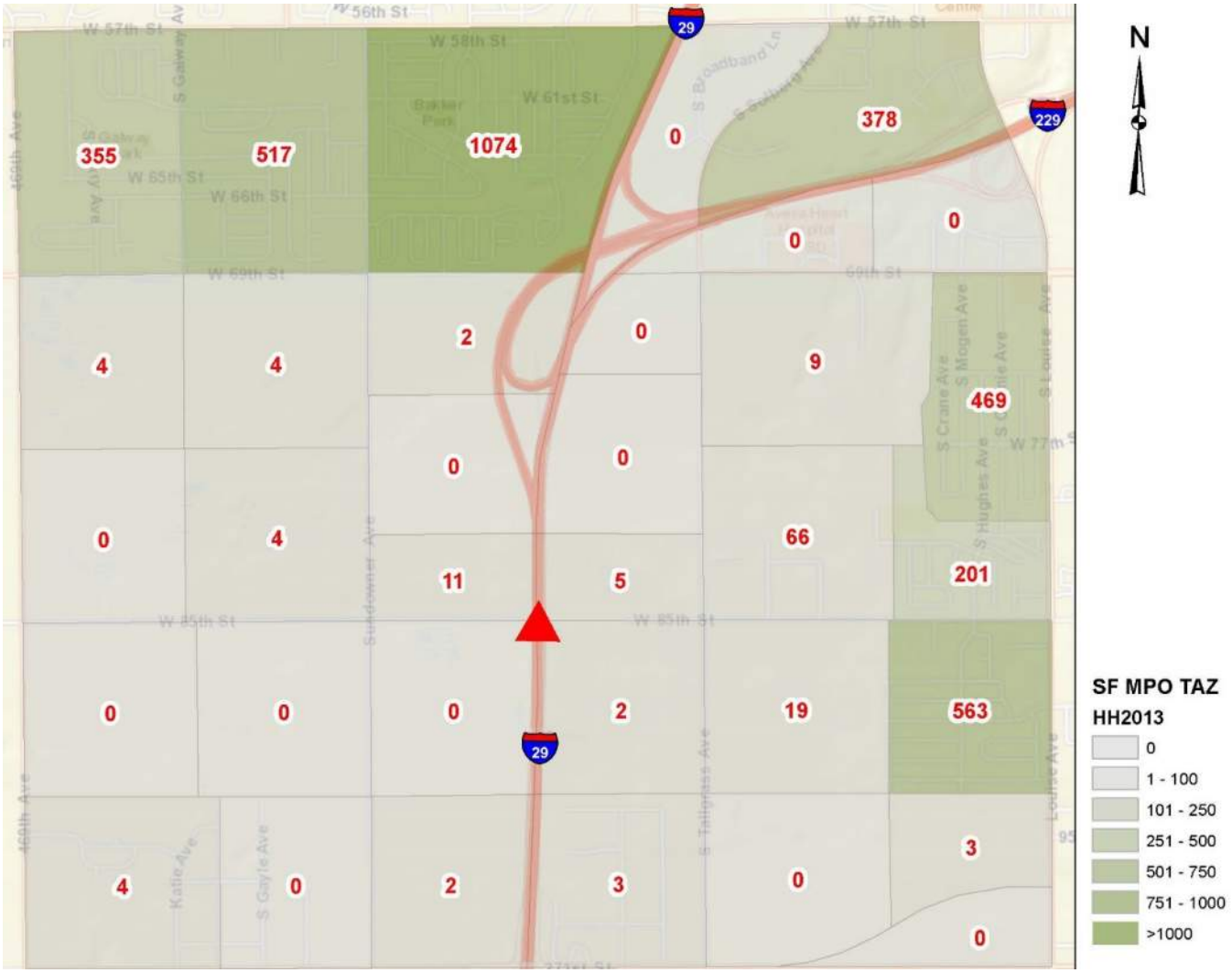
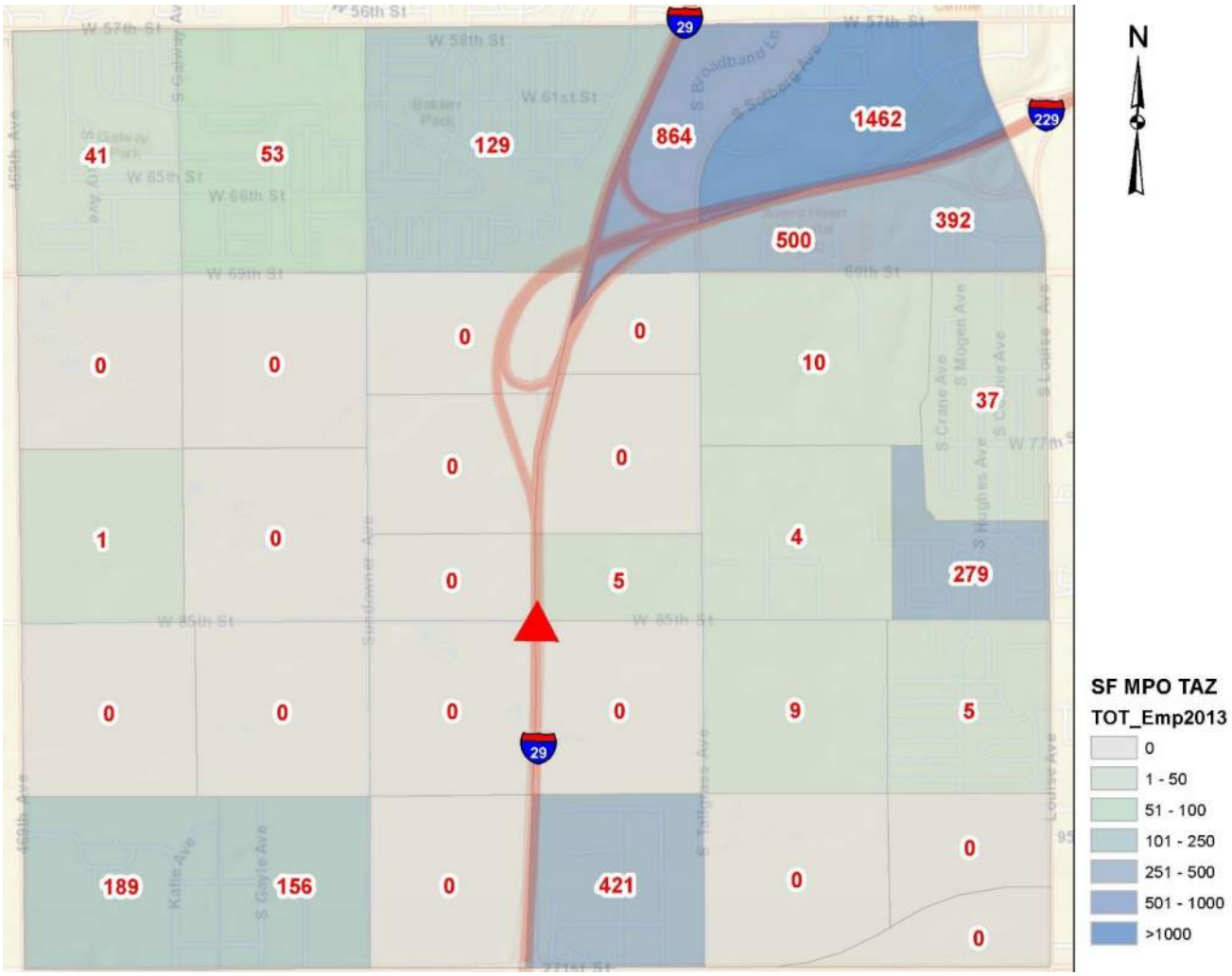


Figure 4 – Existing Employment by TAZ

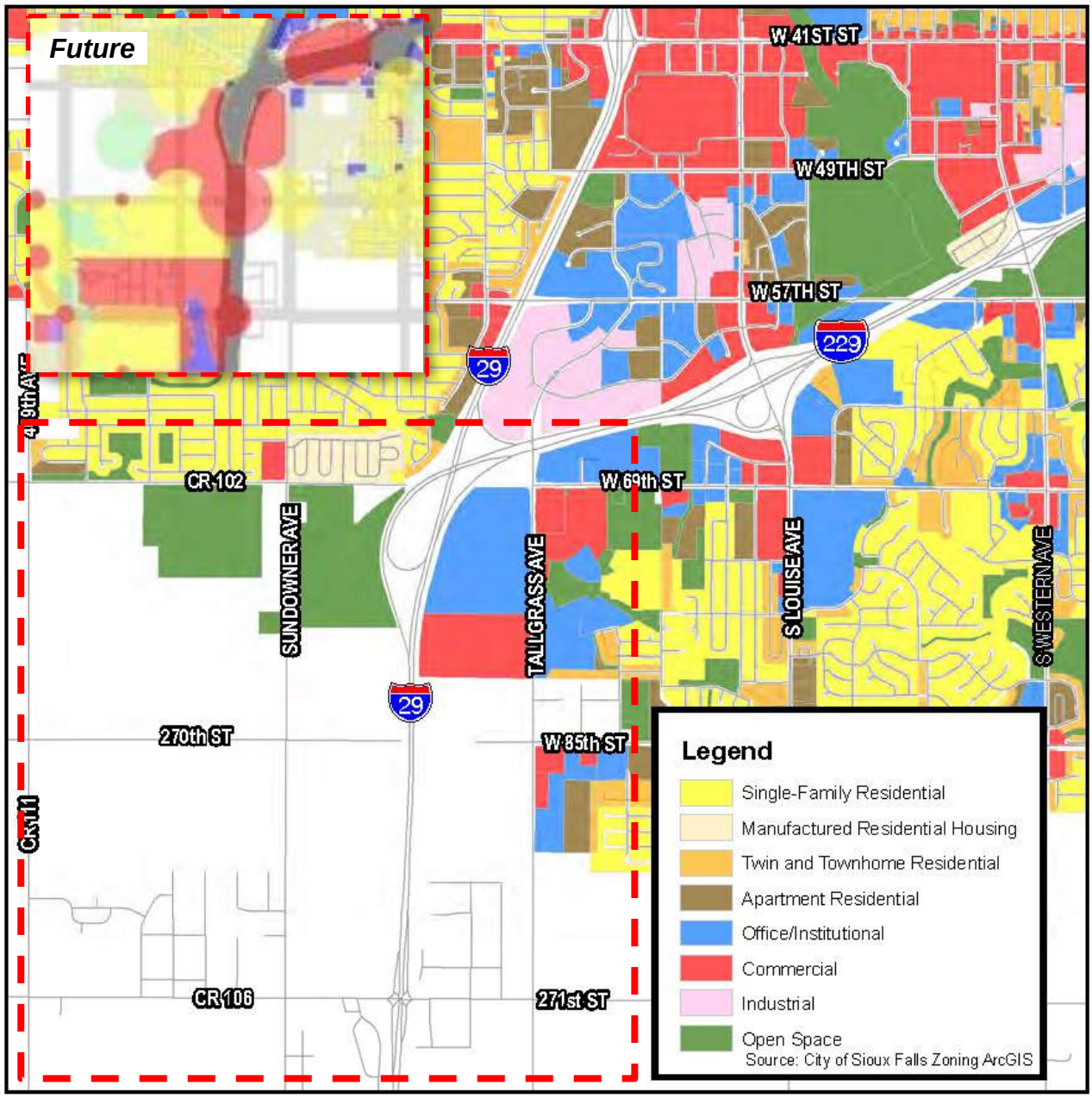


3.2 Land Use

Within the Sioux Falls city limits, land use surrounding the northern edge of the project area is primarily commercial-office in the northeast quadrant and primarily residential in the northwest quadrant.

Currently, the majority of the southern portion of the project area is undeveloped and in agricultural production. The majority of this land area is part of the Lincoln County and City of Sioux Falls Joint Jurisdiction Area which is planning for significant growth in the area. The expected land use for the area will evolve into a commercial hub with residential growth. The inset graphic included with the current City of Sioux Falls zoning map (Figure 5 below) illustrates the expected future land use (also see appendix K).

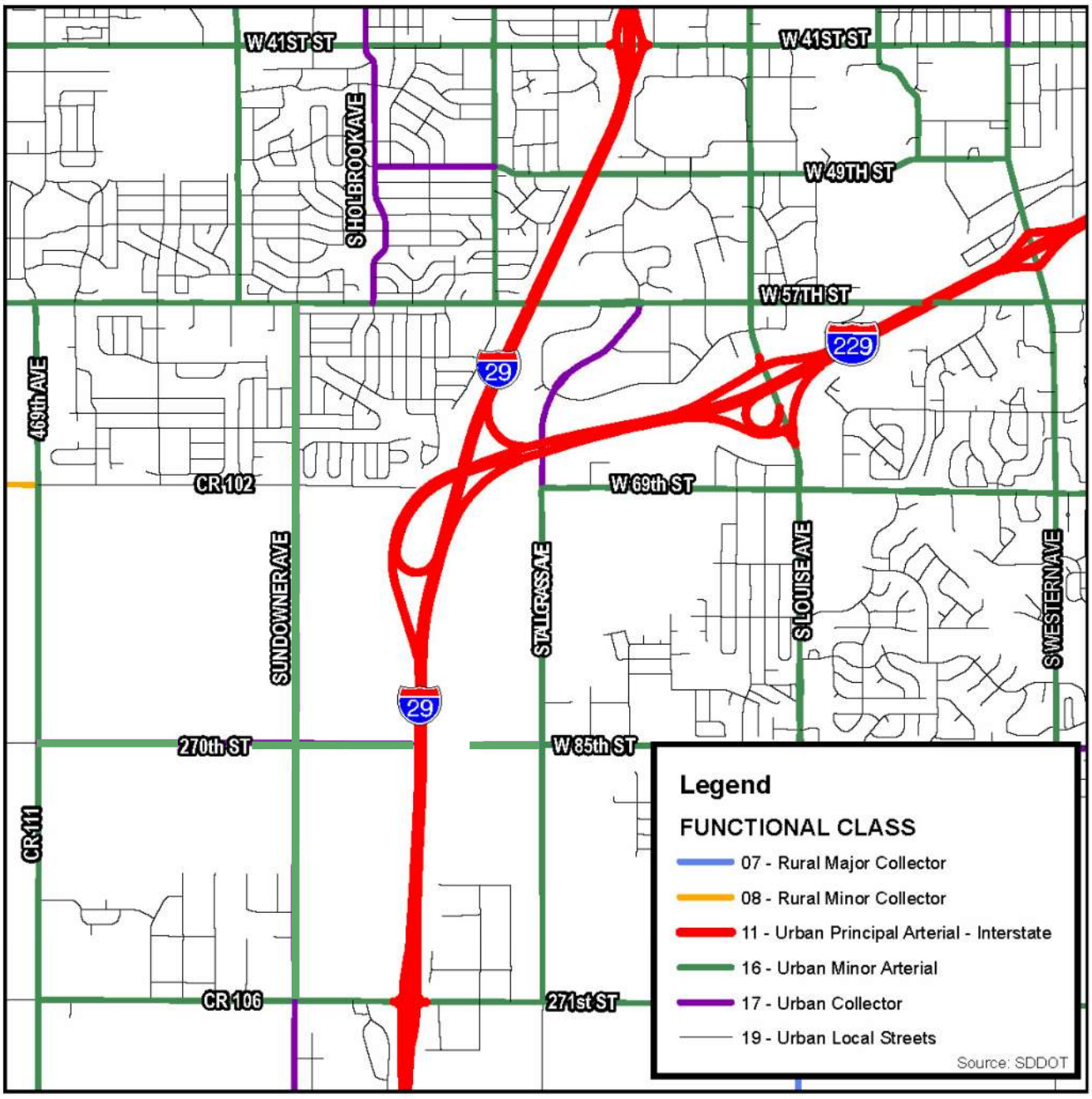
Figure 5 – Existing Zoning



3.3 Roadway Network

The existing roadway network surrounding the project area is shown along with the Federal functional classification map in Figure 6.

Figure 6 – Existing Federal Functional Classification



Key roadways are described in the following:

- ***I-29*** in the project area is a four-lane interstate highway with auxiliary lanes between I-229 and County Road (CR) 106, however north of I-229, I-29 is a six-lane interstate highway. The system interchange of I-29/I-229 (I-29 Exit 75) is located approximately two miles south of 41st Street, one mile west of Louise Avenue and two miles north of CR 106. The three-legged interchange is a trumpet design interchange. Between the I-29/I-229 System Interchange and the local service interchange at 41st Street, both 57th Street and 49th Street cross over I-29, but do not have direct access to I-29.
- ***I-229*** in the project area has a two-lanes eastbound and three-lanes westbound between the I-29 junction and the Louise Avenue interchange. East of the Louise Avenue interchange auxiliary lanes are provided in both directions, resulting in a six-lane interstate. Between the I-29/I-229 System Interchange and the local service interchange at Louise Avenue, 471st Street/Solberg Avenue crosses over I-229, but does not have direct access to I-229.
- ***85th Street*** is functionally classified as a minor arterial roadway.
- While it is an unpaved roadway, 85th Street is a continuous corridor from Tallgrass Avenue east to approximately 2.5 miles east of South Dakota State Highway 11. West of I-29, 85th Street is a continuous corridor from just west of the interstate right-of-way west to South Dakota State Highway 19. The corridor does not provide an access across I-29 between Sundowner Avenue and 471st Street/Tallgrass Avenue. The corridor is currently a two-lane, unpaved roadway adjacent to I-29 and intersections along the route are either uncontrolled or have stop sign control on two or all four approaches. ***County Road 106/271st Street*** is part of the Lincoln County roadway system, functionally classified as a minor arterial roadway between CR 111 and Louise Avenue. CR 106 is a two-lane paved roadway throughout the study area, and includes a single-point urban interchange with I-29. Turn lanes are provided at the I-29/Highway 106 (Tea) interchange and additional east-west through lanes are provided for a short distance on either side of the interchange.

  The intersection of CR 106/Tea Ellis Road is signalized, the intersection of CR 106/Louise Avenue is four-way stop controlled, and the remaining study area intersections are two-way stop controlled with CR 106 operating as the free movement.
- ***69th Street*** is functionally classified as a minor arterial between Tallgrass Avenue and Louise Avenue and is classified as a local system road in the rural area west of I-29. 69th Street is a paved three-lane roadway between Avera Hospital (Medical Court West driveway) and Connie Avenue (just west of Louise Avenue), a paved five-lane roadway between Connie Avenue and Louise Avenue. A recent construction project reconstructed the intersection of 69th Street and Solberg Avenue which is now a divided four-lane east of Solberg Avenue while no west leg was constructed.

  West of I-29, 69th Street is an unpaved, continuous corridor through Tea-Ellis Road and is a continuous corridor to approximately 1 mile west of South Dakota State Highway 19. The corridor does not provide a crossing of I-29 between Sundowner Avenue and Tallgrass Avenue.

  The intersections of 69th Street/Louise Avenue and 69th Street/Solberg Avenue are signal controlled, while the rest of the corridor is either uncontrolled or stop sign controlled.

- ***57th Street*** is functionally classified as a minor arterial street in the study area. East of I-29, 57th Street is a four-lane divided roadway with traffic signals at Solberg Avenue and Louise Avenue. Between Marion Road and I-29, 57th Street is a four-lane roadway with a traffic signal at the Marion Road/57th Street intersection. West of Marion Road, 57th Street is a four-lane undivided roadway with traffic signals provided at 57th Street/Holbrook Avenue and 57th Street/Sertoma Avenue. All other intersections are two-way stop controlled with 57th Street as the free movement.
- ***41st Street*** is functionally classified as a minor arterial street, east of I-29 41st Street is a six-lane roadway with a center left-turn lane and west of I-29, 41st Street is a 4-lane roadway with center left-turn lane, 41st street has a diamond-style interchange with I-29. A Interchange Modification Justification Report was approved to reconstruction this as a Diverging Diamond. Traffic signals are present at the following 41st Street study area intersections:
    - 41st Street/Louise Avenue
    - 41st Street/Shirley Avenue (not included in operations analysis)
    - 41st Street/Empire Mall entrance (not included in operations analysis)
    - 41st Street/Northbound I-29 ramps
    - 41st Street/Southbound I-29 ramps
    - 41st Street/Terry Road (not included in operations analysis)
    - 41st Street/Marion Road

    All other intersections along the corridor are two-way stop controlled, with 41st Street as the free movement.
- ***Louise Avenue*** is functionally classified as a minor arterial in the study area and includes an I-229 service interchange that consists of a partial cloverleaf design.

    Between 41st Street and 57th Street, Louise Avenue is a four-lane roadway with a center left-turn lane. From 57th Street to 74th Street, Louise Avenue is a divided roadway with two north-bound lanes and three southbound lanes. Between 74th Street and 93rd Street, Louise Avenue is a divided four lane roadway. South of 93rd Street, Louise Avenue is a rural two-lane paved roadway.

    The following Louise Avenue intersections are signalized in the study area:
    - 41st Street/Louise Avenue
    - 49th Street/Louise Avenue (not included in operations analysis)
    - 57th Street/Louise Avenue
    - 59th Street/ Louise Avenue
    - Westbound I-229 ramps/Louise Avenue
    - Eastbound I-229 ramps/Louise Avenue
    - 69th Street/Louise Avenue
    - 77th Street/Louise Avenue (not included in operations analysis)
    - 85th Street/Louise Avenue
    - The intersection of Louise Avenue/Highway 106 is four-way stop controlled. All other intersections along the corridor are two-way stop controlled, with Louise Avenue operating as the free movement.

- ***Tallgrass Avenue*** is functionally classified as a minor arterial street between 69th Street and CR 106, and classified as a local system roadway south of CR 106. Between 69th Street and 57th Street, ***Solberg Avenue*** is functionally classified as a collector.

  South of approximately 74th Street, Tallgrass is unpaved in the study area. All intersections along Tallgrass are either uncontrolled or stop controlled.

  Between 69th Street and 57th Street, Solberg Avenue is a four-lane divided roadway with traffic signals provided at Solberg Avenue/69th Street and Solberg Avenue/57th Street. All other intersections along Solberg are either uncontrolled or stop controlled.

- ***Sundowner Avenue*** is functionally classified as a minor arterial roadway throughout the study area. South of approximately 67th Street, Sundowner is an unpaved roadway that is either stop controlled or uncontrolled. Sundowner is a two-lane paved street between approximately 67th Street and 57th Street, its northern terminus. The intersection of Sundowner Avenue and 57th Street utilizes two-way stop control with 57th Street operating as the free movement.

- ***County Road 111/Tea-Ellis Road*** is functionally classified as a minor arterial roadway throughout the study area. CR 111 is a two-lane paved street between approximately 57th Street and CR 106. The intersection of CR 111 and CR 106 is controlled by a traffic signal. All intersections along CR 111 are either uncontrolled or stop controlled.

3.4 Alternative Travel Modes

Given the rural nature of the area surrounding the proposed access, there is currently no routine transit stops to the interchange area. As the immediate project area is located south of Sioux Falls city limits, the only alternative travel mode provided for through the project area is by means of Jefferson Lines, an interstate bus service that runs daily routes between Sioux Falls and Sioux City, Iowa along I-29.

Sioux Area Metro (SAM) buses serve the northern portion of the project area, but does not run buses through the immediate interchange area south of I-229.

The Sioux Falls Regional Airport is located about 7 miles northeast of the interchange, providing both commercial and general aviation passenger and air freight services to southeastern South Dakota, southwestern Minnesota and northwestern Iowa. The Lincoln County Airport is located approximately 2 miles south of the interchange and provides general aviation services for Minnehaha and Lincoln Counties.

Although state law does not prohibit bicycle travel through the interchange area along the Interstate mainline shoulders, it does not routinely occur. The Sioux Falls MPO has designated on-street bicycle routes throughout the MPO into three categories, Primary, Secondary, and Urban. A review of those designated routes shows no designated Primary Bicycle Route within the interchange's influence area. A designated Secondary Bicycle Route parallels I-29 along the Lincoln County Highway 111 (Tea-Ellis Road) to the west of the interchange. There are numerous designated Urban Bicycle Routes within the northern project area of influence, most notably on the 57th Street crossroad north of the interchange and along the Solberg Avenue / Tallgrass Avenue crossroad to the east of the interchange. The Sioux Falls Bike & Recreation Trail also runs along the Big Sioux River approximately 1 ½ miles northeast of the interchange area. There are bicycle lanes proposed for the typical section of 85th Street that will cross I-29 once that crossing is completed.

3.5 Interchanges

The following is a description and aerial photograph of the four existing interchanges within the project study area.

3.5.1 I-29 / I-229 System Interchange (Exit 75)

The existing interchange for I-29 and I-229 is a trumpet configuration and shown in Figure 7 below. All ramps are currently single lane ramps at the merge and diverges with I-29 and I-229. The system interchange is 1.0 mile north of the proposed 85th St. interchange.

Recent construction improvements shifted the southbound I-29 loop ramp to I-229 further north (illustrated in figure) and provide auxiliary lanes on all three legs of the interchange.

Figure 7 – Existing I-29/I-229 Interchange Configuration

3.5.2 I-29 at CR 106 (Exit 73)

The adjacent interchange south of the I-29/I-229 System Interchange is the service interchange of CR 106, Exit 73. The interchange provides access to Lincoln County Highway 106 and is commonly referred to as the Tea interchange as it provides access to the City of Tea, located 1 ½ miles west of the interchange along Lincoln County Highway 106. The Exit 73 interchange is 1.0 mile south of the proposed 85th St. interchange.

