

LINCOLN COUNTY HIGHWAY 106

CORRIDOR STUDY



January 2024

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INTRODUCTION

Lincoln County Highway 106/271st Street (LC Hwy 106) is the growth boundary between the City of Sioux Falls and City of Harrisburg east of Interstate 29 (I-29), and currently under the jurisdiction of Lincoln County. With rapid growth of both communities and the start of construction of the southern segment of Veterans Parkway, the South Eastern Council of Governments (SECOG) initiated a study in 2023 to develop a long-range plan for the corridor.

The LC Hwy 106 study limits are shown in **Figure I**, which extends approximately nine miles from the Tallgrass Avenue intersection to the 480th Avenue intersection.

A Study Advisory Team (SAT) was organized to provide guidance and feedback at key milestones and included representatives from:

- SECOG/Sioux Falls Metropolitan Planning Organization (MPO)
- Lincoln County
- City of Harrisburg
- City of Sioux Falls
- South Dakota Department of Transportation (SDDOT)

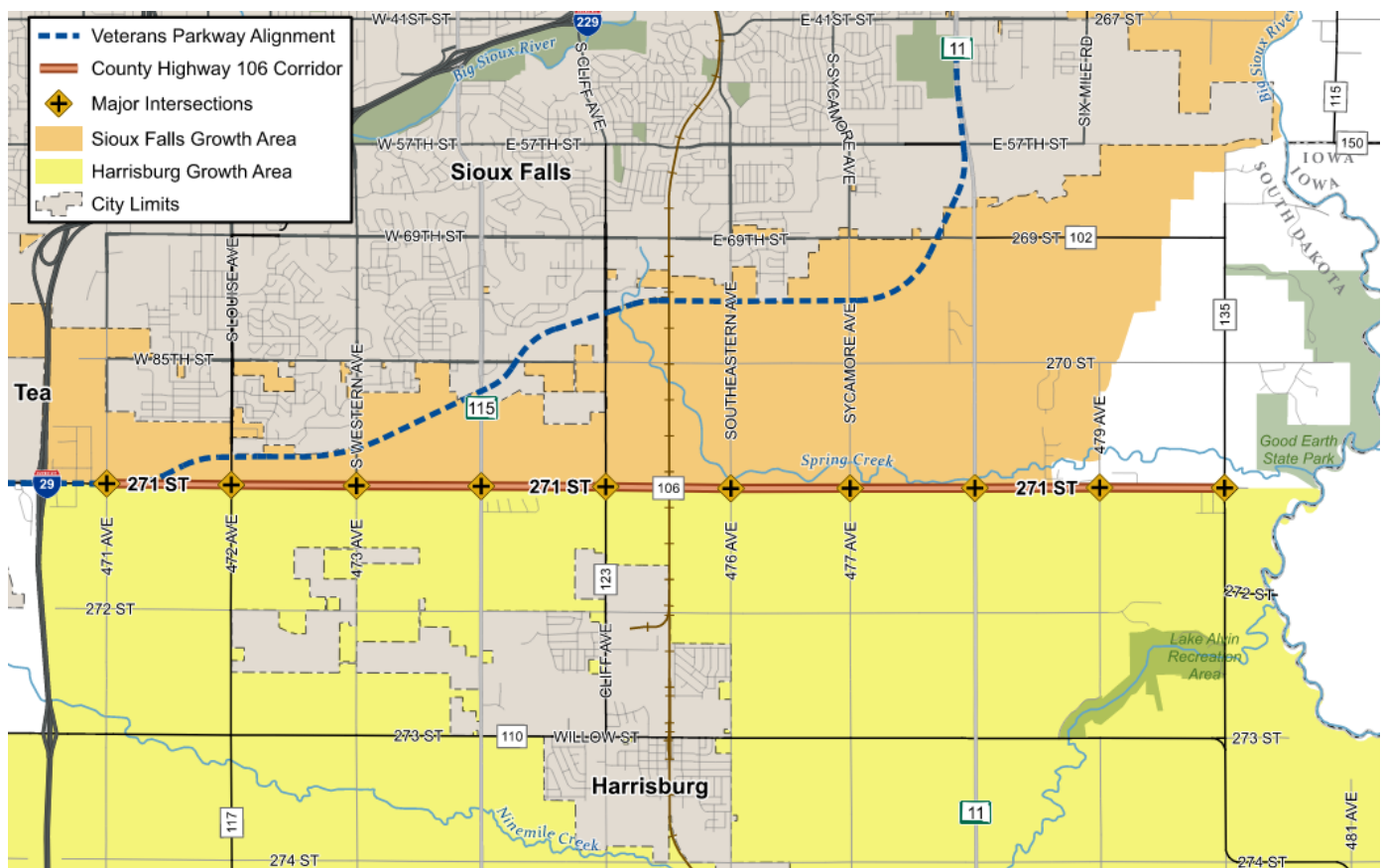


Figure 1: Study Area

Study Objectives

Lincoln County Highway 106 Corridor Study objectives include:

1. Determine potential intersection configurations for all arterial section line intersections.
2. Determine the need for additional through, turning, and/or passing lanes.
3. Develop a corridor land use and access management plan.
4. Create a high-level environmental review technical memorandum of known environmental issues.
5. Develop a long-range plan to help guide partnering agencies in implementation of recommended improvements.

Study Process

The study used a four-step process to develop long-range planning recommendations for the corridor:

1. Identify transportation issues and needs
2. Develop alternatives
3. Evaluate and refine alternatives
4. Develop recommendations

Study Advisory Team, public, and stakeholder involvement were instrumental throughout the process, which included six Study Advisory Team meetings, a land use planning meeting, and two sets of public open houses and virtual stakeholder meetings.

Methods and Assumptions

A *Methods and Assumptions* document was prepared at the onset of the study to serve as a historical record of analysis methodology. The final version is provided in **Appendix A**.

Prior Studies

The following planning documents were referenced to support this study:

- *Northern Lincoln County Corridors (SD 11 and SD 115) Study*
- *2045 Go Sioux Falls Long Range Transportation Plan (LRTP)*
- *Veterans Parkway Traffic Design Memo*
- *Lincoln County and Harrisburg Master Transportation Plans*
- *City of Harrisburg Master Transportation Plan*
- *2019 City of Harrisburg Comprehensive Plan*
- *Shape Sioux Falls 2040 – Comprehensive Plan*
- *Area bicycle and pedestrian plans*
- *Area traffic impact studies*

BASELINE CONDITIONS

Existing Road Conditions

A summary of existing roadway segment and intersection information is shown in **Figure 2**. While LC Hwy 106 maintains a 2-lane cross-section throughout the study corridor, several features vary such as posted speed, intersection configuration, and intersection traffic control. There is an at-grade railroad crossing at the ½-mile point between Cliff Avenue and Southeastern Avenue. The corridor crosses two state highways, SD115 (Minnesota Avenue) and SD11.

Corridor Growth Areas

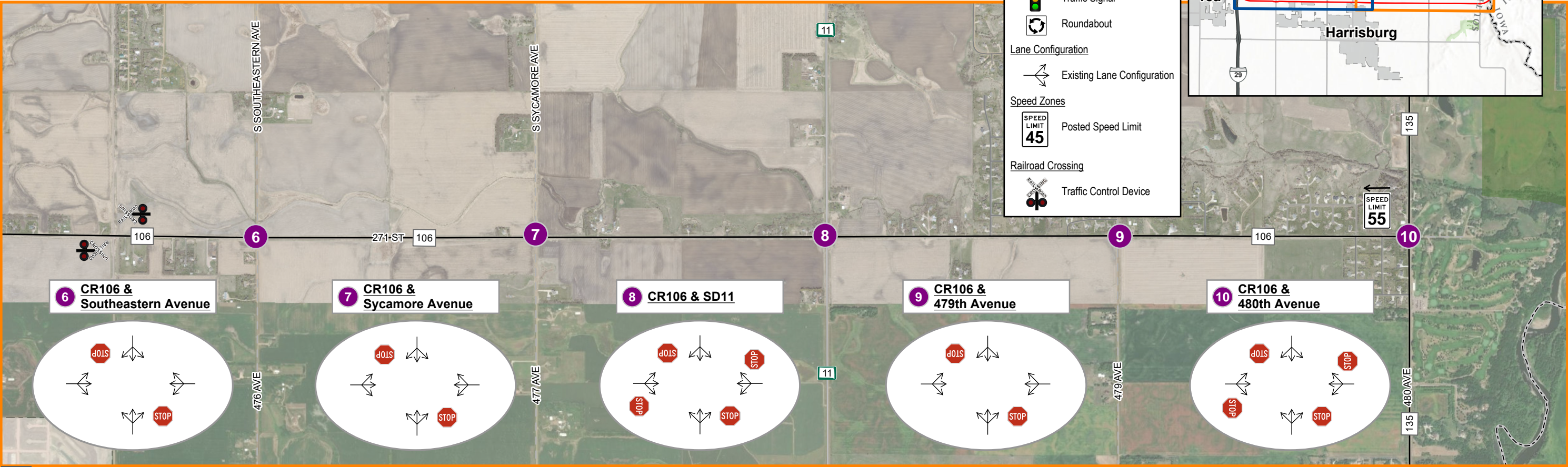
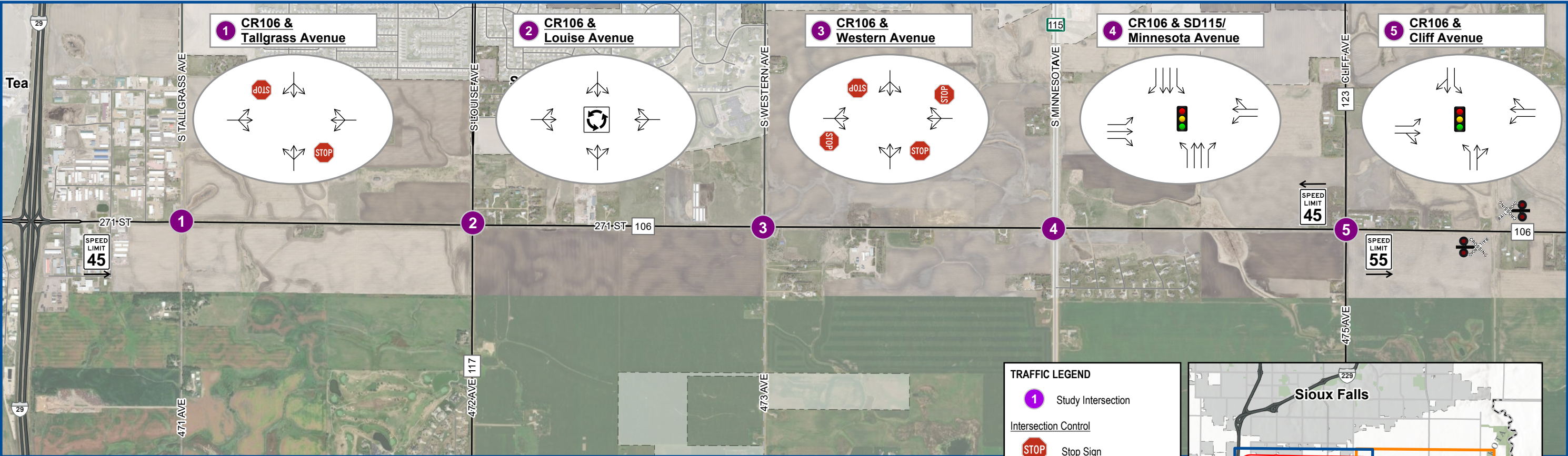
The LC Hwy 106 corridor is the growth boundary for City of Harrisburg (south of LC Hwy 106) and City of Sioux Falls (north of LC Hwy 106). Growth planning by both communities provides valuable context on when and where development is expected to occur, which translates to planning-level timelines of when transportation network improvements may be required.

On the north side of LC Hwy 106, the City of Sioux Falls Growth Management Plan identifies areas of development and approximate timelines based on serviceability of utilities. The March 8, 2023, version, shown in **Figure 3**, categorizes developable areas into three tiers:

- Tier 1: City services available within the five-year CIP period
- Tier 2: City services are projected to be available for the development within 6 to 15 years
- Tier 3: City services are projected to be available for development within 16 to 25 years

In general, the Harrisburg growth area south of LC Hwy 106 follows a similar projection. Areas west of Cliff Avenue are anticipated to develop first (aligning with City of Sioux Falls Tier 1 and Tier 2 growth areas). An overview of the City of Harrisburg future land use is shown in **Figure 4**. City of Harrisburg growth planning also includes industrial and commercial development along the SD11 corridor.

The Sioux Falls MPO travel demand model (TDM) accounts for anticipated growth throughout the MPO area and was updated with local agency growth planning as part of the *2045 Go Sioux Falls LRTP*. Within this study's 25-year planning horizon, most development is expected to occur west of Southeastern Avenue with development beginning to intensify east of Southeastern Avenue in the latter years of the planning horizon.



TRAFFIC LEGEND

1 Study Intersection

Intersection Control

- Stop Sign
- Traffic Signal
- Roundabout

Lane Configuration

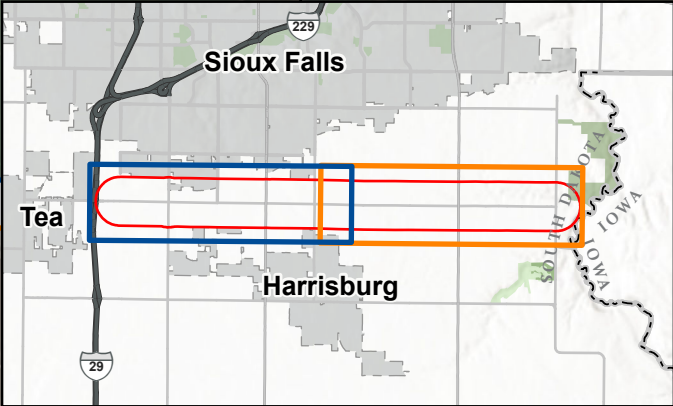
- Existing Lane Configuration

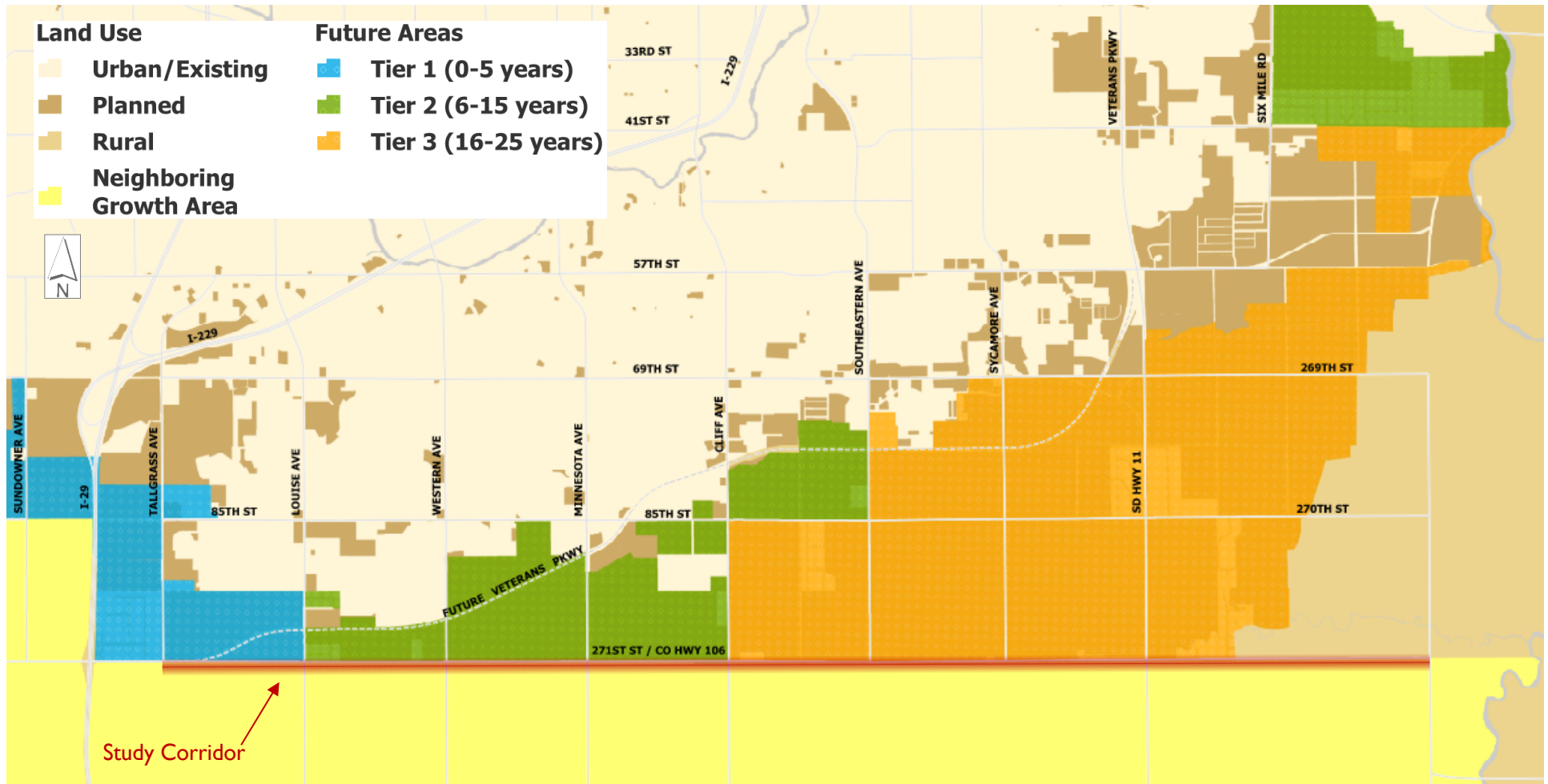
Speed Zones

- Posted Speed Limit

Railroad Crossing

- Traffic Control Device

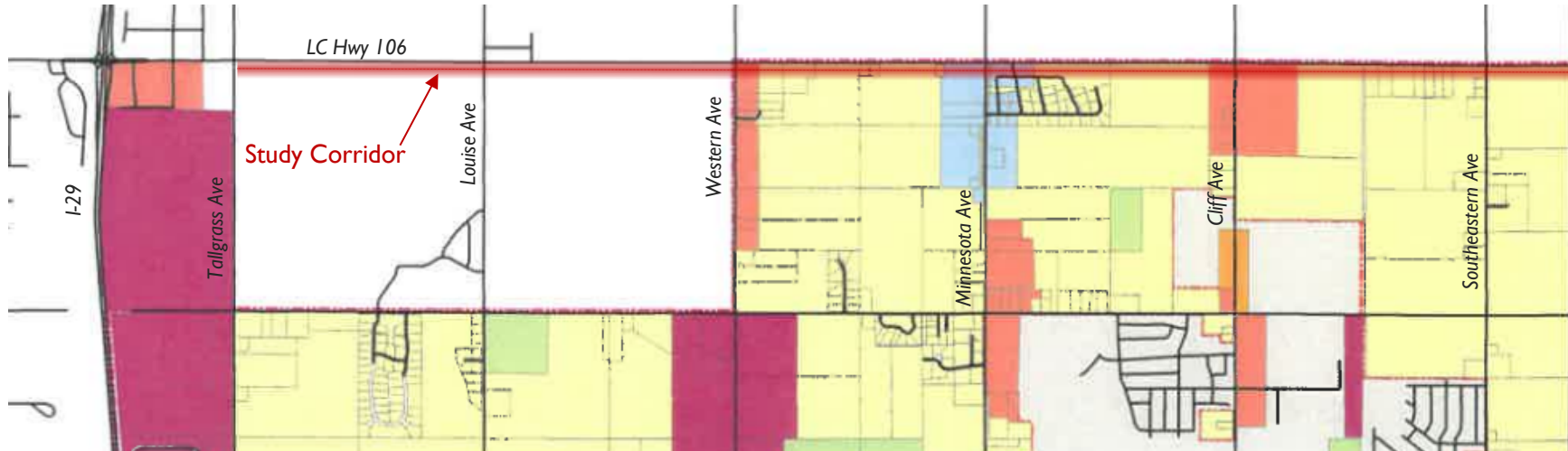




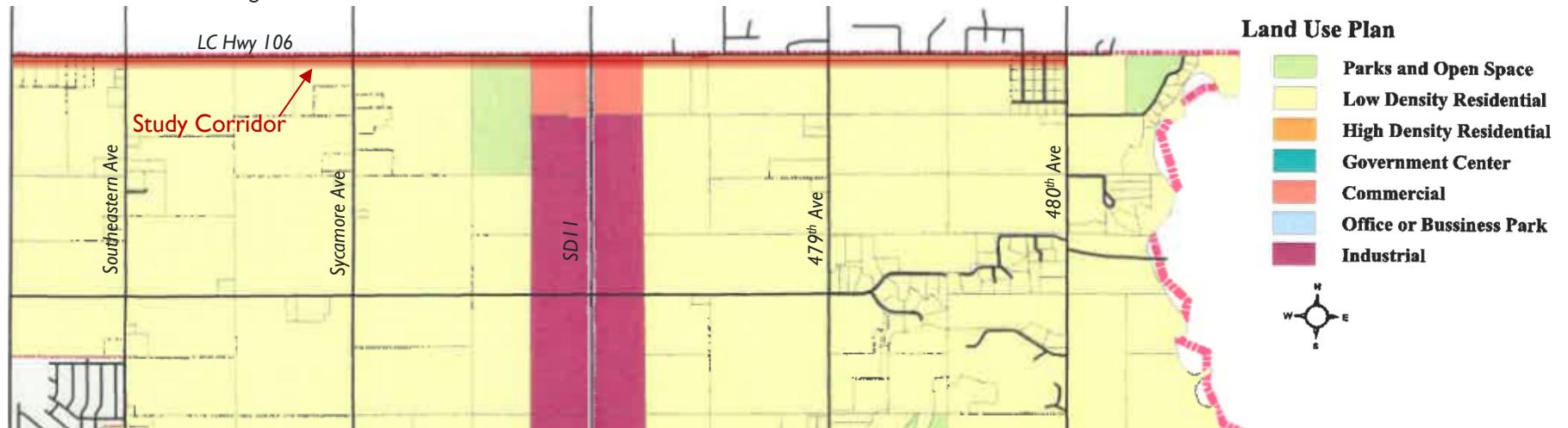
Source: Adapted from City of Sioux Falls (March 8, 2023)

Figure 3: City of Sioux Falls Growth Management Plan Development Areas

I-29 to Southeastern Avenue:



Southeastern Avenue to Big Sioux River:



Source: Adapted from 2019 City of Harrisburg Comprehensive Plan

Figure 4: Harrisburg Comprehensive Plan Future Land Use

South Veterans Parkway

When complete, Veterans Parkway will be a 17-mile access-controlled regional arterial corridor within the eastern and southern edges of the Sioux Falls growth area. Veterans Parkway corridor termini include interchanges at I-29 (west) and I-90 (north), though local roadways continue beyond those interchanges. The North Veterans Parkway segment from 57th Street northward to I-90 is mostly complete. Construction of South Veterans Parkway started in 2023 with Segment 1, shown in **Figure 5**, with anticipated completion of all four phases in 2027.

Veterans Parkway will tie into the I-29 Exit 73 interchange and Gateway Boulevard corridor on the west end. Heading east from the I-29 Exit 73 interchange, Veterans Parkway will be constructed on the existing LC Hwy 106 alignment until approximately ½-mile east of Tallgrass Avenue where the corridor begins more of a northeastern trajectory on new alignment to 57th Street. Following completion of Veterans Parkway, LC Hwy 106 will no longer have a direct connection with the I-29 Exit 73 interchange and a cul-de-sac will be constructed west of the Louise Avenue intersection. The new limits of LC Hwy 106 east of I-29 will be between Louise Avenue and 480th Avenue.

It is anticipated that Veterans Parkway will become the primary high-capacity, high speed regional route through this area. With LC Hwy 106 no longer having a direct connection with the I-29 Exit 73 interchange, a considerable amount of traffic is anticipated to shift from LC Hwy 106 to the new Veterans Parkway corridor.



Figure 5: South Veterans Parkway Alignment and Construction Schedule

Traffic Volumes

See *Traffic Forecasts Memo* in **Appendix B** for additional information.

2022 Existing Volumes

Existing condition traffic volumes are based on daily and peak hour traffic counts collected in July 2022. Other counts collected through City of Sioux Falls, Lincoln County, and SDDOT count programs were also reviewed.

Traffic Forecasts

Future-year traffic forecasts were developed to help assess future-year capacity and operational needs throughout the study area due to anticipated development, growth in traffic demand, and/or changes in traffic patterns. For this study, forecast years include:

- 2028: First Possible Year of LC Hwy 106 Project Completion
 - Reflects completion of Veterans Parkway
- 2040: Interim Year
- 2050: Planning Horizon

Traffic forecasts were developed using the Sioux Falls MPO travel demand model (TDM) and *NCHRP 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design* methodology. All forecasts assume the completion of Veterans Parkway between I-29 and 57th Street and the I-29 & 85th Street interchange projects. Mid-segment intersections, between each north/south arterial intersection, were introduced in the 2028, 2040, and 2050 conditions to incorporate future development-generated traffic volumes on the corridor.

Upon opening of Veterans Parkway between I-29 and 57th Street, it is expected that a considerable amount of LC Hwy 106 east/west traffic will shift to Veterans Parkway and result in an immediate drop in corridor traffic volumes. A special 2018 base year TDM scenario was developed to help estimate this immediate shift in traffic and served as the base condition for LC Hwy 106 segment volumes in all future-year conditions.