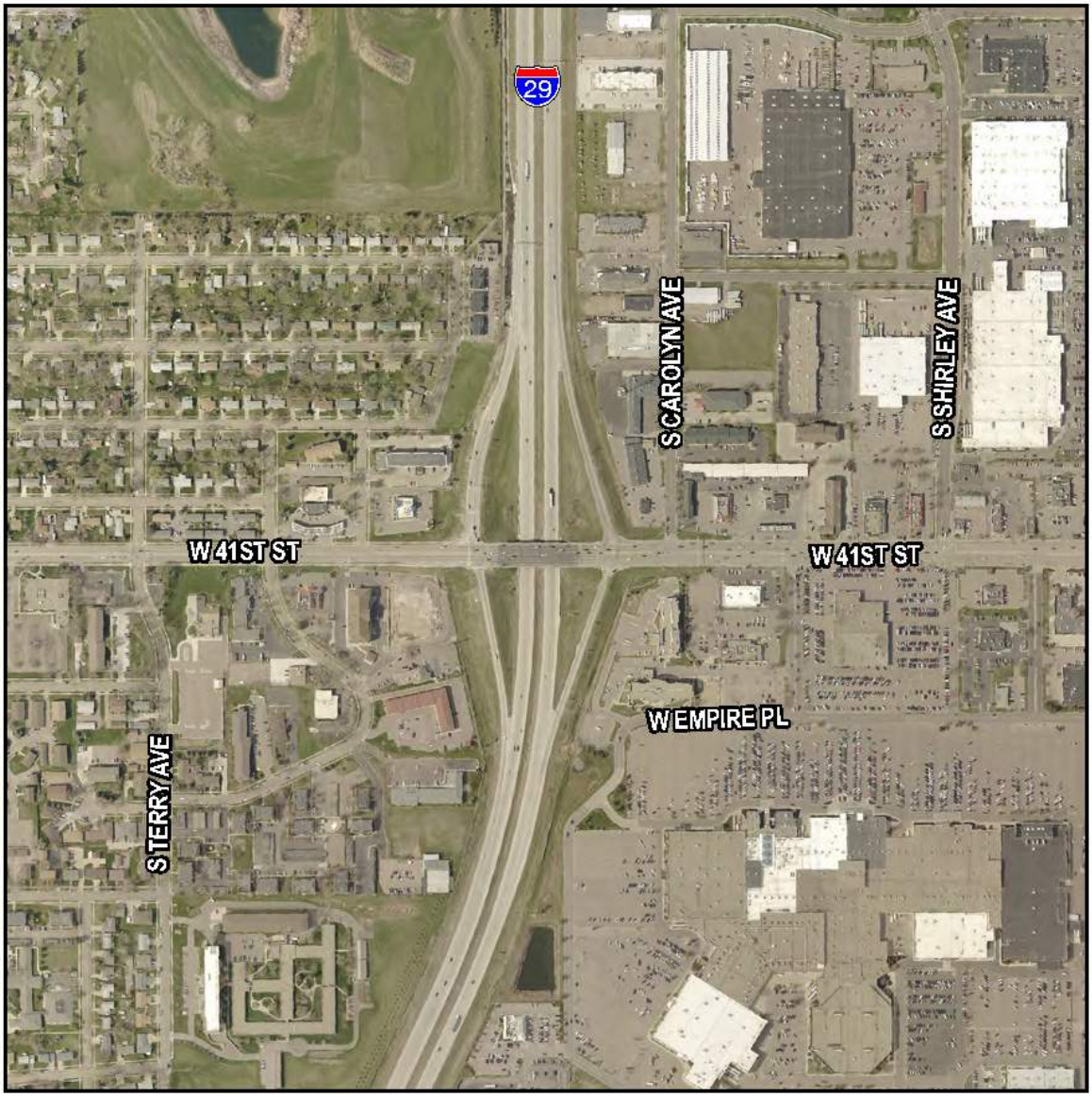
The Exit 73 interchange is a single-point configuration and is shown in Figure 8 below.

Figure 8 – Existing I-29 at CR 106 Interchange Configuration

3.5.3 I-29 at 41st Street (Exit 77)

The adjacent interchange north of the I-29 / I-229 System Interchange is the service interchange for 41st Street in Sioux Falls. The Exit 77 interchange is a typical diamond configuration that also allows for full access to the local roadway network. The aerial photo in Figure 9 shows the configuration of the existing Exit 77 interchange.

Figure 9 – Existing I-29 at 41st Street Interchange Configuration



A corridor study of the 41st Street crossroad completed in 2012 evaluated the future needs of the interchange due to the limited ability to accommodate the projected traffic growth. The study developed and analyzed options to reconfigure the interchange, determining potential improvement configurations of either a diverging diamond or a single point to be feasible alternatives. The diverging diamond configuration was given Engineering and Operations Acceptance through an IMJR study.

All of the technically feasible configuration options for the Exit 77 interchange would have a negligible effect on the I-29 / I-229 System Interchange and surrounding service interchanges given the distance between the interchanges.

3.5.4 I-229 at Louise Avenue (Exit 1C)

The adjacent interchange east of the I-29 / I-229 System Interchange is the service interchange for Louise Avenue in Sioux Falls. The Exit 1C interchange is a partial cloverleaf configuration. Southbound I-229 includes a standard diamond configuration and northbound I-229 includes a single exit ramp and directional entrance ramps from Louise Avenue. Southbound Louise Avenue to I-229 northbound includes a loop ramp in the southwest quadrant of the interchange and northbound Louise Avenue to I-229 northbound includes a free movement directional ramp. Neither of the I-229 ramp movements at the south ramp terminal intersection travel through the signalized ramp terminal intersection; only the northbound off ramp traffic are controlled by the traffic signal.

The aerial photo in Figure 10 shows the configuration of the existing Exit 1C interchange.

Figure 10 – Existing I-229 at Louise Avenue Interchange Configuration

3.6 Existing Data

The majority of the data used to create this document was obtained from the SDDOT and the City of Sioux Falls. Updated traffic count information was obtained by SEH in May and June of 2015 for all project study intersections and along I-29 and I-229 freeway segments.

3.7 Operational Performance

A traffic operations study was conducted for the project area using 2015 traffic volumes. A total of twenty four existing intersections and seventeen ramp junctions were analyzed within the 85th Street interchange study area.

The traffic analysis were completed using procedures and methodologies found in the 2010 Highway Capacity Manual (HCM). Traffic operations analysis was completed using the Highway Capacity Software (HCS) which uses the procedures defined in the HCM.

Level of Service (LOS) for signalized and unsignalized intersections according to the Highway Capacity Manual was used to measure traffic operation at each of the intersections analyzed. Each lane of traffic has delay associated with it and therefore a correlating LOS. The weighted average delay for each of these lanes of traffic for a signalized intersection is the intersection LOS. LOS categories range from LOS "A" (best) to "F" (worst) as shown in Tables 1, 2, and 3.

The freeway and intersection Level of Service (LOS) criteria presented in the following tables were used to evaluate the traffic operations in study area; the information is from the SDDOT Road Design Manual.

Table 1
Freeway Measures of Effectiveness

Level of Service (LOS)	Description	Density (pc/mi/ln)
A	Free-flow operation	≤ 11.00
B	Reasonably free-flow operation; minimal restriction on lane changes and maneuvers	> 11.0 – 18.0
C	Near free-flow operation: noticeable restriction on lane changes and other maneuvers	> 18.0 – 26.0
D	Speed decline with increasing flows; significant restriction on lane changes and other maneuvers	> 26.0 – 35.0
E	Facility operates at capacity; very few gaps for lane changes and other maneuvers; frequent disruptions and queues	> 35.0 – 45.0
F	Unstable flow; operational breakdown	> 45.0

Source: SDDOT Road Design Manual (Table 15-1)

Table 2
Signalized Intersection Control Measures of Effectiveness

Level of Service (LOS)	Description	Delay (sec/veh)
A	Very minimal queuing; excellent corridor progression	≤ 10.00
B	Some queueing; good corridor progression	> 10.0 – 20.0
C	Regular queueing; not all demand may be serviced on some cycles (cycle failure)	> 20.0 – 35.0
D	Queue lengths increased; routine cycle failures	> 35.0 – 55.0
E	Majority of cycles fail	> 55.0 – 80.0
F	Volume to capacity ratio near 1.0; very long queues, almost all cycles fail	> 80.0

Source: SDDOT Road Design Manual (Table 15-5)

Table 3
All-Way Stop and Two-Way Stop Control Measures of Effectiveness

Level of Service (LOS)	Description	Delay (sec/veh)
A	Queuing is rare	≤ 10.00
B	Occasional queuing	> 10.0 – 15.0
C	Regular queuing	> 15.0 – 25.0
D	Queue lengths increased	> 25.0 – 35.0
E	Significant queuing	> 35.0 – 50.0
F	Volume to capacity ratio approaches 1.0; very long queues	> 50.0

Source: SDDOT Road Design Manual (Tables 15-6 and 15-7)

The SDDOT typically triggers capacity improvements when the LOS is below C on urban Interstate highway corridors or below D on urban non-Interstate corridors.

The summation of the existing traffic operations analysis show that mainline I-29 and I-229, including all existing ramp junctions, operate at a LOS B or better during the AM and PM peak hours. Results for the individual segments and ramp junctions of I-29 and I-229 are shown in Tables 4 and 5, below.

Figure 11 is a visual representation of the existing freeway lane geometrics and the traffic operational results. The 2015 intersection turning movement counts, at all study intersections, can be found in Appendix C, *I-29/85th Street Interchange Justification Report (IJR) – Traffic Forecasts* memorandum, Figures 7.1A through 7.1C.

Figure 11 – Existing Freeway Configuration and Results

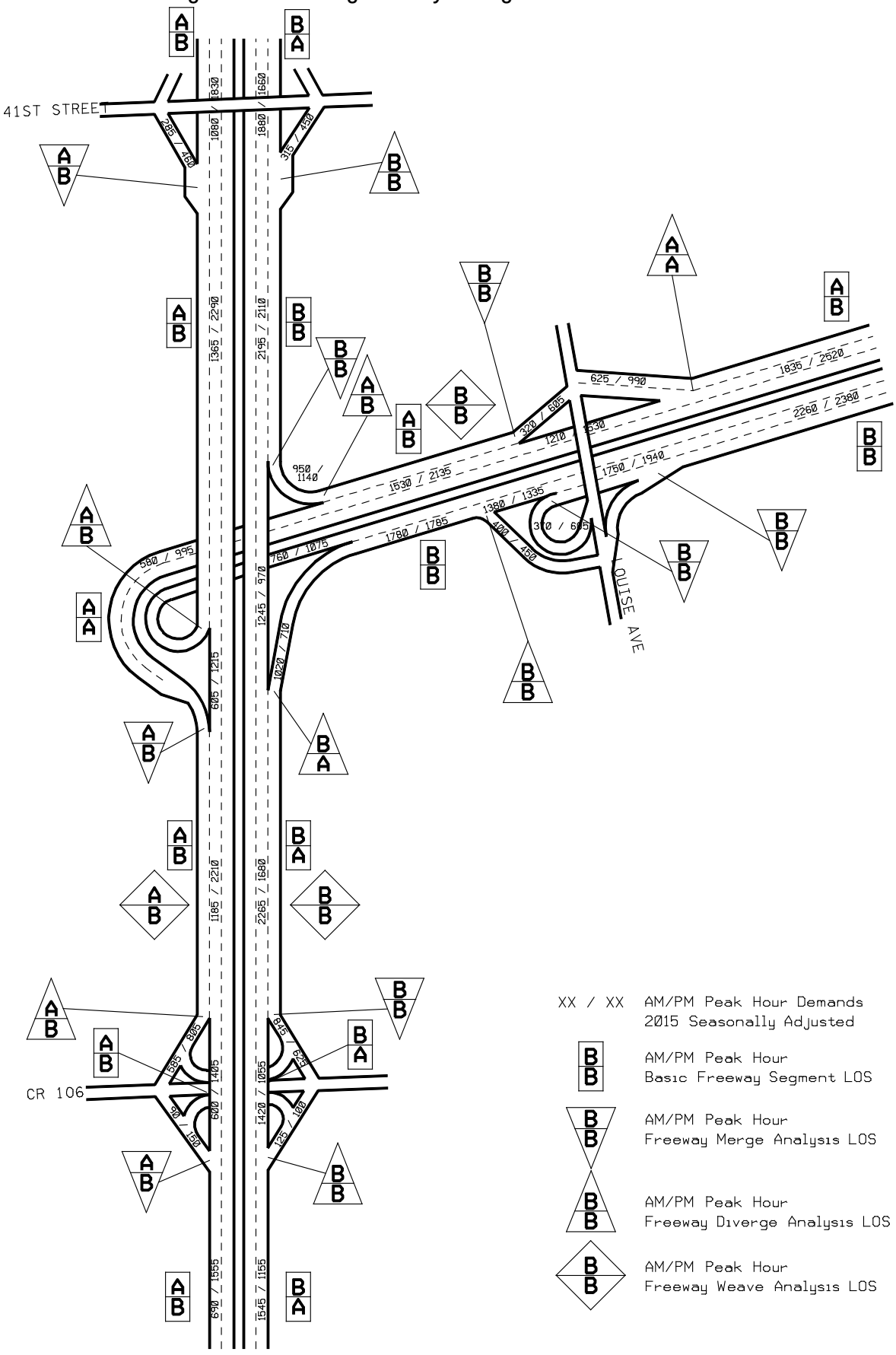


Table 4
Existing 2015 I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-29	NB I-29 – South of Exit 73	Basic	B	A
	NB I-29 – Exit 73 to CR 106	Diverge	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	A
	NB I-29 – CR 106 Entrance	Merge	B	B
	NB I-29 – between CR 106 to NB I-229 Exit	Basic	B	A
	NB I-29 – between CR 106 to NB I-229 Exit	Weave	B	B
	NB I-29 – Exit 77 to NB I-229	Diverge	B	A
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	A
	NB I-29 – SB I-229 Entrance	Merge	B	B
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	B	B
	NB I-29 – Exit 77 to 41st St	Diverge	B	B
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	A
SB I-29	SB I-29 – between 41st St Exit and 41st St Entrance	Basic	A	B
	SB I-29 – 41st St Entrance	Merge	A	B
	SB I-29 – between 41st St Entrance and NB I-229 Exit	Basic	A	B
	SB I-29 – Exit 77 to NB I-229	Diverge	A	B
	SB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	A	B
	SB I-29 – SB I-229 Entrance	Merge	A	B
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Basic	A	B
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Weave	A	B
	SB I-29 – Exit 73 to CR 106	Diverge	A	B
	SB I-29 – between CR 106 Exit and CR 106 Entrance	Basic	A	B
	SB I-29 – CR 106 Entrance	Merge	A	B
	SB I-29 – South of CR 106 Entrance	Basic	A	B

Table 5
Existing 2015 I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	n/a	n/a
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	B	B
	NB I-229 – Exit 1C to Louise Avenue	Diverge	B	B
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	B	B
	NB I-229 – SB Louise Avenue Entrance	Merge	B	B
	NB I-229 – between SB Louise Ave Entrance and NB Louise Ave Entrance	Basic	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	B	B
	NB I-229 – East of Louise Avenue Interchange	Basic	B	B
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	A	B
	SB I-229 – Exit 1C to Louise Avenue	Diverge	A	A
	SB I-229 – between Louise Avenue Exit and Louise Avenue Entrance	Basic	A	B
	SB I-229 – Louise Avenue Entrance	Merge	B	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	A	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	B	B
	SB I-229 – Exit 1A to NB I-29	Diverge	A	B
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	A

"n/a" – merge area cannot be analyzed with HCM methodologies due to two single lane merge area

The project study area also includes twenty four arterial intersections identified for operational analysis. Table 6 summarizes the results of the existing traffic analysis for the ramp terminal intersections as well as adjacent major intersections within the project area. Appendix A provides schematic graphical maps showing the arterial intersection analysis results.

Under the existing traffic demands, the majority of the intersections operate acceptable in the more rural southern portion of the project area. However in the northern portion, where more urban land uses currently exist, the corridors of 41st Street, 57th Street, and Louise Avenue all have failing operations for the majority of the roadway segments.

Available storage for turning vehicles at an intersection plays an important role in the operations of an intersection. The HCM software does not properly handle lane blockage conditions, providing LOS results that are not reflective of actual operations. The HCM methodologies provide a "Queue Storage Ratio" (RQ) which is the maximum stacking of queued vehicles (SDDOT recommends the 95th percentile queue) divided by the available storage length provided for the movement. If the RQ is above 1.0, it represents a queue that is spilling outside of the available storage and blocking other movements at the intersection. At any intersection where the RQ is above 1.0 for a movement, it is SDDOT preference to state the intersection has failing operations and the LOS will be recorded as a LOS F, regardless of the overall delay at the intersection.

The minor street stop controlled intersections of 57th Street at Sundowner Avenue and CR 106 at Sundowner Avenue have significant delays reported from the HCS analysis. It should be noted that while intersection video observations of the two intersections did show significant delays at the side street stop approaches, the delays were not as severe as the reported analysis.

Table 6
Existing 2015 Arterial Intersection Operations Summary

Major Roadway	Intersecting Roadway	Intersection Control Type	AM Peak	PM Peak
			LOS	LOS
41st Street	Marion Road	Signal	F**	F**
41st Street	I-29 SB Ramp Terminal	Signal	F**	F**
41st Street	I-29 NB Ramp Terminal	Signal	F**	F**
41st Street	Louise Avenue	Signal	C	F**
57th Street	Sundowner Avenue	Minor Stop*	F	F
57th Street	Marion Road	Signal	F**	D
57th Street	Solberg Avenue	Signal	F**	F**
Louise Avenue	57th Street	Signal	F**	F**
Louise Avenue	59th Street	Signal	A	F**
Louise Avenue	SB I-229 Ramp Terminal	Signal	B	F**
Louise Avenue	NB I-229 Ramp Terminal	Signal	A	A
CR 111 (Tea-Ellis Road)	69th Street	Minor Stop*	B	C
Sundowner Avenue	69th Street	Minor Stop*	A	A
471st Ave/Solberg Avenue	69th Street	Signal	A	A
Louise Avenue	69th Street	Signal	C	C
CR 111 (Tea-Ellis Road)	85th Street	Minor Stop*	B	B
Sundowner Avenue	85th Street	All-Way Stop	A	A
471st Ave/Solberg Avenue	85th Street	Minor Stop*	A	B
Louise Avenue	85th Street	Signal	B	A
CR 106	CR 111 (Tea-Ellis Road)	Signal	C	B
CR 106	Sundowner Avenue	Minor Stop*	F	F
CR 106	I-29 Ramp Terminal (Single Point)	Signal	C	C
CR 106	471st Ave/Tallgrass Avenue	Minor Stop*	C	D
CR 106	CR 117/Louise Avenue	All-Way Stop	C	F

Note – Average Intersection LOS shown, individual movements and/or approaches may be different

*Minor Street Stop Control intersection LOS represents the worst approach LOS; major roadway would operate at a LOS A

**Queue Storage Ratio greater than 1.0 for at least 1 movement, results in LOS F for entire intersection

3.8 Safety Conditions

A comprehensive safety analysis was conducted for the entire project area for this study. The analysis included the most recent 5-years of crash history available from the SDDOT, it included the five calendar years of 2010, 2011, 2012, 2013 and 2014.

A total of 2,087 crashes occurred within the project study area during the 5-year analysis period. A total of 999 crashes occurred at the study intersections, 773 crashes occurred along the study area roadway segments between the intersections, and 389 crashes occurred along the freeway mainline or ramp connections. In addition, predictive crash modeling (IHSDM) was completed for Alternative 1. See Appendix N for the 85th St Interchange Alternatives Review Memo for details on the predictive crash modeling results.

The following tables show the severity breakdown of the study area intersections, roadway segments, and freeway segments.

Table 7
Intersection Crash Summary 2010-2014

Intersection	Fatal	Severity A	Severity B	Severity C	Property Damage	TOTAL CRASHES	Crash Rate	Critical Rate
CR 106 at CR 111**	0	0	2	4	9	15	0.73	1.05
CR 106 at Sundowner Avenue	0	0	2	4	4	10	0.44	0.57
CR 106 and I-29**	0	0	2	10	44	56	**1.65**	1.38
CR 106 at Tallgrass Avenue	0	0	1	0	3	4	0.23	0.62
CR 106 at Louise Avenue	0	0	1	1	8	10	0.38	0.57
85th Street at Louise Avenue**	0	0	1	0	6	7	0.24	0.97
85th Street at Tallgrass Avenue	0	0	0	0	1	1	0.46	1.78
85th Street at Sundowner Avenue	0	0	0	0	0	0	0.00	2.03
85th Street at CR 111	0	0	0	1	3	4	0.46	0.78
69th Street at CR 111	0	2	0	2	3	7	0.72	0.75
69th Street at Sundowner Avenue	0	0	0	0	1	1	0.21	1.28
69th Street at Solberg Avenue**	0	0	0	0	0	0	0.00	1.31
69th Street at Louise Avenue**	1	1	4	8	38	52	**0.95**	0.87
Louise Avenue at NB I-229**	0	0	1	1	16	18	0.32	0.86
Louise Avenue at SB I-229**	0	1	11	21	61	94	**1.28**	1.24
Louise Avenue at 59th Street**	0	2	3	11	34	50	0.69	0.83
Louise Avenue at 57th Street**	0	0	13	17	50	80	0.79	1.19
57th Street at Solberg Avenue**	0	0	4	5	16	25	0.41	0.85
57th Street at Marion Road**	0	1	2	13	25	41	0.70	1.28
57th Street at Sundowner Avenue	1	0	1	2	6	10	0.34	0.55
41st Street at Marion Road**	0	1	15	30	64	110	**1.53**	1.24
41st Street at SB I-29**	0	0	7	23	86	116	**1.73**	1.25
41st Street at NB I-29**	0	1	10	25	74	110	**1.91**	0.86
41st Street at Louise Avenue**	0	1	20	43	114	178	**2.00**	1.21
TOTAL	**2**	**10**	**100**	**221**	**665**	**999**		

Bolded Crash Rate indicates a calculated crash rate that is higher than the critical rate; indicating a potential situation where existing conditions are affecting operational safety.

There are seven intersections within the study area that are above the calculated critical crash rate. The four study intersections along 41st Street are among the intersections with a sustained crash problem. A separate study was recently completed for the 41st Street corridor and interchange with I-29 for the evaluation of safety and capacity of the corridor.

The intersection of CR 106 at the I-29 ramp terminal intersection, single point interchange design, is also above the critical rate. Of the 56 crashes that occurred at the intersection, 30 were rear-end collisions, 8 were angle collisions, 5 were side-swipe collisions and 13 were single vehicle crashes.

The intersections of Louise Avenue at 69th Street and the SB I-229 ramp terminal are also above the critical rate. Both intersections have a high percentage of rear-end and angle crashes.

Table 8
Arterial Segment Crash Summary 2010-2014

Roadway	From	To	Fatal	Severity A	Severity B	Severity C	Property Damage	Total Crashes	Crash Rate	Critical Rate
CR 106	CR 111	Sundowner Ave	0	1	1	4	8	14	0.81	2.06
CR 106	Sundowner Ave	I-29	0	0	0	1	0	1	0.29	3.19
CR 106	I-29	Tallgrass Ave	0	0	0	1	5	6	1.20	2.83
CR 106	Tallgrass Ave	Louise Ave	0	0	0	1	3	4	0.27	2.22
69th St	Louise Ave	Solberg Ave	0	0	0	0	0	0	0.00	2.43
85th St	Louise Ave	Tallgrass Ave	0	0	0	0	2	2	0.43	2.74
57th St	Louise Ave	Solberg Ave	0	1	4	8	17	30	1.53	4.49
57th St	Solberg Ave	Marion Road	0	0	5	4	15	24	1.21	4.49
57th St	Marion Road	Sundowner Ave	0	0	5	3	16	24	0.88	4.22
41st St	Marion Road	SB I-29	0	3	16	25	89	133	**6.01**	4.42
41st St	NB I-29	Louise Ave	0	5	26	62	126	219	**13.03**	4.79
CR 111	CR 106	85th St	0	1	1	2	9	13	1.54	2.42
CR 111	85th St	69th St	0	0	1	0	10	11	1.55	2.55
Sundowner Ave	CR 106	85th St	0	1	0	0	1	2	1.21	3.97
Sundowner Ave	85th St	69th St	0	0	2	1	3	6	**4.54**	4.32
Sundowner Ave	69th St	57th St	0	0	3	0	6	9	1.87	2.40
Tallgrass Ave	85th St	CR 106	0	0	0	0	2	2	1.51	4.28
Tallgrass Ave	85th St	69th St	0	0	0	0	1	1	0.60	3.96
Marion Road	57th St	41st St	0	0	5	9	38	52	2.40	6.00
Louise Ave	CR 106	85th St	0	0	2	0	5	7	0.33	3.06
Louise Ave	85th St	69th St	0	1	7	3	19	30	1.08	2.94
Louise Ave	69th St	NB I-229	0	0	0	2	6	8	1.06	3.68
Louise Ave	NB I-229	SB I-229	0	0	0	0	0	0	0.00	5.20
Louise Ave	57th St	41st St	0	4	24	42	105	175	2.96	3.88
		TOTAL	**0**	**17**	**102**	**168**	**476**	**773**		

Bolded Crash Rate indicates a calculated crash rate that is higher than the critical rate; indicating a potential situation where existing conditions are affecting operational safety.

There are three arterial roadway segments in the project area that are above the calculated critical crash rate. Two segments are located along 41st Street with a sustained crash problem.

The segment of Sundowner Avenue, between 85th Street and 69th Street is also above the critical rate; this roadway is an unpaved, low volume section of Sundowner Avenue. All six crashes that occurred on this segment were single vehicle crashes, two of which involved wet or icy conditions.

Of the 389 crashes that occurred on the freeway segments, 315 occurred along the mainline and 74 occurred on the ramp segments. The following Table 9 represents the 315 crashes that occurred along the freeway mainline. While there are many segments above the statewide average crash rate, 1.05 for an urban freeway segment, only one segment is above the critical crash rate. The diverge area along westbound I-229 exiting to northbound I-29 is above the critical rate.