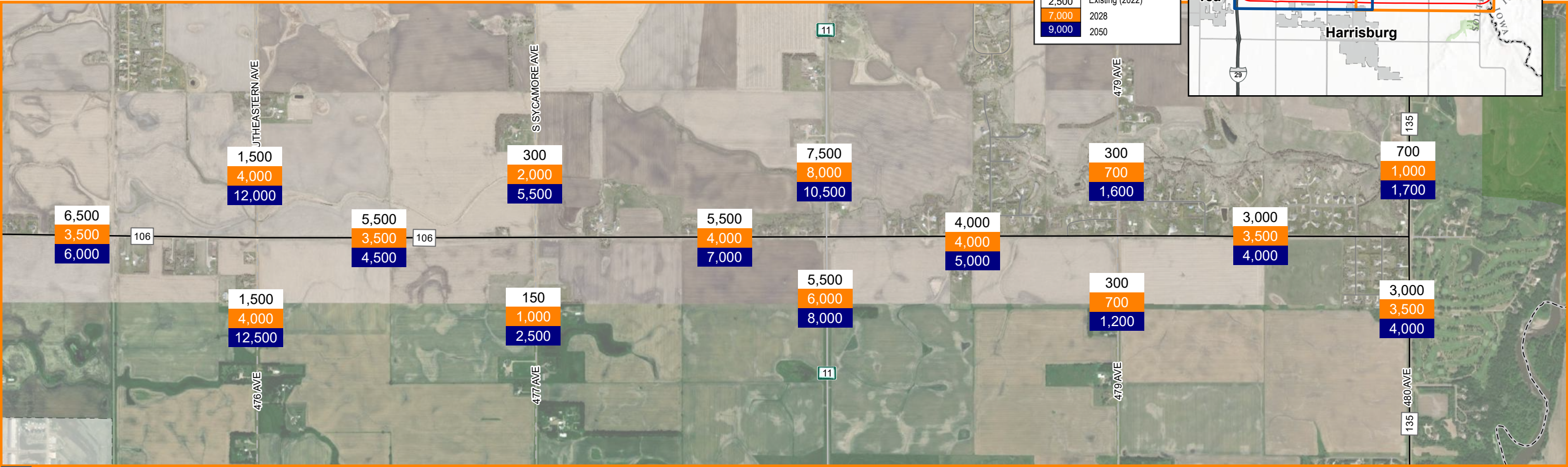
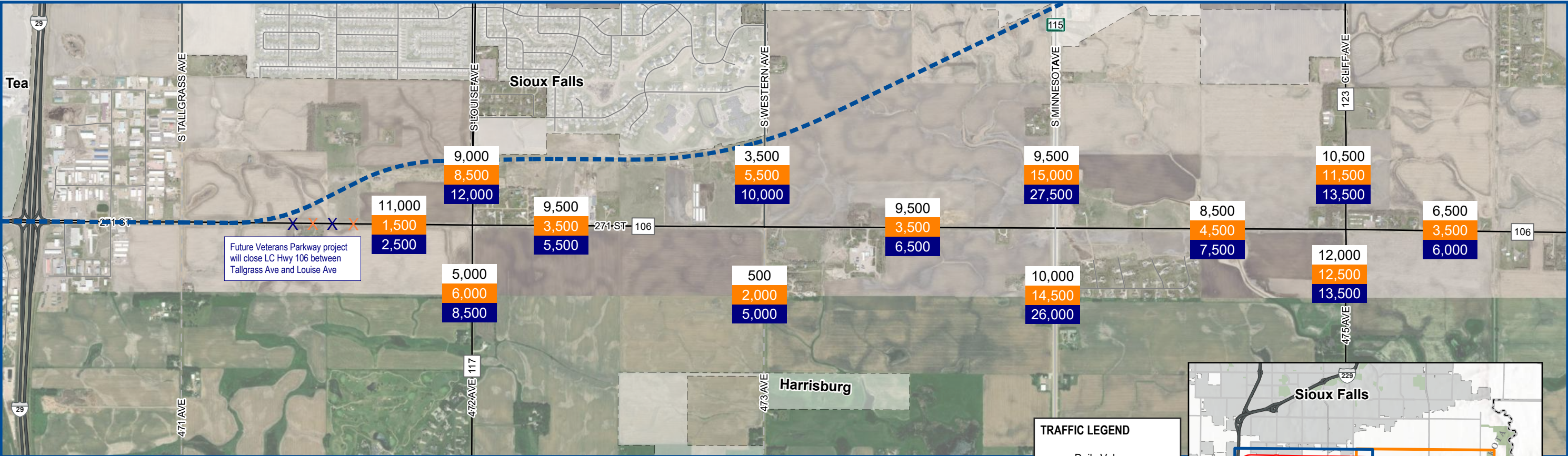
A comparison of 2022 existing condition, 2028, and 2050 Planning Horizon daily traffic volumes is shown in **Figure 6**. Daily and peak hour volumes for all traffic scenarios are provided in the *Traffic Forecasts Memo* in **Appendix B**.

Findings

Key findings in the forecast development process include:

- LC Hwy 106 corridor east/west traffic is expected to decrease considerably with the opening of Veterans Parkway due to:
 - Reduced demand of regional traffic
 - Veterans Parkway will provide the high-speed, high-capacity east/west route in northern Lincoln County, with direct connectivity between I-29, existing Veterans Parkway, and all intersecting north/south arterial roadways

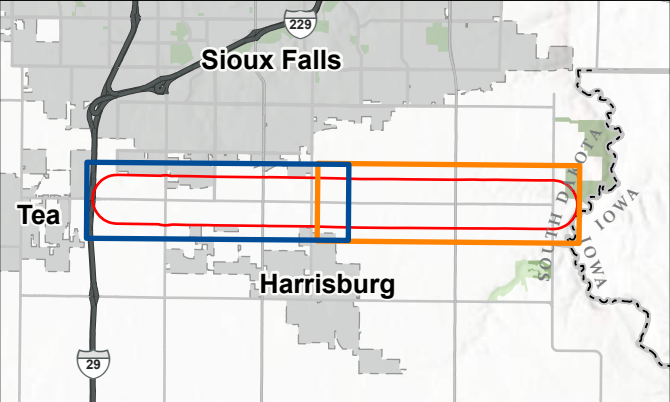
- Limited existing development along the LC Hwy 106 corridor results in few locally generated trips
- Veterans Parkway has considerably less impact on future north/south arterial corridor volumes through LC Hwy 106 intersections, though turning-movement volumes are expected to change
 - North/south arterial routes will continue to facilitate connectivity between Sioux Falls and Harrisburg areas
 - Following completion of Veterans Parkway, turning traffic to/from LC Hwy 106 will drop significantly and intersection flows will predominantly feature north/south traffic
 - Turning traffic volumes will increase with future development along the LC Hwy 106 corridor
- Once Veterans Parkway is complete, the Sioux Falls MPO TDM shows limited desirability for east/west regional travel on LC Hwy 106 unless traffic is generated along the corridor
 - Exceptions include cut-through type routes:
 - I-29 traffic originating from/destined to areas south of LC Hwy 106 may use the corridor to travel to Louise Avenue to access Veterans Parkway
 - SD11 traffic accessing Veterans Parkway (to the west) may use LC Hwy 106 (via Southeastern or Sycamore Avenue) instead of traveling north to 69th Street
 - Development traffic traveling between SD11 and Sycamore Avenue area
- Development is limited east of Cliff Avenue in the Sioux Falls MPO TDM, which contributes to low east/west volumes, due to:
 - Sioux Falls Tier 3 growth area and serviceability with utilities
 - Spring Creek constrains development along north side of the corridor from Southeastern Avenue to SD11



TRAFFIC LEGEND

Daily Volumes

2,500	Existing (2022)
7,000	2028
9,000	2050



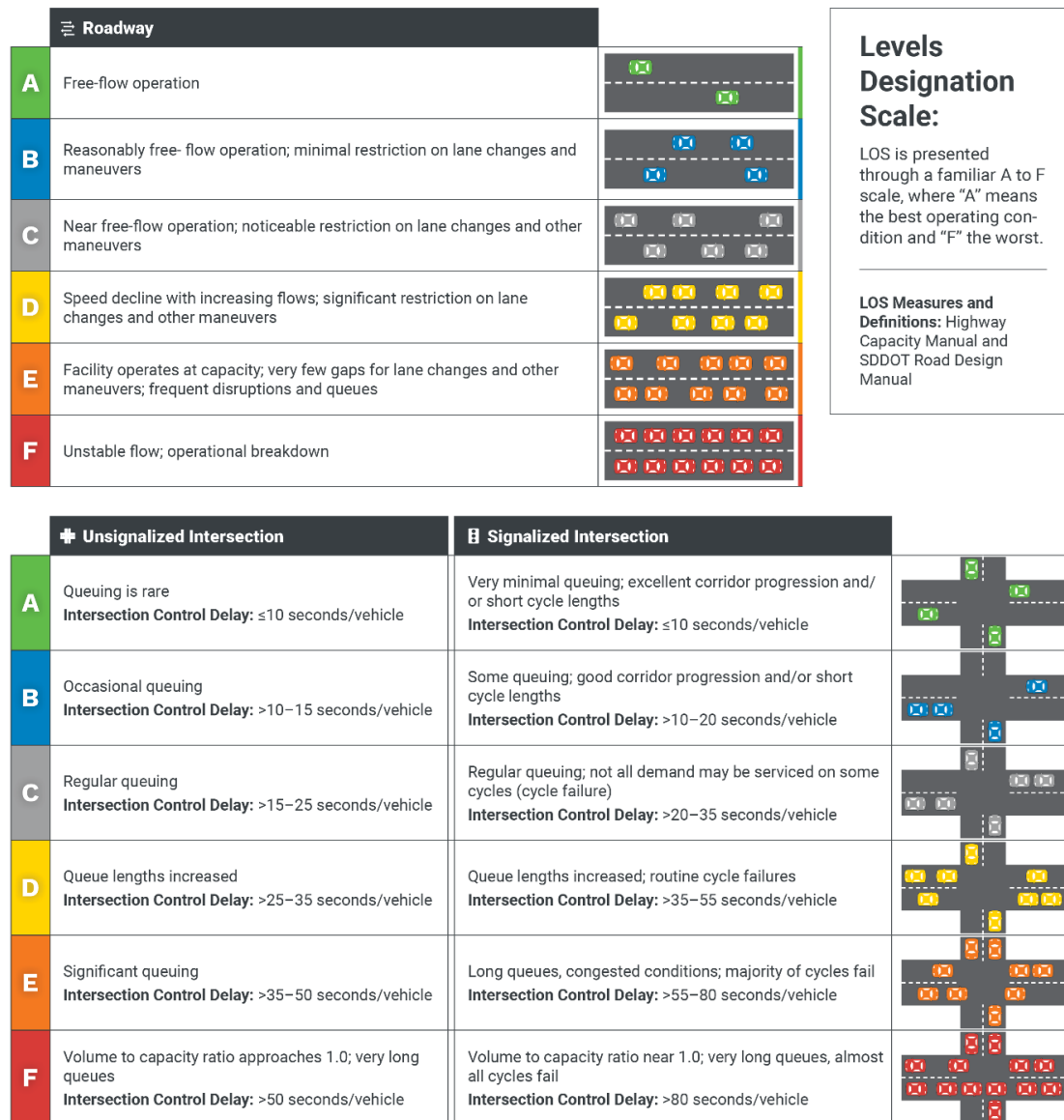
DAILY TRAFFIC VOLUMES (EXISTING, 2028, AND 2050)

FIGURE 6

Traffic Operations Analysis

See Existing and Future No Build Condition Intersection Traffic Operations Analysis Memo in **Appendix C** for additional information.

Intersection and roadway operational performance is evaluated through a focus on of quality of service, which describes how well a transportation facility operates from a traveler's perspective considering travel speeds and intersection delay. Quality of service is typically reported as a Level of Service (LOS), which is presented by a letter grade ranging from LOS A (free-flowing conditions) to LOS F (stopped / heavily delayed traffic). A description of LOS measures for intersections and roadway segments pertinent to this study are provided in **Figure 7**.



Note: Unsignalized intersection control delay shown in figure for overall (or weighted) intersection delay. Two-way stop-control delay (TWSC) is measured from the worst-case stop-controlled approach with the same average delay (seconds/vehicle) thresholds.

Figure 7: LOS Descriptions

Intersection and roadway segment peak hour LOS was calculated using Highway Capacity Software 2023 Release (HCS2023) and methodology described in the *Highway Capacity Manual (HCM) 7th Edition*. Guidelines for use of HCS2023 in this study are documented in the *Methods & Assumptions* document. Applicable LOS measures and minimum allowable LOS by facility type are summarized in **Table 1** and **Table 2**, respectively.

Table 1: Level of Service Measures

Roadway Feature	LOS Measure	Supporting Measures
Intersections	Total (overall) intersection delay	95th percentile queues Individual movement delay TWSC intersections: worst-case stop-control delay
Urban Street Segment / Facility	Travel speed	Travel time

TWSC: two-way stop-control

Table 2: Minimum Allowable Level of Service by Facility

Roadway Feature	Minimum Allowable LOS	Notes
Signalized Intersections	LOS C	Individual movements allowed to operate at LOS D Individual movements not allowed with a v/c ratio > 1.0 Queue storage ratios not allowed to exceed 1.0
Unsignalized Intersections	LOS C	TWSC, AWSC, and roundabouts LOS based on weighted average intersection delay Worst-case stop-controlled (WCSC) approach delay and LOS may be lower than the minimum allowable LOS
Urban Street Segment / Facility	-	Measure for comparison of alternatives LOS C desired

TWSC: two-way stop-control; AWSC: all-way stop-control

Existing and Future No Build Condition Analysis

Existing and future No Build condition traffic analyses were conducted to aid in the identification of short-term and long-range operational needs at study intersections. Level of Service results are summarized in the following tables:

- **Table 3:** No Build Condition AM Peak Hour
- **Table 4:** No Build Condition AM Peak Hour

Locations that do not meet minimum allowable LOS thresholds for this study are noted in **Bold Orange** text. Additional analysis information, including output reports, is included in the *Existing and Future No Build Condition Intersection Traffic Operations Analysis Technical Memo* in **Appendix C**.

Table 3: Intersection Level of Service – No Build Condition AM Peak Hour

Analysis Year	Tallgrass Ave	Louise Ave	Western Ave	Minnesota Ave (SD115)	Cliff Ave	Southeastern Ave	Sycamore Ave	SD11	479 th Ave	480 th Ave
<i>Intersection Control</i>	TWSC	R	AWSC	S	S	TWSC	TWSC	AWSC	TWSC	AWSC
Existing (2022)	A	A	C	C	C	A	A	B	A	A
2028 No Build	-	A	A	C	C	B	A	B	A	A
2040 No Build	-	A	B	C	C	F	A	D	A	A
2050 No Build	-	A	C	D	D	F	C	F	A	A

TWSC: two-way stop-control; AWSC: all-way stop-control; S: traffic signa; R: roundabout

Locations not meeting minimum allowable LOS noted in **Bold Orange**

Table 4: LC Hwy 106 Intersection Operations – No Build Condition PM Peak Hour

Analysis Year	Tallgrass Ave	Louise Ave	Western Ave	Minnesota Ave (SD115)	Cliff Ave	Southeastern Ave	Sycamore Ave	SD11	479 th Ave	480 th Ave
<i>Intersection Control</i>	TWSC	R	AWSC	S	S	TWSC	TWSC	AWSC	TWSC	AWSC
Existing (2022)	A	C	E	C	D	A	A	D	A	A
2028 No Build	-	A	B	C	C	B	A	C	A	A
2040 No Build	-	A	C	C	C	F	A	F	A	A
2050 No Build	-	A	F	D	D	F	C	F	A	A

TWSC: two-way stop-control; AWSC: all-way stop-control; S: traffic signa; R: roundabout

Locations not meeting minimum allowable LOS noted in **Bold Orange**

Findings

Based on Existing and No Build condition findings in **Table 3** and **Table 4**, a planning-level timeline of intersection improvement needs is shown in **Figure 8**. This timeline reflects the approximate time for when intersection operations exceed the study's minimum allowable LOS. In several instances, the decrease in east/west volumes associated with the opening of Veterans Parkway addressed existing condition operational needs.

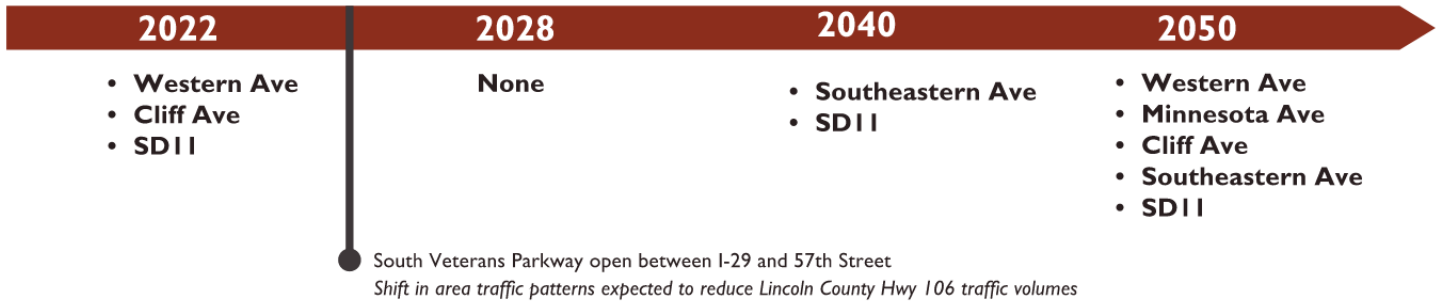


Figure 8: No Build Condition Intersection Needs Timeline

While the LC Hwy 106 & Minnesota Avenue intersection did not show an operational need from an overall intersection LOS perspective, the analysis did replicate the long westbound queues motorists currently experience during peak hours. This leads to undesirable delay for westbound LC Hwy 106 traffic and a consideration with future spot-improvements.

Other key corridor-wide Existing and No Build condition findings include:

- Sharp decrease in east/west volumes are expected with the opening of Veterans Parkway
 - Veterans Parkway will provide the direct connection to I-29 Exit 73 and facilitate the high-capacity, high-speed east/west travel in northern Lincoln County
 - Expected shift in east/west traffic from LC Hwy 106 to Veterans Parkway anticipated to mitigate existing intersection operational needs along the corridor
- Continued growth on north/south arterials for vehicles traveling between Harrisburg and Sioux Falls is an important consideration with future condition intersection operations
- East/west corridor volumes will increase with development surrounding the corridor
 - Pace and density of this development will be an important consideration when identifying the timeline and extent of future LC Hwy 106 improvements

Crash History Review

See *Crash History Review Memo* in **Appendix D** for additional information.

Crash history along the LC Hwy 106 corridor was reviewed for years 2017 through 2021. Data for reported crashes in the statewide crash database were provided by SDDOT. The density of reported crashes throughout the study corridor is shown in **Figure 9**.

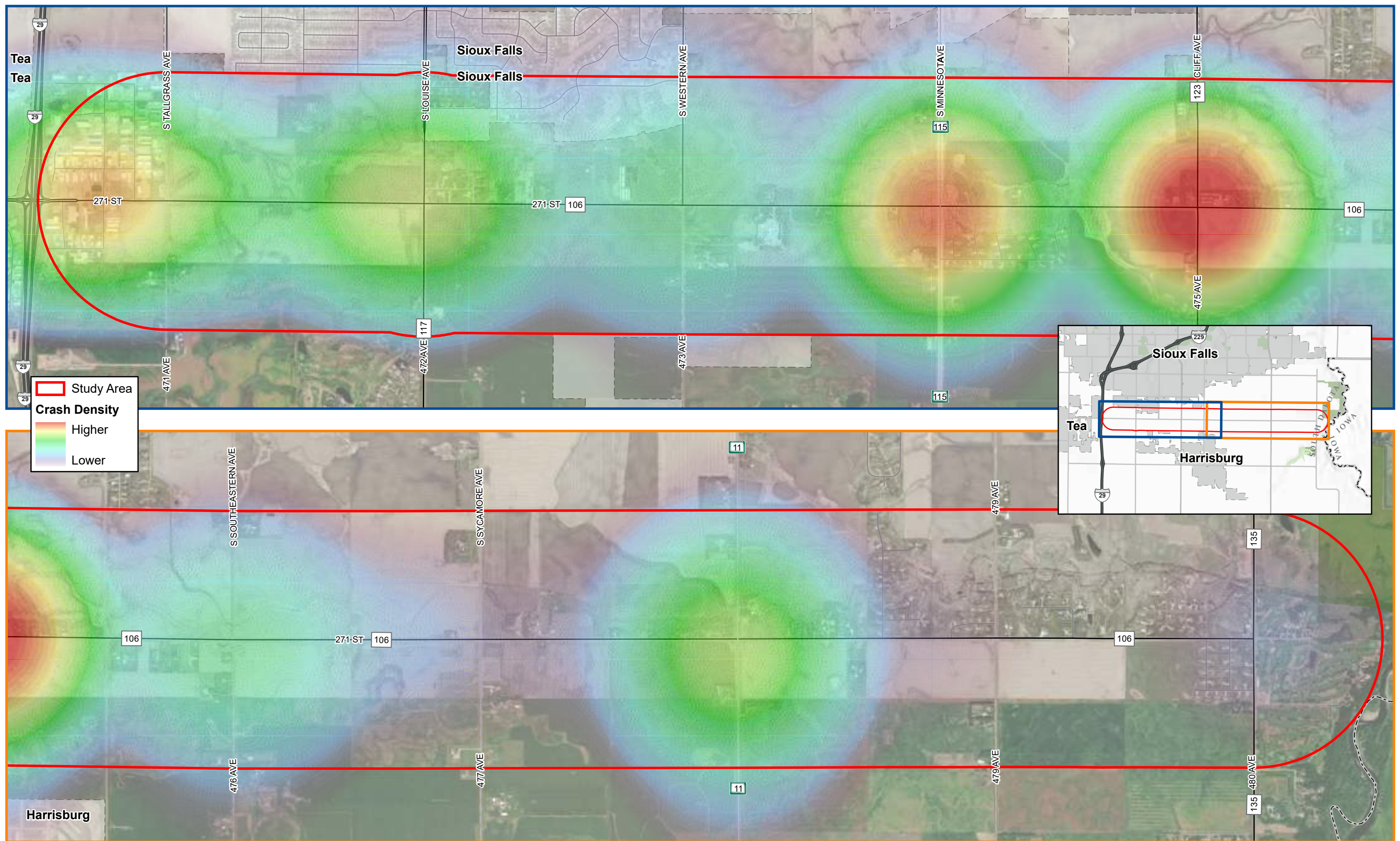
Crashes were categorized as intersection and corridor crashes based on location and reviewed for elevated crash rates and trends. Crash rates were calculated in terms of crashes per million entering vehicles (crashes/MEV) for intersections and crashes per million vehicle miles traveled (crashes/MVMT) for segments. Critical crash rates were calculated based on the statistical populations for each crash location (intersection or segment) using methods presented in the *Highway Safety Manual* (American Association of State Highway and Transportation Officials (AASHTO), 2010). A critical crash rate accounts for a desired level of confidence (95 percent used in this study), vehicle exposure, and similar facility types.

Summaries of intersection and segment crash rates are shown in **Table 5** and **Table 6**. Locations with an elevated crash rate when compared to the critical rate are noted. Crash characteristics for intersection and segment crashes are shown in **Table 7** and **Table 8**.

One fatal crash occurred along the corridor in the analyzed timeframe. In a 2017 angle crash, a northbound driver failed to comply with the stop sign at the Southeastern Avenue & LC Hwy 106 intersection. The driver was under the influence of alcohol and one of the involved motorists was not using a seatbelt.

Overarching trends from the crash review included:

- Locations with elevated crash rates when compared to the critical rate include:
 - Intersections: Tallgrass Avenue, Cliff Avenue, Southeastern Avenue, and SD11
 - Segments: Tallgrass Avenue to Louise Avenue and Cliff Avenue to Southeastern Avenue
- Intersections
 - 40 percent of intersection crashes occurred at the Minnesota Avenue and Cliff Avenue intersections
 - Cliff Avenue intersection accounted for a third of the study corridor intersection crashes
 - 52 percent rear-end crashes and 42 percent angle crashes
 - Minnesota Avenue intersection exhibited the highest crash rate
 - 50/50 split of rear-end and angle crashes
- Segments
 - Over 90 percent of the segment rear-end crashes occurred west of Southeastern Avenue
 - 34 percent of the segment crashes were rear-end crashes
 - Both segments with elevated crash rates exhibited more than 40% of the crashes occurring on snow/ice/slush/wet roadway surfaces



0 0.5 Miles



LC HWY 106 CRASH DENSITY (2017-2021)

FIGURE 9

LINCOLN COUNTY, SD | HIGHWAY 106 CORRIDOR STUDY

Table 5: Intersection Crash Rates (2017 – 2021)

LC Hwy 106 Intersection	Traffic Control Device	Total Crashes	Daily Entering Vehicles	Crash Rate (crashes/MEV)	Elevated Crash Rate*
Tallgrass Ave	TWSC	14	11,500	0.67	Yes
Louise Ave*	Roundabout	12	16,300	0.67	-
Western Ave	AWSC	8	10,700	0.41	-
Minnesota Ave (SD115)**	Signalized	10	13,400	1.03	-
Cliff Ave	Signalized	31	17,800	0.96	Yes
Southeastern Ave	TWSC	8	7000	0.63	Yes
Sycamore Ave	TWSC	2	5,400	0.20	-
SD11	AWSC	16	10,200	0.86	Yes
479 th Ave	TWSC	0	2,100	0.00	-
480 th Ave	AWSC	1	2,000	0.27	-

Table 6: Segment Crash Rates (2017 – 2021)

LC Hwy 106 Segment	Segment Length (miles)	Total Crashes	Daily Vehicles	Crash Rate (crashes/MVMT)	Elevated Crash Rate*
Tallgrass Ave to Louise Ave	1	14	10,500	0.73	Yes
Louise Ave to Western Ave	1	8	9,100	0.48	-
Western Ave to Minnesota Ave (SD115)	1	8	9,100	0.48	-
Minnesota Ave (SD115) to Cliff Ave	1	5	8,200	0.34	-
Cliff Ave to Southeastern Ave	1	10	6,100	0.89	Yes
Southeastern Ave to Sycamore Ave	1	5	5,200	0.55	-
Sycamore Ave to SD11	1	5	5,200	0.53	-
SD11 to 479 th Ave	1	4	3,500	0.61	-
479 th Ave to 480 th Ave	1	0	280	0.00	-

Table notes for this page:

*Intersection crashes 2019–2021; **Intersection crashes from 2020–2021

Elevated crash rate based on a comparison to the critical crash rate (crash rate/critical crash rate ratio > 0.7); see *Crash History Review Memo* for additional information

Table 7: Intersection Crash Rates (2017 – 2021)

LC Hwy 106 Intersection	Total Crashes	Injury Severity					Manner of Collision				
		Fatal	Serious Injury	Minor Injury	Possible Injury	No Injury	Single Vehicle	Rear-End	Head-On	Angle	Sideswipe
Tallgrass Ave	14	0	0	3	1	9	4	3	0	4	2
Louise Ave*	12	0	0	1	0	10	7	3	0	2	0
Western Ave	8	0	0	1	1	6	2	2	0	4	0
Minnesota Ave (SD 115)**	10	0	0	2	1	7	0	5	0	5	0
Cliff Ave	31	0	1	4	2	24	1	16	0	13	1
Southeastern Ave	8	1	0	0	1	6	3	1	0	4	0
Sycamore Ave	2	0	0	0	2	0	1	1	0	0	0
SD 11	16	0	0	2	2	12	2	5	0	8	1
479 th Ave	0	0	0	0	0	0	0	0	0	0	0
480 th Ave	1	0	0	0	0	1	1	0	0	0	0
Totals:	102	1 (1%)	1 (1%)	13 (13%)	10 (10%)	75 (75%)	21 (21%)	36 (35%)	0	40 (40%)	4 (4%)

*Intersection crashes from 2019–2021

**Intersection crashes from 2020-2021

Table 8: Segment Crash Rates (2017 – 2021)

LC Hwy 106 Segment	Total Crashes	Injury Severity					Manner of Collision				
		Fatal	Serious Injury	Minor Injury	Possible Injury	No Injury	Single Vehicle	Rear-End	Head-On	Angle	Sideswipe
Tallgrass Ave to Louise Ave	14	0	0	2	2	10	7	4	2	0	1
Louise Ave to Western Ave	8	0	0	1	1	6	4	3	1	0	0
Western Ave to Minnesota Ave (SD 115)	8	0	0	1	3	4	4	4	0	0	0
Minnesota Ave (SD 115) to Cliff Ave	5	0	0	0	1	4	1	4	0	0	0
Cliff Ave to Southeastern Ave	10	0	0	0	0	10	6	3	1	0	0
Southeastern Ave to Sycamore Ave	5	0	0	0	0	5	4	0	1	0	0
Sycamore Ave to SD 11	5	0	1	0	0	4	2	2	0	1	0
SD 11 to 479 th Ave	4	0	0	0	1	3	4	0	0	0	0
479 th Ave to 480 th Ave	0	0	0	0	0	0	0	0	0	0	0
Totals:	59	0	1 (2%)	4 (7%)	8 (14%)	46 (78%)	32 (54%)	20 (34%)	5 (8%)	1 (2%)	1 (2%)

Railroad Grade Separation Warrant Review

See *Grade Separation Warrant Review Memo* in **Appendix E** for additional information.