It should be noted that the crashes occurred prior to the current construction project that is adding auxiliary lanes and improving the operations of the freeway.

Table 9
Freeway Crash Summary 2010-2014

Roadway	From	To	Fatal	Sev A	Sev B	Sev C	Property Damage	TOTAL	Crash Rate	Critical Rate
NB I-29	CR 106 Exit	CR 106 Ent.	0	1	1	0	11	13	0.67	1.67
NB I-29	CR 106 Ent Ramp Merge	Merge Area	0	0	2	0	6	8	0.78	1.92
NB I-29	CR 106 Ent.	EB/NB I-229 Exit	0	3	0	2	27	32	0.68	1.44
NB I-29	EB I-229 Ramp Diverge	Diverge Area	0	0	0	1	3	4	0.87	2.39
NB I-29	EB/NB I-229 Exit	WB/SB I-229 Ent.	0	1	1	2	11	15	0.93	1.74
NB I-29	WB I-229 Ramp	Merge Area	0	0	1	2	8	11	1.33	2.03
NB I-29	WB/SB I-229 Ent.	2-lane Section	0	1	0	3	7	11	0.48	1.62
NB I-29	3-lane section	41st St Exit	0	0	0	4	8	12	0.59	1.66
NB I-29	41st St Exit	Diverge Area	0	0	1	0	6	7	1.24	2.25
NB I-29	41st St Exit	41st St Ent.	0	0	0	0	3	3	0.26	1.86
		TOTAL	**0**	**6**	**6**	**14**	90	**116**	0.70	1.26
SB I-29	41st St Exit	41st St Ent.	0	0	0	0	2	2	0.15	1.81
SB I-29	41st St Ent.	Merge Area	0	1	0	0	14	15	1.26	1.86
SB I-29	41st St Ent.	3-lane section	1	0	3	3	9	16	0.61	1.59
SB I-29	2-lane section	EB/NB I-229 Exit	0	0	0	3	17	20	0.54	1.50
SB I-29	EB/NB I-229 Exit	Diverge Area	0	0	1	0	7	8	1.26	2.18
SB I-29	EB/NB I-229 Exit	WB/SB I-229 Ent.	0	1	0	1	5	7	0.67	1.92
SB I-29	WB/SB I-229 Ent.	Merge Area	0	0	0	1	10	11	1.78	2.19
SB I-29	WB/SB I-229 Ent.	CR 106 Exit	0	1	1	3	27	32	1.14	1.57
SB I-29	CR 106 Exit	Diverge Area	0	1	0	0	0	1	0.32	2.69
SB I-29	CR 106 Exit	CR 106 Ent.	0	0	2	5	10	17	1.28	1.81
		TOTAL	**1**	**4**	**7**	**16**	101	**129**	0.83	1.26
NB I-229	SB I-29 Ent.	Merge Area	0	0	0	0	10	10	1.42	2.12
NB I-229	SB I-29 Ent.	Louise Ave Exit	0	0	0	1	8	9	0.99	1.98
NB I-229	Louise Ave Exit	Diverge Area	0	0	0	1	4	5	2.08	2.96
NB I-229	Louise Ave Exit	SB Louise Ave Ent.	0	0	0	0	2	2	0.23	2.00
NB I-229	SB Louise Ave Ent.	Merge Area	0	0	0	1	8	9	1.36	2.15
NB I-229	SB Louise Ave Ent.	NB Louise Ave Ent.	0	0	0	0	0	0	0.00	2.41
NB I-229	NB Louise Ave Ent.	Merge Area	0	0	0	0	2	2	0.23	2.01
		TOTAL	**0**	**0**	**0**	**3**	34	**37**	0.79	1.45
SB I-229	Louise Ave Exit	Diverge Area	0	0	0	0	0	0	0.00	1.92
SB I-229	Louise Ave Exit	Louise Ave Ent.	0	0	0	0	9	9	0.71	1.83
SB I-229	Louise Ave Ent.	Merge Area	0	0	0	0	5	5	0.84	2.22
SB I-229	Louise Ave Ent.	NB I-29 Exit	0	0	0	2	5	7	2.14	2.66
SB I-229	NB I-29 Exit	Diverge Area	1	1	1	0	9	12	**2.58**	2.38
		TOTAL	**1**	**1**	**1**	**2**	28	**33**	0.89	1.50

Bolded Crash Rate indicates a calculated crash rate that is higher than the critical rate; indicating a potential situation where existing conditions are affecting operational safety.

The following Figure 12, represents the location of all reported crashes for the 5-calendar years evaluated for the proposed interchange area.

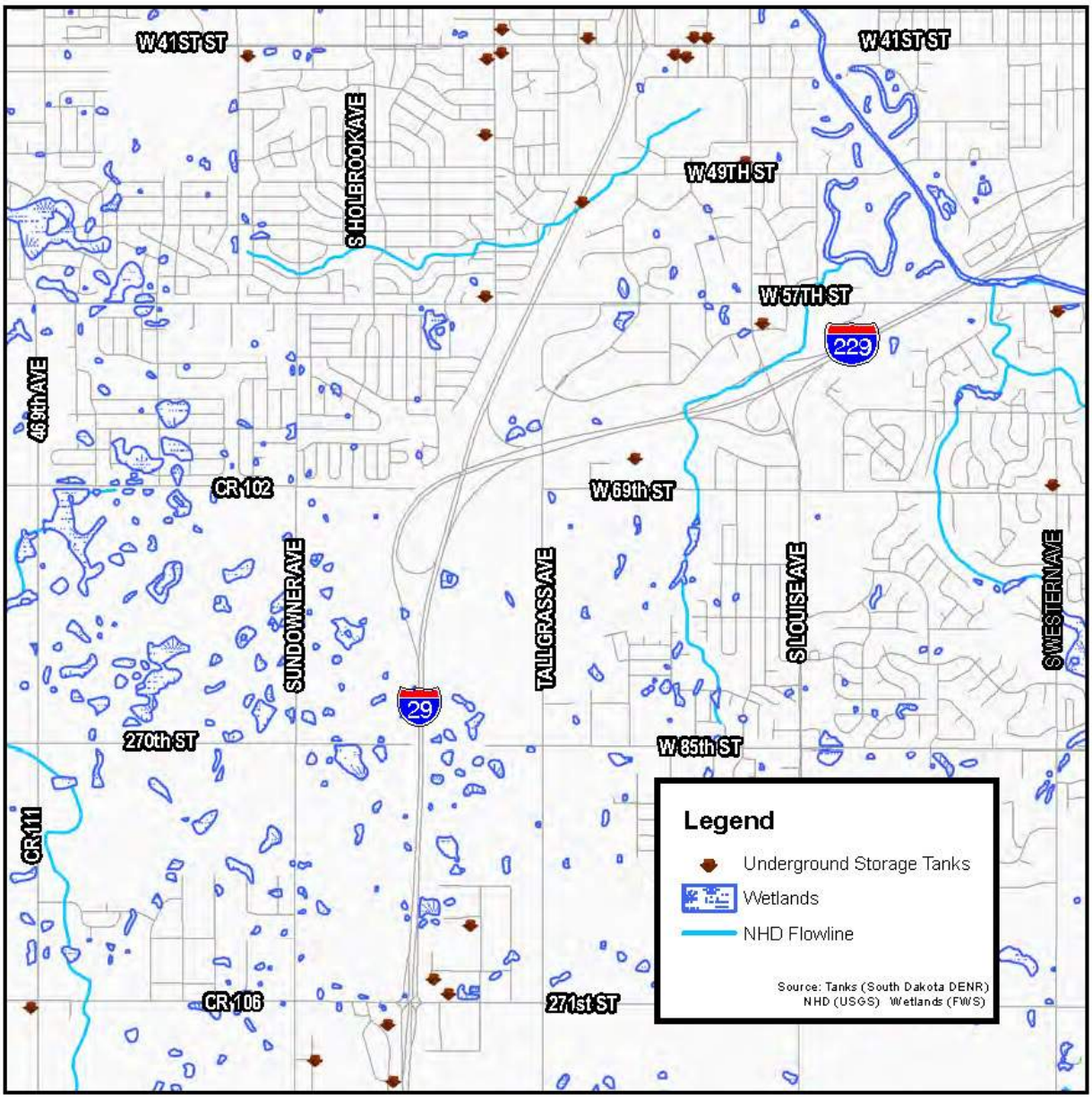
Figure 12 – Existing Crashes 2010 to 2014

3.9 Environmental Constraints

An overview of the study area surrounding the existing interchanges shows that the most potential environmental constraint could be caused by the known wetlands surrounding the interchange. Figure 13 shows the location of the known environmental constraints within the 85th Street interchange project area.

These type of environmental impacts will be addressed as a part of the Environmental Assessment.

Figure 13 – Known Potential Environmental Constraints



4.0 Need

The primary needs for the proposed interchange have been identified as:

- Transportation Demand – construct an interchange that will be consistent with the City/MPO's long range transportation plan and support the high growth development demands that are planned in the study area.
- Limited access – improve access opportunities to the freeway to best support the local roadway network, balancing traffic demands throughout the network versus funneling to only currently available freeway access locations.
- Economic Development – allow the region to capitalize on a major development opportunity, creating the ability to maximize land use potential which is contingent on improved access and system capacity.
- Safety – improved freeway access and overall system capacity lead to improved safety for all users.

At the time of the previous 2010 long range transportation plan (LRTP), land development south of 69th Street and west of Tallgrass Avenue was light with the development generally assumed was low-density residential. Assumptions of limited amounts of low-density development were due primarily to adequate amounts of more readily developable property in other areas of the region. However the most recent 2015 LRTP suggests a significant growth in the land area surrounding the City of Tea as well as the Sioux Falls Joint Jurisdiction Area.

Access along segments the of I-29 and I-229 in the study currently consist of the I-29/I-229 system interchange with local service interchanges 2.0 miles south at I-29/Highway 106 (Tea), 1.8 miles north at I-29/41st Street and 1.2 miles east at I-229/Louise Avenue. The freeway distance between the Highway 106 (Tea) and 41st Street access points along I-29 is approximately 3.8 miles. In the developed portions of Sioux Falls, interchanges are generally provided every mile, the minimum standard in accordance with the AASHTO guidance. Improvements have been made by the SDDOT to improve system capacity in the study area.

In the latest LRTP update (2015), provided in appendix K, targeted development areas within the region have shifted more to the southwest part of the region and over the past few years there has been significant development occurring on the southern fringe of Sioux Falls, including within the study area. Based on updated land development plans for the region, many portions of the study area are projected to develop to urban-scale development densities providing substantial employment opportunities in the office, retail, medical sectors, as well as moderate to high density housing development.

Destinations west of I-29 in the study area are required to travel north to 41st Street interchange or south to the Tea interchange to access I-29. Drivers on the west side of I-29 can also access the Interstate System by crossing the interstate via the 41st Street, 49th Street (overpass), 57th Street (overpass) or Highway 106 crossings of I-29, and then access I-229 via the Louise Avenue interchange. The I-29/41st Street and I-229/Louise Avenue interchanges currently experience recurring congestion in peak periods, and peak period travel delays are forecasted to increase over the planning horizon as traffic levels increase.

Thus, under the No build scenario where limited added capacity and no new routes are provided in the area, accessibility to and through the study area will decline as traffic volumes increase, congestion worsens and safety concerns rise.

5.0 Alternatives

Based on the I-29 Corridor Study (Exit 73 through Exit 77) the Preliminary Preference for an interchange concept was the Composite 9A illustrated here on the right. The concept includes a diamond interchange, Single Point Urban Interchange type (SPUI), with a ramp braid for southbound exiting traffic. The SPUI configuration, for consistency with the SPUI at Exit 73 to the south, along with a No Build Alternative was the basis of the IJR study's detailed capacity analysis evaluations for the years 2020, 2035 and 2045 with documentation provided in the appendices.

The 85th Street interchange configuration was also evaluated for alternative diamond configurations, seeking to improve operational and safety features for the interchange. The evaluation utilized the 2045 Build condition to evaluate alternatives, as discussed in Sections 5.3 and 5.4.

In determining the configuration of the build alternative, the access connections and basic freeway design standards were evaluated based on the American Association of State Highway and Transportation Official's (AASHTO) Policy on Geometric Design of Highways and Streets 2011 edition.

5.1 Access Connections and Design

The purpose of this section is to discuss the I-29 and I-229 system plan and proposed access modification from the 85th Street interchange.

5.1.1 Design Criteria

The primary design principles and criteria that were used to guide the design process include:

- Basic Lane Capacity
- Route continuity
- Lane balance
- Interchange Spacing
- Ramp Spacing

These criteria are described in the AASHTO Policy on Geometric Design of Highways and Streets 2011 edition.

The existing design speed for I-29 and I-229 in the project area is 70 mph, with a posted speed limit of 65 mph. The design speed of this project will follow the existing design speed of 70 mph.

5.1.1.1 Basic Lane Capacity

The basic number of lanes is defined as a minimum number of lanes designated and maintained over a significant length of a corridor, regardless of changes in traffic volumes and lane-balance. An assessment of basic lane needs is an indicator of minimum capacity requirements; it is not an indicator of actual capacity. The table below summarizes the basic lane volumes for LOS C, D and E from the 2010 Highway Capacity Manual.

Table 10
Basic Lane Capacity Thresholds

Free-Flow Speed	Per-Lane Volume Threshold (pcphpl)/ (Vehicle Density (pc/mi/ln))		
	LOS C	LOS D	LOS E
75 mph	1,750 / (26.0)	2,110 / (35.0)	2,400 / (45.0)
70 mph	1,690 / (26.0)	2,080 / (35.0)	2,400 / (45.0)
65 mph	**1,630 / (26.0)**	**2,030 / (35.0)**	**2,350 / (45.0)**
60 mph	1,560 / (26.0)	2,010 / (35.0)	2,300 / (45.0)
55 mph	1,430 / (26.0)	1,900 / (35.0)	2,250 / (45.0)

Highway Capacity Manual, Exhibit 11-17; assumes weaving density of 43 pc/mi/ln

The following set of tables represents the AM and PM peak hour traffic demands compared to the basic roadway capacity. If the basic lane need exceeds the number of lanes provided it would represent a capacity constraint on the roadway.

Under the existing 2015 condition, all traffic demands are below the basic capacity thresholds throughout the project area.

Table 11
Basic Lane Capacity Assessment – Existing 2015

	FROM	TO	Basic Number of Lanes Provided	Peak Hour Traffic Demands		Basic Lane Needs (HCM thresholds)	
				AM	PM	LOS C	LOS D
NB I-29	CR 106 Exit	CR 106 Entrance	2	1,420	1,055	0.9	0.7
	CR 106 Entrance	NB I-229 Exit	3	2,265	1,680	1.4	1.1
	NB I-229 Exit	SB I-229 Entrance	2	1,245	970	0.8	0.6
	SB I-229 Entrance	41st Street Exit	3	2,195	2,110	1.3	1.1
	41st Street Exit	41st Street Entrance	3	1,880	1,660	1.2	0.9
SB I-29	41st Street Exit	41st Street Entrance	3	1,080	1,830	1.1	0.9
	41st Street Entrance	NB I-229 Exit	3	1,365	2,290	1.4	1.1
	NB I-229 Exit	SB I-229 Entrance	2	605	1,215	0.7	0.6
	SB I-229 Entrance	CR 106 Exit	3	1,185	2,210	1.4	1.1
	CR 106 Exit	CR 106 Entrance	2	600	1,405	0.9	0.7
NB I-229	SB I-29 Entrance	Louise Avenue Exit	2	1,780	1,785	1.1	0.9
	Louise Avenue Exit	SB Louise Avenue Entrance	2	1,380	1,335	0.8	0.7
	SB Louise Avenue Entrance	NB Louise Avenue Entrance	3	1,750	1,940	1.2	1.0
SB I-229	Louise Avenue Exit	Louise Avenue Entrance	2	1,210	1,530	0.9	0.8
	Louise Avenue Entrance	NB I-29 Exit	3	1,530	2,135	1.3	1.1
	NB I-29 Exit	SB I-29 Ramp	2	580	995	0.6	0.5

Under the No Build 2045 (No Build – no interchange, development based on 85th St. overpass only) condition, all traffic demands are below the basic capacity thresholds throughout the project area. Discussion of the 2045 future traffic demands can be found in Section 6.0 of this document.

Table 12
Basic Lane Capacity Assessment – No Build 2045

	FROM	TO	Basic Number of Lanes Provided	Peak Hour Traffic Demands		Basic Lane Needs (HCM thresholds)	
				AM	PM	LOS C	LOS D
NB I-29	CR 106 Exit	CR 106 Entrance	2	1,685	1,770	1.1	0.9
	CR 106 Entrance	NB I-229 Exit	3	3,060	2,770	1.9	1.5
	NB I-229 Exit	SB I-229 Entrance	2	1,660	1,490	1.0	0.8
	SB I-229 Entrance	41st Street Exit	3	3,090	3,030	1.9	1.5
	41st Street Exit	41st Street Entrance	3	2,610	2,360	1.6	1.3
SB I-29	41st Street Exit	41st Street Entrance	3	2,000	2,245	1.4	1.1
	41st Street Entrance	NB I-229 Exit	3	2,420	2,940	1.8	1.4
	NB I-229 Exit	SB I-229 Entrance	2	1,040	1,770	1.1	0.9
	SB I-229 Entrance	CR 106 Exit	3	1,980	3,550	2.2	1.7
	CR 106 Exit	CR 106 Entrance	2	1,050	2,240	1.4	1.1
NB I-229	SB I-29 Entrance	Louise Avenue Exit	2	2,780	2,450	1.7	1.4
	Louise Avenue Exit	SB Louise Avenue Entrance	2	2,280	1,885	1.4	1.1
	SB Louise Avenue Entrance	NB Louise Avenue Entrance	3	2,745	2,640	1.7	1.4
SB I-229	Louise Avenue Exit	Louise Avenue Entrance	2	1,980	2,610	1.6	1.3
	Louise Avenue Entrance	NB I-29 Exit	3	2,370	3,320	2.0	1.6
	NB I-29 Exit	SB I-29 Ramp	2	940	1,780	1.1	0.9

Under the proposed Build 2045 (new 85th St. interchange with associated development) condition, all traffic demands are below the basic capacity thresholds throughout the project area without any mitigations to the existing roadway configuration.

However the new interchange access and surrounding development does increase traffic demands along both freeway corridors. While no basic capacity thresholds are exceeded, the increased mainline demands bring two I-229 freeway segments within 10% of the LOS C to D threshold.

Discussion of the 2045 future traffic demands can be found in Section 6.0 of this document.

Table 13
Basic Lane Capacity Assessment – Build 2045

	FROM	TO	Basic Number of Lanes Provided	Peak Hour Traffic Demands		Basic Lane Needs (HCM thresholds)	
				AM	PM	LOS C	LOS D
NB I-29	CR 106 Exit	CR 106 Entrance	2	1,785	1,700	1.1	0.9
	CR 106 Entrance	85th Street Exit	3	3,055	2,620	1.9	1.5
	85th Street Exit	85th Street Entrance	3	2,760	2,345	1.7	1.4
	85th Street Entrance	NB I-229 Exit	3	3,910	3,690	2.4	1.9
	NB I-229 Exit	SB I-229 Entrance	2	2,170	2,020	1.3	1.1
	SB I-229 Entrance	41st Street Exit	3	3,440	3,410	2.1	1.7
	41st Street Exit	41st Street Entrance	3	2,930	2,705	1.8	1.4
SB I-29	41st Street Exit	41st Street Entrance	3	2,140	2,610	1.6	1.3
	41st Street Entrance	NB I-229 Exit	3	2,550	3,290	2.0	1.6
	NB I-229 Exit	SB I-229 Entrance	2	1,230	2,140	1.3	1.1
	SB I-229 Entrance	85th Street Exit	3	2,390	4,390	2.7	2.2
	85th Street Exit	85th Street Entrance	3	1,865	3,380	2.1	1.7
	85th Street Entrance	CR 106 Exit	3	2,240	3,760	2.3	1.9
	CR 106 Exit	CR 106 Entrance	2	1,400	2,560	1.6	1.3
NB I-229	SB I-29 Entrance	Louise Avenue Exit	2	3,060	2,820	1.9	1.5
	Louise Avenue Exit	SB Louise Avenue Entrance	2	2,570	2,260	1.6	1.3
	SB Louise Avenue Entrance	NB Louise Avenue Entrance	3	2,995	2,940	1.8	1.5
SB I-229	Louise Avenue Exit	Louise Avenue Entrance	2	2,100	3,045	1.9	1.5
	Louise Avenue Entrance	NB I-29 Exit	3	2,430	3,640	2.2	1.8
	NB I-29 Exit	SB I-29 Ramp	2	1,160	2,250	1.4	1.1
				Within 10% of basic capacity threshold			

5.1.1.2 Route Continuity

A route continuity evaluation is to determine if any forced lane changes are required to continue along a specific highway. A forced lane change occurs when either an established through lane is dropped at a Major Fork Diverge or when an auxiliary lane is added to the left side of the roadway to accommodate the design of a Major Fork Diverge and the through traffic must change lanes in order to continue.

Route continuity is satisfied for both I-29 and I-229 in the project area.

I-29 has two continuous travel lanes in both directions from south of the project limits through the I-229 system interchange where an additional through lane is added to the outside of the freeway. This 3rd continuous lane extends to approximately the I-90 system interchange.

I-229 has two continuous travel lanes in both directions east of the I-29 system interchange that extend to the I-90 system interchange.

5.1.1.3 Lane Balance

The concept of lane balance is intended to smooth traffic flow through and beyond an interchange. The AASHTO definition of lane balance is as follows:

1. At entrances, the number of lanes beyond the merging of two traffic streams should not be less than the sum of all traffic lanes on the merging roadways minus one.
2. At exits, the number of approach lanes on the highway must be equal to the number of lanes on the highway beyond the exit, plus the number of lanes on the exit, minus one. Exceptions to this principle occur at cloverleaf loop-ramp exits that follow a loop-ramp entrance and at exits between closely spaced interchanges (i.e. interchanges where the distance between the end of the taper of the entrance terminal and the beginning of the taper of the exit terminal is less than 1,500 ft). In these cases, the auxiliary lane may be dropped in a single-lane exit with the number of lanes on the approach roadway being equal to the number of through lanes beyond the exit plus the lane on the exit.
3. The traveled way of the highway should be reduced by not more than one traffic lane at a time.

Lane balance is satisfied at all entrances in the project area along both I-29 and I-229. Lane balance is not satisfied at the exit ramp locations that are fed by a full auxiliary lane; to fully satisfy the criteria, escape lanes would need to be provided after the exit ramp to ensure vehicles would not become trapped in the auxiliary lane.

5.1.1.4 Interchange Spacing

In urban or urbanizing areas, the minimum recommended interchange spacing is 1-mile. In rural areas, the minimum recommended interchange spacing is 2-miles. Collector distributor (CD) roadways are recommended when that spacing criteria is not met.

All interchange spacing currently meets the spacing criteria, represented in Table 14 below. The proposed access at 85th Street does satisfy the criteria for the urbanizing area surrounding the interchange.

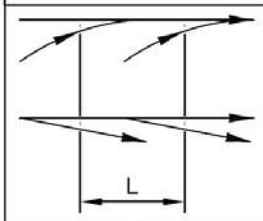
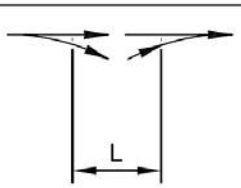
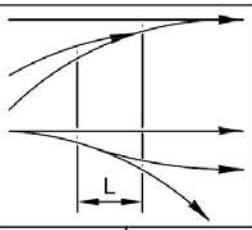
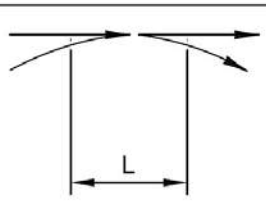
Table 14
Interchange Spacing Assessment

Freeway	From	To	Existing Spacing (miles)	Proposed Spacing (miles)	Desired Spacing (miles)	Comments
I-29	CR 106	I-229	2.0	n/a	2.0	Satisfied, Rural
	CR 106	85th Street	n/a	1.0	1.0	Satisfied, Urban
	85th Street	I-229	n/a	1.0	1.0	Satisfied, Urban
	I-229	41st Street	1.9	1.9	1.0	Satisfied, Urban
I-229	I-29	Louise Avenue	1.25	1.25	1.0	Satisfied, Urban

5.1.1.5 Ramp Spacing

The distance between freeway ramps can be one of the most important features to impact freeway operations. AASHTO criteria and these minimum guidelines are documented in the Design Manual and are shown in Figure 14.

Figure 14 – AASHTO Minimum Ramp Spacing Criteria

EN-EN OR EX-EX		EX-EN		TURNING ROADWAYS		EN-EX (WEAVING)			
									
FULL FWY	C-D ROAD OR FWY.DIST.	FULL FWY	C-D ROAD OR FWY.DIST.	SYSTEM INTERCHANGE	SERVICE INTERCHANGE	SYSTEM TO SERVICE INTERCHANGE		SERVICE TO SERVICE INTERCHANGE	
						FULL FWY	C-D ROAD OR FWY.DIST.	FULL FWY	C-D ROAD OR FWY.DIST.
300 m [1000 ft]	240 m [800 ft]	150 m [500 ft]	120 m [400 ft]	240 m [800 ft]	180 m [600 ft]	600 m [2000 ft]	480 m [1600 ft]	480 m [1600 ft]	300 m [1000 ft]

The following Table 15 represents both the existing and proposed ramp spacing. Under the existing conditions, all ramp spacing criteria is met. Under the base proposed condition, the majority of ramp spacing criteria is met, however there are two locations that are below the minimum criteria.