An at-grade BNSF Railway railroad crossing is located on LC Hwy 106 between Cliff Avenue and Southeastern Avenue (crossing number 381643V). This study reviewed grade separation warrants for the crossing using City of Sioux Falls Railroad Overpass Policy guidelines documented in the *City of Sioux Falls Engineering Design Standards*. These guidelines consider Design Criteria of the roadway and five Analysis Factors, such as safety, vehicle and pedestrian accessibility, street connectivity, driver delay, and train noise, which are summarized in the following.

Design Criteria

- Roadway is designated as an arterial street on the City of Sioux Falls Major Street Plan: Yes
 - Type 3 Arterial
- The roadway design speed is at least 45 mph: Yes
 - Posted speed 55 mph through crossing
- The roadway has a projected average annual daily traffic (AADT) that exceeds 10,000 vehicles per day: No
 - Future volumes are highly influenced by development-generated trips along the corridor. Future development density, timing, and access locations will impact future traffic volumes. While forecasts developed for this study's planning horizon do not reach 10,000 vehicles per day, it is expected this volume could be exceeded in the future as the City of Sioux Falls Tier 3 growth area, and the corresponding City of Harrisburg growth area, develops.
- The rail line has a design speed of at least 49 mph: No
 - Current maximum timetable speed is 40 mph with typical speed range is 1-40 mph
- The rail line carries an average of three or more trains per day at the location under consideration: No
 - Two movements per day, but subject to change

Analysis Factors

- Safety
 - No reported vehicle train crashes between 2017 and 2021
 - Approach sight distance constraints with tree shelterbelts in northwest and southeast crossing quadrants (see **Figure 10**)
 - Grade separation would eliminate vehicle-train and pedestrian/bicyclist-train conflicts, reduce secondary rear-end crashes due to queue spillback, and eliminate potential blocking of nearby access points
- Vehicle and Pedestrian Accessibility
 - Grade separation would benefit multimodal accessibility and connectivity along the LC Hwy 106 corridor and with surrounding development and transportation facilities
- Street Connectivity
 - Grade separation would benefit street connectivity and travel reliability by removing a point of recurring conflict and extended delay

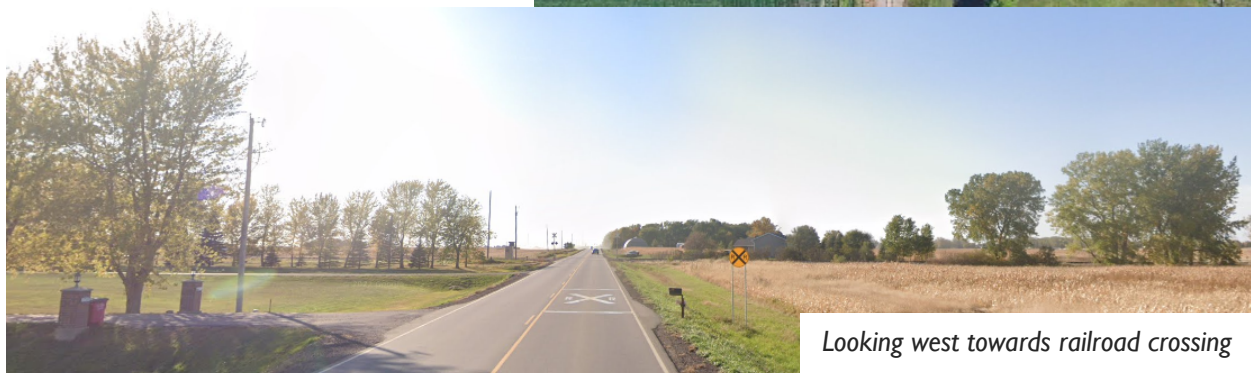
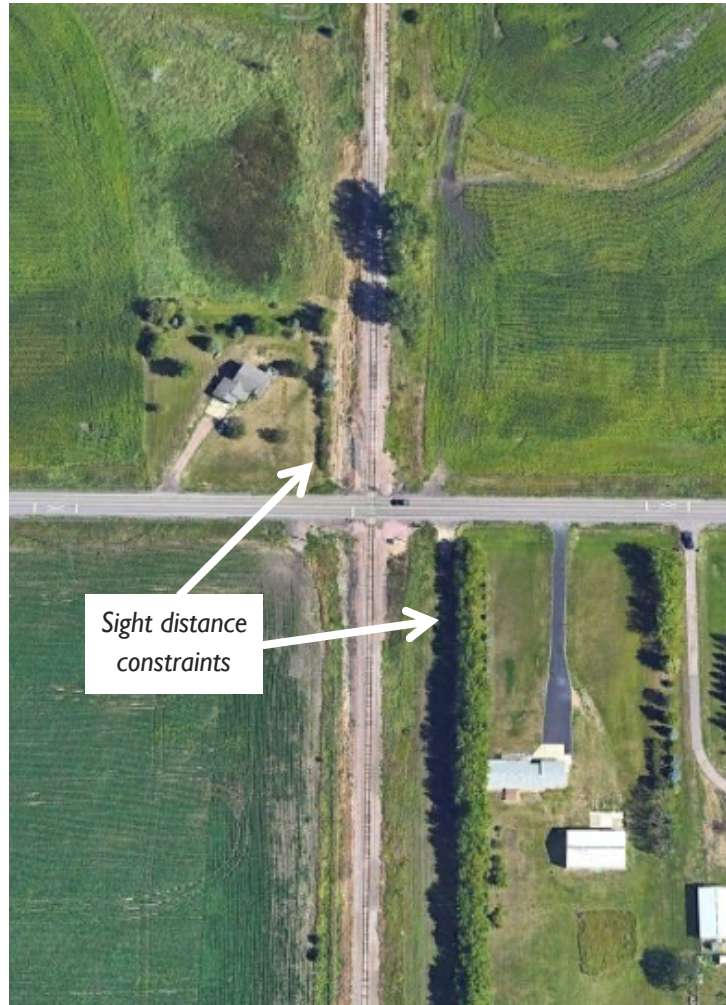
- Driver Delay
 - Grade separation would benefit roadway users by eliminating delay, and risk for delay, at the crossing location. A grade separation would also benefit Harrisburg-area emergency response and support City of Harrisburg and City of Sioux Falls officials when planning future locations for emergency response facilities.
- Train Noise
 - Residential development is anticipated to occur along the corridor in the future, thus reducing train noise would benefit quality of life in the area

Conclusions

Through this review, it was found that the City of Sioux Falls Railroad Overpass Policy guideline's Design Criteria and Analysis Factors support consideration of a future LC Hwy 106 grade separation of the BNSF rail line between Cliff Avenue and Southeastern Avenue. Development of conceptual layouts is recommended to illustrate potential configurations and impacts to adjacent property.

If grade separation is not implemented in the future, it is recommended that gate warning devices (active traffic control system) be installed due to their safety benefits and notable reduction in predicted crash frequency. If train frequency increases, the evaluation should be revisited to account for the additional impacts to crossing operations and safety.

Figure 10: Railroad Crossing Sight Distance Constraints (Between Cliff Ave and Southeastern Ave)



Looking west towards railroad crossing

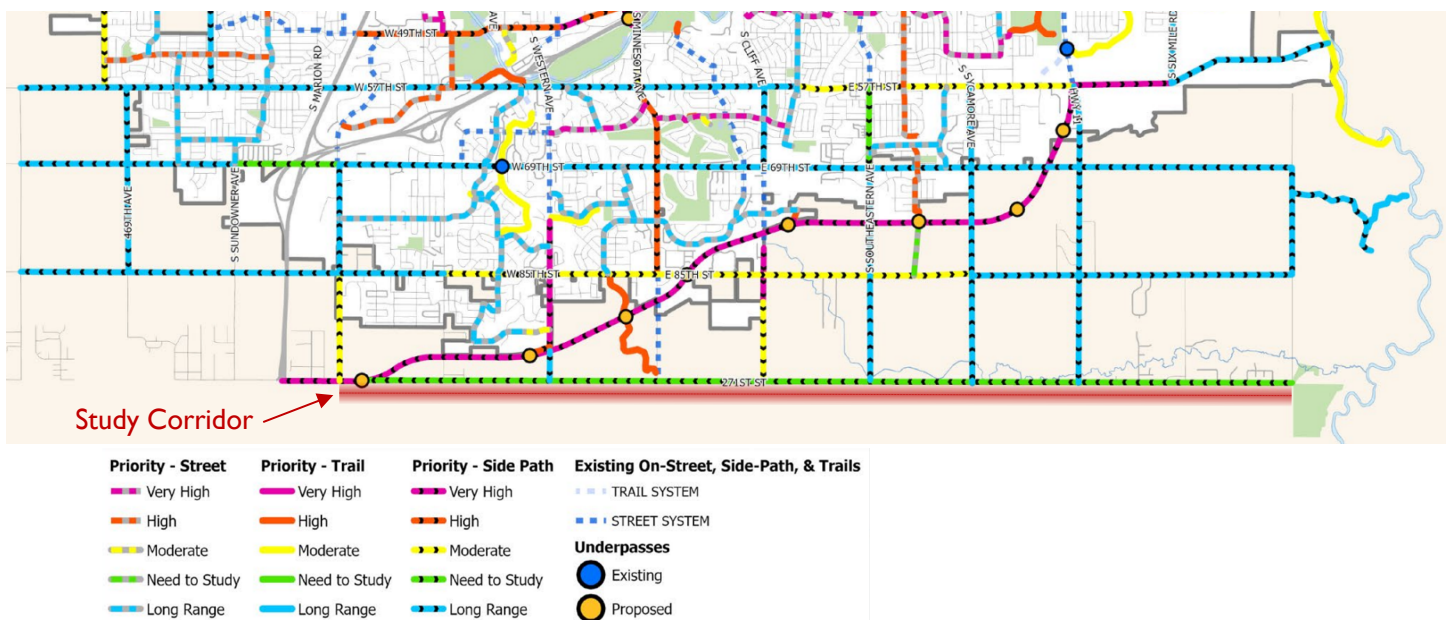
Bicycle and Pedestrian Travel

There are currently no dedicated pedestrian and bicycle facilities along the corridor, which reflects a typical 2-lane rural cross-section, and thus future improvements identified as part of this study will guide multimodal elements and area connectivity.

Bicycle and pedestrian planning recommendations from the 2022 *City of Harrisburg Master Transportation Plan* (shown in **Figure 11**) and 2023 *Sioux Falls Bicycle Plan* (shown in **Figure 12**) were reviewed as part of this study. The Harrisburg Master Transportation Plan incorporated recommendations from the 2007 *Harrisburg Parks & Trails Master Plan*.

The 2023 *Sioux Falls Bicycle Plan* notes the LC Hwy 106 as a side path corridor for further study. Existing or future side path connections with LC Hwy 106 are noted along Western Avenue, Minnesota Avenue, Cliff Avenue, Southeastern Avenue, Sycamore Avenue, and SD 11. A future high priority trail extension with Veterans Parkway underpass is identified west of Minnesota Avenue between 85th Street and LC Hwy 106.

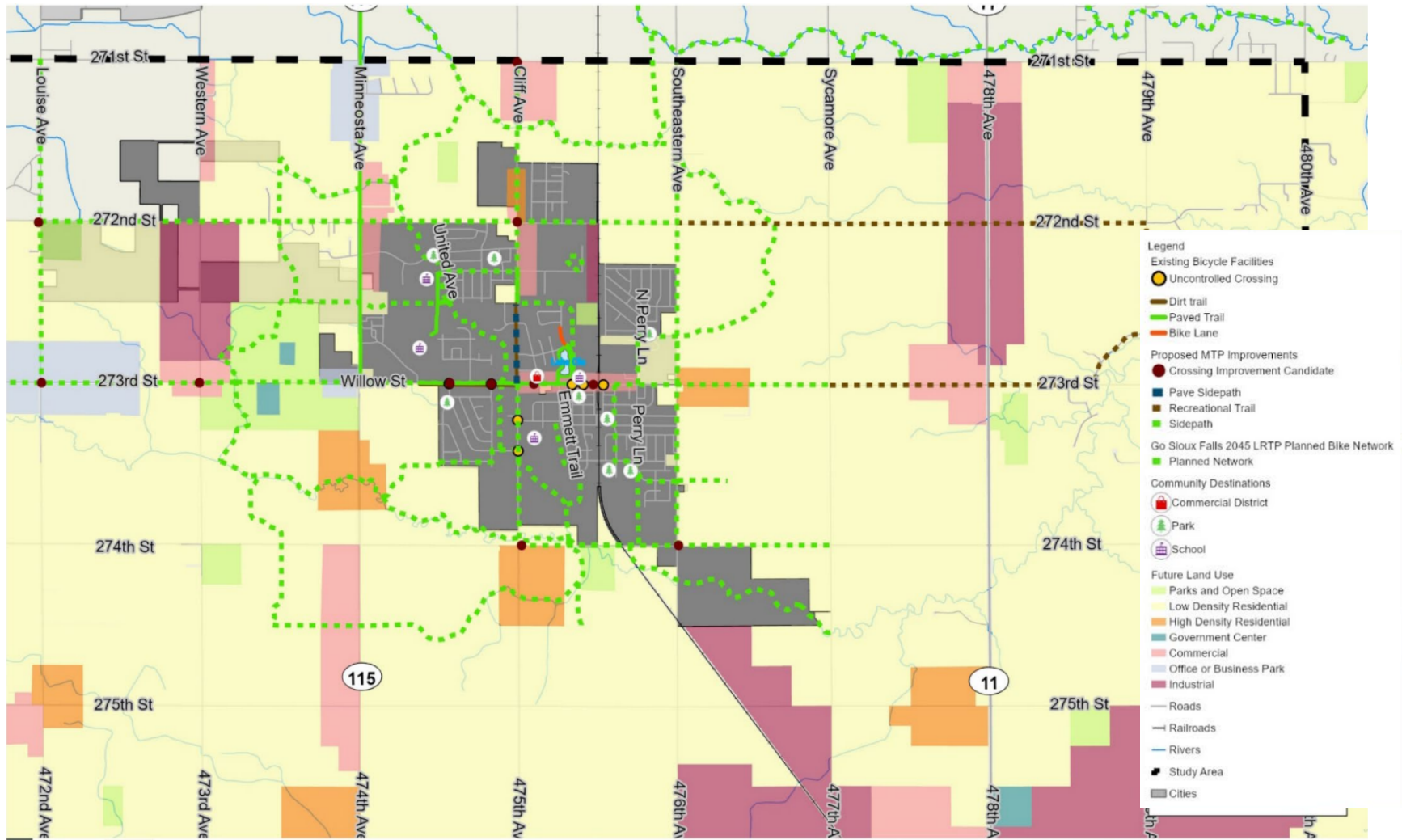
City of Harrisburg future paved trails generally follow existing drainageways with pedestrian and bicycle enhancements to arterial corridors. Coordination of the future regional trail network north and south of LC Hwy 106 will be beneficial as this area develops. The LC Hwy 106 corridor is an opportune location to provide regional connectivity for trails and shared use paths extending to the north and south.



Source: Adapted from 2023 *Sioux Falls Bicycle Plan*, Appendix 2 (Map #8 – Bicycle Plan Map)

<https://cms2.revize.com/revize/secogmpo/Document%20Center/Resources/Master%20Plans/Bicycle-Plan-2023-f.pdf>

Figure 11: City of Sioux Falls Bicycle Plan Recommendations (2023)



Source: Adapted from 2022 City of Harrisburg Master Transportation Plan, Figure 29

[cms2.revize.com/revize/secogmpo/Document Center/Resources/Master Plans/06_Harrisburg_MTP_FINAL.pdf](https://cms2.revize.com/revize/secogmpo/Document%20Center/Resources/Master%20Plans/06_Harrisburg_MTP_FINAL.pdf)

Figure 12: City of Harrisburg Master Transportation Plan Proposed Bicycle and Pedestrian Network

PUBLIC OUTREACH SUMMARY

See *Public Open House #1* and *Public Open House #2* summary memos in **Appendix F** for additional information.

The study included several opportunities for the public and stakeholders to provide comments and feedback throughout the process, including:

- Two public open houses
- Two sets of virtual stakeholder meetings
- Digital survey
- Study website

The first public open house and virtual stakeholder meetings introduced the study and provided an opportunity to gather feedback on transportation-related issues and needs to be addressed by the study. The in-person public open house was held at Harrisburg Liberty Elementary on Thursday, October 13, 2022, with approximately 100 attendees. A recorded presentation was played throughout the open house and attendees had the opportunity to review study information, discuss the study with the Study Advisory Team, and provide comments via mark-up maps and comment cards. Virtual small-group stakeholder meetings were also held the day before and day of the public open house. Stakeholders included adjacent landowners, developers, and representatives from other government agencies that may be impacted by future corridor improvements.



A digital survey was available in conjunction with the first public meeting open house and included questions on transportation safety, corridor vision, and study priorities. A snapshot of survey results is provided in **Figure 13**.

Overarching themes from the first public open house and stakeholder meetings centered on:

- **Identifying corridor needs**, such as congested intersections, gravel crossroad improvements (e.g., Southeastern Avenue and Western Avenue), turn lanes, speed, and future access locations
- **Strong support for roundabouts** throughout the corridor
- **Recommendations of future corridor elements**, such as a shared use path, turn lanes, roundabouts, number of lanes (single through lane in each direction vs. two through lanes in each direction), balance of speed and access, and prioritizing north/south arterial corridors
- **Opposition to a future arterial extension of LC Hwy 106** westward from Louise Avenue to Tallgrass Avenue following completion of Veterans Avenue

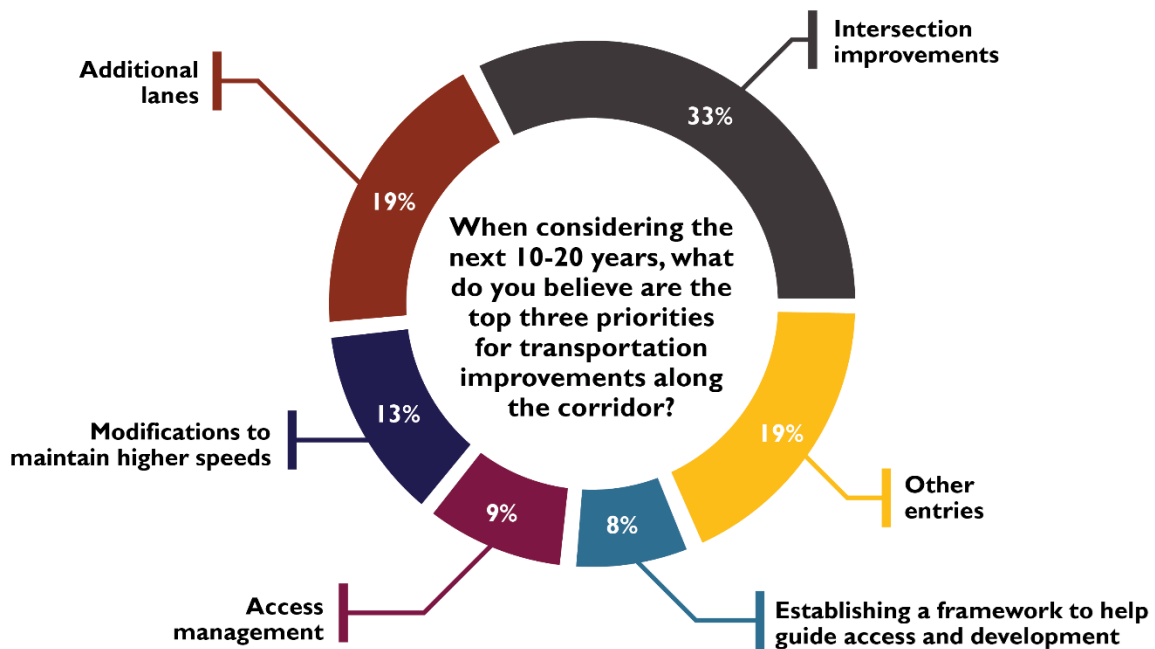
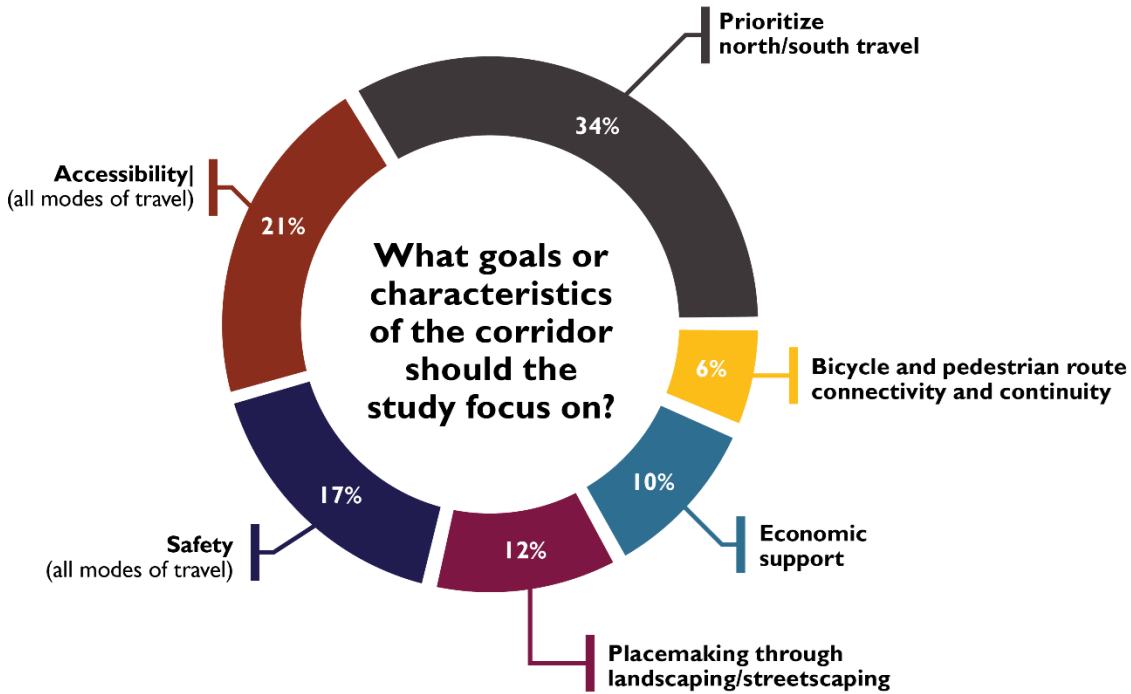


Figure 13: Issues and Needs Survey Results

The second public open house and virtual stakeholder meetings presented preliminary recommendations for feedback. The in-person open house was held at Harrisburg Liberty Elementary on Thursday, May 18, 2023, with approximately 60 attendees. A recorded presentation was available throughout the open house. Preliminary recommendations were shown on table-top roll plots and display boards. Attendees provided comments and feedback through discussion with Study Advisory Team members and comment cards. Virtual small-group stakeholder meetings were also held the day before and day of the public open house to present preliminary recommendations.



Overall, attendees were supportive of the preliminary recommendations and provided several recommendations for enhancements, timing of future projects, and other considerations.

All public open house information was provided on the study website, including a recording of the presentation, display boards, informational handouts, and study contact information for comments and questions.

SUMMARY OF NEEDS

Based on findings from the baseline conditions analysis and feedback from the Study Advisory Team, stakeholder, and public, overarching needs to be address by the corridor study focus on the following:

- Intersection and corridor segment safety
- Corridor number of lanes and future cross-section (urban vs. rural)
- Future intersection configurations and traffic control
- Planning-level timing for projects
- Future access locations for development
- Corridor land use and access plans
- Grade-separated crossing (between Cliff Avenue and Southeastern Avenue) concepts and review of impacts
- Bicycle and pedestrian facilities along the corridor, with a focus on connectivity and continuity

LAND USE PLAN

See *LC Hwy 106 Corridor Land Use and Access Plan Memo* in **Appendix G** for additional information.