The first ramp spacing that is below the criteria is for northbound I-29 between the CR 106 Entrance ramp and the proposed 85th Street exit ramp. The minimum spacing criteria is 1,500 feet and the proposed condition only achieves approximately 1,480 feet. This ramp spacing is just below the criteria and could easily be adjusted through design adjustments in order to maximize the weaving distance between the ramps and achieve the criteria.

The second ramp spacing that is below the criteria is for southbound I-29 between the system interchange with I-229 and the proposed 85th Street exit ramp. The initial design alternative, represented in Table 15, included reconstructing the southbound I-229 ramp and shifting the entrance gore approximately 1,050 feet north of the current location in order to maximize the weaving distance. Even with this reconfiguration, the weaving distance between the ramps was only able to be extended to approximately 930 feet, significantly lower than the minimum criteria.

Therefore, this design would not be considered technically feasible and mitigation must occur. To remedy the constraint, the southbound I-29 exit ramp to 85th Street can be braided over the southbound I-229 entrance ramp; this means the 85th Street exit ramp would exit I-29 north of the I-229 entrance ramp and be grade separated over the I-229 entrance ramp. This removes the short weaving section and the existing weaving section between I-229 and CR 106 would remain. Shifting the 85th Street exit ramp to the north and constructing the braid would not impact the ramp spacing criteria as shown in the "I-29 Braided" section of the table.

In order to achieve full access to the interchange for the surrounding Sioux Falls area, a connector ramp from southbound I-229 to the 85th Street ramp would be provided. See Appendix N for the 85th St Interchange Alternatives Review Memo specific to the connector ramp element.

Table 15
I-29 Ramp Spacing Assessment

	FROM	TO	Spacing Type	Minimum Spacing (feet)	Existing Spacing (feet)	Proposed Spacing (feet)	Comments
NB I-29	CR 106 Exit	CR 106 Entrance	EX-EN	500	3350	3350	No change
	CR 106 Entrance	NB I-229 Exit	EN-EX[1]	2000	7450	n/a	n/a
	CR 106 Entrance	85th Street Exit	EN-EX	1500	n/a	**1480**	just below criteria
	85th Street Exit	85th Street Entrance	EX-EN	500	n/a	3140	Satisfied
	85th Street Entrance	NB I-229 Exit	EN-EX[1]	2000	n/a	2830	Satisfied
	NB I-229 Exit	SB I-229 Entrance	EX-EN	500	3020	3020	No change
	SB I-229 Entrance	41st Street Exit	EN-EX[1]	2000	7070	7070	No change
	41st Street Exit	41st Street Entrance	EX-EN	500	2000	2000	No change
SB I-29	41st Street Exit	41st Street Entrance	EX-EN	500	2185	2185	No change
	41st Street Entrance	NB I-229 Exit	EN-EX[1]	2000	9700	9700	No change
	NB I-229 Exit	SB I-229 Entrance	EX-EN	500	3640	2590	No change
	SB I-229 Entrance	CR 106 Exit	EN-EX[1]	2000	5490	n/a	n/a
	SB I-229 Entrance	85th Street Exit	EN-EX[1]	2000	n/a	**930**	**Criteria NOT MET**
	85th Street Exit	85th Street Entrance	EX-EN	500	n/a	3110	Satisfied
	85th Street Entrance	CR 106 Exit	EN-EX	1500	n/a	2500	Satisfied
	CR 106 Exit	CR 106 Entrance	EX-EN	500	3300	3300	No change
SB I-29 Braided	NB I-229 Exit	85th Street Exit	EX-EX	1000	n/a	1870	Satisfied
	85th Street Exit	SB I-229 Entrance	EX-EN	500	n/a	1770	Satisfied
	SB I-229 Entrance	CR 106 Exit	EN-EX[1]	2000	5490	5490	No change

EN-EX[1] indicates a System Interchange to Service Interchange weaving segment
All ramp spacing distances are approximate.
Highlighted cells indicate spacing below minimum standards.
"n/a" indicates the ramp spacing does not exist for that scenario

5.2 Alternative 0 – No Build

This alternative would not provide new access to I-29, only includes an 85th Street overpass of I-29. The arterial roadway network would be built to accommodate the future traffic growth in the project area, however no changes to interstate system would be included.

5.3 Alternative 1 – Build, 85th Street Interchange

To balance proper ramp spacing requirements, traffic safety, as well as minimize right of way impacts, a diamond type interchange configuration was selected as the most appropriate option as it provides adequate spacing in 3 or the four quadrants without negative impacts.

Both of the southern ramp connections to and from I-29 provide adequate ramp spacing between CR 106 and 85th Street. The 85th Street entrance ramp to northbound I-29 would provide approximately 2,830 feet of weaving distance for the northbound I-229 exit ramp.

The southbound I-29 exit ramp would require a braided configuration with the southbound I-229 entrance ramp in order to eliminate the substandard weaving section. To provide full access from both I-29 and I-229, a connector ramp from the 2-lane section of I-229 to the 85th Street ramp would also be provided. See Appendix N for the 85th St Interchange Alternatives Review Memo specific to the connector ramp element.

While a diamond configuration was selected as the most appropriate interchange configuration, including the braided southbound ramp and connector ramp, the ramp terminal intersection control needed to be evaluated further. The 2045 Design Year Analysis was conducted with a Single Point Urban Interchange (SPUI) as the base type, similar with the 2020 and 2035 years, and then two alternative intersection controls types were evaluated. All three provide similar ramp spacing and operational results on the interstate system.

Utilizing a standard diamond interchange configuration, there are three variations of intersection control types that can be implemented, those include:

- Standard Diamond with Traffic Signal Control
    - Include 26 intersection conflict points
- Single Point Urban Interchange (SPUI)
    - Includes 20 intersection conflict points
- Diverging Diamond Interchange (DDI)
    - Includes 14 intersection conflict points

Operational analysis for these three configurations was conducted for the 2045 Build model with results provided in Figure A12 of the appendix. Results indicated all three provided acceptable level-of-service operations (LOS C or better) for both AM and PM peaks. The DDI configuration provided the best operations for the AM peak period. The 2020 Opening Day operations were also checked with the DDI configuration. A LOS B is provided for both AM and PM peak periods with the DDI, compared to LOS C for the SPUI. Based on the better operational results and fewest conflict points for safety, the DDI configuration is considered the most technically feasible option. The DDI configuration also has the lowest construction cost estimate of the three options considered (see Appendix L). Figure 15 represents the diverging diamond interchange (DDI) configuration with the braided southbound I-29 ramp and the I-229 connector ramp connection.

While no operations data is included in this report, a standard diamond interchange with roundabout intersection control was initially considered but removed. The design would require three circulating lanes to handle the high traffic demands forecasted. Roundabouts of this size can significantly reduce the safety benefits typically associated with the intersection control and also become difficult for drivers to maneuver through.

Figure 15 – Alternative 1 – 85th Street, Diverging Diamond Interchange (DDI)

5.4 Dismissed Alternatives

Through the course of the previous project and current project, different interchange design concepts were evaluated but ultimately removed from consideration. The following is a brief discussion of the dismissed alternatives.

5.4.1 Diamond Interchange – No Ramp Braid

To reduce costs, an alternative without a braid ramp connection was evaluated along southbound I-29. In order to provide weaving distance between the system interchange and service interchange, the southbound I-229 ramp connection to southbound I-29 would need to be reconstructed.

Shifting the existing entrance ramp upstream approximately 1,050 feet would provide approximately 930 feet of weaving distance between the system entrance ramp and the new service exit ramp.

This distance is significantly lower than the minimum distance of 2,000 based on the AASHTO criteria. For this reason, this alternative was not considered feasible and it was dismissed.

Figure 16 – Dismissed Alternative – No Ramp Braid

5.4.2 Folded Diamond Interchange

To reduce costs, an alternative without a braid ramp connection was evaluated along southbound I-29. In order to maximize the weaving distance between the system interchange and service interchange, a folded diamond design was incorporated.

Shifting the 85th Street exit to a loop ramp design allowed for a longer weaving section without the need to reconstruct the system interchange. However, the loop ramp design would only provide approximately 1,740 feet of weaving distance between the system entrance ramp and the new service exit ramp.

The system to service weaving distance is significantly lower than the minimum distance of 2,000 based on the AASHTO criteria. The loop ramp design also pushes the entrance gore for the 85th Street entrance ramp further south, reducing the weaving distance between that

ramp and the Exit 73 off ramp as well. For these reasons, this alternative was not considered feasible and it was dismissed.

Figure 17 – Dismissed Alternative – Folded Diamond Interchange

5.4.3 Diamond Interchange – with I-29 Ramp Braid, no I-229 connection

A diamond interchange design with a braid ramp from I-29 was also considered. This design did not provide a connection from I-229 to 85th Street.

This was dismissed based on the ability of the proposed service interchange to provide full access from the freeway system. Without access from I-229, traffic would route much longer trips along the local roadway network to access the land use surrounding the interchange.

Figure 18 – Dismissed Alternative – No I-229 Connection

6.0 Future Year Traffic

The design year for this project is 2045 with a year of opening of 2020 for analysis purposes. A mid-term forecast year of 2035 was also developed to aid in development of roadway network plan for adding additional capacity to the arterial system.

Traffic forecasts were prepared using the latest version of the regional demand model for the Metropolitan Planning Organization (MPO) area. Traffic operations for both the No Build and Alternative 1 were evaluated based on the forecast demands.

6.1 Future Year Traffic Forecasts

As part of the 85th Street interchange project, traffic forecasts were developed for all intersections and roadway segments within the project area.

The forecasting work included many different scenarios incorporating some additional regional improvements in the project vicinity. However, only the No Build and Alternative 1 scenarios will be evaluated.

Due to the significant change in planned land use between the existing conditions and the design year 2045, many improvements, both programmed and in planning phases, are anticipated to be in place. The following is a brief list of the improvements included in the Transportation Improvement Program (TIP) to be constructed before the end of 2019; this does not include additional improvement made outside of the project study area:

- 85th Street – Tallgrass Avenue to Louise Avenue; 2-lane to 4-lane (2018)
- Tallgrass Avenue – 69th Street to 85th Street; 2-lane to 4-lane (2019)

The following is a brief list of the improvements assumed to be in place for the project area based on the long range planning. A more detailed breakdown is provided in appendix L – Construction Cost Estimate and discussed in Section 8.0 Funding Plan; this does not include additional improvement made outside of the project study area, such as the SD 100 corridor:

- 85th Street – Sundowner Avenue to Tallgrass Avenue; 2-lane to 4-lane (including overpass)
- 41st Street – Capacity Improvement between Marion Road and Louise Avenue
- 69th Street – CR 111 to Solberg Avenue; 2-lane to 4-lane (including overpass)
- CR 106 – 468th Street to I-29; 2-lane to 4-lane
- CR 111/Tea-Ellis Road – CR 106 to 85th Street; 2-lane to 4-lane
- Sundowner Avenue – 272nd Street to 57th Street; 2-lane to 4-lane
- Tallgrass Avenue – CR 106 to 69th Street; 2-lane to 4-lane
- Louise Avenue – CR 106 to 95th Street; 2-lane to 4-lane

The full traffic forecast memorandum*, I-29/85th Street Interchange Justification Report (IJR) – Traffic Forecasts* memorandum, dated July 29, 2016, is provided in Appendix C.

In Appendix C, Figures 7.2A through 7.2C represent the 2045 No Build turning movement data, Figures 7.4A through 7.4C represent the 2045 Build turning movement data, Figures 9.1A through 9.1C represent the 2020 No Build turning movement data, Figures 9.2A through 9.2C represent the 2020 Build turning movement data, Figures 10.3A through 10.3C represent the 2035 No Build turning movement data, and Figures 10.4A through 10.4C represent the 2035 Build turning movement data.

6.2 Design Year Analysis

See Appendix A figures for the No Build and Build geometrics at all the study intersections. The design year analysis for the interchange was based on a diamond configuration utilizing a Single Point Urban Interchange (SPUI), similar to existing Exit 73 at CR 106. Additional analysis was ultimately conducted, as noted in Section 5.3, utilizing the 2045 Build model to determine the most technically feasible intersection configuration and control for the interchange.

6.2.1 2045 No Build

Due to the significant increases in traffic demands along the arterial roadway network, mitigations to the study intersections were incorporated as part of the No Build scenario. Without improvements, 23 of the 24 study intersection would operate under failing conditions for at least one peak hour under the existing geometrics and traffic control. Therefore, all twenty four study intersections will require traffic signal control by the design year based on estimated traffic volumes. Verification of signal warrants as traffic demands increase will need to be completed. Phasing of these potential traffic signal locations are shown in more detail in appendix L – Construction Cost Estimates and Phasing Plan and discussed in Section 8.0 Funding Plan. Improvements that are considered regionally significant or seek federal funding will need to be amended into the LRTP.

The summation of the traffic operations analysis show that mainline I-29 and I-229, including all existing ramp junctions, operate at a LOS C or better during the AM and PM peak hours.

Results for the individual segments and ramp junctions of I-29 and I-229 are shown in Tables 16 and 17, below.

Figure 19 is a visual representation of the 2045 No Build freeway lane geometrics and the results of the traffic analysis.

Figure 19 – 2045 No Build Freeway Configuration and Results

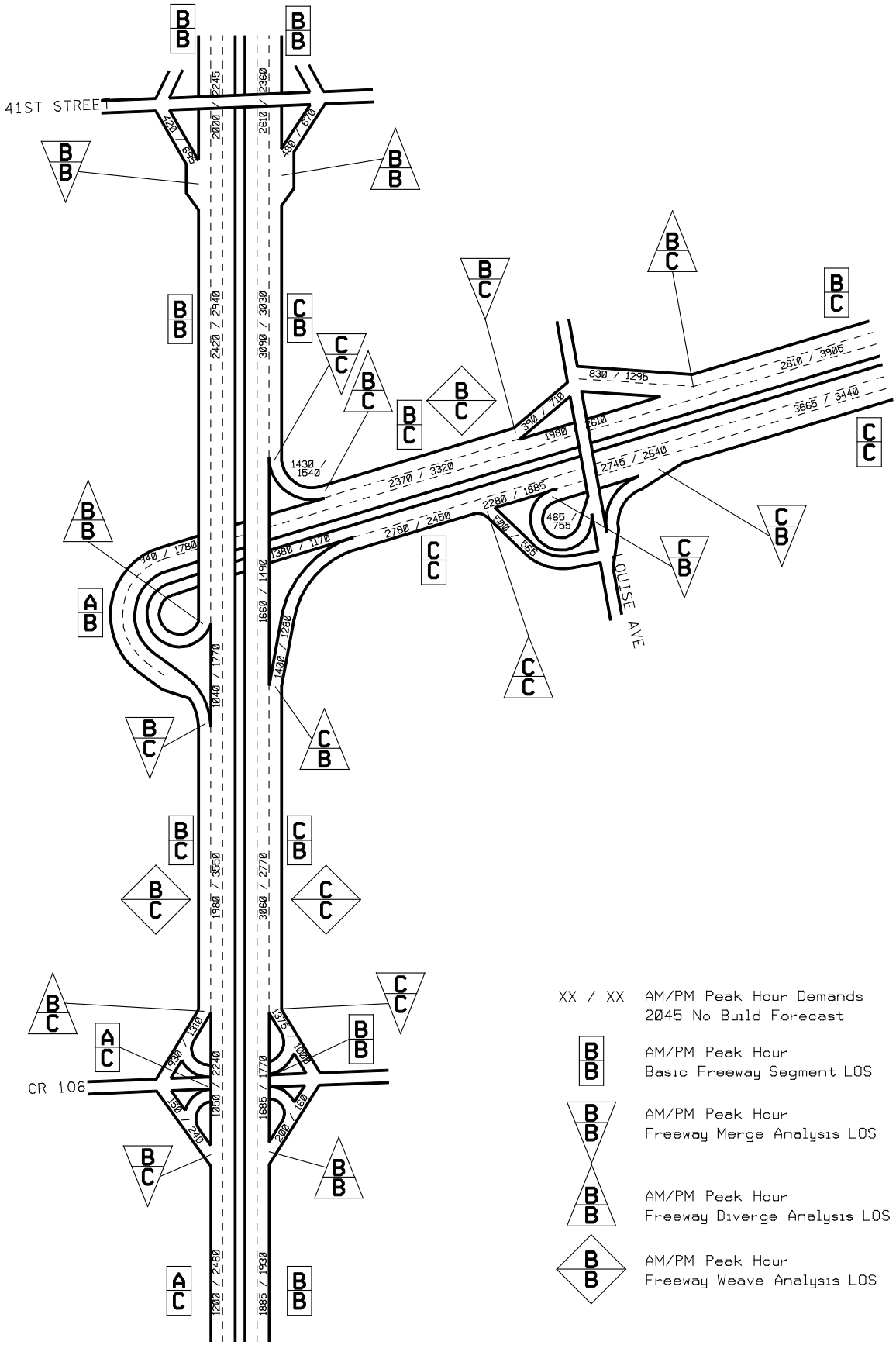


Table 16
2045 No Build I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak LOS	PM Peak LOS
NB I-29	NB I-29 – South of Exit 73	Basic	B	B
	NB I-29 – Exit 73 to CR 106	Diverge	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	B
	NB I-29 – CR 106 Entrance	Merge	C	C
	NB I-29 – between CR 106 to NB I-229 Exit	Basic	C	B
	NB I-29 – between CR 106 to NB I-229 Exit	Weave	C	C
	NB I-29 – Exit 77 to NB I-229	Diverge	C	B
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B
	NB I-29 – SB I-229 Entrance	Merge	C	C
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	C	B
	NB I-29 – Exit 77 to 41st St	Diverge	B	B
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B
SB I-29	SB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B
	SB I-29 – 41st St Entrance	Merge	B	B
	SB I-29 – between 41st St Entrance and NB I-229 Exit	Basic	B	B
	SB I-29 – Exit 77 to NB I-229	Diverge	B	B
	SB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B
	SB I-29 – SB I-229 Entrance	Merge	B	C
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Basic	B	C
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Weave	B	C
	SB I-29 – Exit 73 to CR 106	Diverge	B	C
	SB I-29 – between CR 106 Exit and CR 106 Entrance	Basic	A	C
	SB I-29 – CR 106 Entrance	Merge	B	C
	SB I-29 – South of CR 106 Entrance	Basic	A	C

Table 17
2045 No Build I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	n/a	n/a
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	C	C
	NB I-229 – Exit 1C to Louise Avenue	Diverge	C	C
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	C	B
	NB I-229 – SB Louise Avenue Entrance	Merge	C	B
	NB I-229 – between SB Louise Ave Entrance and NB Louise Ave Entrance	Basic	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	C	B
	NB I-229 – East of Louise Avenue Interchange	Basic	C	C
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	C
	SB I-229 – Exit 1C to Louise Avenue	Diverge	B	C
	SB I-229 – between Louise Avenue Exit and Louise Avenue Entrance	Basic	B	C
	SB I-229 – Louise Avenue Entrance	Merge	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	B	C
	SB I-229 – Exit 1A to NB I-29	Diverge	B	C
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	B

"n/a" – merge area cannot be analyzed with HCM methodologies due to two single lane merge area

Under the 2045 traffic demands and improved traffic control and geometrics, all of the intersections operate at an acceptable LOS in the project area based on the mitigations provided.

The following is a list of the general lane improvements needed to be in place for the project area based on the No Build operations analysis; this does not include intersection turn lanes.

- 41st Street – Additional Lane between Marion Road and I-29 (Long Range Plan)
- 57th Street – Additional Lane between Sundowner Avenue and Solberg Avenue
- 69th Street – 4-lane between Sundowner Avenue and Louise Avenue (Long Range Plan)
- 85th Street – 4-lane between Sundowner Avenue and Tallgrass Avenue (Long Range Plan)
- 85th Street – 6-lane between Tallgrass Avenue and east of Louise Avenue
- CR 106 – Additional Lane between CR 111 and Sundowner Avenue (Long Range Plan)
- CR 106 – 6-lane between CR 111 and I-29
- Sundowner Avenue – Additional Lane between 57th Street and 85th Street (Long Range Plan)
- Tallgrass Avenue – Additional Lane between 69th Street and CR 106 (Long Range Plan)
- Louise Avenue – Additional Lane northbound from south of 69th Street to I-29

Phasing of these potential improvements is shown in more detail in appendix L – Construction Cost Estimates and Phasing Plan and discussed in Section 8.0 Funding Plan. Improvements that are considered regionally significant or seek federal funding will need to be amended into the LRTP.

Table 18 summarizes the results of the 2045 No Build traffic analysis for the ramp terminal intersections as well as adjacent major intersections within the project area. See appendix A for schematic graphical maps showing these results.

Table 18
2045 No Build Arterial Intersection Operations Summary

Major Roadway	Intersecting Roadway	Intersection Control Type	AM Peak	PM Peak
			LOS	LOS
41st Street	Marion Road	Signal	D	D
41st Street	I-29 SB Ramp Terminal	Signal	C	D
41st Street	I-29 NB Ramp Terminal	Signal	C	C
41st Street	Louise Avenue	Signal	C	D
57th Street	Sundowner Avenue	Signal	C	F **
57th Street	Marion Road	Signal	D	D
57th Street	Solberg Avenue	Signal	D	D
Louise Avenue	57th Street	Signal	C	E
Louise Avenue	59th Street	Signal	B	C
Louise Avenue	SB I-229 Ramp Terminal	Signal	B	D
Louise Avenue	NB I-229 Ramp Terminal	Signal	A	A
CR 111 (Tea-Ellis Road)	69th Street	Signal	B	F **
Sundowner Avenue	69th Street	Signal	C	D
471st Ave/Solberg Avenue	69th Street	Signal	C	D
Louise Avenue	69th Street	Signal	D	D
CR 111 (Tea-Ellis Road)	85th Street	Signal	C	C
Sundowner Avenue	85th Street	Signal	C	F **
471st Ave/Solberg Avenue	85th Street	Signal	C	D
Louise Avenue	85th Street	Signal	D	C
CR 106	CR 111 (Tea-Ellis Road)	Signal	C	C
CR 106	Sundowner Avenue	Signal	C	D
CR 106	I-29 Ramp Terminal (Single Point)	Signal	C	C
CR 106	471st Ave/Tallgrass Avenue	Signal	C	C
CR 106	CR 117/Louise Avenue	Signal	C	C

Note – Average Intersection LOS shown, individual movements and/or approaches may be different
**Queue Storage Ratio greater than 1.0 for at least 1 movement, results in LOS F for entire intersection
Highlighted cell denotes a change in traffic control

6.2.2 2045 Alternative 1

Due to the significant increases in traffic demands along the arterial roadway network in the No Build scenario, the same mitigations to the study intersections were incorporated as part of the Build scenario. With substantial increases in the freeway demands, mitigations to the I-29 and I-229 corridor were also incorporated.

The summation of the traffic operations analysis show that mainline southbound I-29, including all existing ramp junctions, operate at a LOS C or better during the AM and PM peak hours. Northbound I-29 and both directions of I-229 will have LOS D or worse operations at spot locations in the project area.

With increased demands along both northbound I-29 and the exit ramp to I-229, the system diverge will operate at a LOS D in the AM peak and the weaving segment between 85th Street to northbound I-229 will operate at a LOS D in the AM peak and a LOS F in the PM peak hours.

The increased mainline demands along I-229 will also begin to operate at a LOS D for eastbound I-229 between I-29 and Louise Avenue and for westbound I-229 between the Louise Avenue ramp connections; both of these basic freeway segments are just over the LOS C/D threshold.

The eastbound I-229 exit ramp to Louise Avenue will operate at a LOS D in both peak hours due to the increased mainline demands.

Results for the individual segments and ramp junctions of I-29 and I-229 are shown in Tables 19 and 20, below.

Figure 20 is a visual representation of the 2045 Base Build freeway lane geometrics and the traffic operational results.

Figure 20 – 2045 Base Build Freeway Configuration and Results

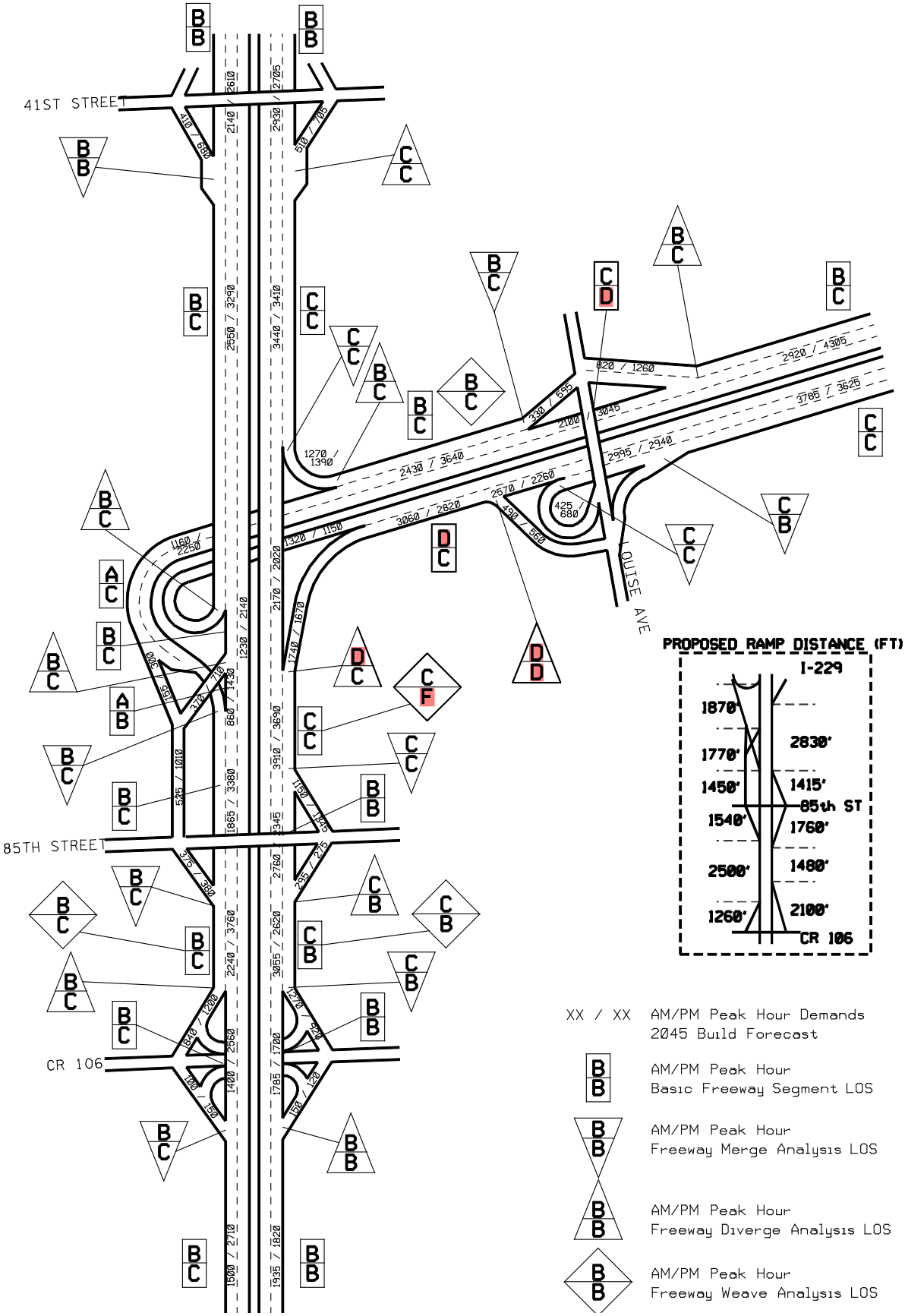


Table 19
2045 Base Build I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak LOS	PM Peak LOS
NB I-29	NB I-29 – South of Exit 73	Basic	B	B
	NB I-29 – Exit 73 to CR 106	Diverge	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	B
	NB I-29 – CR 106 Entrance	Merge	C	B
	NB I-29 – between CR 106 to 85th Street Exit	Basic	C	B
	NB I-29 – between CR 106 to 85th Street Exit	Weave	C	B
	NB I-29 – Exit 74 to 85th Street	Diverge	C	B
	NB I-29 – between 85th Street Exit and Entrance Ramps	Basic	B	B
	NB I-29 – 85th Street Entrance	Merge	C	C
	NB I-29 – between 85th Street to NB I-229 Exit	Basic	C	C
	NB I-29 – between 85th Street to NB I-229 Exit	Weave	C	**F**
	NB I-29 – Exit 77 to NB I-229	Diverge	**D**	C
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B
	NB I-29 – SB I-229 Entrance	Merge	C	C
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	C	C
	NB I-29 – Exit 77 to 41st St	Diverge	C	C
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B
SB I-29	SB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B
	SB I-29 – 41st St Entrance	Merge	B	B
	SB I-29 – between 41st St Entrance and NB I-229 Exit	Basic	B	B
	SB I-29 – Exit 77 to NB I-229	Diverge	B	B
	SB I-29 – between NB I-229 Exit and 85th Street Exit	Basic	B	C
	SB I-29 – Exit 74 to 85th Street	Diverge	B	C
	SB I-29 – between 85th Street Exit and SB I-229 Entrance	Basic	A	B
	SB I-29 – SB I-229 Entrance	Merge	B	C
	SB I-29 – between SB I-229 Entrance and 85th Street Entrance	Basic	B	C
	SB I-29 – 85th Street Entrance	Merge	B	C
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Basic	B	C
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Weave	B	C
	SB I-29 – Exit 73 to CR 106	Diverge	B	C
	SB I-29 – between CR 106 Exit and CR 106 Entrance	Basic	B	C
	SB I-29 – CR 106 Entrance	Merge	B	C
	SB I-29 – South of CR 106 Entrance	Basic	A	C

Note: Highlighted cell denotes results below acceptable MOE

Table 20
2045 Base Build I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak LOS	PM Peak LOS
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	n/a	n/a
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	**D**	C
	NB I-229 – Exit 1C to Louise Avenue	Diverge	**D**	**D**
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	C	C
	NB I-229 – SB Louise Avenue Entrance	Merge	C	C
	NB I-229 – between SB Louise Ave Entrance and NB Louise Ave Ent.	Basic	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	C	B
	NB I-229 – East of Louise Avenue Interchange	Basic	C	C
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	C
	SB I-229 – Exit 1C to Louise Avenue	Diverge	B	C
	SB I-229 – between Louise Avenue Exit and Louise Avenue Entrance	Basic	C	**D**
	SB I-229 – Louise Avenue Entrance	Merge	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	B	C
	SB I-229 – Exit 1A to NB I-29	Diverge	B	C
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	B

Note: "n/a" – merge area cannot be analyzed with HCM methodologies due to two single lane merge area
Highlighted cell denotes results below acceptable MOE

6.2.2.1 Freeway Mitigations

While the southbound direction of I-29 has acceptable operations for all freeway segments and ramp connections, northbound I-29 and both directions of I-229 have operational problems due to the increase in traffic demands to and from the proposed interchange.

With increased demands along northbound I-29 and the exit ramp to I-229, a 2-lane exit is proposed to mitigate LOS issues. However, the taper for a 2-lane system exit would overlap the taper from the proposed entrance ramp from 85th Street; therefore a full auxiliary lane from 85th Street through the northbound I-229 exit, ending at the I-229 Louise Avenue exit is proposed. Under a recent SDDOT project, a 2-lane exit and auxiliary lane along northbound I-229 to Louise Avenue was graded, but only paved with one lane and a shoulder.

A third travel lane along southbound I-229 under Louise Avenue is also proposed, this will modify both the Louise Avenue diverge and merge connections with I-229. The added lane improves the mainline operation to a LOS B. The Louise Avenue entrance ramp will need to be modified to a standard entrance ramp and will still operate at a LOS C or better. See Figures 21 and 22 for the 2045 Mitigated Build freeway lane geometrics.

With the existing 2-lane exit at Louise Avenue and the 3rd lane under the overpass, lane balance became an issue. The exit ramp was evaluated as a single lane exit, with approximately 600 feet or more of taper, and resulted in acceptable operations of LOS C or better. Therefore, to provide proper lane balance, a single lane exit ramp is proposed.

With these mitigation improvements to the freeway system, all mainline and ramp junctions operate at a LOS C or better. Results for the individual segments and ramp junctions of I-29 and I-229 are shown in Tables 21 and 22, on the following pages.

Figure 21 – 2045 Mitigated Build Freeway Configuration and Results

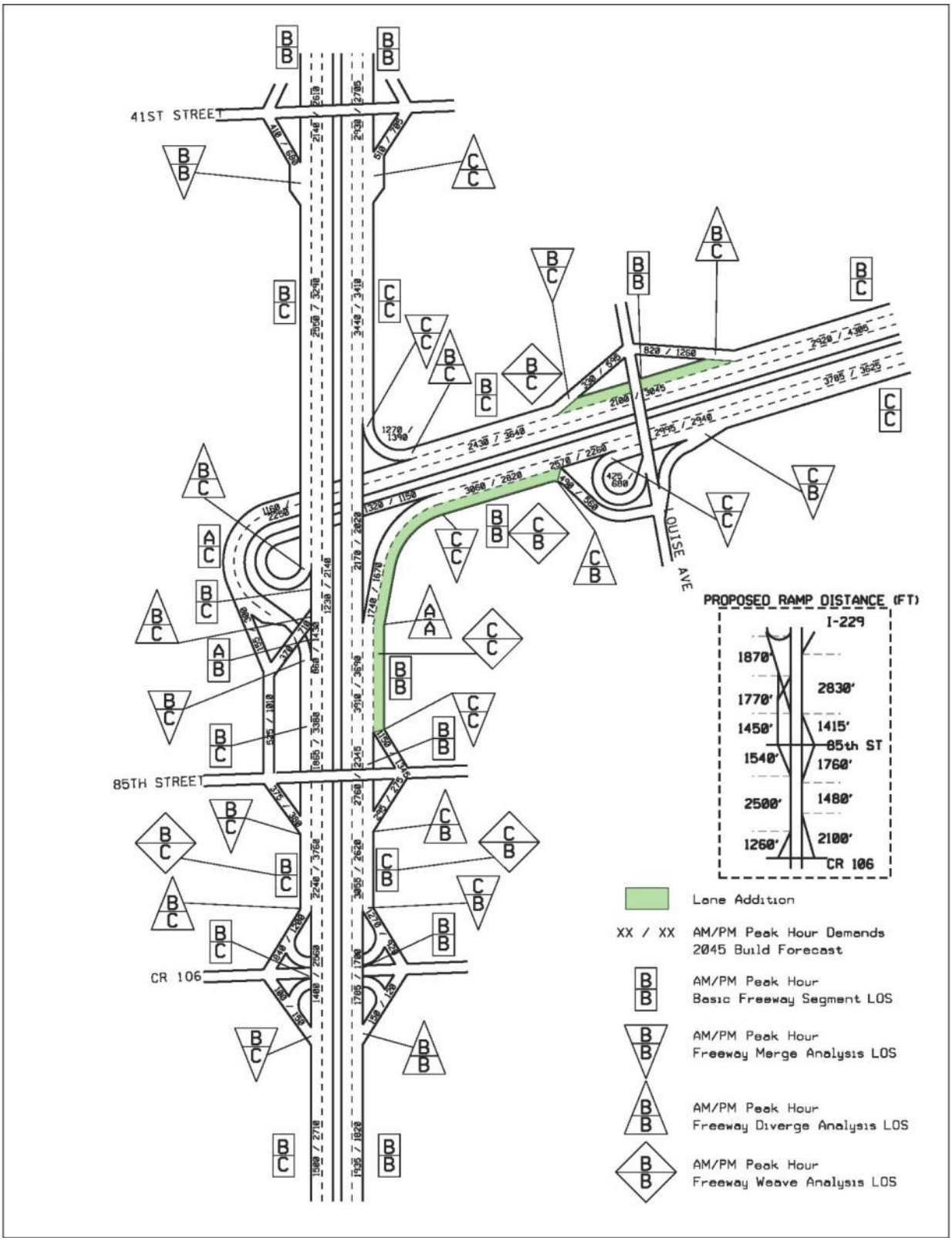
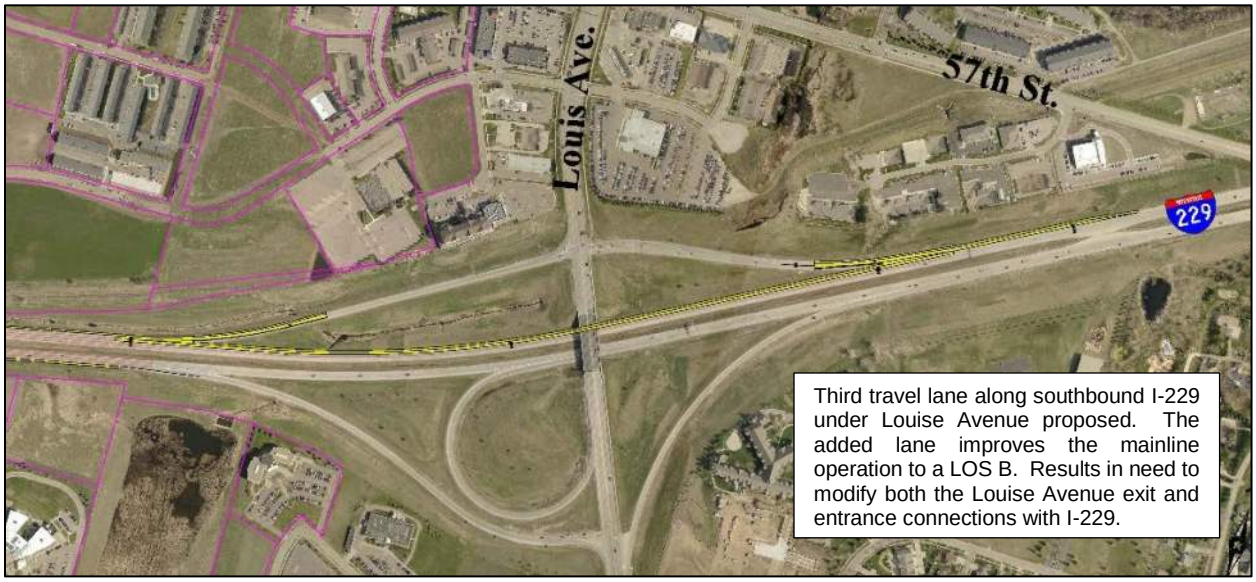


Figure 22 – Westbound I-229 3rd Lane at Louise Avenue



The existing 2-lane exit at Louise Avenue converted to a single lane exit, with approximately 600 feet or more of taper, provides acceptable operations of LOS C or better.

The Louise Avenue entrance ramp will need to be modified to a standard entrance ramp and will still operate at a LOS C or better.

Table 21
2045 Mitigated Build Northbound I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-29	NB I-29 – South of Exit 73	Basic	B	B
	NB I-29 – Exit 73 to CR 106	Diverge	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	B
	NB I-29 – CR 106 Entrance	Merge	C	B
	NB I-29 – between CR 106 to 85th Street Exit	Basic	C	B
	NB I-29 – between CR 106 to 85th Street Exit	Weave	C	B
	NB I-29 – Exit 74 to 85th Street	Diverge	C	B
	NB I-29 – between 85th Street Exit and Entrance Ramps	Basic	B	B
	NB I-29 – 85th Street Entrance	Merge	C	C
	NB I-29 – between 85th Street to NB I-229 Exit	Basic	B	B
	NB I-29 – between 85th Street to NB I-229 Exit	Weave	C	C
	NB I-29 – Exit 77 to NB I-229	Diverge	A	A
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B
	NB I-29 – SB I-229 Entrance	Merge	C	C
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	C	C
	NB I-29 – Exit 77 to 41st St	Diverge	C	C
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B

Table 22
2045 Mitigated Build I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	C	C
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	B	B
	NB I-229 – Exit 1C to Louise Avenue	Diverge	C	B
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	C	B
	NB I-229 – SB Louise Avenue Entrance	Merge	C	B
	NB I-229 – between SB Louise Ave Entrance and NB Louise Ave Entrance	Basic	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	C	B
	NB I-229 – East of Louise Avenue Interchange	Basic	C	C
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	C
	SB I-229 – Exit 1C to Louise Avenue	Diverge	B	C
	SB I-229 – between Louise Avenue Exit and Louise Avenue Entrance	Basic	B	B
	SB I-229 – Louise Avenue Entrance	Merge	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	B	C
	SB I-229 – Exit 1A to NB I-29	Diverge	B	C
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	B

Under the 2045 traffic demands and improved traffic control and geometrics based on the No Build scenario, all of the intersections operate at an acceptable LOS in the project area based on the mitigations provided.

However, due to shifting traffic patterns, two turn lanes were required to be extended based on the queue storage ratio. The southbound dual left turn lanes on Sundowner Avenue approaching 85th Street need to be extended to 500 feet and the northbound left turn lane on Tallgrass Avenue approaching 85th Street needs to be extended to 300 feet.

Table 23 summarizes the results of the 2045 Build traffic analysis for the ramp terminal intersections as well as adjacent major intersections within the project area. 2045 Build figures are provided in appendix A. Table 24 summarizes the different alternative interchange control options for the 85th Street interchange.

Table 23
2045 Build Arterial Intersection Operations Summary

Major Roadway	Intersecting Roadway	Intersection Control Type	AM Peak	PM Peak
			LOS	LOS
41st Street	Marion Road	Signal	D	D
41st Street	I-29 SB Ramp Terminal	Signal	C	C
41st Street	I-29 NB Ramp Terminal	Signal	C	C
41st Street	Louise Avenue	Signal	D	D
57th Street	Sundowner Avenue	Signal	C	F**
57th Street	Marion Road	Signal	D	C
57th Street	Solberg Avenue	Signal	D	D
Louise Avenue	57th Street	Signal	C	E
Louise Avenue	59th Street	Signal	B	C
Louise Avenue	SB I-229 Ramp Terminal	Signal	B	C
Louise Avenue	NB I-229 Ramp Terminal	Signal	A	A
CR 111 (Tea-Ellis Road)	69th Street	Signal	B	C
Sundowner Avenue	69th Street	Signal	C	D
471st Ave/Solberg Avenue	69th Street	Signal	C	D
Louise Avenue	69th Street	Signal	D	D
CR 111 (Tea-Ellis Road)	85th Street	Signal	C	C
Sundowner Avenue	85th Street	Signal	C	F**
471st Ave/Solberg Avenue	85th Street	Signal	C	F**
Louise Avenue	85th Street	Signal	C	C
CR 106	CR 111 (Tea-Ellis Road)	Signal	C	C
CR 106	Sundowner Avenue	Signal	C	C
CR 106	I-29 Ramp Terminal (Single Point)	Signal	C	C
CR 106	471st Ave/Tallgrass Avenue	Signal	C	C
CR 106	CR 117/Louise Avenue	Signal	C	C

Note – Average Intersection LOS shown, individual movements and/or approaches may be different

**Queue Storage Ratio greater than 1.0 for at least 1 movement, results in LOS F for entire intersection

Highlighted cell denotes a change in traffic control

Table 24
2045 Build 85TH Street Ramp Terminal Intersection Operations Summary

Interchange Type	Major Roadway	Intersecting Roadway	Intersection Control Type	AM Peak	PM Peak
				LOS	LOS
Standard Diamond	85th Street	I-29 SB Ramp Terminal	Signal	C	C
	85th Street	I-29 NB Ramp Terminal	Signal	C	C
Diverging Diamond	85th Street	I-29 SB Ramp Terminal	Signal	B	B
	85th Street	I-29 NB Ramp Terminal	Signal	C	C
Single Point Diamond	85th Street	I-29 SB/NB Ramp Terminal	Signal	C	C

Note – Average Intersection LOS shown, individual movements and/or approaches may be different

All three of the diamond interchange configurations provide acceptable traffic operations through the 2045 design year. See appendix A, Figure A12.

6.3 Year of Opening Analysis

6.3.1 2020 No Build

Due to the close proximity of the year of opening and existing years, the increase in traffic demands along the both the freeway network and arterial roadway network is relatively minor. However, signal timing changes and some geometrics changes were incorporated in order to mitigate both the existing operational problems and problems from the increased demands.

The summation of the traffic operations analysis show that mainline I-29 and I-229, including all existing ramp junctions, operate at a LOS C or better during the AM and PM peak hours.

Results for the individual segments and ramp junctions of I-29 and I-229 are shown in Tables 25 and 26, below.

Figure 23 is a visual representation of the 2020 No Build freeway lane geometrics and the traffic operational results.

Figure 23 – 2020 No Build Freeway Configuration and Results

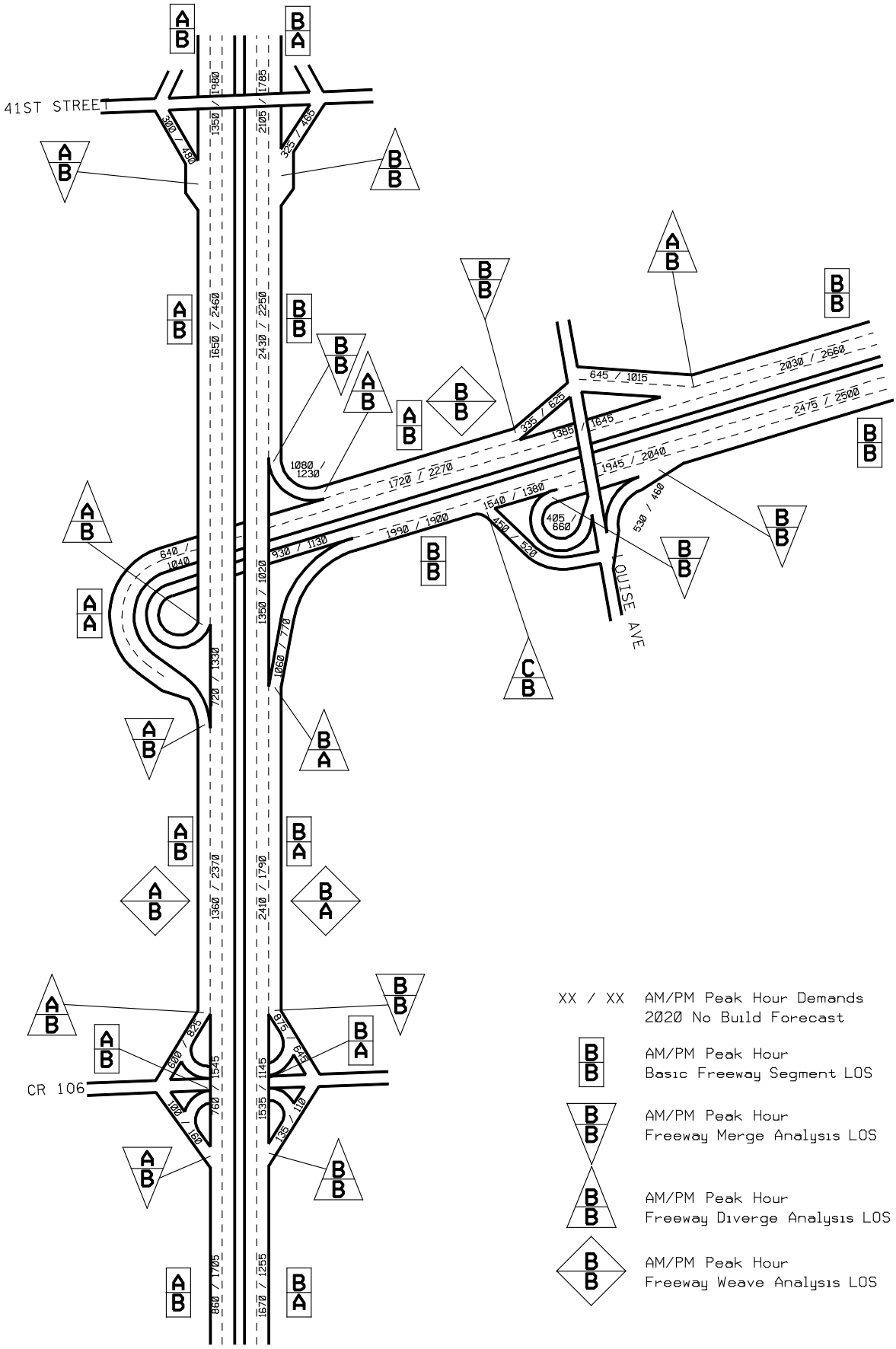


Table 25
2020 No Build I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-29	NB I-29 – South of Exit 73	Basic	A	A
	NB I-29 – Exit 73 to CR 106	Diverge	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	A
	NB I-29 – CR 106 Entrance	Merge	B	B
	NB I-29 – between CR 106 to NB I-229 Exit	Basic	B	A
	NB I-29 – between CR 106 to NB I-229 Exit	Weave	B	A
	NB I-29 – Exit 77 to NB I-229	Diverge	B	A
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	A	A
	NB I-29 – SB I-229 Entrance	Merge	B	B
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	B	B
	NB I-29 – Exit 77 to 41st St	Diverge	B	B
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	A
SB I-29	SB I-29 – between 41st St Exit and 41st St Entrance	Basic	A	B
	SB I-29 – 41st St Entrance	Merge	A	B
	SB I-29 – between 41st St Entrance and NB I-229 Exit	Basic	A	B
	SB I-29 – Exit 77 to NB I-229	Diverge	A	B
	SB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	A	A
	SB I-29 – SB I-229 Entrance	Merge	A	B
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Basic	A	B
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Weave	A	B
	SB I-29 – Exit 73 to CR 106	Diverge	A	B
	SB I-29 – between CR 106 Exit and CR 106 Entrance	Basic	A	B
	SB I-29 – CR 106 Entrance	Merge	A	B
	SB I-29 – South of CR 106 Entrance	Basic	A	B

Table 26
2020 No Build I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak LOS	PM Peak LOS
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	n/a	n/a
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	B	B
	NB I-229 – Exit 1C to Louise Avenue	Diverge	C	B
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	B	B
	NB I-229 – SB Louise Avenue Entrance	Merge	B	B
	NB I-229 – between SB Louise Ave Entrance and NB Louise Ave Entrance	Basic	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	B	B
	NB I-229 – East of Louise Avenue Interchange	Basic	B	B
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	B
	SB I-229 – Exit 1C to Louise Avenue	Diverge	A	B
	SB I-229 – between Louise Avenue Exit and Louise Avenue Entrance	Basic	B	B
	SB I-229 – Louise Avenue Entrance	Merge	B	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	A	B
	SB I-229 – Exit 1A to NB I-29	Diverge	A	B
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	A

"n/a" – merge area cannot be analyzed with HCM methodologies due to two single lane merge area

The 85th Street interchange project has a negligible impact to the traffic operations on the 41st Street corridor. Therefore, in the forecast year 2020, no geometric improvements were incorporated along the corridor, only signal timings modifications were implemented. A separate study was recently completed for the 41st Street corridor and interchange with I-29 for the evaluation of safety and capacity of the corridor.

Under the 2020 traffic demands, improved traffic control and geometrics at some of the study intersections provides acceptable operations in the project area based on the following mitigations provided.