The recommended LC Hwy 106 Corridor Land Use Plan, shown in **Figure 14**, was developed in collaboration with the Study Advisory Team and area comprehensive plans. The following land uses were incorporated, with descriptions adapted from the *Shape Sioux Falls 2040 Future Land Use Map*:

Residential

- Overarching land use along the corridor
- Higher density multifamily residential along arterial corridors
- Lower density single-family away from the arterial corridors

Neighborhood Employment Center

- Serves immediate neighborhoods adjacent to intersections with convenience items and services
- Supports multimodal connectivity
- Node-based development primarily located at arterial/arterial intersections

Business Park

- Office/institutional parks and specialized employment areas with commercial support
- Provides noise buffer between regional highways and residential
- Node-based development typically located at major intersections along regional corridors

Light Industrial/Commercial

- Reflects large area of existing Lincoln County zoned light industrial or commercial between I-29 and Tallgrass Avenue
- Compatible with Neighborhood Employment Center or Business Park through redevelopment

Recreational/Conservation

- Recreation (parks, bike trails, etc.) and nature conservation (drainageways, nature areas, etc.) areas

Drainage

- Drainage elements affecting future land use and development; requires future coordination and consultation with agencies having jurisdiction of the corridor and surrounding developable areas (see **DRAINAGE CONSIDERATIONS** section for additional information)
 - Existing natural detention areas
 - Proposed City of Sioux Falls detention areas
 - Culvert crossings requiring drainage considerations

With concurrence of this study by the Sioux Falls MPO, this study establishes regional consistency of future land use within the study area. Comprehensive Plans for each participating entity shall reflect the land uses depicted in this study.

ACCESS PLAN

See *LC Hwy 106 Corridor Land Use and Access Plan Memo* in **Appendix G** for additional information.

The recommended LC Hwy 106 Access Plan establishes the appropriate balance of access and mobility for the LC Hwy 106 corridor and area land use. Access and mobility goals for this plan include:

1. Support network functional circulation system
2. Support area connectivity, east/west route continuity, and future development
3. Support prioritization of high-volume north/south arterial routes
4. Provide guidance for future development and transportation projects

In conjunction with the corridor Land Use Plan, the following recommended access guidelines were adapted from the *Sioux Falls Engineering Design Standards* for a Type III Arterial.

Corridor Description

Arterial street that typically does not continue across a city and primarily serves residential and neighborhood commercial uses.

Access Spacing

- Signalized intersections: 1/4 mile
- Full movement access: 1/4 mile
- Median opening: 660 feet
- Unsignalized intersection spacing: varies

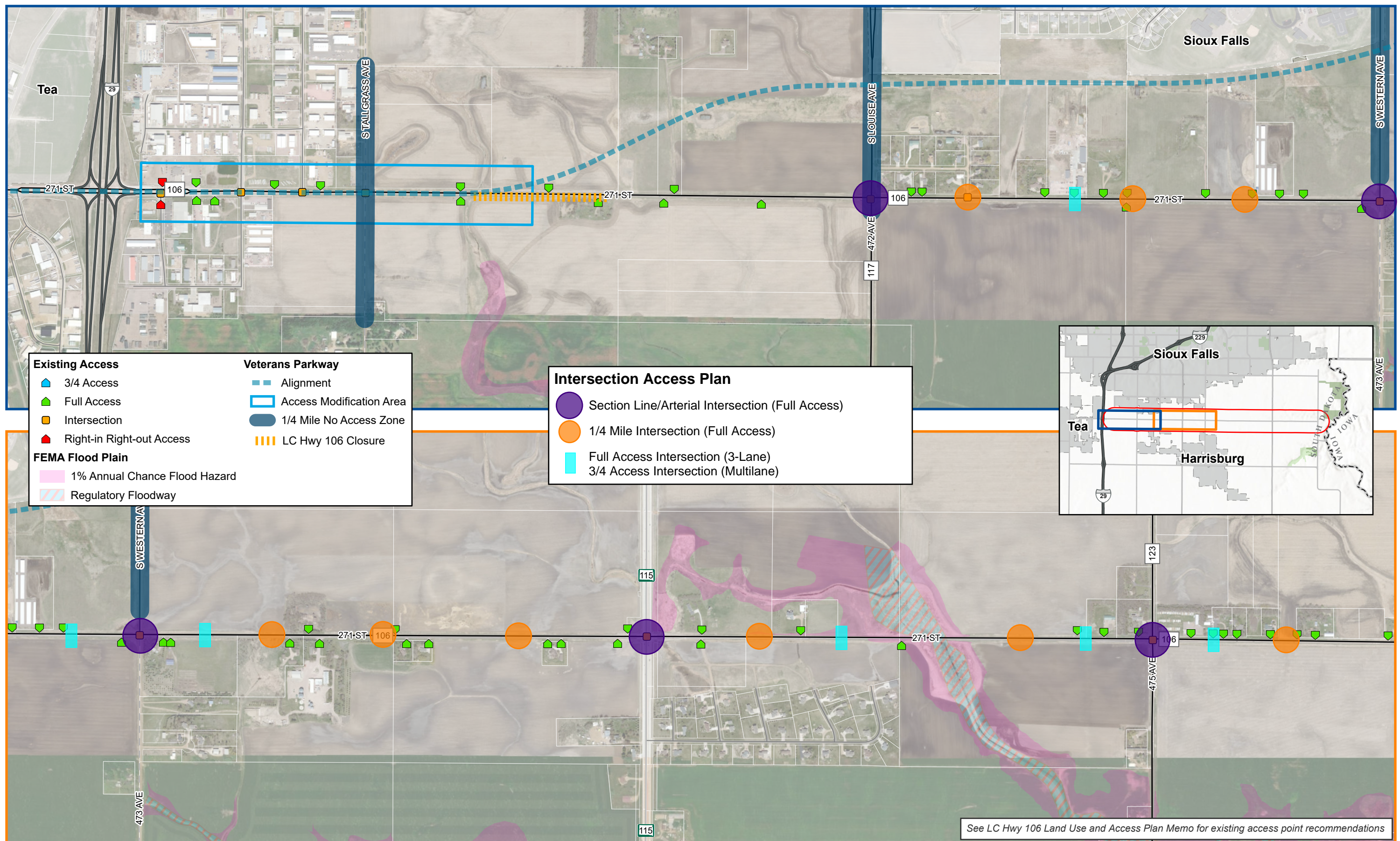
Unsignalized intersection spacing or an additional full movement access at approximately 660 feet from a major intersection may be evaluated through a traffic analysis for consideration by agencies with jurisdiction of the applicable roadway segment.

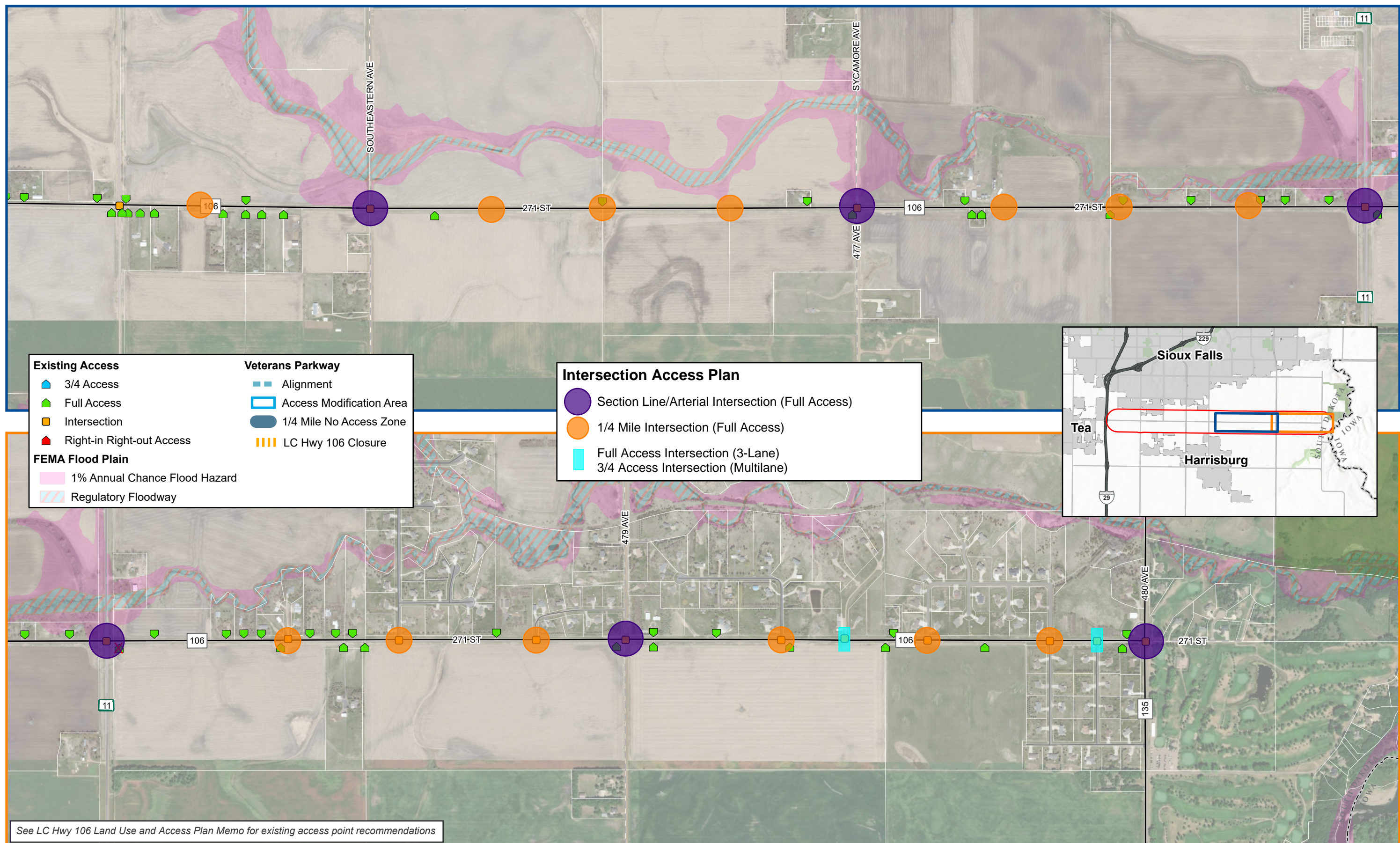
Turn lanes and intersection traffic control should be evaluated with an access request for each access point being added, or modified, through development or redevelopment. Traffic operations should be prioritized for east/west arterial travel at development access points.

Intersection Access Plan

Recommended framework for corridor intersection and access locations is provided in the Intersection Access Plan shown in **Figure 15**. This figure identifies locations for existing and future arterial, 1/4-mile full access, and 660-foot partial-access intersections. Future development requesting full access to LC Hwy 106 shall tie into the identified 1/4-mile full access intersection locations. Supporting notes and recommendations for individual access points are provided in the *Land Use and Access Plan Memo* in **Appendix G**. These recommendations served as a guide for alternatives developed in the **INTERSECTION ALTERNATIVES** and **CORRIDOR SEGMENT ALTERNATIVES** sections.

With concurrence of this study by the Sioux Falls MPO, this study will be the guiding regulation for access. If alternate access is proposed to deviate from this study by Lincoln County, City of Harrisburg, or City of Sioux Falls, all parties will discuss any changes and agree upon what is ultimately changed and designated.





LC HWY 106 INTERSECTION ACCESS PLAN

FIGURE 15

Recommendations to Manage Existing Access

Unless noted in the conceptual layouts, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection (as applicable) is reconstructed, or as access management opportunities arise. Recommendations to manage existing access are as follows:

Access located within major (arterial) intersection functional area

1. Close access and connect parcel to new 1/4-mile intersection via frontage, rearage, or development road
2. Construct median and restrict access to right-in right-out
3. Consolidate access points

Segments with high access density (closely spaced access points)

1. Close access and connect parcel to new 1/4-mile intersection via frontage, rearage, or development road
2. Construct median and restrict access to right-in right-out
3. Consolidate access points

Field access

1. Close and relocate to future 1/4-mile intersection as part of development, redevelopment, or future transportation project

ALTERNATIVES INTRODUCTION

Based on issues and needs identified for the LC Hwy 106 corridor, a series of alternatives were developed for typical sections, arterial/arterial (section-line) intersections, and corridor segments between the arterial intersections. Development, evaluation, and refinement feedback was gathered through a collaborative process with the Study Advisory Team over the course of several meetings. Corridor stakeholders and the public also had an opportunity to review alternatives as part of the second set of stakeholder meetings and public open house.

Alternatives development assumptions include:

- 45 mph design speed (40 mph posted speed), typical of suburban arterial corridors in the Sioux Falls MPO area
- LC Hwy 106 alignment centered within a 100-foot right-of-way
- Arterial intersection alternatives and corridor segment alternatives are interchangeable to support agency flexibility in programming and order of future projects
- Intersection turn lanes reflect a 'typical' turn lane layout. A future design analysis as part of project design should be conducted to determine final turn lane geometrics.

TYPICAL SECTION ALTERNATIVES

LC Hwy 106 typical sections were developed to guide future corridor improvements. These typical sections support multimodal route connectivity and continuity and provide a framework to incrementally implement future projects. The four typical sections that illustrate the long-range vision for the corridor, shown in **Figure 16** through **Figure 19**, include:

- **Rural 3-Lane Typical Section:** widening of the existing typical section to include a center left turn lane plus multimodal elements; reflects a modification to the existing cross-section
- **Urban 3-Lane Typical Section:** single through lane in each direction, center left turn lane, curb and gutter, and multimodal elements
- **Urban 5-Lane Typical Section:** two through lanes in each direction, center left turn lane, curb and gutter, and multimodal elements
- **Urban 4-Lane Divided Typical Section:** two through lanes in each direction, raised median that accommodates a left turn lane at intersections, curb and gutter, and multimodal elements

Key urban typical section elements incorporate:

Right-of-Way

- 100-foot width

Roadway

- Option to provide a single lane or multiple lanes in each direction
- Raised median and two-way left-turn lane (TWLTL) options
- 11-foot lanes

Bicycle/Pedestrian

- 10-foot shared use path on both sides
- Shared use path located along edge of right-of-way to maximize separation from LC Hwy 106 vehicle lanes, increase bicycle and pedestrian comfort, and accommodate future expansion

Streetscape/Appurtenances

- Streetscape opportunities provided in the boulevard sections of all urban typical sections and within raised center median in Urban 4-Lane Divided typical section
- Roadway lighting

The Rural 3-Lane Typical Section reflects a modification to the existing cross-section to help illustrate how various urban elements may be incorporated into the existing section. Rural 5-lane and 4-lane typical sections also developed as part of the study and are shown in **Appendix H**. These rural typical sections require in excess of 120 feet of right-of-way to develop ditches large enough to adequately convey drainage and would result in impacts to adjacent property.

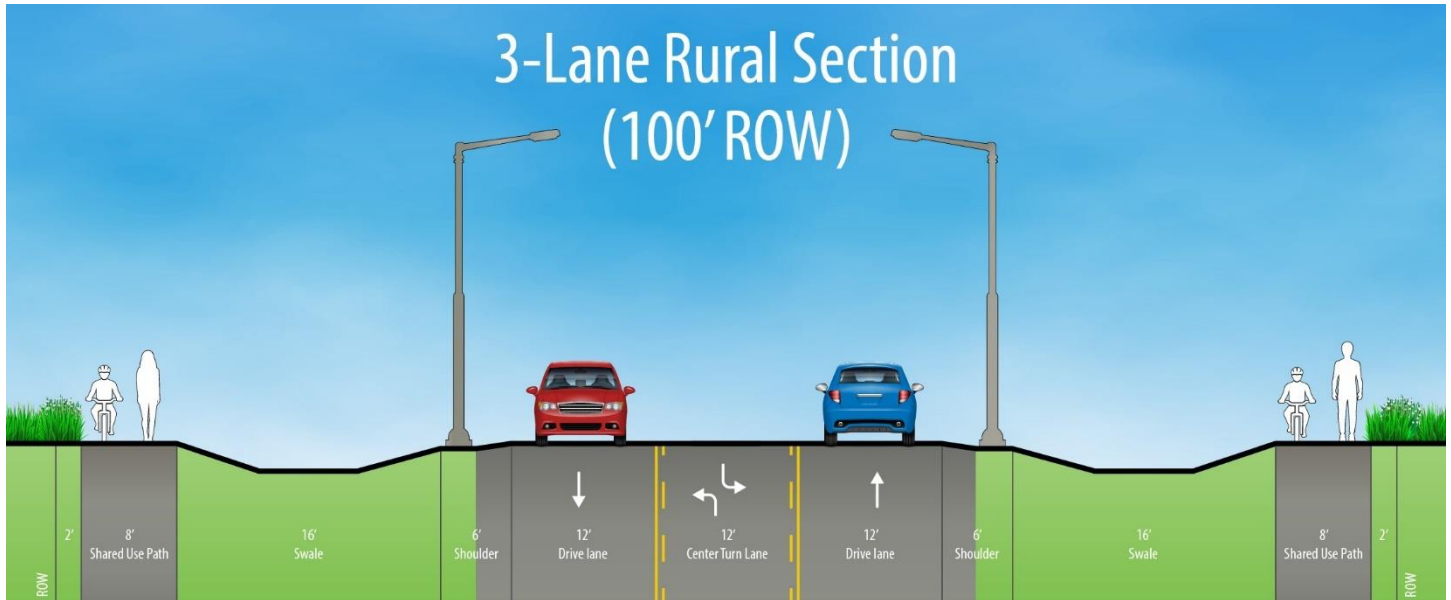


Figure 16: Rural 3-Lane Typical Section

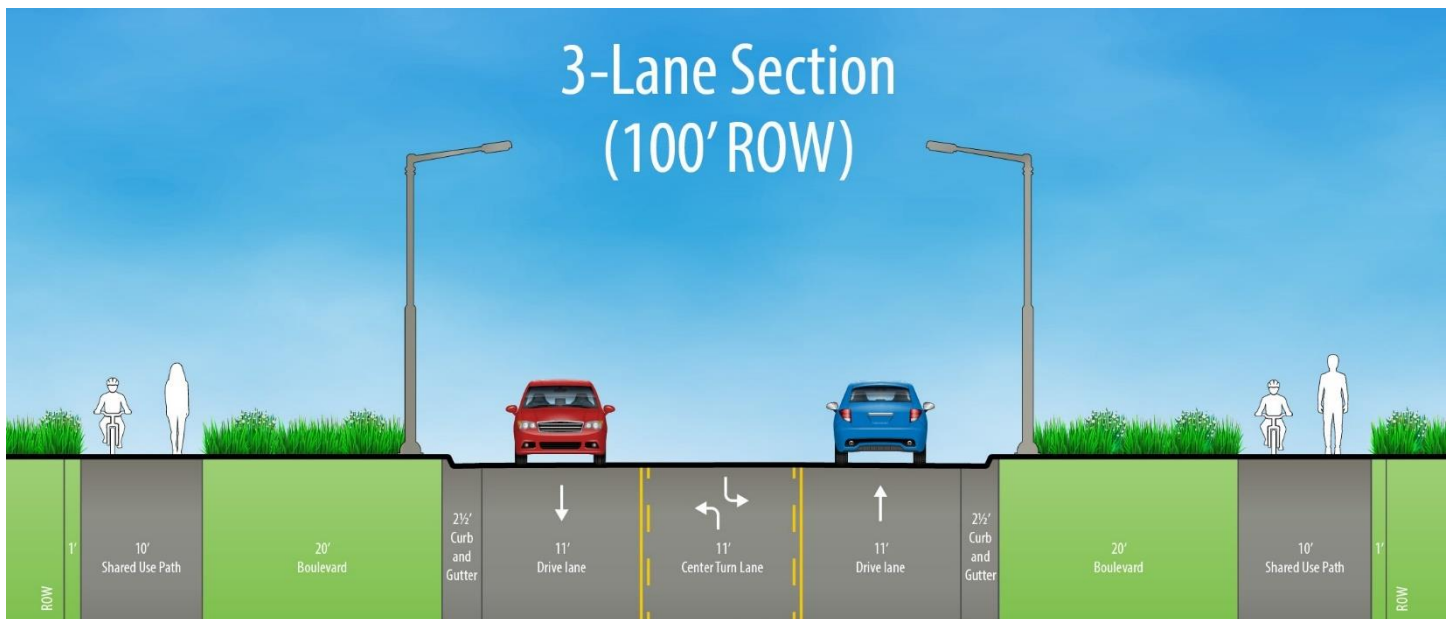


Figure 17: Urban 3-Lane Typical Section

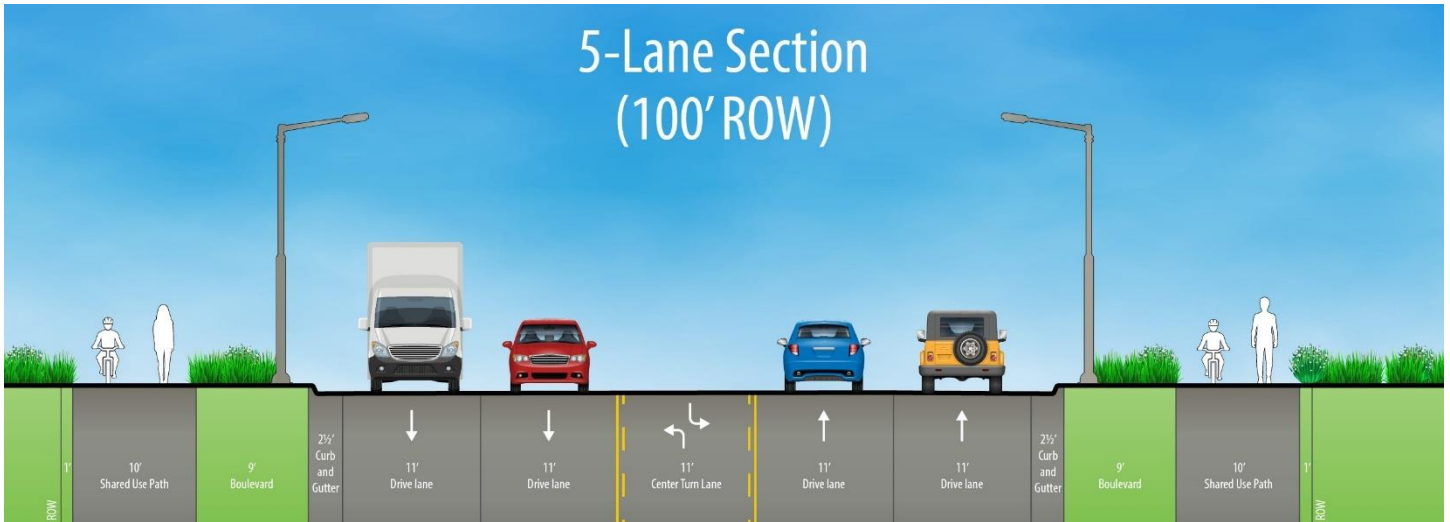


Figure 18: Urban 5-Lane Typical Section



Figure 19: Urban 4-Lane Divided Typical Section

INTERSECTION ALTERNATIVES

*Conceptual layouts of intersection alternatives developed for this study are provided in **Appendix I**.*

Intersection alternatives illustrate potential modifications to existing intersection configurations and address identified issues and needs. Intersection alternatives consist of two main intersection types:

1. Traditional intersection that can either be stop-controlled (stop signs) or signal-controlled (traffic signal)
2. Roundabout (single-lane or multilane)

Intersection traffic control needs (stop sign vs. traffic signal) are based on operational analysis. Existing unsignalized intersections would need to meet *Manual on Uniform Traffic Control (MUTCD)* traffic signal warrants before being signalized. Left and right turn lanes were included in all traditional intersection alternatives. While turn lanes were not required to meet operational goals in several instances, they were still included to reflect the long-range build-out of an arterial corridor where turn lanes provide operational and safety benefits to the transportation network.

LC Hwy 106 typical sections tying into the intersection alternatives include a 3-lane section (e.g., Urban 3-Lane Typical Section) or multilane section (e.g., Urban 5-Lane Typical Section or Urban 4-Lane Divided Typical Section). Assumptions for north/south arterial number of lanes were based on other area studies, Sioux Falls MPO TDM constrained projects, and planned Veterans Parkway-related improvements.

Assumptions incorporated into the alternatives development include:

- Planned Veterans Parkway crossroad arterial improvements, with options reflecting potential tie-in updates and full integration with intersection build-out configurations
- Minnesota Avenue intersection would remain signalized with improvements focused on the west and east intersection approaches
- Southeastern Avenue is a township gravel road and thus the relationship between intersection improvements and Southeastern Avenue corridor improvements is an important consideration when identifying timelines. Southeastern Avenue intersection alternatives assume an improved Southeastern Avenue corridor that can accommodate increased north/south travel.
- SD11 recommendations from the *Northern Lincoln County Corridors (SD11 and SD115) Study* were incorporated for the SD11 corridor, but this study refines recommendations for the east and west approaches
- Multilane roundabouts are a hybrid configuration where only up to two legs have multiple through lanes

A summary matrix of intersection alternatives is provided in **Table 9**.

Table 9: Intersection Alternative Matrix

LC Hwy 106 Intersection	Alternative	Intersection Type	LC Hwy 106 Corridor Typical Section	
			3-Lane	Multilane
Louise Avenue	Louise – 1	Single-Lane Roundabout	X	
	Louise – 2	Multilane Roundabout	X	
	Louise – 3	Traffic Signal	X	
	Louise – 4	Traffic Signal		X
Western Avenue	Western – 1	Single-Lane Roundabout	X	
	Western – 2	Multilane Roundabout	X	
	Western – 3	Traffic Signal	X	
	Western – 4	Traffic Signal		X
Minnesota Avenue (SD 115)	Minnesota – 1	Traffic Signal	X	
	Minnesota – 2	Traffic Signal		X
Cliff Avenue	Cliff – 1	Single-Lane Roundabout	X	
	Cliff – 2	Multilane Roundabout	X	
	Cliff – 3	Traffic Signal	X	
	Cliff – 4	Traffic Signal		X
Southeastern Avenue	Southeastern – 1	Single-Lane Roundabout	X	
	Southeastern – 2	Traffic Signal	X	
	Southeastern – 3	Traffic Signal		X
Sycamore Avenue	Sycamore – 1	Single-Lane Roundabout	X	
	Sycamore – 2	Stop-Control (Traffic Signal)	X	
SD 11	SD 11 – 1	Stop-Control (Traffic Signal)	X	
479 th Avenue	479 th – 1	Single-Lane Roundabout	X	
	479 th – 2	Stop-Control	X	
480 th Avenue	480 th – 1	Single-Lane Roundabout	X	
	480 th – 2	Stop-Control	X	

LC Hwy 106 corridor tying into the intersection alternative:

- 3-Lane: Urban 3-Lane Typical Section
- Multilane: Urban 5-Lane Typical Section or Urban 4-Lane Divided Typical Section

Intersections anticipated to open as stop-control and transition to signalized when warranted indicated by 'Stop-Control (Traffic Signal)'

CORRIDOR SEGMENT ALTERNATIVES

*Conceptual layouts of corridor segment alternatives developed for this study are provided in **Appendix J**.*

Corridor segment alternatives illustrate potential modifications to the LC Hwy 106 corridor between the arterial/arterial (section line) intersections, including:

- Typical section elements
- Future 1/4-mile access locations and minimum lane configurations
- Transition locations for number of lanes (lane add/drop) and raised medians

In the multilane corridor alternatives, a raised median is proposed to extend to the adjacent 1/4-mile intersection to preserve intersection capacity and maintain expected levels of safety by minimizing conflict points within the major intersection functional area. Deviations from this must be evaluated in accordance with the corridor's Access Plan.