- 57th Street at Sundowner – EB/WB left turn lanes, Traffic Signal Control
- 57th Street at Marion – WB Right turn lane, SB Right turn lane (AM Peak still contains queue storage issues)
- 57th Street at Solberg – WB and NB dual left turns
- 57th Street at Louise – WB right turn lane, SB additional through lane; this intersection still operates under failing conditions. Major capacity is required however it is not directly tied to this interchange project.
- Louise Avenue at I-229 North Ramp – extend NB left turn lane to 600 feet
- Solberg Avenue at 69th Street – SB left turn to 450 feet; assumes single lane approach on west leg for development
- 85th Street at Tallgrass – 85th and Tallgrass will be 4-lane (TIP), convert to All Way Stop
- CR 106 at Sundowner – NB right turn lane; Traffic Signal Control
- CR 106 at Tallgrass – Add left turn lanes at all four approaches

- CR 106 at Louise – Add left turn lanes at all four approaches

Table 27 summarizes the results of the 2020 No Build traffic analysis for the ramp terminal intersections as well as adjacent major intersections within the project area. See appendix A.

Table 27
2020 No Build Arterial Intersection Operations Summary

Major Roadway	Intersecting Roadway	Intersection Control Type	AM Peak	PM Peak
			LOS	LOS
41st Street	Marion Road	Signal	C	**F****
41st Street	I-29 SB Ramp Terminal	Signal	B	**F****
41st Street	I-29 NB Ramp Terminal	Signal	**F****	**F****
41st Street	Louise Avenue	Signal	C	**F****
57th Street	Sundowner Avenue	Signal	B	B
57th Street	Marion Road	Signal	**F****	D
57th Street	Solberg Avenue	Signal	C	C
Louise Avenue	57th Street	Signal	C	**F****
Louise Avenue	59th Street	Signal	A	A
Louise Avenue	SB I-229 Ramp Terminal	Signal	B	C
Louise Avenue	NB I-229 Ramp Terminal	Signal	A	B
CR 111 (Tea-Ellis Road)	69th Street	Minor Stop*	B	C
Sundowner Avenue	69th Street	Minor Stop*	C	C
471st Ave/Solberg Avenue	69th Street	Signal	B	B
Louise Avenue	69th Street	Signal	C	C
CR 111 (Tea-Ellis Road)	85th Street	Minor Stop*	C	D
Sundowner Avenue	85th Street	All-Way Stop	A	B
471st Ave/Solberg Avenue	85th Street	All-Way Stop	B	C
Louise Avenue	85th Street	Signal	B	B
CR 106	CR 111 (Tea-Ellis Road)	Signal	C	B
CR 106	Sundowner Avenue	Minor Stop*	C	C
CR 106	I-29 Ramp Terminal (Single Point)	Signal	C	C
CR 106	471st Ave/Tallgrass Avenue	Minor Stop*	E	D
CR 106	CR 117/Louise Avenue	All-Way Stop	B	D

Note – Average Intersection LOS shown, individual movements and/or approaches may be different

*Minor Street Stop Control intersection LOS represents the worst approach LOS; major roadway would operate at a LOS A

**Queue Storage Ratio greater than 1.0 for at least 1 movement, results in LOS F for entire intersection

Highlighted cell denotes a change in traffic control

6.3.2 2020 Build Alternative 1 - Year of Opening

Due to the close proximity of the year of opening and existing years, the increase in traffic demands along both the freeway network and arterial roadway network is relatively minor. However, signal timing changes and some geometrics changes were incorporated in order to mitigate both the existing operational problems and problems from the increased demands in the proposed interchange area.

The majority of the 2020 No Build mitigations were left in place, however there are spot intersection locations where the Build scenario relieves demands on the surrounding roadway network.

Traffic analysis evaluations were conducted with a typical Single Point Urban Interchange (SPUI) matching the type at the next access south at CR 106, as noted in Section 5.0 Alternatives, for the 2020 year of opening, Build alternative.

The summation of the traffic operations analysis show that mainline I-29 and I-229, including all existing ramp junctions, operate at a LOS C or better during the AM and PM peak hours. For the 2020 Build Year of Opening traffic demands, no freeway mitigations are necessary to provide a LOS C or better.

Results for the individual segments and ramp junctions of I-29 and I-229 are shown in Tables 28 and 29, below.

Figure 24 is a visual representation of the 2020 Build freeway lane geometrics and the traffic operational results.

Figure 24 – 2020 Build Freeway Configuration and Results

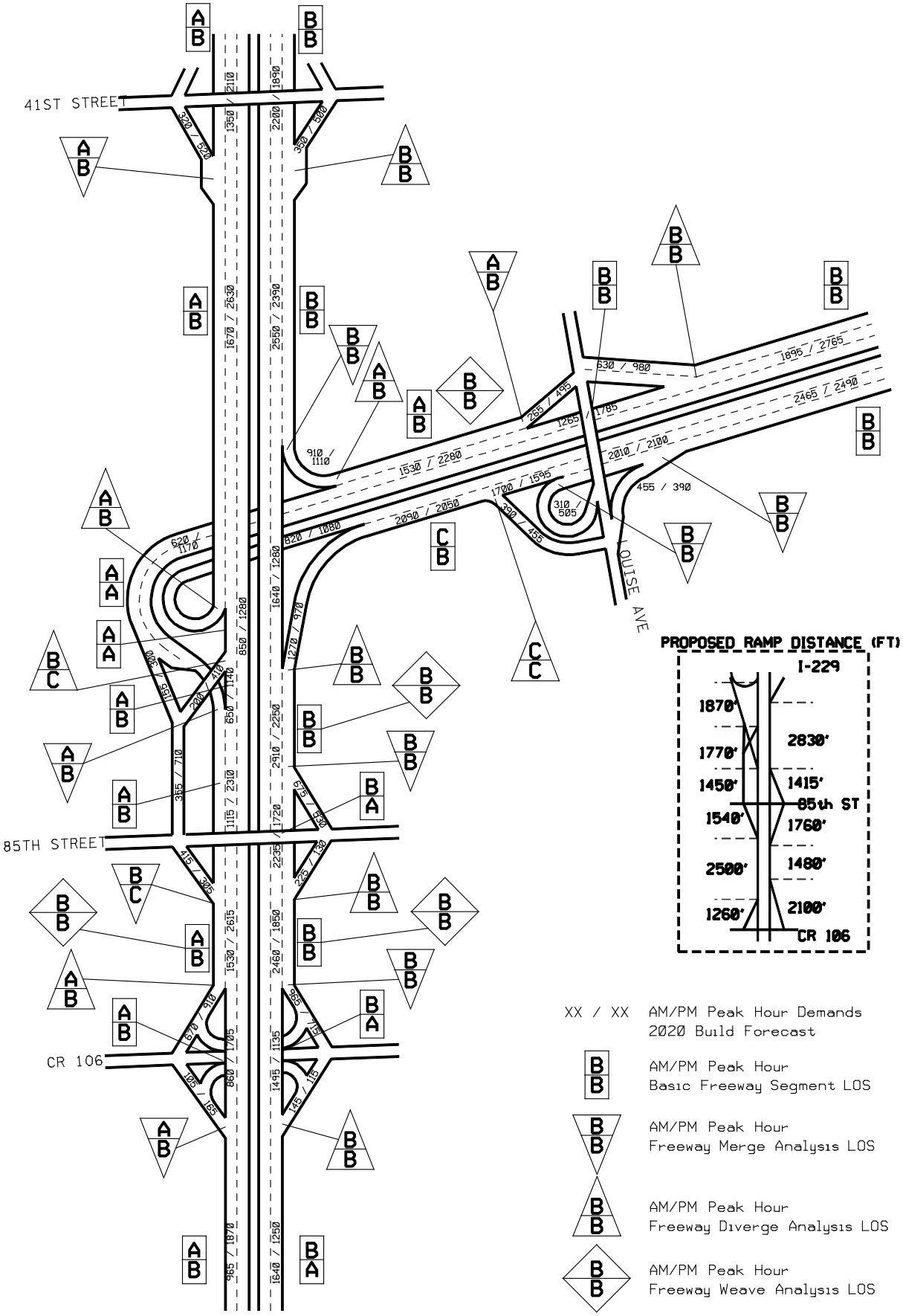


Table 28
2020 Build I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-29	NB I-29 – South of Exit 73	Basic	B	A
	NB I-29 – Exit 73 to CR 106	Diverge	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	A
	NB I-29 – CR 106 Entrance	Merge	B	B
	NB I-29 – between CR 106 to 85th Street Exit	Basic	B	B
	NB I-29 – between CR 106 to 85th Street Exit	Weave	B	B
	NB I-29 –Exit 74 to 85th Street	Diverge	B	B
	NB I-29 – between 85th Street Exit and Entrance Ramps	Basic	B	A
	NB I-29 – 85th Street Entrance	Merge	B	B
	NB I-29 – between 85th Street to NB I-229 Exit	Basic	B	B
	NB I-29 – between 85th Street to NB I-229 Exit	Weave	B	B
	NB I-29 – Exit 77 to NB I-229	Diverge	B	B
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	A	A
	NB I-29 – SB I-229 Entrance	Merge	B	B
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	B	B
	NB I-29 – Exit 77 to 41st St	Diverge	B	B
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B
SB I-29	SB I-29 – between 41st St Exit and 41st St Entrance	Basic	A	B
	SB I-29 – 41st St Entrance	Merge	A	B
	SB I-29 – between 41st St Entrance and NB I-229 Exit	Basic	A	B
	SB I-29 – Exit 77 to NB I-229	Diverge	A	B
	SB I-29 – between NB I-229 Exit and 85th Street Exit	Basic	A	A
	SB I-29 – Exit 74 to 85th Street	Diverge	B	C
	SB I-29 – between 85th Street Exit and SB I-229 Entrance	Basic	A	B
	SB I-29 – SB I-229 Entrance	Merge	A	B
	SB I-29 – between SB I-229 Entrance and 85th Street Entrance	Basic	A	B
	SB I-29 – 85th Street Entrance	Merge	B	C
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Basic	A	B
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Weave	B	B
	SB I-29 – Exit 73 to CR 106	Diverge	A	B
	SB I-29 – between CR 106 Exit and CR 106 Entrance	Basic	A	B
	SB I-29 – CR 106 Entrance	Merge	A	B
	SB I-29 – South of CR 106 Entrance	Basic	A	B

Table 29
2020 Build I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak LOS	PM Peak LOS
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	n/a	n/a
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	C	B
	NB I-229 – Exit 1C to Louise Avenue	Diverge	C	C
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	B	B
	NB I-229 – SB Louise Avenue Entrance	Merge	B	B
	NB I-229 – between SB Louise Ave Entrance and NB Louise Ave Entrance	Basic	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	B	B
	NB I-229 – East of Louise Avenue Interchange	Basic	B	B
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	B
	SB I-229 – Exit 1C to Louise Avenue	Diverge	C	B
	SB I-229 – between Louise Avenue Exit and Louise Avenue Entrance	Basic	B	B
	SB I-229 – Louise Avenue Entrance	Merge	A	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	A	B
	SB I-229 – Exit 1A to NB I-29	Diverge	A	B
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	A

"n/a" – merge area cannot be analyzed with HCM methodologies due to two single lane merge area

The 85th Street interchange project has a negligible impact to the 41st Street corridor. Therefore, in the forecast year 2020, no geometric improvements were incorporated along the corridor, only signal timings modifications were implemented. A separate study was recently completed for the 41st Street corridor and interchange with I-29 for the evaluation of safety and capacity of the corridor.

Under the 2020 traffic demands, improved traffic control and geometrics at some of the study intersections provides acceptable operations in the project area. All of the 2020 No Build mitigations were incorporated into the Build scenario, unless otherwise noted below:

- 85th Street at Tallgrass – 85th and Tallgrass will be 4-lane (TIP), convert to Traffic Signal Control
- CR 106 at Tallgrass – no change from existing conditions

Table 30 summarizes the results of the 2020 Build traffic analysis for the ramp terminal intersections as well as adjacent major intersections within the project area.

Table 30
2020 Build Arterial Intersection Operations Summary

Major Roadway	Intersecting Roadway	Intersection Control Type	AM Peak LOS	PM Peak LOS
41st Street	Marion Road	Signal	C	**F****
41st Street	I-29 SB Ramp Terminal	Signal	B	**F****
41st Street	I-29 NB Ramp Terminal	Signal	**F****	**F****
41st Street	Louise Avenue	Signal	C	**F****
57th Street	Sundowner Avenue	Signal	B	B
57th Street	Marion Road	Signal	D	C
57th Street	Solberg Avenue	Signal	C	C
Louise Avenue	57th Street	Signal	C	**F****
Louise Avenue	59th Street	Signal	A	A
Louise Avenue	SB I-229 Ramp Terminal	Signal	B	C
Louise Avenue	NB I-229 Ramp Terminal	Signal	B	B
CR 111 (Tea-Ellis Road)	69th Street	Minor Stop*	B	C
Sundowner Avenue	69th Street	Minor Stop*	B	C
471st Ave/Solberg Avenue	69th Street	Signal	B	B
Louise Avenue	69th Street	Signal	D	C
CR 111 (Tea-Ellis Road)	85th Street	Minor Stop*	C	D
Sundowner Avenue	85th Street	All-Way Stop	B	C
471st Ave/Solberg Avenue	85th Street	Signal	C	C
Louise Avenue	85th Street	Signal	B	C
CR 106	CR 111 (Tea-Ellis Road)	Signal	B	C
CR 106	Sundowner Avenue	Minor Stop*	C	C
CR 106	I-29 Ramp Terminal (Single Point)	Signal	C	B
CR 106	471st Ave/Tallgrass Avenue	Minor Stop*	C	C
CR 106	CR 117/Louise Avenue	All-Way Stop	B	C
85th Street	I-19 Ramp Terminal (Single Point Urban)	Signal	C	B
			Change in traffic control	

Note – Average Intersection LOS shown, individual movements and/or approaches may be different

*Minor Street Stop Control intersection LOS represents the worst approach LOS; major roadway would operate at a LOS A

**Queue Storage Ratio greater than 1.0 for at least 1 movement, results in LOS F for entire intersection

6.4 Mid-Term Design Year Analysis

6.4.1 2035 No Build

Due to the significant increases in traffic demands along the arterial roadway network, mitigations to the study intersections were incorporated as part of the No Build scenario. Without improvements, 23 of the 24 study intersection would operate under failing conditions for at least one peak hour under the existing geometrics and traffic control. Therefore, twenty two study intersections will require traffic signal control by the mid-term design year and two will be converted to All-Way stop control.

The summation of the traffic operations analysis show that mainline I-29 and I-229, including all existing ramp junctions, operate at a LOS C or better during the AM and PM peak hours.

Results for the individual segments and ramp junctions of I-29 and I-229 are shown in Tables 31 and 32, below.

Figure 25 is a visual representation of the 2035 No Build freeway lane geometrics and the traffic operational results.

Figure 25 – 2035 No Build Freeway Configuration and Results

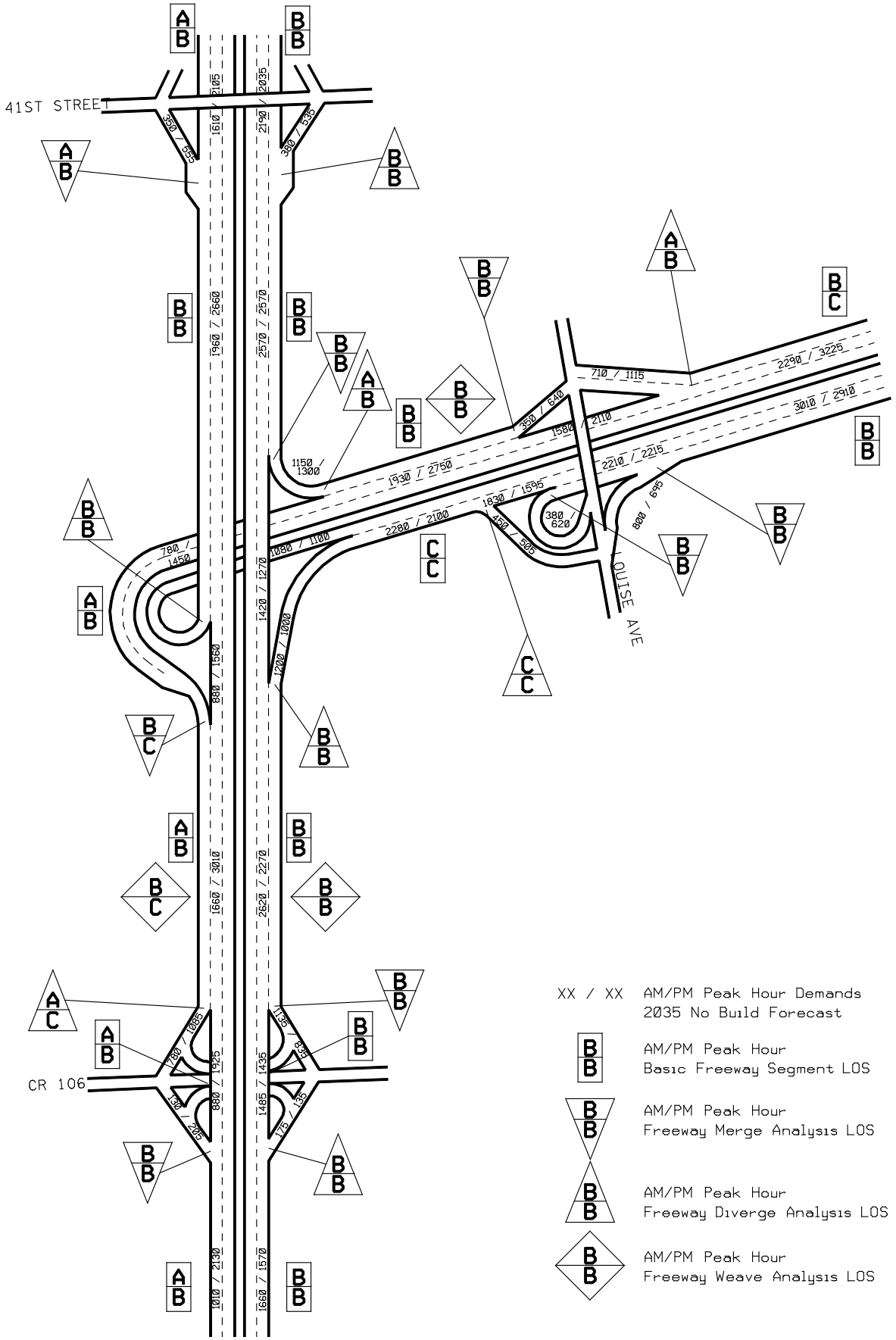


Table 31
2035 No Build I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak LOS	PM Peak LOS
NB I-29	NB I-29 – South of Exit 73	Basic	B	B
	NB I-29 – Exit 73 to CR 106	Diverge	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	B
	NB I-29 – CR 106 Entrance	Merge	B	B
	NB I-29 – between CR 106 to NB I-229 Exit	Basic	B	B
	NB I-29 – between CR 106 to NB I-229 Exit	Weave	B	B
	NB I-29 – Exit 77 to NB I-229	Diverge	B	B
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B
	NB I-29 – SB I-229 Entrance	Merge	B	B
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	B	B
	NB I-29 – Exit 77 to 41st St	Diverge	B	B
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B
SB I-29	SB I-29 – between 41st St Exit and 41st St Entrance	Basic	A	B
	SB I-29 – 41st St Entrance	Merge	A	B
	SB I-29 – between 41st St Entrance and NB I-229 Exit	Basic	B	B
	SB I-29 – Exit 77 to NB I-229	Diverge	B	B
	SB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B
	SB I-29 – SB I-229 Entrance	Merge	B	C
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Basic	A	B
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Weave	B	C
	SB I-29 – Exit 73 to CR 106	Diverge	A	C
	SB I-29 – between CR 106 Exit and CR 106 Entrance	Basic	A	B
	SB I-29 – CR 106 Entrance	Merge	B	B
	SB I-29 – South of CR 106 Entrance	Basic	A	B

Table 32
2035 No Build I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	n/a	n/a
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	C	C
	NB I-229 – Exit 1C to Louise Avenue	Diverge	C	C
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	B	B
	NB I-229 – SB Louise Avenue Entrance	Merge	B	B
	NB I-229 – between SB Louise Ave Entrance and NB Louise Ave Entrance	Basic	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	B	B
	NB I-229 – East of Louise Avenue Interchange	Basic	B	B
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	C
	SB I-229 – Exit 1C to Louise Avenue	Diverge	A	B
	SB I-229 – between Louise Avenue Exit and Louise Avenue Entrance	Basic	B	B
	SB I-229 – Louise Avenue Entrance	Merge	B	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	B	B
	SB I-229 – Exit 1A to NB I-29	Diverge	A	B
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	B

"n/a" – merge area cannot be analyzed with HCM methodologies due to two single lane merge area

Under the 2035 traffic demands and improved traffic control and geometrics, the majority of the intersections operate acceptable in the project area based on the mitigations provided.

The following is a list of the general lane improvements needed to be in place for the project area based on the No Build operations analysis; this does not include intersection turn lanes. See the appendix Figure A7 for the No Build geometrics at all intersections.

- 41st Street – Additional Lane between Marion Road and I-29 (Long Range Plan; currently being studied)
- 69th Street – 4-lane between Sundowner Avenue and Louise Avenue (Long Range Plan)
- 85th Street – 4-lane between Sundowner Avenue and east of Louise Avenue (Long Range Plan)
- CR 106 – Additional Lane between CR 111 and Sundowner Avenue (Long Range Plan)
- CR 106 – 4-lane between CR 111 and I-29
- Sundowner Avenue – 4-lane between 57th Street and 85th Street (Long Range Plan)
- Tallgrass Avenue – 4-lane between 69th Street and south of 85th Street (Long Range Plan)
- Marion Road – 4-lane between 41st Street and 57th Street

Table 33 summarizes the results of the 2035 No Build traffic analysis for the ramp terminal intersections as well as adjacent major intersections within the project area. See appendix A.

Table 33
2035 No Build Arterial Intersection Operations Summary

Major Roadway	Intersecting Roadway	Intersection Control Type	AM Peak	PM Peak
			LOS	LOS
41st Street	Marion Road	Signal	D	D
41st Street	I-29 SB Ramp Terminal	Signal	B	C
41st Street	I-29 NB Ramp Terminal	Signal	C	C
41st Street	Louise Avenue	Signal	C	**E**
57th Street	Sundowner Avenue	Signal	C	D
57th Street	Marion Road	Signal	**F***	**F***
57th Street	Solberg Avenue	Signal	D	D
Louise Avenue	57th Street	Signal	C	**F***
Louise Avenue	59th Street	Signal	B	B
Louise Avenue	SB I-229 Ramp Terminal	Signal	B	C
Louise Avenue	NB I-229 Ramp Terminal	Signal	A	A
CR 111 (Tea-Ellis Road)	69th Street	All-Way Stop	B	C
Sundowner Avenue	69th Street	Signal	C	C
471st Ave/Solberg Avenue	69th Street	Signal	C	C
Louise Avenue	69th Street	Signal	D	D
CR 111 (Tea-Ellis Road)	85th Street	All-Way Stop	B	C
Sundowner Avenue	85th Street	Signal	C	C
471st Ave/Solberg Avenue	85th Street	Signal	C	C
Louise Avenue	85th Street	Signal	D	C
CR 106	CR 111 (Tea-Ellis Road)	Signal	D	C
CR 106	Sundowner Avenue	Signal	C	C
CR 106	I-29 Ramp Terminal (Single Point)	Signal	C	C
CR 106	471st Ave/Tallgrass Avenue	Signal	C	C
CR 106	CR 117/Louise Avenue	Signal	C	C
			Change in traffic control	

Note – Average Intersection LOS shown, individual movements and/or approaches may be different

**Queue Storage Ratio greater than 1.0 for at least 1 movement, results in LOS F for entire intersection

6.4.2 2035 Alternative 1

Due to the significant increases in traffic demands along the arterial roadway network in the No Build scenario, the same mitigations to the study intersections were incorporated as part of the Build scenario.

The majority of the 2035 No Build mitigations were left in place, however there are spot intersection locations where the Build scenario relieves demands on the surrounding roadway network.

The summation of the traffic operations analysis show that mainline I-29 and I-229, including all existing ramp junctions, operate at a LOS C or better during the AM and PM peak hours. For the 2035 Build mid-term design year traffic demands, no freeway mitigations are necessary to provide a LOS C or better.

Traffic analysis evaluations were conducted with a typical Single Point Urban Interchange (SPUI) matching the type at the next access south at CR 106, as noted in Section 5.0 Alternatives, for the 2035 mid-term Build analysis.

Results for the individual segments and ramp junctions of I-29 and I-229 are shown in Tables 34 and 35, below.

Figure 26 is a visual representation of the 2035 Build freeway lane geometrics and the traffic operational results.

Figure 26 – 2035 Build Freeway Configuration and Results

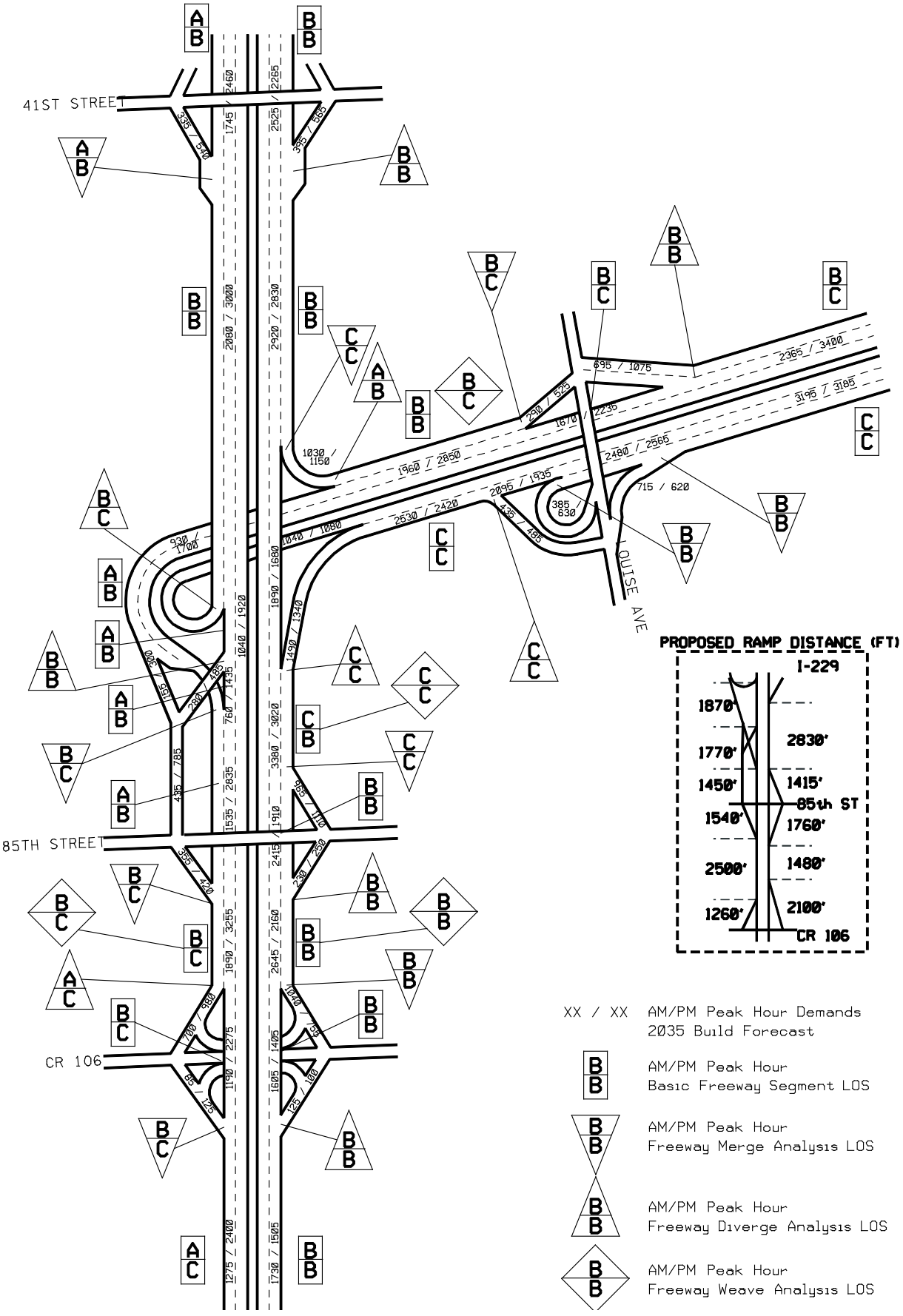


Table 34
2035 Build I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-29	NB I-29 – South of Exit 73	Basic	B	B
	NB I-29 – Exit 73 to CR 106	Diverge	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	B
	NB I-29 – CR 106 Entrance	Merge	B	B
	NB I-29 – between CR 106 to 85th Street Exit	Basic	B	B
	NB I-29 – between CR 106 to 85th Street Exit	Weave	B	B
	NB I-29 – Exit 74 to 85th Street	Diverge	B	B
	NB I-29 – between 85th Street Exit and Entrance Ramps	Basic	B	B
	NB I-29 – 85th Street Entrance	Merge	C	C
	NB I-29 – between 85th Street to NB I-229 Exit	Basic	C	B
	NB I-29 – between 85th Street to NB I-229 Exit	Weave	C	B
	NB I-29 – Exit 77 to NB I-229	Diverge	B	C
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B
	NB I-29 – SB I-229 Entrance	Merge	C	C
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	B	B
	NB I-29 – Exit 77 to 41st St	Diverge	B	B
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B
SB I-29	SB I-29 – between 41st St Exit and 41st St Entrance	Basic	A	B
	SB I-29 – 41st St Entrance	Merge	A	B
	SB I-29 – between 41st St Entrance and NB I-229 Exit	Basic	B	B
	SB I-29 – Exit 77 to NB I-229	Diverge	B	C
	SB I-29 – between NB I-229 Exit and 85th Street Exit	Basic	A	B
	SB I-29 – Exit 74 to 85th Street	Diverge	B	B
	SB I-29 – between 85th Street Exit and SB I-229 Entrance	Basic	A	B
	SB I-29 – SB I-229 Entrance	Merge	B	C
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Basic	A	B
	SB I-29 – 85th Street Entrance	Merge	B	C
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Basic	B	C
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Weave	B	C
	SB I-29 – Exit 73 to CR 106	Diverge	A	C
	SB I-29 – between CR 106 Exit and CR 106 Entrance	Basic	B	C
	SB I-29 – CR 106 Entrance	Merge	B	C
	SB I-29 – South of CR 106 Entrance	Basic	A	C

Table 35
2035 Build I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak	PM Peak
			LOS	LOS
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	n/a	n/a
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	C	C
	NB I-229 – Exit 1C to Louise Avenue	Diverge	C	C
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	B	B
	NB I-229 – SB Louise Avenue Entrance	Merge	B	B
	NB I-229 – between SB Louise Ave Entrance and NB Louise Ave Entrance	Basic	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	B	B
	NB I-229 – East of Louise Avenue Interchange	Basic	C	C
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	C
	SB I-229 – Exit 1C to Louise Avenue	Diverge	B	B
	SB I-229 – between Louise Avenue Exit and Louise Avenue Entrance	Basic	B	C
	SB I-229 – Louise Avenue Entrance	Merge	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	B	C
	SB I-229 – Exit 1A to NB I-29	Diverge	A	B
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	B

"n/a" – merge area cannot be analyzed with HCM methodologies due to two single lane merge area

Under the 2035 traffic demands with improved traffic control and geometrics based on the No Build scenario, all of the intersections provide acceptable LOS in the project area based on the mitigations provided.

However, due to shifting traffic patterns some intersection were able to have reduced capacity needs while others required more.

- CR 106 at Sundowner – reduced southbound dual left to single left
- CR 106 at Tallgrass – SB and WB separate right turn lane not required
- 85th Street at Tallgrass – reduced northbound approach lanes
- 85th Street at Sundowner – SB dual left turns required

Table 36 summarizes the results of the 2035 Build traffic analysis for the ramp terminal intersections as well as adjacent major intersections within the project area. See Appendix A for the arterial network exhibits.

Table 36
2035 Build Arterial Intersection Operations Summary

Major Roadway	Intersecting Roadway	Intersection Control Type	AM Peak	PM Peak
			LOS	LOS
41st Street	Marion Road	Signal	D	D
41st Street	I-29 SB Ramp Terminal	Signal	C	C
41st Street	I-29 NB Ramp Terminal	Signal	B	B
41st Street	Louise Avenue	Signal	C	D
57th Street	Sundowner Avenue	Signal	C	D
57th Street	Marion Road	Signal	**F****	**F****
57th Street	Solberg Avenue	Signal	D	D
Louise Avenue	57th Street	Signal	C	D
Louise Avenue	59th Street	Signal	B	B
Louise Avenue	SB I-229 Ramp Terminal	Signal	B	C
Louise Avenue	NB I-229 Ramp Terminal	Signal	B	B
CR 111 (Tea-Ellis Road)	69th Street	Signal	B	C
Sundowner Avenue	69th Street	Signal	C	D
471st Ave/Solberg Avenue	69th Street	Signal	C	C
Louise Avenue	69th Street	Signal	D	D
CR 111 (Tea-Ellis Road)	85th Street	Signal	B	C
Sundowner Avenue	85th Street	Signal	C	D
471st Ave/Solberg Avenue	85th Street	Signal	C	C
Louise Avenue	85th Street	Signal	C	C
CR 106	CR 111 (Tea-Ellis Road)	Signal	C	C
CR 106	Sundowner Avenue	Signal	C	C
CR 106	I-29 Ramp Terminal (Single Point)	Signal	C	C
CR 106	471st Ave/Tallgrass Avenue	Signal	C	C
CR 106	CR 117/Louise Avenue	Signal	C	C
85th Street	I-29 Ramp Terminal (Single Point Urban)	Signal	C	C

Note – Average Intersection LOS shown, individual movements and/or approaches may be different

**Queue Storage Ratio greater than 1.0 for at least 1 movement, results in LOS F for entire intersection

7.0 Alternatives Analysis

This section will discuss the alternatives based on the following:

- Conformance with Transportation Plans
- Compliance with Policies and Engineering Standards
- Environmental Impacts
- Traffic Safety
- Traffic Operations
- Evaluation Matrix
- Coordination

7.1 Conformance with Transportation Plans

The build alternative evaluated will conform to current local and state transportation plans. The current LRTP has been amended to include the interchange project.

The South Dakota Interstate Corridor Study completed in February 2001, the 2010 South Dakota Decennial Interstate Corridor Study, and the I-29 Corridor Study (Exit 73 through Exit 77) indicated that an interchange at 85th Street was being evaluated for justification along this portion of Interstate 29.

7.2 Compliance with Policies and Engineering Standards

The proposed interchange satisfy FHWA policies regarding interchange and ramp spacing and the preliminary engineering concepts require no special design exceptions.

Control of access by SDDOT will be maintained to 660 feet away from the ramp terminal intersections. Access control beyond SDDOT limits would be determined by City's Engineering Design Standards, with special studies potentially required based on development requests.

7.3 Environmental Impacts

Considering the minimal additional right-of-way that is anticipated to be acquired, it is anticipated that the environmental impacts specific to any interchange compared to Alternative 0 (No Build including the 85th Street Overpass) will be minimal and may produce some secondary impacts resulting from changes in land use and conversion of agricultural property. However, the change in access will result in an environmental assessment being conducted.

7.4 Safety

Upon reviewing the reported crash data, there were a total of 64 crashes that occurred in the 5-year evaluation along I-29 between CR 106 and the system interchange with I-229. A total of 33 (52%) involved collisions from a single vehicle with 16 (25%) included with animals. The current construction project will provide additional capacity through this area and bring the interstate up to current roadway standards.

The improved access connections, with the proposed 85th Street interchange, increases the vehicle miles traveled along the interstate system and reduces the vehicle mile traveled along the arterial roadways. In South Dakota, the interstate crash rate is significantly less than all arterial roadway crash rates, and thus as a result a decrease in the total number of crashes for the project area should be expected.

The interchange configuration and additional intersections along 85th Street would theoretically have an increase in crashes (see Appendix N, which includes IHSDM crash prediction modeling for Alternative 1). However, the proposed ramp terminals would be designed to full standards and the intersection control has a reduced number of conflict points compared to a standard diamond interchange and will reduce crashes.

7.5 Operational Performance

The proposed project will provide acceptable traffic operations for all users within the project area based on the traffic operations analysis. In addition, there is also a recognized benefit to the roadway users based on potential savings for vehicle miles traveled (VMT) and vehicle hours traveled (VHT). Section 7.5.2 Roadway User Benefits will discuss these savings in more detail.

7.5.1 Traffic Operations

Under all No Build forecast demands, all existing freeway operations would maintain a LOS C or better through 2045. The addition of the proposed interchange and the trips attracted to the interchange area would increase operational issues for both I-29 and I-229.

The proposed mitigations to northbound I-29 and the proposed braided ramp design for southbound I-29 will provide LOS C or better freeway operations through the 2045 design year. The following Tables 37 and 38 compares the 2045 No Build to the mitigated Build freeway operations.

The arterial network under both the No Build and Build scenarios requires extensive capacity improvements throughout the study area. However, all intersections can be improved to show acceptable operations in both scenarios.

Traffic analysis evaluations were conducted with a Single Point Urban Interchange (SPUI) as noted in Section 5.0 Alternatives, for the 2020 year of opening, 2035 mid-term and 2045 design year build scenarios. Results indicate acceptable LOS C or better operations can be maintained through the 2045 design year.

Alternative ramp terminal configurations and operation options were also evaluated for the 2045 build scenarios and discussed in Section 5.1 through 5.4. Options considered and evaluated included a standard diamond with signals, SPUI and a Diverging Diamond Interchange (DDI) configurations. The analysis of these three options under the 2045 build scenario yielded similar operational outputs and measures of effectiveness, with the DDI providing better performance in the AM peak (LOS B) in comparison (LOS C) with the other two.

Table 37
2045 No Build (NB) versus Build (B) I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak		PM Peak	
			NB	B	NB	B
NB I-29	NB I-29 – South of Exit 73	Basic	B	B	B	B
	NB I-29 – Exit 73 to CR 106	Diverge	B	B	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	B	B	B
	NB I-29 – CR 106 Entrance	Merge	C	C	C	B
	NB I-29 – between CR 106 to 85th Street Exit	Basic	C	C	B	B
	NB I-29 – between CR 106 to 85th Street Exit	Weave	C	C	C	B
	NB I-29 – Exit 74 to 85th Street	Diverge	n/a	C	n/a	B
	NB I-29 – between 85th Street Exit and Entrance Ramps	Basic	n/a	B	n/a	B
	NB I-29 – 85th Street Entrance	Merge	n/a	C	n/a	C
	NB I-29 – between 85th Street to NB I-229 Exit	Basic	n/a	B	n/a	B
	NB I-29 – between 85th Street to NB I-229 Exit	Weave	n/a	C	n/a	C
	NB I-29 – Exit 77 to NB I-229	Diverge	C	A	B	A
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B	B	B
	NB I-29 – SB I-229 Entrance	Merge	C	C	C	C
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	C	C	B	C
	NB I-29 – Exit 77 to 41st St	Diverge	B	C	B	C
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B	B	B
SB I-29	SB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B	B	B
	SB I-29 – 41st St Entrance	Merge	B	B	B	B
	SB I-29 – between 41st St Entrance and NB I-229 Exit	Basic	B	B	B	B
	SB I-29 – Exit 77 to NB I-229	Diverge	B	B	B	B
	SB I-29 – between NB I-229 Exit and 85th Street Exit	Basic	B	B	B	C
	SB I-29 – Exit 74 to 85th Street	Diverge	n/a	B	n/a	C
	SB I-29 – between 85th Street Exit and SB I-229 Entrance	Basic	n/a	A	n/a	B
	SB I-29 – SB I-229 Entrance	Merge	B	B	C	C
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Basic	B	B	C	C
	SB I-29 – 85th Street Entrance	Merge	n/a	B	n/a	C
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Basic	n/a	B	n/a	C
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Weave	B	B	C	C
	SB I-29 – Exit 73 to CR 106	Diverge	B	B	C	C
	SB I-29 – between CR 106 Exit and CR 106 Entrance	Basic	A	A	C	C
	SB I-29 – CR 106 Entrance	Merge	B	B	C	C
	SB I-29 – South of CR 106 Entrance	Basic	A	A	C	C

Indicates improved LOS NB to B

Indicates lowered LOS NB to B

Table 38
2045 No Build (NB) versus Build (B) I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak		PM Peak	
			NB	B	NB	B
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	n/a	C	n/a	C
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	C	B	C	B
	NB I-229 – Exit 1C to Louise Avenue	Diverge	C	C	C	B
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	C	C	B	B
	NB I-229 – SB Louise Avenue Entrance	Merge	C	C	B	B
	NB I-229 – between SB Louise Ave Ent and NB Louise Ave Ent	Basic	B	B	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	C	C	B	B
	NB I-229 – East of Louise Avenue Interchange	Basic	C	C	C	C
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	B	C	C
	SB I-229 – Exit 1C to Louise Avenue	Diverge	B	B	C	C
	SB I-229 – between Louise Avenue Exit and Louise Avenue Ent	Basic	B	B	C	B
	SB I-229 – Louise Avenue Entrance	Merge	B	B	C	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	B	C	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	B	B	C	C
	SB I-229 – Exit 1A to NB I-29	Diverge	B	B	C	C
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	A	B	B

"n/a" – merge area cannot be analyzed with HCM methodologies due to two single lane merge area

Indicates improved LOS NB to B

Indicates lowered LOS NB to B

Under both the 2020 and 2035 forecast demands, the Build forecast demands do not require any mitigations to maintain traffic operations of a LOS C or better. For this section, only the mid-term 2035 will be compared between the No Build and Build alternatives as the 2020 year of opening has negligible differences.

Therefore, the mitigations for the 2045 traffic demands could be maintained in right of way but only constructed as the demands in the project area increase to the forecast level.

The following Tables 39 and 40 compares the 2035 No Build to the non-mitigated, Base Build operations.

The arterial network under both the No Build and Build scenarios requires extensive capacity improvements through the study area. However, all intersections can be improved to show acceptable operations in both scenarios.

Table 39
2035 No Build versus Base Build I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak		PM Peak	
			NB	B	NB	B
NB I-29	NB I-29 – South of Exit 73	Basic	B	B	B	B
	NB I-29 – Exit 73 to CR 106	Diverge	B	B	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	B	B	B
	NB I-29 – CR 106 Entrance	Merge	B	B	B	B
	NB I-29 – between CR 106 to 85th Street Exit	Basic	B	B	B	B
	NB I-29 – between CR 106 to 85th Street Exit	Weave	B	B	B	B
	NB I-29 – Exit 74 to 85th Street	Diverge	n/a	B	n/a	B
	NB I-29 – between 85th Street Exit and Entrance Ramps	Basic	n/a	B	n/a	B
	NB I-29 – 85th Street Entrance	Merge	n/a	C	n/a	C
	NB I-29 – between 85th Street to NB I-229 Exit	Basic	n/a	C	n/a	B
	NB I-29 – between 85th Street to NB I-229 Exit	Weave	n/a	C	n/a	B
	NB I-29 – Exit 77 to NB I-229	Diverge	B	B	B	C
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B	B	B
	NB I-29 – SB I-229 Entrance	Merge	B	C	B	C
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	B	B	B	B
	NB I-29 – Exit 77 to 41st St	Diverge	B	B	B	B
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B	B	B
SB I-29	SB I-29 – between 41st St Exit and 41st St Entrance	Basic	A	A	B	B
	SB I-29 – 41st St Entrance	Merge	A	A	B	B
	SB I-29 – between 41st St Entrance and NB I-229 Exit	Basic	B	B	B	B
	SB I-29 – Exit 77 to NB I-229	Diverge	B	B	B	C
	SB I-29 – between NB I-229 Exit and 85th Street Exit	Basic	B	A	B	B
	SB I-29 – Exit 74 to 85th Street	Diverge	n/a	B	n/a	B
	SB I-29 – between 85th Street Exit and SB I-229 Entrance	Basic	n/a	A	n/a	B
	SB I-29 – SB I-229 Entrance	Merge	B	B	C	C
	SB I-29 – between SB I-229 Entrance and CR 106 Exit	Basic	A	A	B	B
	SB I-29 – 85th Street Entrance	Merge	n/a	B	n/a	C
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Basic	n/a	B	n/a	C
	SB I-29 – between 85th Street Entrance and CR 106 Exit	Weave	B	B	C	C
	SB I-29 – Exit 73 to CR 106	Diverge	A	A	C	C
	SB I-29 – between CR 106 Exit and CR 106 Entrance	Basic	A	B	B	C
	SB I-29 – CR 106 Entrance	Merge	B	B	B	C
	SB I-29 – South of CR 106 Entrance	Basic	A	A	B	C

Indicates improved LOS NB to B

Indicates lowered LOS NB to B

Table 40
2035 No Build (NB) versus Base Build (B) I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak		PM Peak	
			NB	B	NB	B
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	n/a	n/a	n/a	n/a
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	C	C	C	C
	NB I-229 – Exit 1C to Louise Avenue	Diverge	C	C	C	C
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	B	B	B	B
	NB I-229 – SB Louise Avenue Entrance	Merge	B	B	B	B
	NB I-229 – between SB Louise Ave Ent and NB Louise Ave Ent	Basic	B	B	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	B	B	B	B
	NB I-229 – East of Louise Avenue Interchange	Basic	B	C	B	C
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	B	C	C
	SB I-229 – Exit 1C to Louise Avenue	Diverge	A	B	B	B
	SB I-229 – between Louise Avenue Exit and Louise Avenue Ent	Basic	B	B	B	C
	SB I-229 – Louise Avenue Entrance	Merge	B	B	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	B	B	B
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	B	B	B	C
	SB I-229 – Exit 1A to NB I-29	Diverge	A	A	B	B
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	A	B	B

"n/a" – merge area cannot be analyzed with HCM methodologies due to two single lane merge area

Indicates improved LOS NB to B

Indicates lowered LOS NB to B

7.5.2 Roadway User Benefits

With minimal negative impact to either the Interstate System or the arterial roadway network after mitigation, the proposed interchange provides better access and connectivity for the surrounding area and ultimately provides the vehicle users with a significant benefit.

The SDDOT provides users costs for both Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT) to show a monetary value of the benefit from a project. The most current user's costs are divided between automobiles and heavy commercial trucks. For auto's, the costs for VMT is $0.58 per mile and VHT is $12.60 per hour. For trucks the costs for VMT is $1.68 per mile and VHT is $18.00 per hour. The discount rate to bring future year dollars back to current year dollars is 4.43%; this number was provided by SDDOT for this project. The discount rate is calculated based on current inflation and interest rates and is updated on an annual basis by SDDOT.

With a new access point providing a major regional shift in traffic patterns, the MPO forecast traffic demand model was used to determine the VMT and VHT impacts of the proposed project.

The existing and future year 2045 forecasts models were used to develop the VMT and VHT data in order to calculate a typical 20-year benefit-cost analysis. A linear regression analysis was completed to determine the 2025 forecast data. The data provided in the following table is representative of the entire regional modeled roadway network.

The following Tables 41 and 42 represent the yearly VMT/VHT data as well as the user cost benefit calculations.

Table 41
Yearly VMT / VHT Data

Alternative	Alternative 0 No Build	Alternative 1 Build 85th Street Interchange
2015 Existing VMT	1,523,405,780	n/a
2015 Existing VHT	48,947,860	n/a
2025 VMT	2,028,169,867	2,031,318,813
2025 VHT	66,481,133	65,958,880
2045 VMT	3,037,698,040	3,047,144,880
2045 VHT	101,547,680	99,980,920

Table 42
User Costs Calculations – 20 Year

Alternative	Alternative 0 No Build	Alternative 1 Build 85th Street Interchange
2025 VMT	$1,319,940,385	$1,322,139,924
2025 VHT	$878,177,509	$870,783,968
2045 VMT	$1,928,938,255	$1,934,936,999
2045 VHT	$1,306,918,642	$1,286,754,440
VMT 20-year Benefit (non-discounted)	n/a	**$(81,982,826)**
VMT 20-year Benefit (discounted 2016 dollars)	n/a	**$(33,795,345)**
VHT 20 year Benefit (non-discounted)	n/a	**$275,577,416**
VHT 20 year Benefit (discounted 2016 Dollars)	n/a	**$113,599,814**
TOTAL USER BENEFIT	**n/a**	**$79,804,469**

The proposed interstate access would provide a user benefit of approximately $80,000,000 over a 20-year analysis.

The proposed access would actually increase vehicle miles traveled throughout the region based on vehicles having access to the higher speed interstate system that can provide longer trips at shorter travel times.

The proposed access provides a significant user benefit based on shorter trip times that reduce the overall vehicle hours traveled within the region.

It should be noted that this benefit does not include any safety benefit or comparison against the cost of construction for the project.

7.6 Evaluation Matrix

A matrix comparing the No Build alternative to Alternative 1 is shown in Table 43.

Table 43
2045 Build 85TH Street Ramp Terminal Intersection Operations Summary

Evaluation Criteria	Alternative 0 No Build	Alternative 1 Build 85th Street Interchange
Meets all SDDOT Design Criteria	Yes	Yes
Meets SDDOT Access Criteria	Yes	Yes
Lowest Ramp Merge/Diverge LOS 2045	C	C
ROW Impacts	None	Minimal
Environmental Impacts	None	Minimal
Safety Improvement	None	Fair
Providing local access	No	Yes
Provide area development opportunities	No	Yes

7.7 Coordination

The SDDOT has a long history of public involvement in the development of transportation plans and projects. The 2012 passage of the Moving Ahead for Progress in the 21st Century Act (MAP-21) requires a public involvement process.

The previous I-29 Corridor Study had a study webpage, an e-newsletter, and numerous public meetings held while the study was active. The study evaluated different interchange options for 85th and those were presented at public meetings. The I-29 Corridor Study's final report is available at:

http://www.sddot.com/transportation/highways/planning/specialstudies/docs/I29Exit73FinalCorridorStudyReportNoAppendices.pdf

Meetings with the landowners adjacent to the project were held multiple times throughout development of the IJR study in 2015, 2016 and 2017. Future public meetings would likely be held during the NEPA phase as the project development process continues.

Throughout the project's development to-date, the project team has included representatives from FHWA, SDDOT, City of Sioux Falls, City of Tea, and Lincoln County.

8.0 Funding Plan

The planned project to add I-29 access at 85th Street is currently estimated to cost $23.2 million (in 2016 dollars) for the interchange and interstate improvements. Planning level cost estimates were developed and are provided in Appendix L, Construction Cost Estimates and Phasing Plan. The project partners are currently anticipating funding the interchange project with the combination of funding sources as shown in Table 44.

Table 44
Anticipated Funding Allocation Breakdown

State Funding Category	Federal Funding Category	Federal Funds	State Funds	City Funds	Other	Total Funds	Notes
Interstate	None	$0	$200,000	$0	$0	$200,000	
Interstate	State Infrastructure Bank Loans	$13,645,500	$1,354,500	$0	$0	$15,000,000	Split is 90/10
Local Urban Systems	Surface Transportation Block Grant Program	$3,183,950	$316,050	$0	$0	$3,500,000	Split is 90/10
Sioux Falls Capital Improvements Program	None	$0	$0	$1,030,000	$0	$1,030,000	Utility cost to construct under the 85th Street Interchange
Land Owners*	None	$0	$0	$0	$3,470,000	$3,470,000	
Total		$16,829,450	$1,870,550	$1,030,000	$3,470,000	$23,200,000	

* Total investment for the Land Owners is $4 million minus the Interchange Justification Report and Environmental Assessment Costs.