Where multilane corridor alternatives were developed in conjunction with signalized bookend intersections, the multilane section was carried through the bookend signalized intersections and lanes were added or dropped at the adjacent 1/4-mile intersection. This helps with lane utilization at major intersections by encouraging motorists to use both lanes through the signalized intersection and then providing a 1/4-mile distance for lane changes. Lane add and drop locations should be further evaluated as part of future projects and development.

Where multilane corridor alternatives were developed in conjunction with multilane roundabout bookend intersections, lanes could be added/dropped at the roundabout through channelized turn lanes. This channelization aligns with forecasted traffic patterns and associated lane utilization and driver expectancy. Extending a multilane section to the 1/4-mile intersection, beyond the bookend roundabout, was not needed with the roundabout alternatives.

The mid-segment 1/4-mile intersections are meant to provide guidance for future development. Developers should use these locations as the foundation to develop their internal road network and corresponding land use. The corridor alternative layouts reflect the recommended minimum lane configuration at these mid-segment intersections. It is anticipated they will open as stop-controlled (from the side-street approaches) unless an engineering study shows a traffic signal will be warranted.

A summary matrix of corridor segment alternatives is provided in **Table 10**. Access options developed for the corridor segment between Cliff Avenue and Southeastern Avenue are listed in **Table 11**.

Table 10: Corridor Segment Alternative Matrix

LC Hwy 106 Segment	Alternative	LC Hwy 106 Corridor Typical Section	
		3-Lane	Multilane
Louise Avenue to Western Avenue	Louise – Western A	X	
	Louise – Western B		X
Western Avenue to Minnesota Avenue	Western – Minnesota A	X	
	Western – Minnesota B		X
Minnesota Avenue (SD 115) to Cliff Avenue	Minnesota – Cliff A	X	
	Minnesota – Cliff B		X
Cliff Avenue to Southeastern Avenue	Cliff – Southeastern A	X	
	Cliff – Southeastern B		X
	Railroad Grade Separation		X
Southeastern Avenue to Sycamore Avenue	Southeastern – Sycamore A	X	
Sycamore Avenue to SD 11	Sycamore – SD 11 A	X	
SD 11 to 479 th Avenue	SD 11 – 479 th A	X	
479 th Avenue to 48 th Avenue	479 th – 480 th A	X	

Table 11: Cliff Avenue to Southeastern Avenue Access Options

LC Hwy 106 Segment	Alternative	LC Hwy 106 Corridor Typical Section		Options
		3-Lane	Multilane	
Cliff Avenue to Southeastern Avenue	Cliff – Southeastern A	X		A: Maintain existing access B: Frontage road C: Access consolidation
	Cliff – Southeastern B		X	A: Maintain existing driveway access points B: Frontage road C: Access consolidation
	Railroad Grade Separation		X	A: Fill option B: Wall option

BUILD CONDITION ANALYSIS

See *Build Condition Traffic Operations Analysis Memo* in **Appendix K** for additional information.

Intersection Traffic Operations

Build condition traffic operations were analyzed for all arterial intersections to assess feasibility, quantify traffic operational benefits, and aid in the evaluation and comparison of alternatives. Intersection LOS results are summarized in **Table 12** through **Table 17** for Years 2028, 2040, and 2050.

Key intersection traffic operations analysis findings include:

- On LC Hwy 106 approaches to all analysis intersections, providing a single through lane in each direction plus intersection improvements (e.g., adding left and/or right turn lanes, changing intersection traffic control) was found to address operational needs through the study's 2050 Planning Horizon
- Roundabouts consistently provide less delay (better LOS) compared to signalized intersections
 - Single-lane roundabouts exhibit consistent operational benefits through the 2050 Planning Horizon at several analysis intersections, highlighting their adaptability to accommodate daily traffic volume variability and traffic growth
- A multilane LC Hwy 106 corridor (two through lanes in each direction) provides notable benefit at the Minnesota Avenue intersection, where the two eastbound/westbound through lanes allows for enhanced traffic signal prioritization of north/south Minnesota Avenue traffic

Table 12: Intersection Level of Service – 2028 AM Peak Hour

Intersection Type	Louise Ave	Western Ave	Minnesota Ave (SD 115)	Cliff Ave	Southeastern Ave	Sycamore Ave	SD 11	479 th Ave	480 th Ave
No Build	A	A	C	C	B	A	B	A	A
Stop-Control						A		A	A
Roundabout (Single Lane)	A	A		A	A	A		A	A
Roundabout (Multilane)	A	A		A					
Traffic Signal	B	B	C	B	B		C		

Table 13: Intersection Level of Service – 2028 PM Peak Hour

Intersection Type	Louise Ave	Western Ave	Minnesota Ave (SD 115)	Cliff Ave	Southeastern Ave	Sycamore Ave	SD 11	479 th Ave	480 th Ave
No Build	A	B	C	C	B	A	C	A	A
Stop-Control						A		A	A
Roundabout (Single Lane)	A	A		B	A	A		A	A
Roundabout (Multilane)	A	A		A					
Traffic Signal	B	B	C	B	B		C		

Table 14: Intersection Level of Service – 2040 AM Peak Hour

Intersection Type	Louise Ave	Western Ave	Minnesota Ave (SD 115)	Cliff Ave	Southeastern Ave	Sycamore Ave	SD 11	479 th Ave	480 th Ave
No Build	A	B	C	C	F	A	D	A	A
Stop-Control						A		A	A
Roundabout (Single Lane)	A	A		B	A	A		A	A
Roundabout (Multilane)	A	A		A					
Traffic Signal	B	B	C	B	B		C		

Table 15: Intersection Level of Service – 2040 PM Peak Hour

Intersection Type	Louise Ave	Western Ave	Minnesota Ave (SD 115)	Cliff Ave	Southeastern Ave	Sycamore Ave	SD 11	479 th Ave	480 th Ave
No Build	A	C	C	C	F	A	F	A	A
Stop-Control						A		A	A
Roundabout (Single Lane)	A	A		C	A	A		A	A
Roundabout (Multilane)	A	A		A					
Traffic Signal	B	B	C	B	B		C		

Table 16: Intersection Level of Service – 2050 AM Peak Hour

Intersection Type	Louise Ave	Western Ave	Minnesota Ave (SD 115)	Cliff Ave	Southeastern Ave	Sycamore Ave	SD 11	479 th Ave	480 th Ave
No Build	A	C	D	D	F	C	F	A	A
Stop-Control						B		A	A
Roundabout (Single Lane)	A	A		C	B	A		A	A
Roundabout (Multilane)	A	A		B					
Traffic Signal	C	C	C	C	C		C		

Table 17: Intersection Level of Service – 2050 PM Peak Hour

Intersection Type	Louise Ave	Western Ave	Minnesota Ave (SD 115)	Cliff Ave	Southeastern Ave	Sycamore Ave	SD 11	479 th Ave	480 th Ave
No Build	A	F	D	D	F	C	F	A	A
Stop-Control						B		A	A
Roundabout (Single Lane)	A	A		C	B	A		A	A
Roundabout (Multilane)	A	A		A					
Signal	C	C	C	B	C		C		

Corridor Traffic Operations

LC Hwy 106 corridor segments were analyzed in terms of travel time and LOS. Travel time reflects the running time to traverse the respective segments plus arterial intersection delay. Level of Service is based on travel speeds.

Analysis results for the following 2050 Planning Horizon corridor scenarios are summarized in **Table 18** through **Table 21**:

- **‘Roundabout and Signalized Corridor’**
 - Single-lane roundabouts at Louise Avenue, Western Avenue, Cliff Avenue, and Southeastern Avenue intersections
 - Signalized intersections at Minnesota Avenue (SD115) and SD11
- **‘Signalized Corridor’**
 - Signalized intersections at Louise Avenue, Western Avenue, Minnesota Avenue, Cliff Avenue, Southeastern Avenue, and SD11 intersections

Both scenarios analyzed a 3-lane LC Hwy 106 corridor between Louise Avenue and SD11. The travel time measure for a given segment reflects running time plus arterial delay of the downstream intersection. The differences between the two scenarios for segment and overall corridor travel times are directly related to differences in intersection delay of the roundabout and signalized intersections.

Key corridor segment traffic operations analysis findings include:

- The ‘Roundabout and Signalized Corridor’ scenario provides a travel time savings of up to 10 percent for east/west travel through the corridor
- All corridor segments measure LOS A
 - Elements that would degrade corridor LOS include:
 - Increased number of access points
 - Changes in traffic control at mid-segment intersections that would stop east/west travel (e.g., traffic signal)
 - Omitting turn lanes at major intersections and higher-volume mid-segment intersections

Table 18: LC Hwy 106 Travel Time and LOS – AM Eastbound (2050 Build)

Segment Measures	Louise Ave	Segment A	Western Ave	Segment B	Minnesota Ave	Segment C	Cliff Ave	Segment D	Southeastern Ave	Segment E	SD11	Facility: Louise Ave to SD11
Signalized Corridor												
Intersection Type	S		S		S		S		S		S	
Travel Time (sec)		108		126		109		111		190		10 min, 44 sec
LOS		A		A		A		A		A		
Roundabout & Signal Corridor												
Intersection Type	R		R		S		R		R		S	
Travel Time (sec)		98		126		99		99		190		10 min, 12 sec
LOS		A		A		A		A		A		

S: signalized intersection; R: roundabout

Table 19: LC Hwy 106 Travel Time and LOS – AM Westbound (2050 Build)

Segment Measures	Louise Ave	Segment A	Western Ave	Segment B	Minnesota Ave	Segment C	Cliff Ave	Segment D	Southeastern Ave	Segment E	SD11	Facility: Louise Ave to SD11
Signalized Corridor												
Intersection Type	S		S		S		S		S		S	
Travel Time (sec)		111		113		127		120		191		11 min, 2 sec
LOS		A		A		A		A		A		
Roundabout & Signal Corridor												
Intersection Type	R		R		S		R		R		S	
Travel Time (sec)		100		101		127		114		183		10 min, 25 sec
LOS		A		A		A		A		A		

S: signalized intersection; R: roundabout

Table 20: LC Hwy 106 Travel Time and LOS – PM Eastbound (2050 Build)

Segment Measures	Louise Ave	Segment A	Western Ave	Segment B	Minnesota Ave	Segment C	Cliff Ave	Segment D	Southeastern Ave	Segment E	SD11	Facility: Louise Ave to SD11
Signalized Corridor												
Intersection Type	S		S		S		S		S		S	
Travel Time (sec)		109		127		116		116		201		11 min, 9 sec
LOS		A		A		A		A		A		
Roundabout & Signal Corridor												
Intersection Type	R		R		S		R		R		S	
Travel Time (sec)		101		126		116		106		195		10 min, 44 sec
LOS		A		A		A		A		A		

S: signalized intersection; R: roundabout

Table 21: LC Hwy 106 Travel Time and LOS – PM Westbound (2050 Build)

Segment Measures	Louise Ave	Segment A	Western Ave	Segment B	Minnesota Ave	Segment C	Cliff Ave	Segment D	Southeastern Ave	Segment E	SD11	Facility: Louise Ave to SD11
Signalized Corridor												
Intersection Type	S		S		S		S		S		S	
Travel Time (sec)		114		114		125		117		199		11 min, 9 sec
LOS		A		A		A		A		A		
Roundabout & Signal Corridor												
Intersection Type	R		R		S		R		R		S	
Travel Time (sec)		98		100		125		102		184		10 min, 9 sec
LOS		A		A		A		A		A		

S: signalized intersection; R: roundabout

Bicycle and Pedestrian Operations

Multimodal elements were incorporated into HCS Streets files when supported by methodology and software. Key elements contributing to beneficial LOS measures include:

- Continuous 10-foot shared use paths on both sides of LC Hwy 106
 - Provides ample space for pedestrians and bicyclists
- Wide boulevard that maximizes separation between vehicular lanes and shared use paths
- Buffer areas clear of fixed objects to not reduce the shared use path effective width
- Connectivity with other area sidewalks and shared use paths beyond the study corridor
- Crosswalks across all major intersection legs (provide for all movements)
- Managed delay at major intersections, which benefits vehicular operations, pedestrian delay, and integration of required signal phasing for all modes

Bicycle and pedestrian LOS throughout the study corridor was measured at LOS C or better for pedestrians (shared use path travel) and LOS D or better for on-street bicyclists. No dedicated on-street bicycle facilities (bike lanes) were included so the analysis assumed on-street bicyclists are using the vehicle travel lane (within or at the edge of the travel lane) and thus the LOS D.

2050 Sensitivity Scenario Traffic Operations

There was considerable interest in future-year traffic volumes at the first public open house and stakeholder meetings, particularly with the notable drop in forecasted traffic volumes upon full opening of Veterans Parkway by Year 2028. In several instances, long-range forecasts were not shown to reach current traffic levels by the 2050 Planning Horizon as the primary source of corridor traffic growth is anticipated to be adjacent development.

It is important to understand City of Sioux Falls and City of Harrisburg growth and land use assumptions built into the Sioux Falls MPO TDM. It is equally important to recognize that development may occur quicker and at greater density than what is accounted for in the TDM, and vice-versa. To account for a scenario where development occurs quicker and at a greater density (generating higher levels of traffic) than what is shown in the TDM, a sensitivity analysis was conducted to reflect LC Hwy 106 volumes that are 50 to 75 percent greater than the forecasted 2050 Planning Horizon volumes.

The 2050 Sensitivity Scenario applied a factor of 1.75 to LC Hwy 106 daily and peak hour traffic volumes from Louise Avenue through Southeastern Avenue to correspond with the City of Sioux Falls Tier I and Tier II growth areas and the core City of Harrisburg growth area. Daily and peak hour volumes were not increased on the north/south arterial corridors as those volumes show continued growth in the TDM. This scenario assumes additional traffic generated along the LC Hwy 106 corridor either stays on the corridor or is integrated into the north/south arterial through movement volumes (similar to pass-by trips in a traffic impact study). 2050 Sensitivity Scenario daily volumes are shown in **Figure 20**.

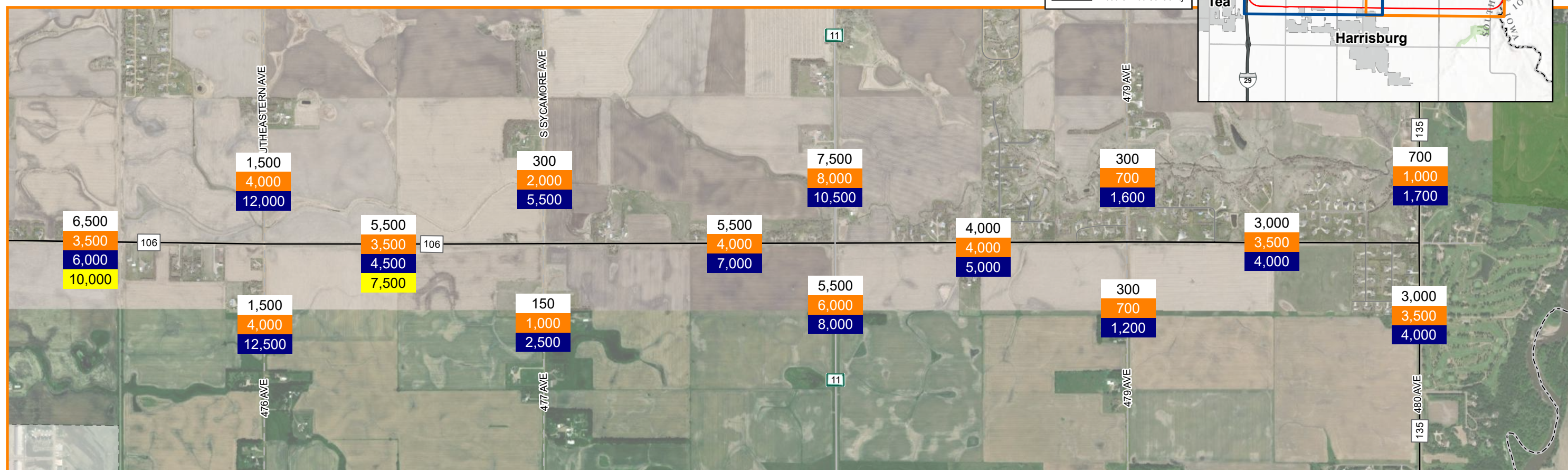
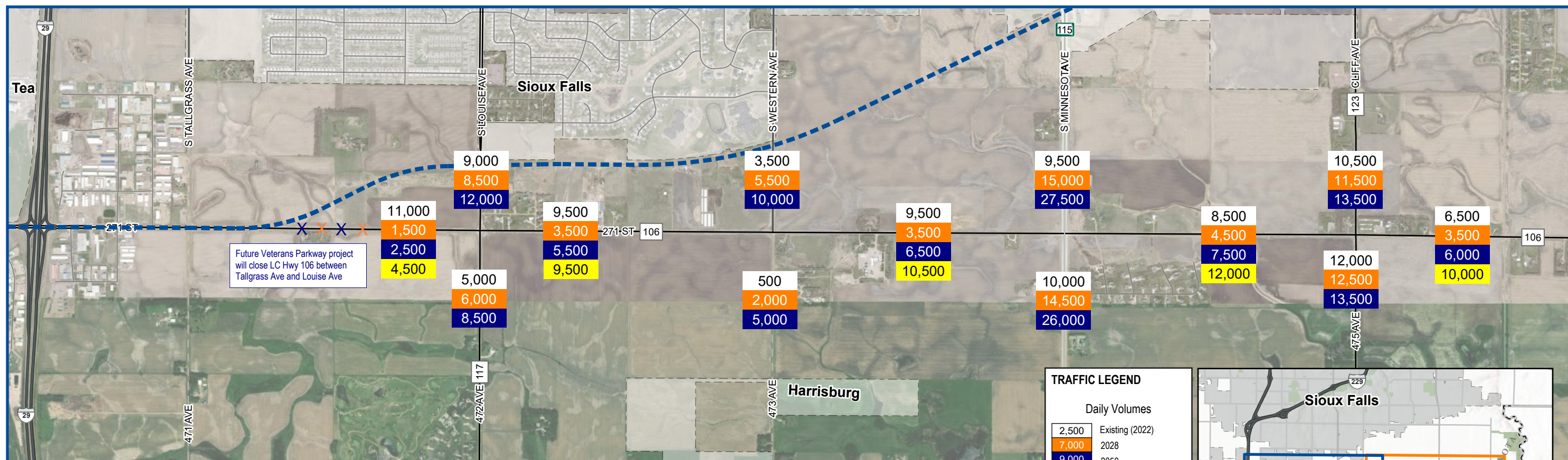
Table 22 summarizes intersection operations for the Louise Avenue, Western Avenue, Minnesota Avenue, Cliff Avenue, and Southeastern Avenue intersections. A multilane LC Hwy 106 corridor was analyzed through the Western Avenue, Minnesota Avenue, and Cliff Avenue intersections and resulted in the same LOS measure as the 3-lane LC Hwy 106 signalized intersection alternatives.

Table 22: Intersection Level of Service – 2050 Sensitivity Scenario

Intersection Type	AM Peak Hour					PM Peak Hour				
	Louise Ave	Western Ave	Minnesota Ave (SD115)	Cliff Ave	Southeastern Ave	Louise Ave	Western Ave	Minnesota Ave (SD115)	Cliff Ave	Southeastern Ave
No Build	A	C	D	D	F	A	F	D	D	F
Roundabout (Single Lane)	B	C		F	C	B	C		F	D
Roundabout (Multilane)	A	A		E		A	A		D	
Signal	C	C	D	C	C	C	C	D	C	C

Key findings from 2050 Sensitivity Scenario traffic operations analysis include:

- Louise Avenue and Western Avenue intersections
 - Single-lane roundabouts exhibit 25-50 percent less delay than signalized intersections
 - Multilane roundabouts with lane add and/or drops within the roundabout exhibit the least delay of all intersection alternatives at LOS A
- Minnesota Avenue intersection
 - Signalized intersection LOS D for both the 3-lane and multilane LC Hwy 106 corridor
 - 3-lane LC Hwy 106 measures higher delay than the multilane corridor, which points towards the 2050 Planning Horizon traffic volumes analyzed in the previous sections are near the upper limits of where the signalized intersection could absorb fluctuations. As 2050 Planning Horizon volumes grow towards the 2050 Sensitivity Scenario volumes, they will begin impacting overall intersection operations during the peak hours.
 - Multilane LC Hwy 106 corridor provides the greatest flexibility and capacity to accommodate peak volume fluctuations
- Cliff Avenue intersection
 - Single-lane roundabout fails at LOS F in both AM and PM peak hours, which illustrates the capacity ceiling of a single-lane roundabout
 - Multilane roundabout measures LOS E in the AM peak hour and LOS D in the PM peak hour, showing the analyzed 2050 Sensitivity Scenario volumes are towards the upper capacity limits for acceptable operations
 - Negligible difference between 3-lane and multilane signalized intersection operations
- Southeastern Avenue intersection
 - Similar operations between single-lane roundabout and signalized intersection alternatives



Intersection and Corridor Segment Safety Benefits

Planning-level crash modification factors (CMF)s were identified for a variety of intersection improvements using countermeasures from the *Highway Safety Manual* and *Crash Modification Factors Clearinghouse*. **Table 23** provides examples of expected crash reduction in terms of injury crashes and total crashes when converting one intersection type to a different intersection type. Presented CMFs are for illustrative purposes to provide an understanding of potential safety benefits associated with each overarching intersection type analyzed in this study. It should be noted that CMF values vary based on crash type, injury severity, roadway/area type, and research study.

Table 23: Potential Crash Reduction Comparison – Intersection Improvements

Treatment	CMF	Crash Reduction	Source
Conversion of a stop-control intersection to a...			
All-Way Stop-Control Intersection	0.30 (Injury) 0.32 (Total)	70% reduction (Injury) 68% decrease (Total)	HSM/CMF 314 CMF 3127
Signalized Intersection	0.64 (Injury) 0.95 (Total)	36% reduction (Injury) 5% decrease (Total)	CMF 319 HSM/CMF 322
Single-Lane Roundabout	0.22 (Injury) 0.22 (Total)	78% reduction (Injury) 78% decrease (Total)	HSM HSM
Multilane Roundabout	0.32 (Injury) 0.81 (Total)	68% reduction (Injury) 19% decrease (Total)	HSM HSM
Conversion of a signalized intersection to a...			
Single-Lane Roundabout	0.45 (Injury) 0.74 (Total)	55% reduction (Injury) 26% decrease (Total)	HSM HSM
Multilane Roundabout	0.29 (Injury) 0.81 (Total)	71% reduction (Injury) 19% decrease (Total)	HSM HSM

Crash Modification Clearinghouse ID obtained from website <https://www.cmfclearinghouse.org/>

Roundabout safety benefits are demonstrated by extensive research across the United States. For example, the HSM shows an expected 55 percent reduction in injury crashes when a signalized intersection is converted to a single-lane roundabout. The expected reduction is 78 percent when a stop-control intersection is converted to a single-lane roundabout.

It should be noted that there is an expected crash reduction when unwarranted traffic signals are removed (0.76 CMF or 24 percent reduction of total crashes). This illustrates the importance of not installing traffic signals when MUTCD traffic signal warrants are not met.

Other elements incorporated into the alternatives with safety benefits (supported by CMFs) include:

- Roadway lighting
- Left and right turn lanes
- Access closures, consolidation, relocation, and/or restriction of turn/crossing movements
- Raised medians within major intersection functional areas
- Shared use paths (to separate pedestrians/bicyclists from vehicular traffic)

CONCEPTUAL COSTS

Planning-level intersection and corridor segment alternative Construction + Right-of-Way cost estimates are summarized in the following tables. For consistency across intersection types, each planning-level intersection cost accounts for reconstructing the intersection physical area plus 800 feet east and west of the intersection on LC Hwy 106 and 550 feet north and south of the intersection on the crossroad arterial. LC Hwy 106 corridor segment costs are based on the segment length, approximately 3,680 feet, between the major intersection areas. Conceptual costs do not include preliminary and construction engineering costs and would be in addition to what is presented. A cost breakdown by generalized work item is provided in **Appendix L**.