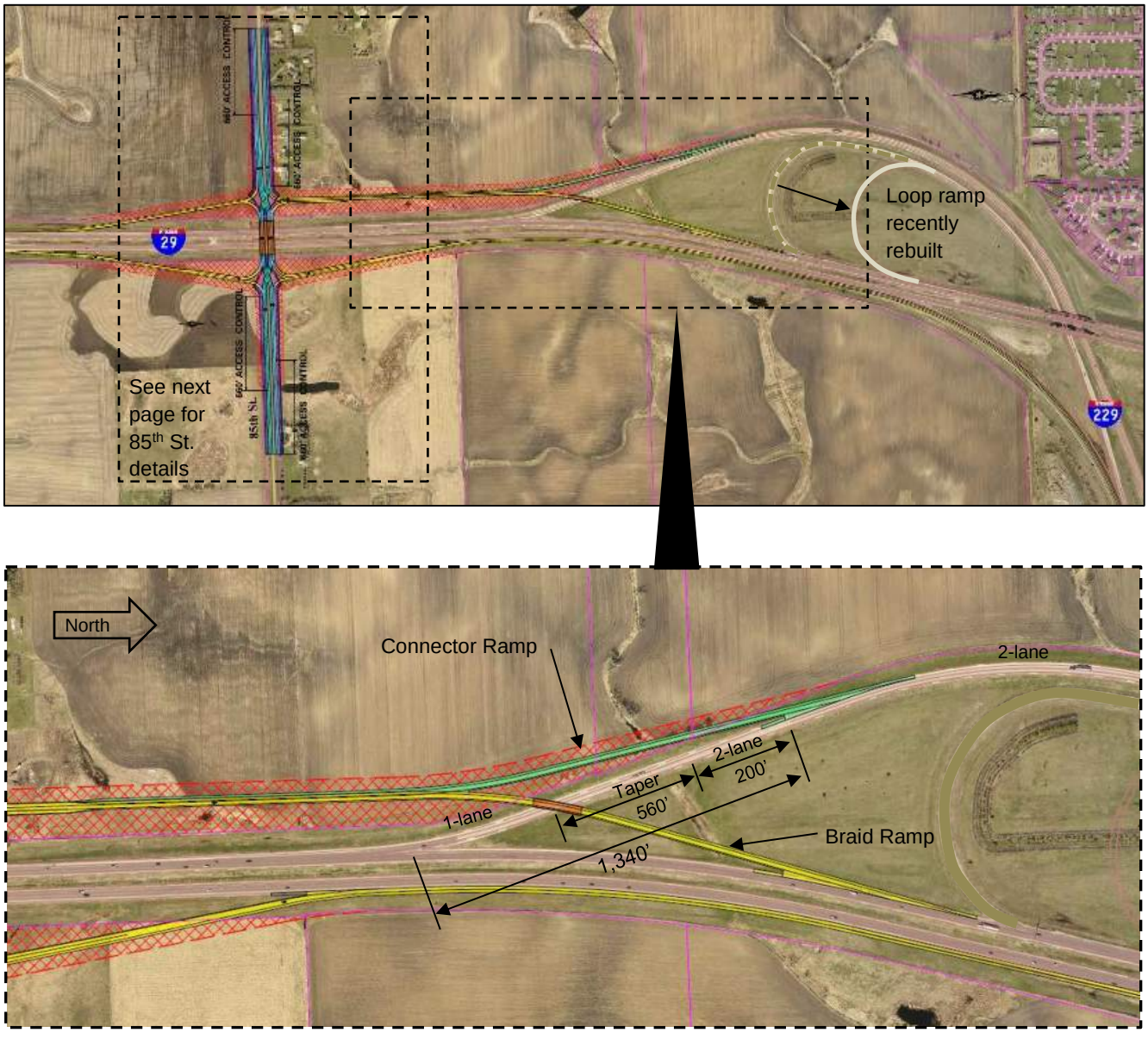
Note: As funding is fluid, category breakdown may be different at time of project authorization.

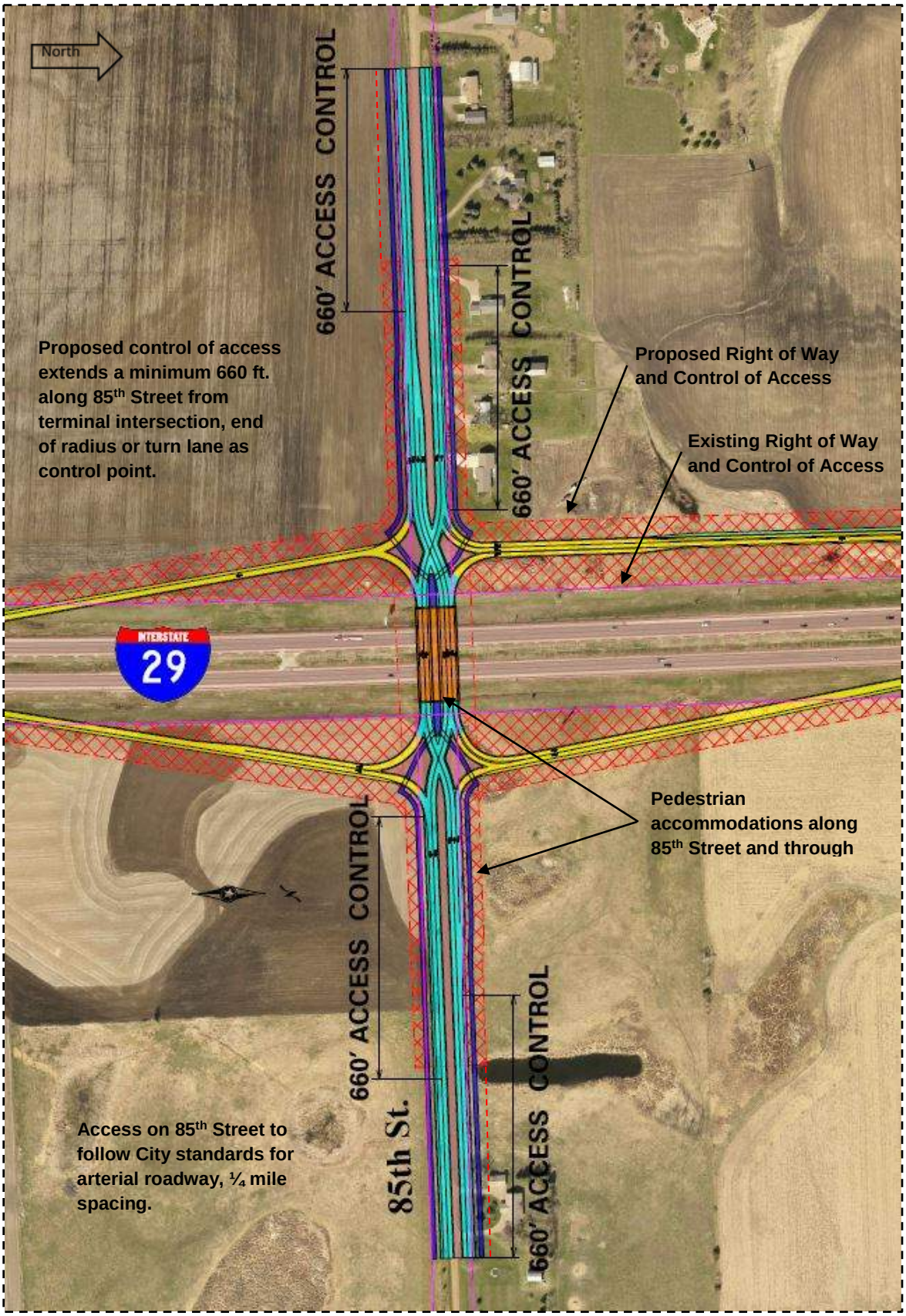
9.0 Recommendations

This justification request is to add access to I-29 at the location of 85th Street. The interchange would be I-29 Exit 74 and proposed as a Diverging Diamond Interchange (DDI) configuration, meeting all current standards. Below and on the following page are concept layouts for the interchange.

This recommendation addresses the eight policy requirements for new or revised access points to the existing Interstate system published in the Federal Register Volume 74 Number 165: August 27, 2009.

Figure 27 – Diverging Diamond Interchange (DDI) Concept Layout




North
660' ACCESS CONTROL
660' ACCESS CONTROL
Proposed control of access extends a minimum 660 ft. along 85th Street from terminal intersection, end of radius or turn lane as control point.
Proposed Right of Way and Control of Access
Existing Right of Way and Control of Access
INTERSTATE
29
Pedestrian accommodations along 85th Street and through
660' ACCESS CONTROL
660' ACCESS CONTROL
85th St.
Access on 85th Street to follow City standards for arterial roadway, ¼ mile spacing.

9.1 Policy Number One

The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year demands (23 CFR 625.2(a)).

The proposed project will address limited access concerns and ultimately provide a benefit to both the interstate and local roadway systems.

Local access along segments the of I-29 and I-229 in the study are currently provided at the service interchanges of I-29/Highway 106 (Tea), I-29/41st Street and I-229/Louise Avenue. The I-29/I-229 system interchange north of the proposed 85th Street interchange location impacts the placement of additional access along this section of the freeway. Spacing between the Highway 106 (Tea) and 41st Street local access points along I-29 is approximately four (4) miles, with the I-29 and I-229 system interchange located midway between these two accesses. In the developed portions of Sioux Falls, interchanges are generally provided every mile which are acceptable with minimum AASHTO guidelines.

In the latest LRTP update (2015), targeted development areas within the region have shifted more to the southwest part of the region and over a few years there has been significant development occurring on the southern fringe of Sioux Falls, including within the study area. Based on updated land development plans for the region, many portions of the study area are projected to develop to urban-scale development densities providing substantial employment opportunities in the office, retail, medical sectors, as well as moderate to high density housing development.

Destinations west of I-29 in the study area are required to travel north to 41st Street interchange or south to the Tea interchange to access I-29. Drivers on the west side of I-29 can also access the Interstate System by crossing the interstate via the 41st Street, 49th Street (overpass), 57th Street (overpass) or Highway 106 crossings of I-29, and then access I-229 via the Louise Avenue interchange. The I-29/41st Street and I-229/Louise Avenue interchanges currently experience recurring high levels of congestion in peak periods, and peak period travel delays are forecasted to increase over the planning horizon as traffic levels increase.

The proposed 85th Street interchange on I-29 will provide an important new service interchange to support the expected regional growth for the area, providing better access and connectivity for the surrounding area roadway network compared to the No Build scenario. The proposed I-29 access would provide a significant user benefit through a decrease of over 20 million Vehicle Hours Traveled (VHT) with a cost savings of approximately $80,000,000 over a 20-year analysis in comparison the No Build scenario.

9.2 Policy Number Two

The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(a)).

Based on review of published documents, currently there are no areas within the State of South Dakota that are anticipated to consistently experience congestion levels extreme enough to make ramp metering or HOV facilities economically feasible in the foreseeable future.

The project need is based on providing interstate access to a large, unserved, growing area on the southwest side of Sioux Falls. Adding additional improvements to the interstate system or transportation system management strategies would not improve access to the growth area.

9.3 Policy Number Three

An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)).

Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

An extensive operations analysis was conducted for the study area, as previous sections presented. Results indicate the freeway segments of I-29 and I-229 with the current configuration, mitigated with minor lane additions, will provide acceptable operations in 2045 for both the No Build and Build conditions. The next page provides a figure (23) and tables (21 and 22) repeated from Section 6.2.2.1 Freeway mitigations support the acceptable operations, LOS C and above, assessment.

Arterial network operations analysis was conducted on 24 intersections, as previous sections presented. Results indicate the arterials and intersections will require improvements to provide acceptable operations in 2045 for both the No Build and Build conditions.

The results of the operations analysis confirm the addition of a new access on I-29 at 85th Street will not adversely impact safety and operations of the freeway or arterial network. Predictive crash modeling (IHSDM) was completed for Alternative 1. See Appendix N for the 85th St Interchange Alternatives Review Memo for details on the predictive crash modeling results.

Required improvements have been amended into the MPO's Long Range Transportation Plan (LRTP), TIP and STIP.

A Signing Plan has been developed for the proposed interchange and interstate improvements which is provided in Appendix M. A detail of the immediate 85th St. interchange is shown in Figure 28.

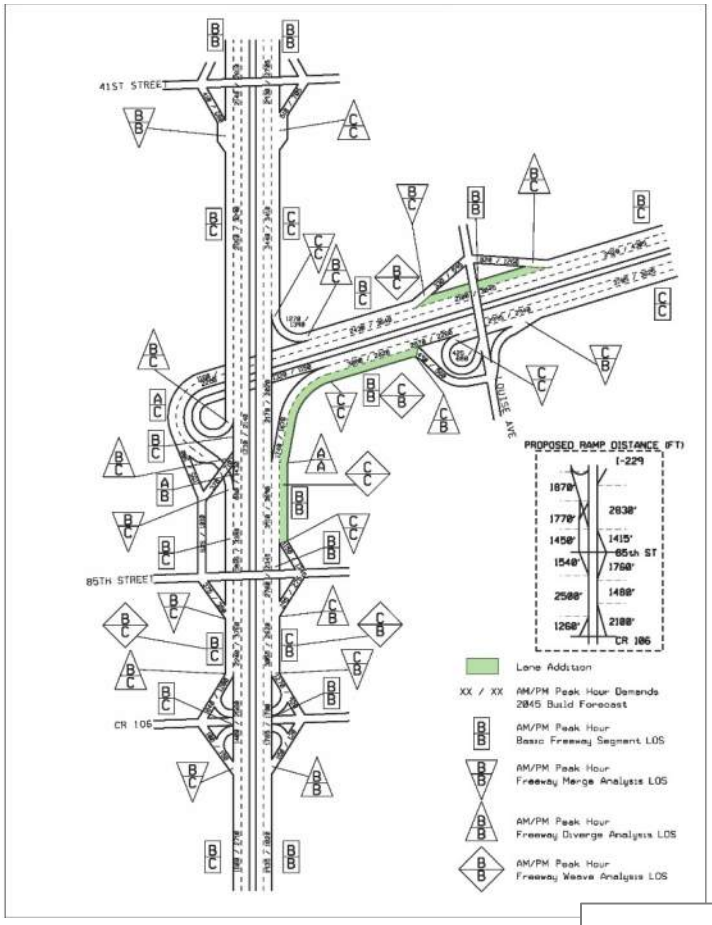


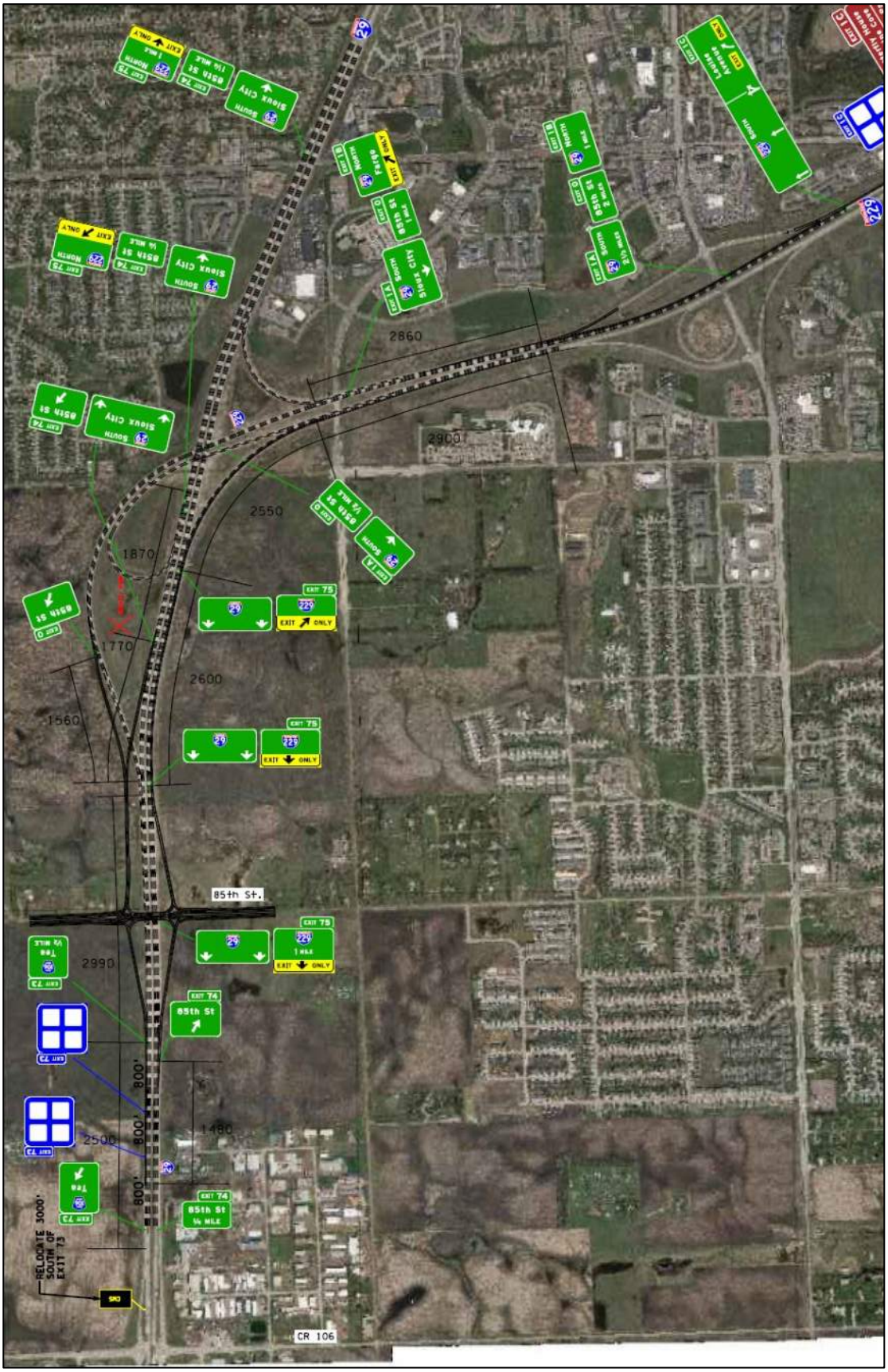
Table 21
2045 Mitigated Build Northbound I-29 Freeway Operations Summary

	Description	Analysis Type	AM Peak LOS	PM Peak LOS
NB I-29	NB I-29 – South of Exit 73	Basic	B	B
	NB I-29 – Exit 73 to CR 106	Diverge	B	B
	NB I-29 – between CR 106 Exit and Entrance Ramps	Basic	B	B
	NB I-29 – CR 106 Entrance	Merge	C	B
	NB I-29 – between CR 106 to 85th Street Exit	Basic	C	B
	NB I-29 – between CR 106 to 85th Street Exit	Weave	C	B
	NB I-29 – Exit 74 to 85th Street	Diverge	C	B
	NB I-29 – between 85th Street Exit and Entrance Ramps	Basic	B	B
	NB I-29 – 85th Street Entrance	Merge	C	C
	NB I-29 – between 85th Street to NB I-229 Exit	Basic	B	B
	NB I-29 – between 85th Street to NB I-229 Exit	Weave	C	C
	NB I-29 – Exit 77 to NB I-229	Diverge	A	A
	NB I-29 – between NB I-229 Exit and SB I-229 Entrance	Basic	B	B
	NB I-29 – SB I-229 Entrance	Merge	C	C
	NB I-29 – between SB I-229 Entrance and 41st St Exit	Basic	C	C
	NB I-29 – Exit 77 to 41st St	Diverge	C	C
	NB I-29 – between 41st St Exit and 41st St Entrance	Basic	B	B

Table 22
2045 Mitigated Build I-229 Freeway Operations Summary

	Description	Analysis Type	AM Peak LOS	PM Peak LOS
NB I-229	NB I-229 – NB I-29 and SB I-29 Entrance	Merge	C	C
	NB I-229 – between I-29 and Louise Avenue Exit	Basic	B	B
	NB I-229 – Exit 1C to Louise Avenue	Diverge	C	B
	NB I-229 – between Louise Ave Exit and SB Louise Ave Entrance	Basic	C	B
	NB I-229 – SB Louise Avenue Entrance	Merge	C	B
	NB I-229 – between SB Louise Ave Entrance and NB Louise Ave Entrance	Basic	B	B
	NB I-229 – NB Louise Avenue Entrance	Merge	C	B
	NB I-229 – East of Louise Avenue Interchange	Basic	C	C
SB I-229	SB I-229 – East of Louise Avenue Interchange	Basic	B	C
	SB I-229 – Exit 1C to Louise Avenue	Diverge	B	C
	SB I-229 – between Louise Avenue Exit and Louise Avenue Entrance	Basic	B	B
	SB I-229 – Louise Avenue Entrance	Merge	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Basic	B	C
	SB I-229 – between Louise Ave Entrance and NB I-29 Exit	Weave	B	C
	SB I-229 – Exit 1A to NB I-29	Diverge	B	C
	SB I-229 – between NB I-229 Exit and entrance to SB I-29	Basic	A	B

Figure 28 – Signing Plan, 85th Street Interchange



9.4 Policy Number Four

The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)).

The proposed interstate access would create a new, full access interchange to a public roadway (85th Street). The proposed design will meet or exceed current standards on Federal-aid projects on the Interstate System.

9.5 Policy Number Five

The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.

The proposed new interchange at 85th Street is targeted for construction in 2021. The interchange, a part of the MPO's Long Range Transportation Plan (LRTP), TIP and STIP, is consistent with the vision of local land use plans for the area and local transportation planning for network improvements. Amendments to the current LRTP, TIP and STIP were completed in 2018 to include the proposed 85th Street interchange and remove the previously completed 85th St. Overpass EA project.

9.6 Policy Number Six

In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d), 23 CFR 625.2(a), 655.603(d), and 771.111).

Neither the South Dakota Interstate Corridor Study completed in February 2001, the 2010 South Dakota Decennial Interstate Corridor Study, nor the I-29 Corridor Study (Exit 73 through Exit 77) indicated that there is a potential for additional future interchange additions along the segments of Interstate 29 between the proposed Exit 74 and the adjacent exits.

The Interchange Modification Justification Report for the I-29 and I-229 system interchange, 2014, also indicated that only access to the proposed 85th Street overpass would be considered feasible. All other potential access points in the vicinity of the system interchange were deemed either not feasible or too impactful.

While not a new interchange addition, the SDDOT has an ongoing SD 100 Corridor Preservation Project that is within the proximity of the proposed project area. SD 100 would parallel I-229 at the outer edge of the City of Sioux Falls and ultimately be a 17-mile limited access highway connecting I-29 to I-90. The connection to I-29 would occur at the existing Exit 73 interchange of CR 106; therefore no new interchange additions are anticipated to be needed. The proposed project, when complete, would draw trips from both I-229 and 85th Street; which will reduce the forecasted demands along 85th Street.

9.7 Policy Number Seven

When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d)).

The new access change is proposed as a result of traffic operational and safety concerns due to forecast year growth in the developing area. The request for new access only includes the 85th Street interchange location.

The City of Sioux Falls, the City of Tea, Lincoln County and the 85th Street Business District Joint Venture Group (landowners) were project stakeholders throughout the project and are committed to improving the local arterial network to handle the traffic pattern shifts that occur with the proposed access changes and developing land uses. Significant efforts were expended by these stakeholders through planning and coordination before and during the study of the proposed interchange. These efforts resulted in the development of a Pre-Annexation Agreement between the City of Sioux Falls and the 85th Street Business District Joint Venture Group along with a detailed Project Phasing Plan. Entity commitments to financially support improvements to the transportation network in conjunction with the proposed interchange, as outlined in the agreement, are summarized below.

• South Dakota Department of Transportation	$200,000
• Lincoln County	$15,980,000
• City of Tea	$4,252,000
• City of Sioux Falls	$30,202,000
• Ownership Group	$4,000,000
Total:	**$54,634,000**

Phasing of these potential improvements are described in more detail in the Phasing Plan Memorandum provided in Appendix L – Construction Cost Estimates and Phasing Plan. Improvements that are considered regionally significant or seek federal funding have been amended into the LRTP, TIP and STIP.

9.8 Policy Number Eight

The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111).

The Environmental Assessment (EA) for the project will commence upon concurrence by the SDDOT and FHWA for a tentative approval for the IJR.

The EA will discuss the potential social, economic, and environmental impacts of the proposed improvements. The document will be available for public review at that time and a public meeting will be held to receive comments.

Preliminary analysis indicates that the proposed project is not expected to have substantial social, economic, or environmental impacts and that any impacts that will occur will be mitigated using appropriate measures.

Appendix A

Arterial Roadway and Intersection Figures

Appendix B

I-29 and 85th Street Interchange Methods and Assumptions Report

Appendix C

I-29/85th Street IJR Traffic Forecasts Memorandum

Appendix D

HCS Analysis Summary Files - Existing

Appendix E

HCS Analysis Summary Files – 2045 No Build

Appendix F

HCS Analysis Summary Files – 2045 Build Alternative 1

Appendix G

HCS Analysis Summary Files – 2020 No Build

Appendix H

HCS Analysis Summary Files – 2020 Build Alternative 1

Appendix I

HCS Analysis Summary Files – 2035 No Build

Appendix J

HCS Analysis Summary Files – 2035 Build Alternative 1

Appendix K

Sioux Falls 2040 LRTP – Final November 2015

Chapter 5.0 Land Use and Regional Demographics

Appendix L

Construction Cost Estimates and Phasing Plan

Appendix M

Signing Plan

Appendix N

85th Street Interchange Alternatives Review