Table 24: LC Hwy 106 Intersection Conceptual Costs

Intersection Type	LC Hwy 106 Corridor Section	Crossroad Number of Lanes (North/South Arterial)	Construction + ROW Costs (\$M, 2023)
Single-Lane Roundabout	3-Lane	3-Lane	\$4.0
Multilane Roundabout	3-Lane	North leg: multilane South leg: 3-lane	\$4.8
Multilane Roundabout	3-Lane	North leg: multilane South leg: multilane	\$5.6
Stop Control	3-Lane	3-Lane	\$4.0
Traffic Signal	3-Lane	North leg: multilane South leg: 3-lane	\$5.2
Traffic Signal	3-Lane	North leg: multilane South leg: multilane	\$6.2
Traffic Signal	Multilane	North leg: multilane South leg: multilane	\$6.7

Intersection limits reflect construction of intersection physical area (~100 feet) plus 800 feet east and west on LC Hwy 106 and 550 feet north and south on crossroad arterial

Table 25: LC Hwy 106 Corridor Segment Conceptual Costs

LC Hwy 106 Corridor Section	Corridor Segment Length (feet)	Construction + ROW Costs (\$M, 2023)
3-Lane	3,580	\$6.8
Multilane	3,580	\$7.9

Corridor segment limits reflect reconstruction of the LC Hwy 106 segment between arterial intersection footprints (5,280 ft – 100 ft - 800 ft – 800 ft = 3,580 ft)

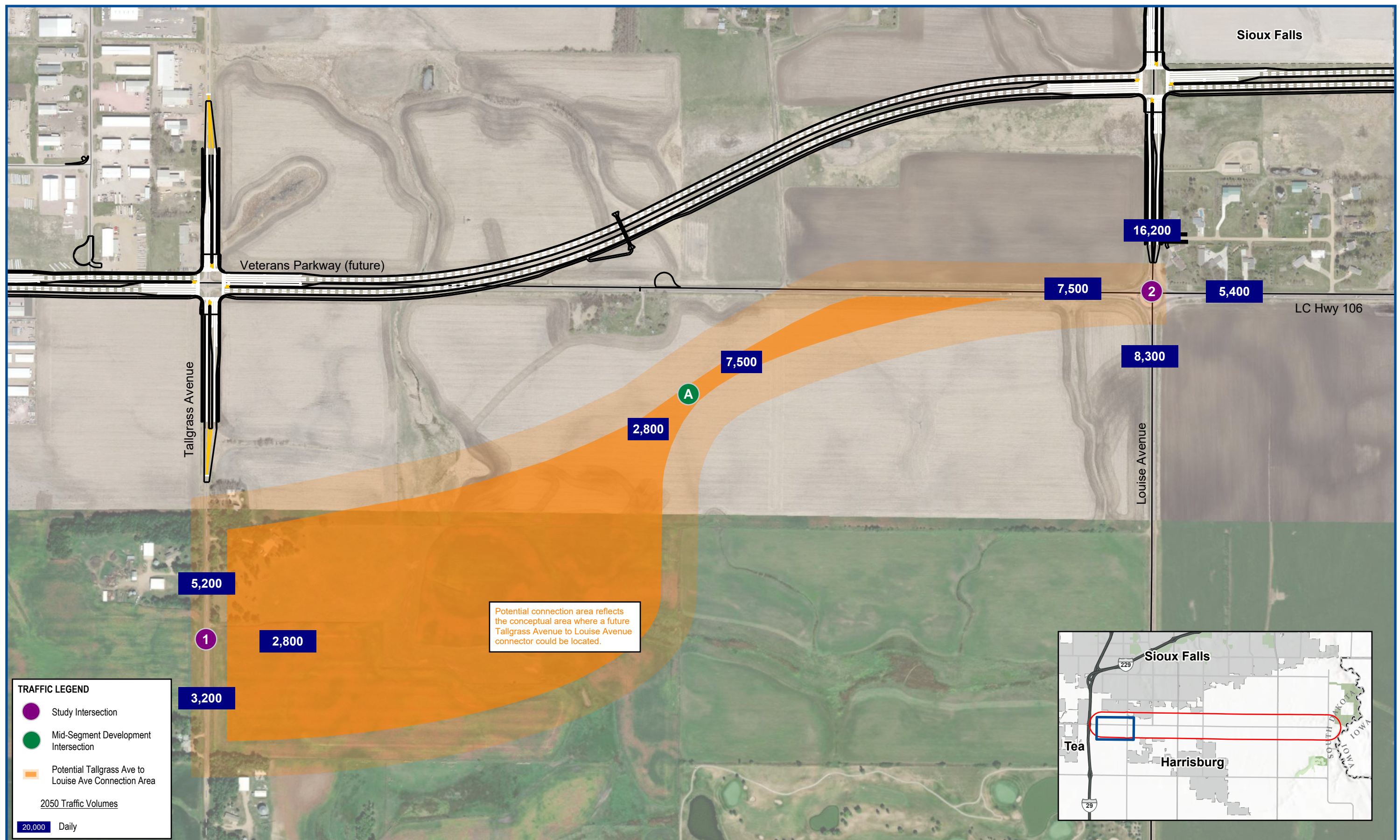
TALLGRASS AVENUE TO LOUISE AVENUE CONNECTION

Following completion of Veterans Parkway, LC Hwy 106 will no longer include a direct connection to Tallgrass Avenue. A supplemental scenario was developed to better understand potential operational benefits or drawbacks of providing a future connection between Tallgrass Avenue and Louise Avenue. This connection would require new right-of-way and be at least 1/4-mile south of Veterans Parkway per the Veterans Parkway access plan and environmental commitments.

An illustrative range of alignments is shown in **Figure 21** to show potential, planning-level options that tie Tallgrass Avenue with the LC Hwy 106 & Louise Avenue intersection. It is estimated that upwards of 7,500 vehicles per day would use this connection by the 2050 Planning Horizon, though most of the traffic is expected to be development-generated with direct access to the segment. Forecasted 2050 Planning Horizon traffic volumes through the connection and adjacent crossroad corridors are also shown in **Figure 21**.

Key findings from the analysis include:

- Limited traffic demand for through travel on the connection (e.g., I-29 to Louise Avenue)
 - Changes to LC Hwy 106 traffic patterns were generally negligible with or without the connection from the Western Avenue intersection eastward
 - Traffic tends to stay on Veterans Parkway when traveling between I-29 and Louise Avenue or Western Avenue
 - The southwest to northeast diagonal connection reflects out of the way travel for these movements
- Mid-segment development-generated traffic (development traffic with direct access to the connection) typically heads to/from Louise Avenue by nearly a 3:1 margin when compared to traffic traveling to/from Tallgrass Avenue
- Connection provides a good opportunity for access to surrounding development and can help manage access on Tallgrass Avenue and Louise Avenue
- Connection provides a good opportunity to improve local roadway connectivity in the area and establishes an east/west option for local, lower-speed traffic
- Single-lane roundabout best manages delay at the LC Hwy 106 & Louise Avenue intersection



**RANGE OF POTENTIAL TALLGRASS AVENUE TO LOUISE AVENUE ALIGNMENTS
(2050 PLANNING HORIZON DAILY TRAFFIC VOLUMES)**

FIGURE 21

Cliff Avenue to Southeastern Avenue Segment Concepts

*Conceptual corridor segment layouts illustrating a potential railroad grade separation and options to manage access between Cliff Avenue and Southeastern Avenue are provided in **Appendix J**.*

The railroad grade separation alternative was developed for a multilane corridor, applicable with an Urban 5-Lane or Urban 4-Lane Divided typical section. The bridge would span upwards of 390 feet and touch down points to the east and west are approximately 1,500 feet from the rail centerline. The alternative includes a fill slope option and wall option to help visualize impacts, shown in **Figure 22**. The fill slope option exhibits a considerably larger footprint that would require full acquisition of at least one parcel while the wall option constructs retaining walls just outside the shared use paths. Rearrange road options are shown in the alternative layout in the Appendix.

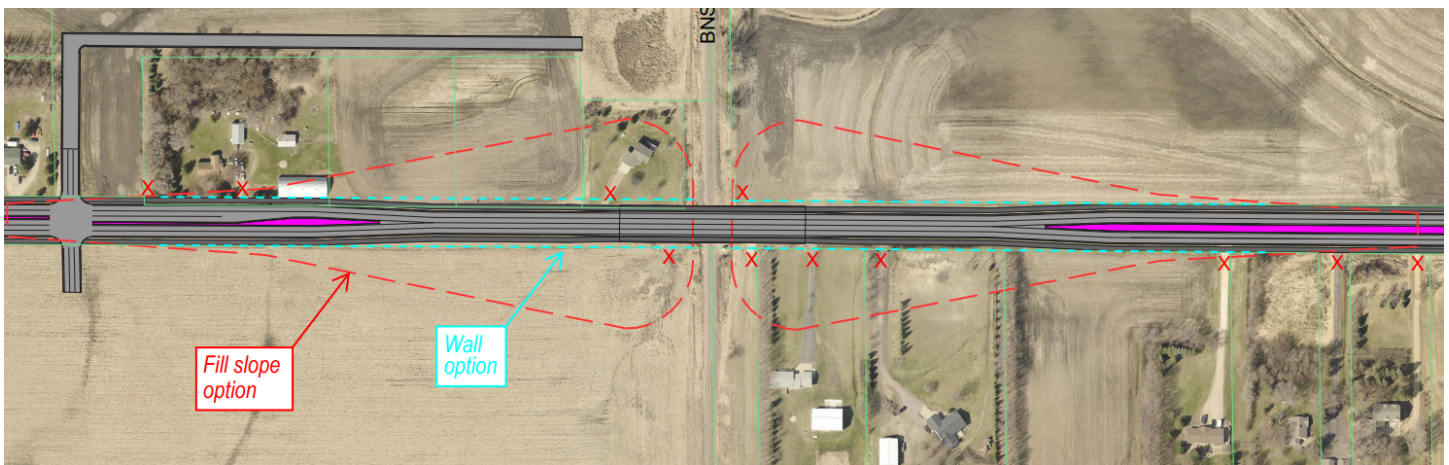


Figure 22: Railroad Grade Separation Conceptual Footprint

Four access concepts were developed for the existing access points on the south side of LC Hwy 106, between the railroad tracks and Southeastern Avenue:

- A. Maintain existing access
- B. Frontage road
- C. Access consolidation
- D. Frontage Road (with 4-Lane Divided section)

The concepts provide varying levels of access management, align with access management recommendations in the Access Plan, and provide flexibility for agency implementation as part of future projects.

UTILITY COORDINATION

See *Utility Coordination Memo* in **Appendix M** for additional information.

Planning-level utility coordination was conducted as part of the corridor study to help identify utilities that are:

- Currently in the corridor
- Planning to be in the corridor and/or planning improvements to existing utilities in the corridor
- Not in the corridor and no plans to locate in the corridor

A survey was sent to local utility contacts in Spring 2023. For utilities in the corridor, a follow-up question was also asked about the type and location of the utility within the corridor.

Responding utilities are noted in **Table 26**. The utility type, location, and supporting notes are provided in **Appendix M**.

Table 26: Responding Utilities Located in the LC Hwy 106 Corridor

AT&T	MidAmerican Energy	Xcel Energy
Bluepeak	Northern Natural Gas	Lincoln County Rural Water System
East River Electric Coop.	NuStar Pipeline	Magellan Pipeline Company L.P.
Lewis & Clark Regional Water	Southeastern Electric Cooperative	
LUMEN	Verizon	

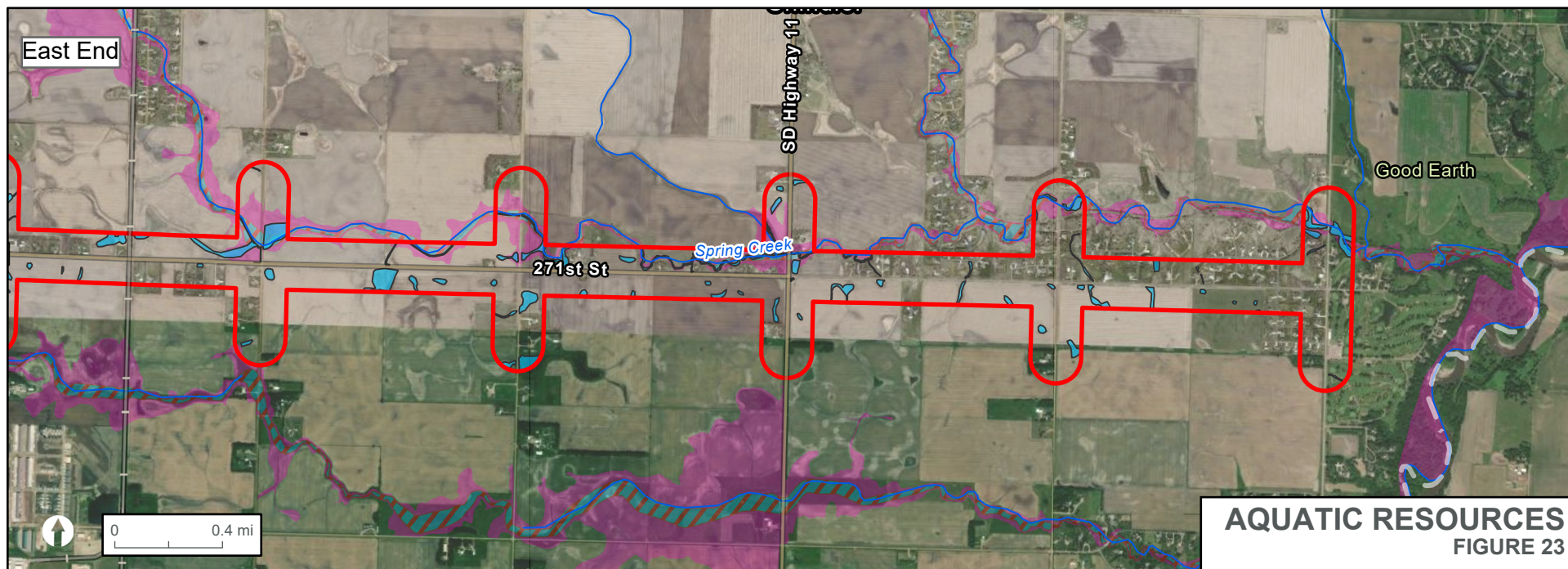
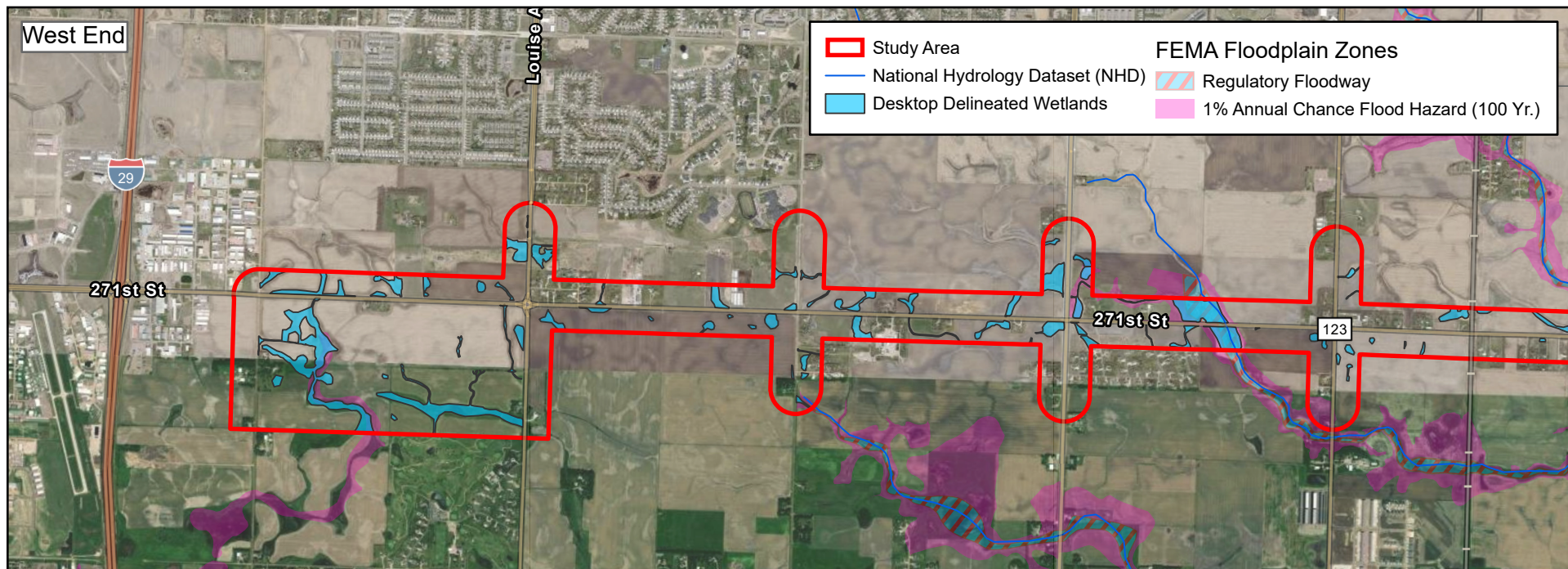
ENVIRONMENTAL REVIEW

See *Environmental Technical Memo* in **Appendix N** for additional information.

An environmental overview of the study area was conducted to identify environmental resources, potential for impacts, and future actions needed as part of the project. The *Environmental Technical Memo*, included in **Appendix N**, documents findings from the review. Figures illustrating environmental resources can also be found with the memo. The following resources likely to be impacted by the project and require further review are summarized below.

Wetlands and Other Waters of the U.S.

A desktop delineation found 134 wetlands within the study area, shown in **Figure 23**, totaling 155 acres. Three stream crossings also exist within the project. Impacts to wetlands or other waters are likely and field delineations should be completed to determine full extent of all wetlands and their boundaries once further project details are known. If impacts occur to wetlands or streams, a U.S. Army Corps of Engineers (USACE) Section 404 Permit may be required.



Threatened and Endangered Species

Trees that serve as habitat for the endangered northern long-eared bat and proposed endangered tricolored bat is present within the study area. A field habitat review will need to be completed and consultation with the U.S. Fish and Wildlife Service should be conducted.

Coordination with SD Game Fish and Parks (SD GFP) also revealed this area to be within the range of the state-listed lined snake. A desktop analysis of suitable lined snake area should be completed for projects pulled forward and visual surveys of habitat may be required.

Archaeological/Historical Properties

Several archaeological and historic properties listed or eligible for listing on the National Register of Historic Places (NRHP) exist within the study area. Many sites have not been evaluated for eligibility for the NRHP. A field survey was not conducted for archaeological/historical properties within the study area. A survey should be conducted to determine if there are any unidentified archaeological/historic properties within the area. Consultation with SD State Historic Preservation Office should occur once impacts to these properties are known.

Floodplain

FEMA floodplain exists within the study area, previously shown in **Figure 23**. Once details for planned projects are developed, a qualified hydraulic staff should review the plan sets to determine if impacts to the floodplain would occur. Additional coordination with the floodplain administrator or FEMA may be required.

LC Hwy 106 Alternatives and Environmental Impacts

Only small differences in anticipated impacts would occur between build options along LC Hwy 106. At intersections, the roundabout options have a larger footprint and may impact slightly more wetland than intersections with a traffic signal or stop control. However, these differences are not anticipated to be significant. Cultural surveys must be completed within project limits once recommendations are known to determine full impacts to archaeological and historic properties. Threatened and endangered species habitat in the area is limited, and build options are not anticipated to remove significant habitat for those species.

DRAINAGE CONSIDERATIONS

The LC Hwy 106 corridor is the headwaters for multiple drainage basins in Lincoln County. Many of these drainage basins have a history of flat terrain and poor drainage causing concern for downstream landowners. Multiple jurisdictions including Lincoln County, City of Sioux Falls, and City of Harrisburg given development in this area and each jurisdiction has design standards and/or ordinances in place to protect downstream drainage through rate and quality control when development occurs. Further, each jurisdiction has ordinances in place regulating development in the FEMA floodplain and regulating impacts to the base flood elevations in the defined floodplain.

The Land Use Plan, introduced in **Figure 14**, identifies major roadway culvert crossing locations on LC Hwy 106 and arterial crossroads. The figure also shows existing natural detention areas that provide some

natural peak flow reduction prior to passing through the existing culvert crossing and proposed detention sites to be constructed during the Veterans Parkway project.

As the LC Hwy 106 corridor develops, the major drainage culvert crossings on LC Hwy 106 and intersecting arterial roadways need to be evaluated to determine the most appropriate method to regulate peak flow rates to meet design standards and minimize future downstream impacts. Based on previous FEMA floodplain analysis or existing drainage studies, several major drainage culvert crossings along the corridor are not sized to convey the 1% annual chance flood event. During this event, flows begin to naturally pond and detain on the upstream side of each existing roadway culvert until the water elevation on the upstream side is high enough to overtop the roadway section. Roadway overtopping flow is often significant at these locations and may damage the existing roadway.

When designing roadway improvements, culvert crossing design considerations and mitigation methods should be evaluated to include, but not limited to:

- City of Sioux Falls, City of Harrisburg, and Lincoln County design standards (as applicable)
- Culvert size and cost for conveying the 1% annual chance flood event without overtopping the roadway
- FEMA Flood Hazard Zone AE (FEMA Zone AE) no-rise condition for the proposed improvement, or a Conditional Letter of Map Revision (CLOMR) would be required
- Preventing an increase in peak flows downstream from the culvert improvement
- Replacement of floodplain attenuation volumes if fill is placed in a FEMA floodplain

Mitigation methods for these design considerations include, but not limited to:

- Adding detention upstream of the roadway culvert crossing to reduce peak flows, reduce culvert crossing size, mitigate a potential rise in a FEMA Zone AE, and/or mitigate floodplain attenuation volume lost
- Adding detention downstream of the roadway culvert crossing to reduce peak flows and/or mitigate floodplain attenuation volume lost
- Coordinating or partnering with neighboring developers to provide additional detention in the development's detention system for the roadway improvements to reduce peak flows, reduce culvert crossing size, mitigate a potential rise in a FEMA Zone AE, and/or mitigate floodplain attenuation volume lost
- Implementing a regional detention solution in the basin to reduce peak flows, reduce culvert crossing size, mitigate a potential rise in a FEMA Zone AE, and/or mitigate floodplain attenuation volume lost
- Obtain a CLOMR if a no-rise cannot be achieved for a FEMA Zone AE

Each design consideration should be reviewed during the final design of these culvert crossings and a potential mitigation option should be implemented to avoid adverse impacts to the drainage system downstream of each culvert.

INTERSECTION ALTERNATIVES EVALUATION

This section provides a summary of Build condition evaluation measures for the various intersection alternatives, focusing on:

- 2050 Planning Horizon traffic operations
- 2050 Sensitivity Scenario traffic operations
- Safety (intersection type crash reduction)
- Long-range compatibility with intersection expansion and/or corridor build-out
- Cost

A description of intersection evaluation measures and considerations is provided in **Table 27**. Evaluation summaries are provided in **Table 28** through **Table 36**.

Each alternative addresses a need established as part of this study. These tables are meant to compare alternatives with consideration to long-range needs. However, there are instances where an alternative may score poorly with respect to these long-range needs, but the alternative addresses a short-term need and may be the best option for an interim measure.

Table 27: Intersection Alternatives Evaluation Description

Category	Considerations	Measure		
		+	Blank	—
2050 Planning Horizon traffic operations	How well does the alternative address Year 2050 traffic operation needs?	LOS A-B	LOS C	LOS D-F
2050 Sensitivity Scenario traffic operations	How well does the alternative address Year 2050 Sensitivity Scenario traffic operation needs?	LOS A-B	LOS C-D	LOS E-F
Safety	Comparison of safety based on intersection type CMFs and expected crash reduction	Best safety performance	Maintain or slight improvement	No safety improvement
Long-Range Compatibility	Long-range compatibility with: <ul style="list-style-type: none"> • Intersection expansion and/or corridor build-out needs (if applicable) • Other area planned improvements (e.g., Veterans Parkway project, SD 11 study recommendations, crossroad arterial reconstruction) If an interim improvement, can it be expanded or does it need reconstructed?	Best addresses long-range needs	Requires modification, but expandable	Reconstruction required
Cost	Construction + ROW costs (2023\$)	n/a	n/a	n/a
		<i>Differentiating benefit</i>	<i>Measure supports study objectives and is a benefit to the corridor</i>	<i>Differentiating drawback</i>

Table 28: Alternatives Evaluation – Louise Avenue Intersection

Alternative	Intersection Type	2050 Traffic Operations	2050 Sensitivity Traffic Operations	Safety	Long-Range Compatibility	Costs (\$M, 2023)
Louise – 1	Single-Lane Roundabout	+	+	+	—	\$4.0
Louise – 2	Multilane Roundabout	+	+	+	+	\$4.8
Louise – 3	Traffic Signal				+	\$5.2 - \$6.2

Table 29: Alternatives Evaluation – Western Avenue Intersection

Alternative	Intersection Type	2050 Traffic Operations	2050 Sensitivity Traffic Operations	Safety	Long-Range Compatibility	Costs (\$M, 2023)
Western – 1	Single-Lane Roundabout	+		+	—	\$4.0
Western – 2	Multilane Roundabout	+	+	+	+	\$4.8 - \$5.6
Western – 3	Traffic Signal					\$5.2 - \$6.2
Western – 4	Traffic Signal (Multilane)				+	\$6.7

Table 30: Alternatives Evaluation – Minnesota Avenue Intersection

Alternative	Intersection Type	2050 Traffic Operations	2050 Sensitivity Traffic Operations	Safety	Long-Range Compatibility	Costs (\$M, 2023)
Minnesota – 1	Traffic Signal					\$2.0
Minnesota – 2	Traffic Signal (Multilane)				+	\$3.5

Costs reflect reconstruction of east and west legs of intersection; minimal modification to existing Minnesota Avenue pavement

Table 31: Alternatives Evaluation – Cliff Avenue Intersection

Alternative	Intersection Type	2050 Traffic Operations	2050 Sensitivity Traffic Operations	Safety	Long-Range Compatibility	Costs (\$M, 2023)
Cliff – 1	Single-Lane Roundabout		—		—	\$4.0
Cliff – 2	Multilane Roundabout	+	—	+	+	\$5.6
Cliff – 3	Traffic Signal					\$6.2
Cliff – 4	Traffic Signal (Multilane)				+	\$6.7

Cliff – 1 safety left blank due to anticipated long-range congestion, which degrades safety benefits during peak periods

Table 32: Alternatives Evaluation – Southeastern Avenue Intersection

Alternative	Intersection Type	2050 Traffic Operations	2050 Sensitivity Traffic Operations	Safety	Long-Range Compatibility	Costs (\$M, 2023)
Southeastern – 1	Single-Lane Roundabout	+		+		\$4.0
Southeastern – 2	Traffic Signal					\$5.2 - \$6.2
Southeastern – 3	Traffic Signal (Multilane)				+	\$6.7

Table 33: Alternatives Evaluation – Sycamore Avenue Intersection

Alternative	Intersection Type	2050 Traffic Operations	2050 Sensitivity Traffic Operations	Safety	Long-Range Compatibility	Costs (\$M, 2023)
Sycamore – 1	Single-Lane Roundabout	+	n/a	+	+	\$4.0
Sycamore – 2	Stop-Control (Traffic Signal)		n/a		+	\$4.0

Table 34: Alternatives Evaluation – SD11 Intersection

Alternative	Intersection Type	2050 Traffic Operations	2050 Sensitivity Traffic Operations	Safety	Long-Range Compatibility	Costs (\$M, 2023)
SD11 – 1	Stop-Control (Traffic Signal)		n/a		+	\$6.2

Table 35: Alternatives Evaluation – 479th Avenue Intersection

Alternative	Intersection Type	2050 Traffic Operations	2050 Sensitivity Traffic Operations	Safety	Long-Range Compatibility	Costs (\$M, 2023)
479 th – 1	Single-Lane Roundabout	+	n/a	+	+	\$4.0
479 th – 2	Stop-Control	+	n/a			\$4.0

Table 36: Alternatives Evaluation – 480th Avenue Intersection

Alternative	Intersection Type	2050 Traffic Operations	2050 Sensitivity Traffic Operations	Safety	Long-Range Compatibility	Costs (\$M, 2023)
480 th – 1	Single-Lane Roundabout	+	n/a	+	+	\$4.0
480 th – 2	Stop-Control	+	n/a			\$4.0

RECOMMENDATION METHODOLOGY

Recommendations were developed through a collaborative process with the Study Advisory Team, analysis, and public and stakeholder input. The recommendation framework follows a Long-Range Vision process that supports agency flexibility with programming projects as needs and opportunities arise. It also fosters coordination amongst agencies to maximize investment and avoid constructing something twice in a short timeframe. This vision framework is supported through recommendations that provide options for:

- Incremental and/or ultimate build-out
- Intersection type (roundabout or traffic signal)
- Corridor number of lanes on LC Hwy 106 and crossroads (3-lane or multilane)
- Incorporating planned improvements for Veterans Parkway, SD 11, and other arterial crossroads

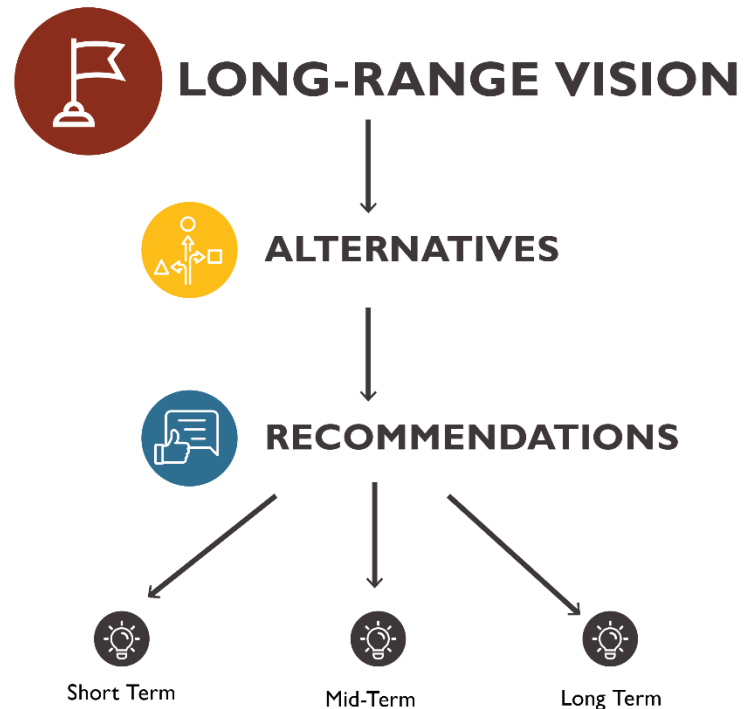
Ultimately, the timeframe for long-range improvement needs is highly dependent on type, pace, and density of future development along the LC Hwy 106 corridor. When a project is identified, this vision process lays the foundation for future design-level evaluation and detailed analysis.

Recommendation Framework

Long-Range Vision: illustrates the overarching, long-range recommendations for the corridor and provides guidance on elements to incorporate in future planning and projects.

Supporting Alternatives: specific modifications that may be implemented individually or collectively when working towards the long-range vision.

Alternatives Recommendations: short-term, mid-term, and long-term recommendations align with anticipated development along the LC Hwy 106 corridor based on the three City of Sioux Falls Growth Management Plan development tiers and City of Harrisburg growth area.

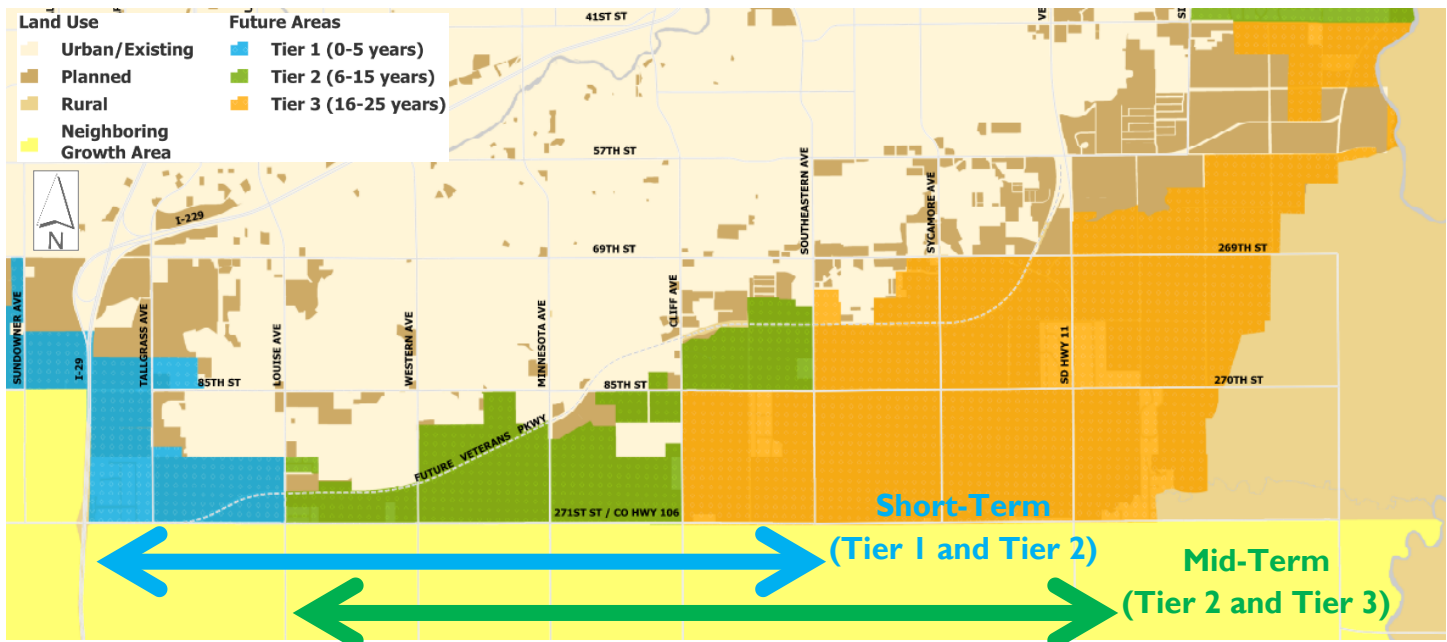


Recommendation Timelines

Recommendation timelines, shown in **Table 37**, correlate with City of Sioux Falls Growth Management Plan development tiers as shown spatially in **Figure 24**. The City of Harrisburg core growth area is similar to the City of Sioux Falls Growth Tiers 1 and 2. Recommendation color-coding corresponds with the initial City of Sioux Falls Growth Tier within the respective timeframe. It is anticipated that Tier 2 development will overlap Short-Term and Mid-Term recommendation timeframes.

Table 37: Recommendation Timeline and City of Sioux Falls Growth Tiers

Recommendation Timeframe		City of Sioux Falls Growth Tiers and Years
Short-Term	Present – 2035	Tier 1 & Tier 2: up to 15 years
Mid-Term	2036 – 2045	Tier 2 & Tier 3: up to 25 years
Long-Term	2046+	26+ years



Source: Adapted from City of Sioux Falls (March 8, 2023)

Figure 24: Spatial Relationship between Recommendation Timeframe and City of Sioux Falls Growth Tiers

Near-term recommendations were also identified for further consideration to reflect spot improvements that address existing needs. These recommendations do not include full reconstruction of an intersection or short segment, rather smaller modifications such as adding a turn lane, modifying an access point, or changing intersection control. They would serve as a bridge between existing and short/mid/long-term recommendations, but not replace those recommendations. If reconstruction is required, short-term and mid-term improvements are recommended.

RECOMMENDATIONS

Typical Sections

Long-Range Vision: Urban typical section

Urban typical sections are recommended for future reconstruction of the corridor:

- **Urban 3-Lane Typical Section:** single through lane in each direction, center left turn lane, curb and gutter, storm sewer, roadway lighting, and 10-foot shared use path on both sides
- **Urban 5-Lane Typical Section:** two through lanes in each direction, center left turn lane, curb and gutter, storm sewer, roadway lighting, and 10-foot shared use path on both sides
- **Urban 4-Lane Divided Typical Section:** two through lanes in each direction, raised median that accommodates a left turn lane at intersections, curb and gutter, storm sewer, roadway lighting, and 10-foot shared use path on both sides

Urban typical sections are recommended in lieu of rural typical sections for this corridor to minimize right-of-way impacts, convey storm water in underground storm sewer instead of ditches due to lack of grade through many areas, and incorporate the desired multimodal transportation elements. It is estimated that a rural multilane typical section would require, at minimum, 120-foot right-of-way that may widen depending on ditch needs.

For near-term spot improvements to intersections or short segments not requiring full reconstruction, maintaining the existing rural section is recommended.

- **Rural 3-Lane Typical Section:** near-term spot improvements

Corridor Number of Lanes

Long-Range Vision:

- **Multilane corridor: Louise Avenue to SD 11**
- **3-Lane corridor: SD 11 to 480th Avenue**

The 2050 Planning Horizon volumes developed for this study are adequately managed through a 3-lane LC Hwy 106 corridor. However, future development along the corridor will highly influence future corridor needs. The 2050 Sensitivity Analysis showed operational benefits for a multilane corridor from Western Avenue eastward to Southeastern Avenue to address intersection operations at Minnesota Avenue and Cliff Avenue.

Route continuity between key north/south arterials is also important and thus it is recommended a multilane corridor be considered west to Louise Avenue and east to SD 11. These intersections reflect the bookend arterial intersections within the primary City of Sioux Falls and City of Harrisburg growth areas.

Short-Term Recommendation: Urban 3-lane corridor

- New 3-Lane: Louise Avenue to Southeastern Avenue
- City of Sioux Falls Tier 1 and Tier 2 growth area
- Core City of Harrisburg growth area

Mid-Term Recommendation: Urban 3-Lane corridor

- Maintain 3-Lane: Louise Avenue to Southeastern Avenue
- New 3-Lane: Southeastern Avenue to SD 11
- Consider 3-Lane: SD 11 to 480th Avenue
- City of Sioux Falls Tier 3 growth area
- SD 11 cut-through route (to/from Sycamore Avenue, Southeastern Avenue, etc.)

Long-Term Recommendation: Urban Multilane and 3-Lane corridor

- New Multilane: Western Avenue to Southeastern Avenue
- Consider Multilane: west to Louise Avenue and east to SD 11
- Maintain or construct 3-Lane on all other segments not reconstructed to multilane sections

Intersection Considerations

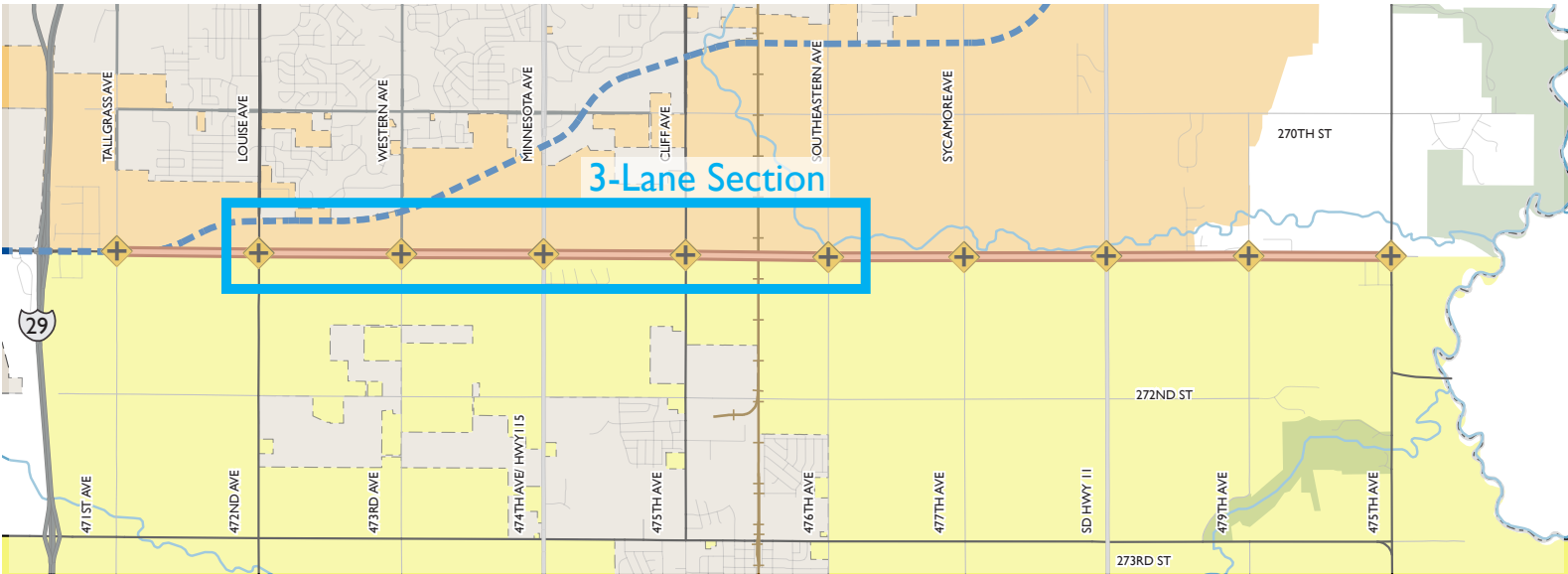
Key considerations with the intersection recommendations include:

- LC Hwy 106 corridor operational needs, future traffic patterns, and route continuity
- Roundabout benefits with traffic operations, safety, and public and stakeholder support
- Prioritize north/south arterial travel
- Anticipated traffic growth on Minnesota Avenue and Cliff Avenue corridors and associated long-range operational needs
- Planned projects in the area and recommendations from other studies
- Potential for incremental build-out of intersections and corridor segments
- Minimize the risk of duplicate work or rework between short/mid/long-term needs

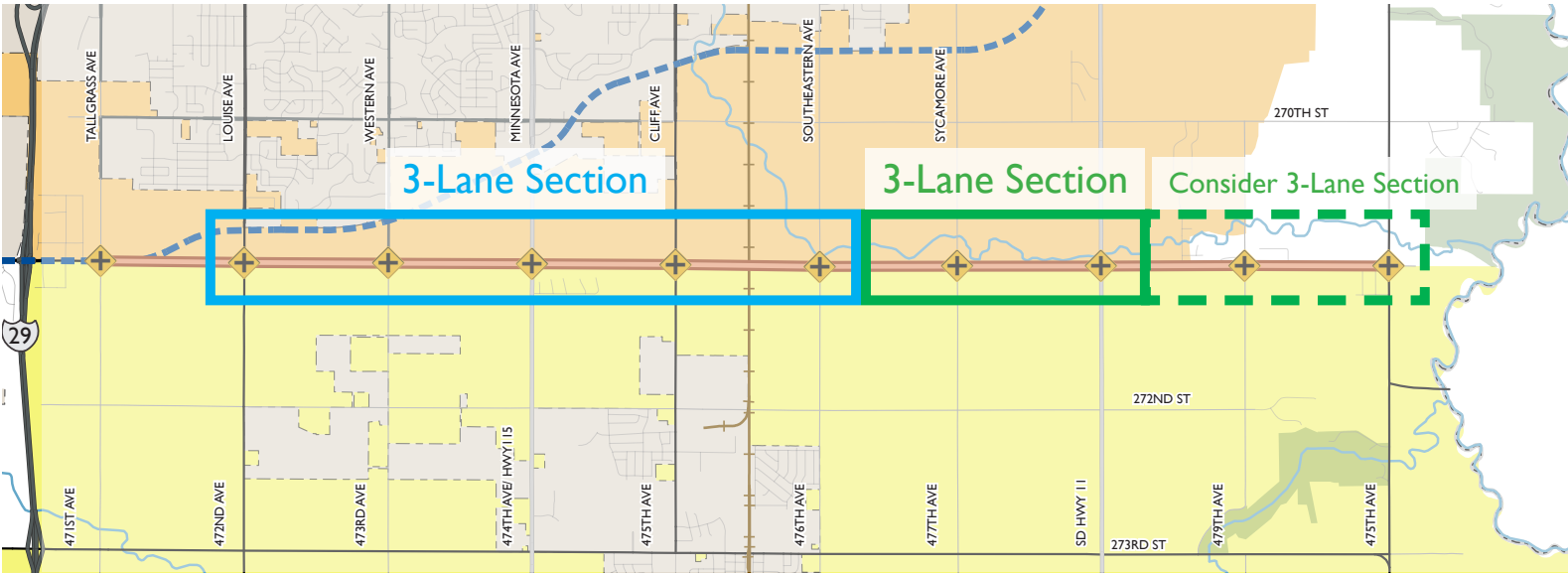
All multilane roundabout alternatives are a 'hybrid' multilane roundabout where only up to two legs of the roundabout are complete multilane sections. All short-term, mid-term, and long-term intersection reconstruction recommendations are for urban intersections.

LC HWY 106 CORRIDOR NUMBER OF LANES RECOMMENDATIONS

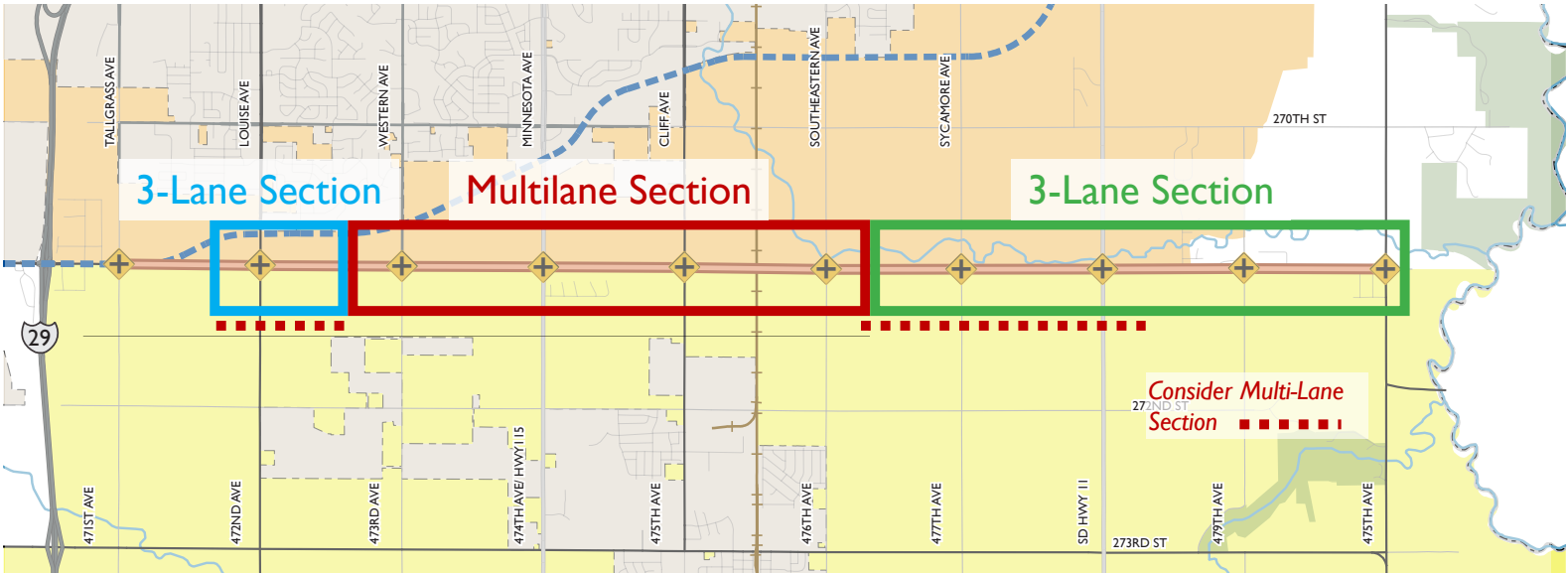
Short-Term Recommendation:



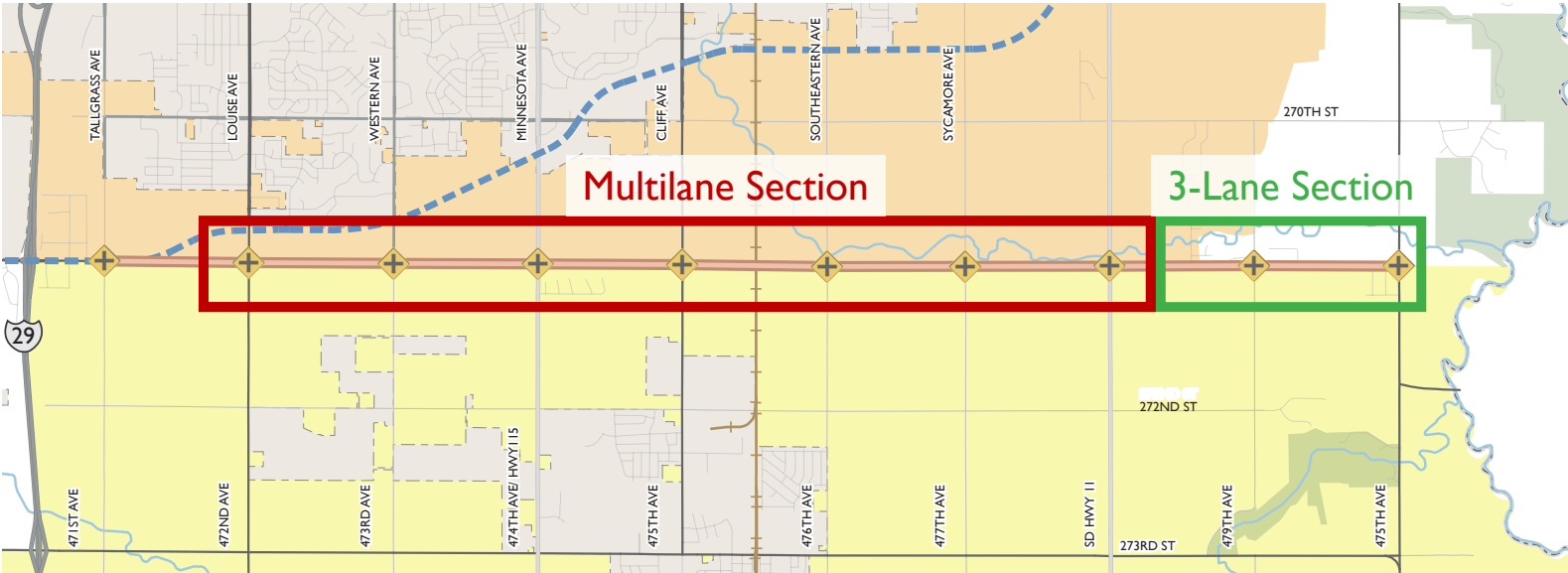
Mid-Term Recommendation:



Long-Term Recommendation:



Long-Range Vision:



ROAD SEGMENTS:

- Urban 3-Lane Section:**
1 lane each direction plus center left turn lane
- Urban Multilane Section:**
2 lanes each direction plus center left turn lane or raised median



FIGURE 25

Lincoln County Highway 106 Corridor Study



Louise Avenue Intersection

The Louise Avenue operational and safety analysis findings highlight benefits of the single-lane and multilane roundabout alternatives at this intersection. The existing single-lane roundabout is anticipated to meet operational demand for the foreseeable future; however, it lacks multimodal features which would need to be added in conjunction with future projects. Further, it requires the multilane Louise Avenue corridor to the north to add/drop lanes north of the intersection. Therefore, the existing single-lane roundabout was noted to not exhibit long-range compatibility with the area. The multilane roundabout alternative addresses the long-range needs for this intersection.

A future signalized intersection may also be considered when the intersection needs to be reconstructed (Louise – 3). However, future traffic patterns may not be conducive to meeting traffic signal warrants and thus there is the potential it would not be signalized upon opening without considerable development along the LC Hwy 106 corridor and Louise Avenue traffic growth.

If a future multilane LC Hwy 106 corridor is extended west to Louise Avenue, the long-term Western Avenue multilane roundabout layout (Western – 2 Modified) would be applicable at this intersection.

Short-Term and Mid-Term Recommendation: Roundabout (Louise – 2)

- Maintain existing single-lane roundabout until reconstruction is needed
- Reconstruct as urban multilane roundabout to tie into the Louise Avenue multilane corridor constructed as part of Veterans Parkway project
 - Add/drop lanes within the roundabout

Long-Term Recommendation: Multilane Roundabout (Louise – 2)

- Maintain or construct the urban multilane roundabout recommended in the Short-Term and Mid-Term recommendations that adds/drops lanes within the roundabout (as needed)

Western Avenue Intersection

Western Avenue intersection considerations are very similar to those at the Louise Avenue intersection. The existing AWSC intersection generally addresses existing traffic operations; however, it lacks multimodal features and the north leg is being reconstructed to a multilane section as part of the Veterans Parkway project.

The multilane roundabout alternative addresses the long-range needs for this intersection by providing operational and safety benefits, facilitating lane adds/drops within the roundabout, and incorporating multimodal features. Further, the roundabout can be expanded to accommodate a multilane section to the east without requiring full reconstruction of the recommended short/mid-term multilane roundabout configuration. Channelized turn lanes provide seamless lane additions within the roundabout that support lane utilization and driver expectancy.

A future signalized intersection may also be considered when the intersection is reconstructed (Western – 3). However, long-range operational and safety benefits are less than what is shown with a roundabout.

Short-Term and Mid-Term Recommendation: Multilane Roundabout (Western – 2)

- Reconstruct as urban multilane roundabout to tie into Western Avenue multilane corridor constructed as part of Veterans Parkway intersection
 - Add/drop lanes within the roundabout

Long-Term Recommendation: Multilane Roundabout (Western – 2 Modified)

- Modify multilane roundabout if needed to tie into a multilane LC Hwy 106 corridor extending east of the intersection
 - Construct channelized northbound and westbound right turn lanes outside of the existing roundabout

Minnesota Avenue Intersection

The SDDOT recently reconstructed Minnesota Avenue (SD 115) from Willow Street (Harrisburg) northward to 85th Street (Sioux Falls) as an urban multilane divided corridor. No changes to the Minnesota Avenue pavement are anticipated and the intersection will remain signalized. Minnesota Avenue is the primary north/south arterial corridor in the area with traffic volumes expected to approach 30,000 vehicles per day by Year 2050. Maintaining a signalized intersection helps prioritize north/south travel.

Recommendations focus on building-out the east and west legs to urban sections based on anticipated traffic needs. Managing operations on the eastbound and westbound approaches with left and right turn lanes, and eventually multiple through lanes, helps prioritize north/south travel by minimizing green time for the east/west movements.

Short-Term and Mid-Term Recommendation: Traffic Signal (Minnesota – 2)

- Maintain as signalized intersection
- Reconstruct east and west intersection legs with Urban 4-Lane Divided section. Constructing Minnesota – 2 as the short/mid-term recommendation:
 - Minimizes need for rework when LC Hwy 106 corridor is expanded
 - Establishes the long-term configuration with traffic signal pole locations/lengths, street lighting locations, curb and gutter, raised median, and drainage
 - Can reflect the Minnesota – 1 lane configuration by striping the outside lanes as right turn lanes until additional through lanes are needed

Long-Term Recommendation: Traffic Signal (Minnesota – 2)

- If Minnesota – 2 previously constructed, maintain intersection configuration and review need for right turn lanes
- If Minnesota – 2 not previously constructed, construct Minnesota – 2 configuration and review need for right turn lanes

Cliff Avenue Intersection

While forecasted volumes are not as high as the Minnesota Avenue corridor, the Cliff Avenue corridor is also anticipated to see considerable traffic growth as a centralized north/south arterial corridor within Harrisburg and Sioux Falls. It is anticipated that Cliff Avenue will be a continuous multilane corridor in the future. Currently, Cliff Avenue has been reconstructed by the City of Sioux Falls southward to approximately 1/2-mile north of the intersection with plans to reconstruct to the LC Hwy 106 intersection.

The traffic operations analysis shows that the single-lane roundabout accommodates Year 2050 traffic volumes but fails with the 2050 Sensitivity Scenario traffic volumes. The multilane roundabout provides considerably better Year 2050 operations, but the 2050 Sensitivity Scenario volumes are nearing capacity thresholds. The signalized intersection alternatives were found to provide the best traffic operations with the 2050 Sensitivity Scenario analysis.

The single-lane roundabout scored poorly in the long-range compatibility based the future Cliff Avenue multilane section and long-range operational needs. The multilane roundabout alternative is a good option through the mid-term, but a signalized intersection would likely be needed with continued Cliff Avenue traffic growth. Therefore, the short-term and mid-term recommendation includes both the multilane roundabout and traffic signal options for consideration.

Short-Term and Mid-Term Recommendation: Multilane Roundabout (Cliff – 2) or Traffic Signal (Cliff – 4)

- Urban reconstruction, with option to construct multilane roundabout or signalized intersection
- If signalized intersection is selected, reconstruct as urban intersection with LC Hwy 106 Urban 4-Lane Divided section. Constructing Cliff – 4 as the short/mid-term recommendation:
 - Minimizes need for rework when LC Hwy 106 corridor is expanded
 - Establishes the long-term configuration with traffic signal pole locations/lengths, street lighting locations, curb and gutter, raised median (and management of existing access), and drainage
 - Can reflect the Cliff – 3 lane configuration by striping the outside lanes as right turn lanes until additional through lanes are needed

Long-Term Recommendation: Traffic Signal (Cliff – 4)

- If Cliff – 4 previously constructed, maintain intersection configuration and review need for right turn lanes
- If Cliff – 4 not previously constructed, construct Cliff – 4 configuration and review need for right turn lanes

Southeastern Avenue Intersection

Southeastern Avenue is at the eastern edge of the Sioux Falls Tier 2 growth area and Harrisburg core growth area. It is currently a township gravel road for over two miles and would need significant improvement to safely accommodate higher volumes. Both development and Southeastern Avenue corridor improvement timelines are important considerations in the future of this intersection as several things need to come together to fully-realize (and accommodate) high levels of traffic growth.

The single-lane roundabout provides the best long-range traffic operations and safety. It can be modified to tie into multilane arterial segments if needed in the future. A signalized intersection is also an option for consideration but exhibits higher levels of delay and less safety benefit.

This intersection is anticipated to be the eastern bookend intersection of the developing area through the mid-term recommendations. Roundabouts are beneficial at major intersections in urban/rural transition areas as they provide traffic calming and serve as a gateway node between two roadway and/or area types. There are safety drawbacks to signalized intersections in these transition areas due to high speeds, speed differential, and driver expectancy issues. With a signalized Cliff Avenue intersection, a roundabout at Southeastern Avenue would not only exhibit safety benefits at the Southeastern Avenue intersection but would likely extend secondary safety benefits eastward through the railroad crossing to the Cliff Avenue intersection.

Short-Term and Mid-Term Recommendation: Single-Lane Roundabout (Southeastern – I)

- Reconstruct as urban single-lane roundabout

Long-Term Recommendation: Multilane Roundabout (Southeastern – I Modified)

- Maintain single-lane roundabout and modify if needed to tie into a multilane LC Hwy 106 corridor extending west of the intersection
 - Construct channelized eastbound and southbound right turn lanes outside of the existing roundabout
- Consider signalized intersection if LC Hwy 106 and Southeastern Avenue corridors are both multilane sections

Sycamore Avenue Intersection

Sycamore Avenue is located in the City of Sioux Falls Tier 3 growth area and thus forecasted traffic volumes are relatively low. The existing TWSC intersection is anticipated to function adequately for the foreseeable future. When reconstruction is needed, a single-lane roundabout is anticipated to provide long-range operational and safety benefits to this intersection.

Short-Term, Mid-Term, and Long-Term Recommendation: Single-Lane Roundabout (Sycamore – I)

- Maintain existing intersection until reconstruction is needed
- Reconstruct as urban single-lane roundabout

SD11 Intersection

SD11 intersection recommendations were carried forward from the *Northern Lincoln County Corridors (SD11 and SD115) Study* completed in 2023. This study recommends constructing left and right turn lanes on the LC Hwy 106 approaches when the SDDOT reconstructs the intersection to minimize blocking of right turn traffic by through vehicles. East/west through traffic is expected to increase with continued development east of SD11 and into Iowa.

Short-Term, Mid-Term, and Long-Term Recommendation: Stop Control (Traffic Signal) (SD11 – I)

- Reconstruct intersection based on Northern Lincoln County Corridor Study recommendations
 - Left turn, through, and right turn lane configuration on eastbound and westbound approaches
- Signalize when warranted

479th and 480th Avenue Intersections

479th Avenue and 480th Avenue intersections are on the periphery of City of Sioux Falls and City of Harrisburg growth areas. However, there is considerable rural residential development in the area and the corridor accommodates traffic traveling to/from Iowa via the 272nd Street Big Sioux River bridge.

The existing intersections are anticipated to function adequately for the foreseeable future. When reconstruction is needed, a single-lane roundabout is anticipated to provide long-range operational and safety benefits to both locations.

Short-Term, Mid-Term, and Long-Term Recommendation: Single-Lane Roundabout (479th – I and 480th – I)

- Maintain existing intersection until reconstruction is needed
- Reconstruct as urban single-lane roundabout

1/4-Mile Mid-Segment Intersections

Mid-segment intersections are recommended as presented in the Access Plan and recommendation conceptual layouts. Future development shall plan for these locations as the full access intersections on LC Hwy 106.

It is recommended that development plan for a 3-lane section and stop-control (TWSC) on the side-street approaches. A development traffic impact study will determine whether a traffic signal and right turn lanes (applicable for all approaches) will be required based on traffic warrants.

Cliff Avenue to Southeastern Avenue Segment (Access Management and Railroad Grade Separation)

Railroad grade separation and an opportunistic approach to access management is recommended for the Cliff Avenue to Southeastern Avenue segment, supporting the desired long-range vision in the area:

Long-Range Vision:

- **Railroad grade separation**
- **Access Options B or C**

Railroad grade separation should be considered as part of future major corridor investments, such as when the corridor needs to be reconstructed. Grant opportunities should be pursued based on the long-range safety, operations, and community connectivity benefits of grade separation along this east/west arterial corridor.

The two recommended access options align with the Access Plan and strategies to manage existing access along the corridor. A collaborative effort with adjacent properties will be paramount in the long-range success of managing corridor access through this segment, through closing, consolidating, moving away from the railroad crossing, and/or restricting turn movement to mitigate angle conflicts.

Bicycle and Pedestrian

The recommended urban typical sections include a 10-foot shared use path on both sides of the LC Hwy 106 corridor. This provides route continuity along the corridor and a framework for multimodal connectivity between City of Sioux Falls, City of Harrisburg, and adjacent development. City of Sioux Falls long-range bicycle planning focuses shared use paths along arterial roadways (plus a trail west of Minnesota Avenue), while City of Harrisburg long-range planning focuses on pathways adjacent to drainageways. Continuous shared use paths along LC Hwy 106 corridor will provide connectivity between these two approaches.

At minimum, adjacent development shall extend sidewalk to the LC Hwy 106 shared use path at mid-segment intersections. Additional connectivity to shared-use paths is encouraged to minimize out of the way travel by bicyclists and pedestrians and support multimodal connectivity between and within Neighborhood Employment Center and Residential land uses.

Jurisdictional Transfer

Jurisdictional transfer of LC Hwy 106 segments is recommended in conjunction with each corridor segment major investment (reconstruction) and/or annexation. Urban development adjacent to the corridor will drive the need for long-range LC Hwy 106 capacity improvements following the opening of Veterans Parkway.

Tallgrass Avenue to Louise Avenue Connection

No specific Tallgrass Avenue to Louise Avenue connection alignment recommendation is being made as part of this corridor study. However, the Land Use Plan, Access Plan, and traffic operations analysis shows a benefit to the area with a future connection by providing arterial (or major collector):

- Access for future development, particularly with access restrictions south of Veterans Parkway
- East/west route connectivity and continuity between I-29 and Big Sioux River

It should be noted that the Sioux Falls TDM only shows limited pass-through traffic on this segment and that most traffic is generated by adjacent development. The recommended Louise Avenue multilane roundabout has ample capacity to accommodate this traffic. Therefore, the designation and future configuration can be scaled accordingly to fit these conditions.

It is recommended that agencies with planning jurisdiction in this area partner with developers to establish an alignment as part of future development. The segment should:

- Connect with the Louise Avenue intersection at the east end
- Connect with Tallgrass Avenue between 1/4-mile and 1/2-mile south of Veterans Parkway
- Provide 3-Lane Urban section

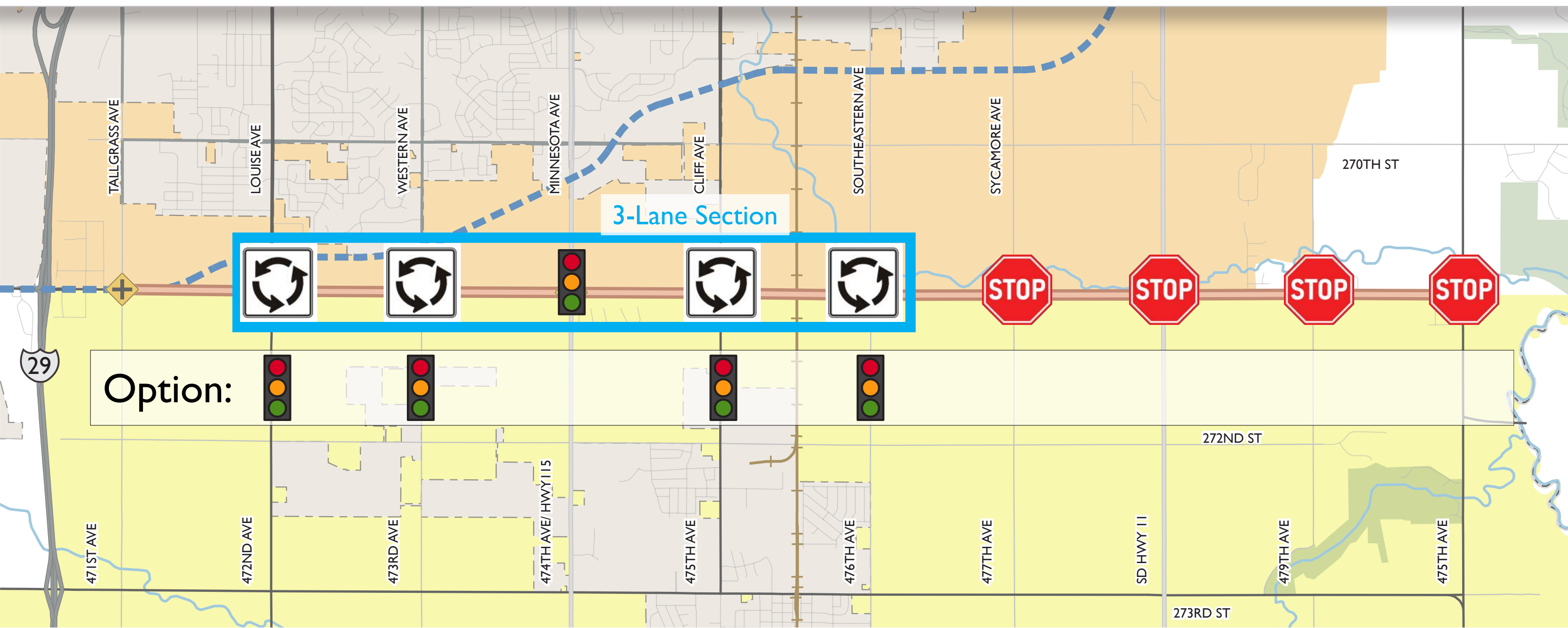
Short-Term and Mid-Term Recommendations Summary

An overview of short-term and mid-term corridor and intersection recommendations is shown in **Figure 26** and **Figure 27**, respectively. Conceptual layouts of the mid-term recommendations (which also covers the short-term layouts) are shown in **Figure 28**.

Long-Term Recommendations Summary

An overview of long-term corridor and intersection recommendations is shown in **Figure 29**. Conceptual layouts of the recommended long-term corridor are shown in **Figure 30**.

SHORT-TERM RECOMMENDATIONS



INTERSECTIONS:

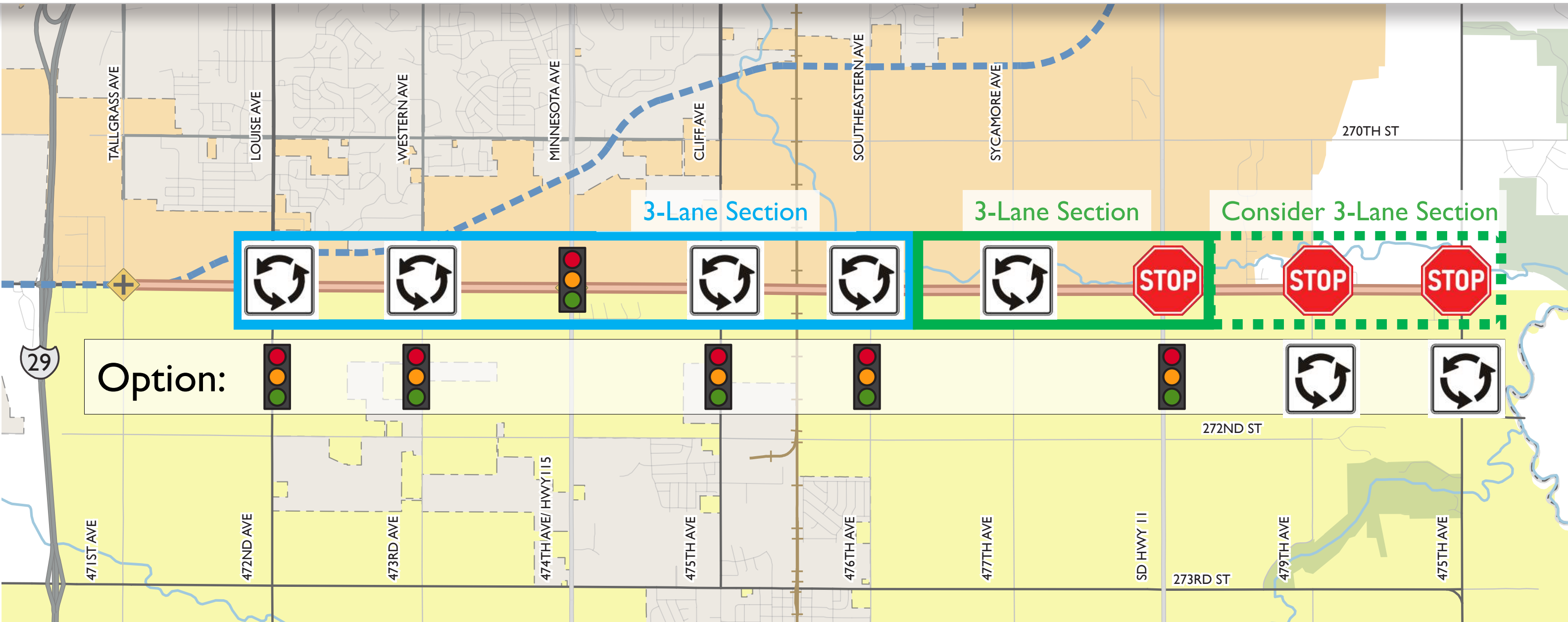
- Roundabout 
- Traffic Signal 
- Stop Signs 

ROAD SEGMENTS:

- Urban 3-Lane Section: 1 lane each direction plus center left turn lane
- Urban Multilane Section: 2 lanes each direction plus center left turn lane

FIGURE 26

MID-TERM RECOMMENDATIONS



INTERSECTIONS:

Roundabout 

Traffic Signal 

Stop Signs 

ROAD SEGMENTS:

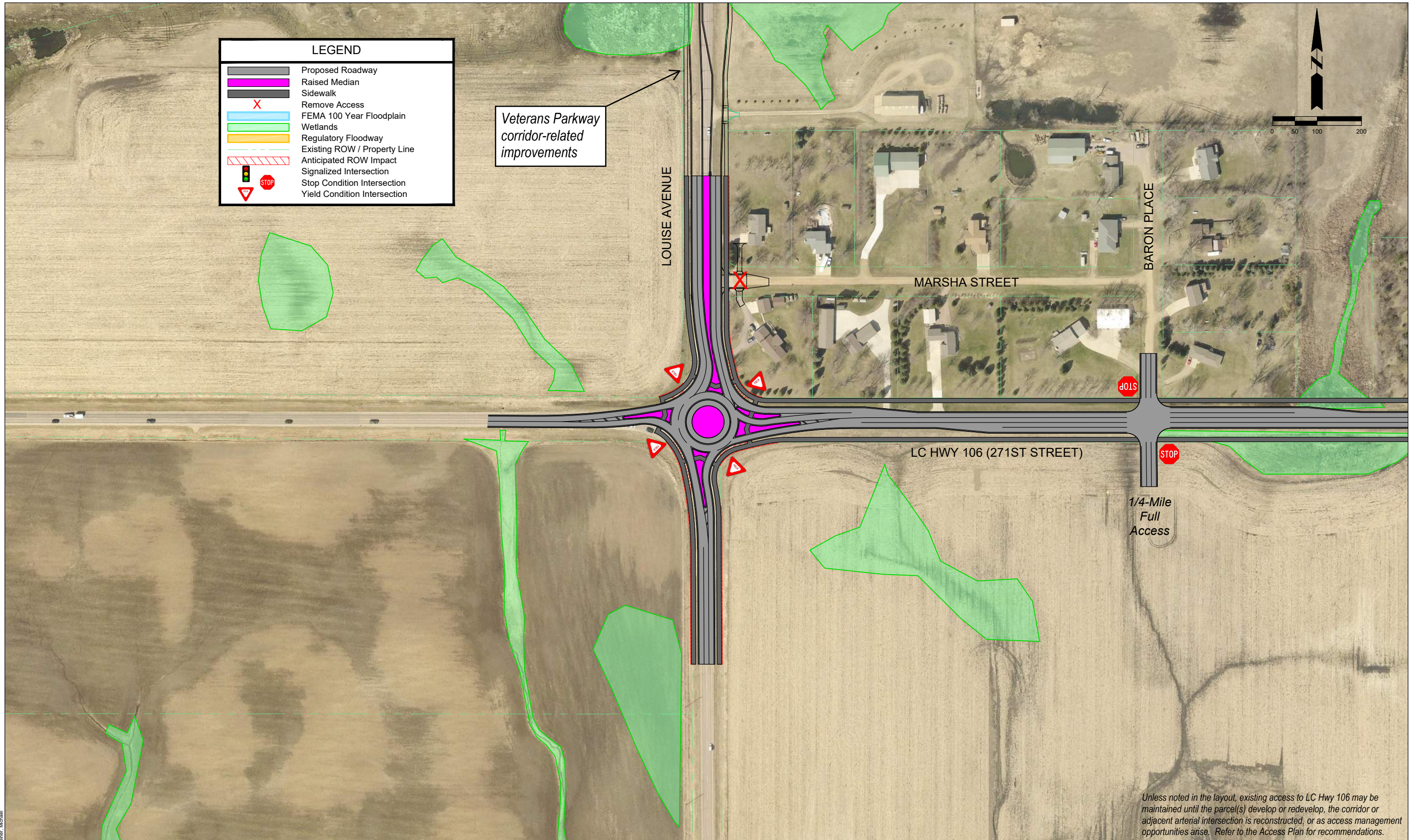
Urban 3-Lane Section: 1 lane each direction plus center left turn lane

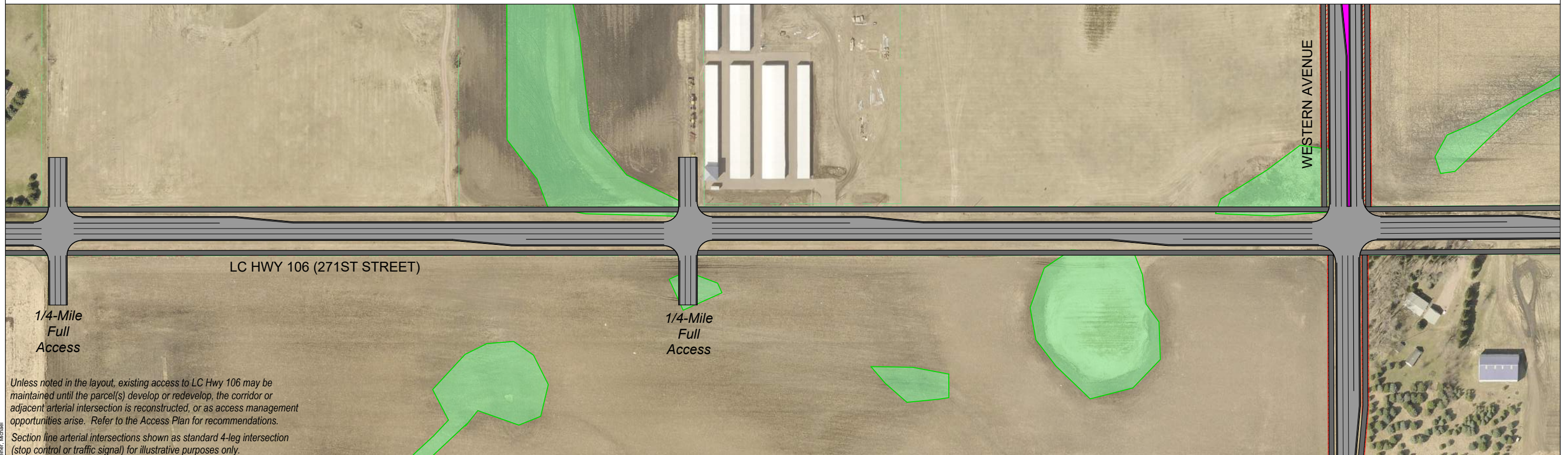
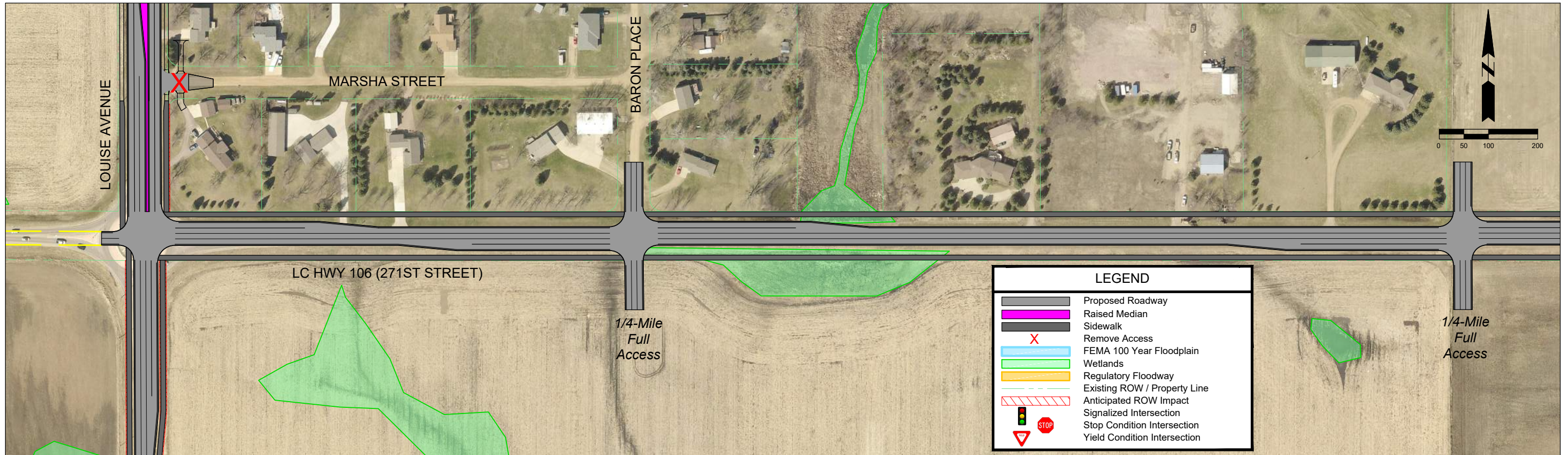
Urban Multilane Section: 2 lanes each direction plus center left turn lane

FIGURE 27

Lincoln County Highway 106 Corridor Study







Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

Section line arterial intersections shown as standard 4-leg intersection (stop control or traffic signal) for illustrative purposes only.

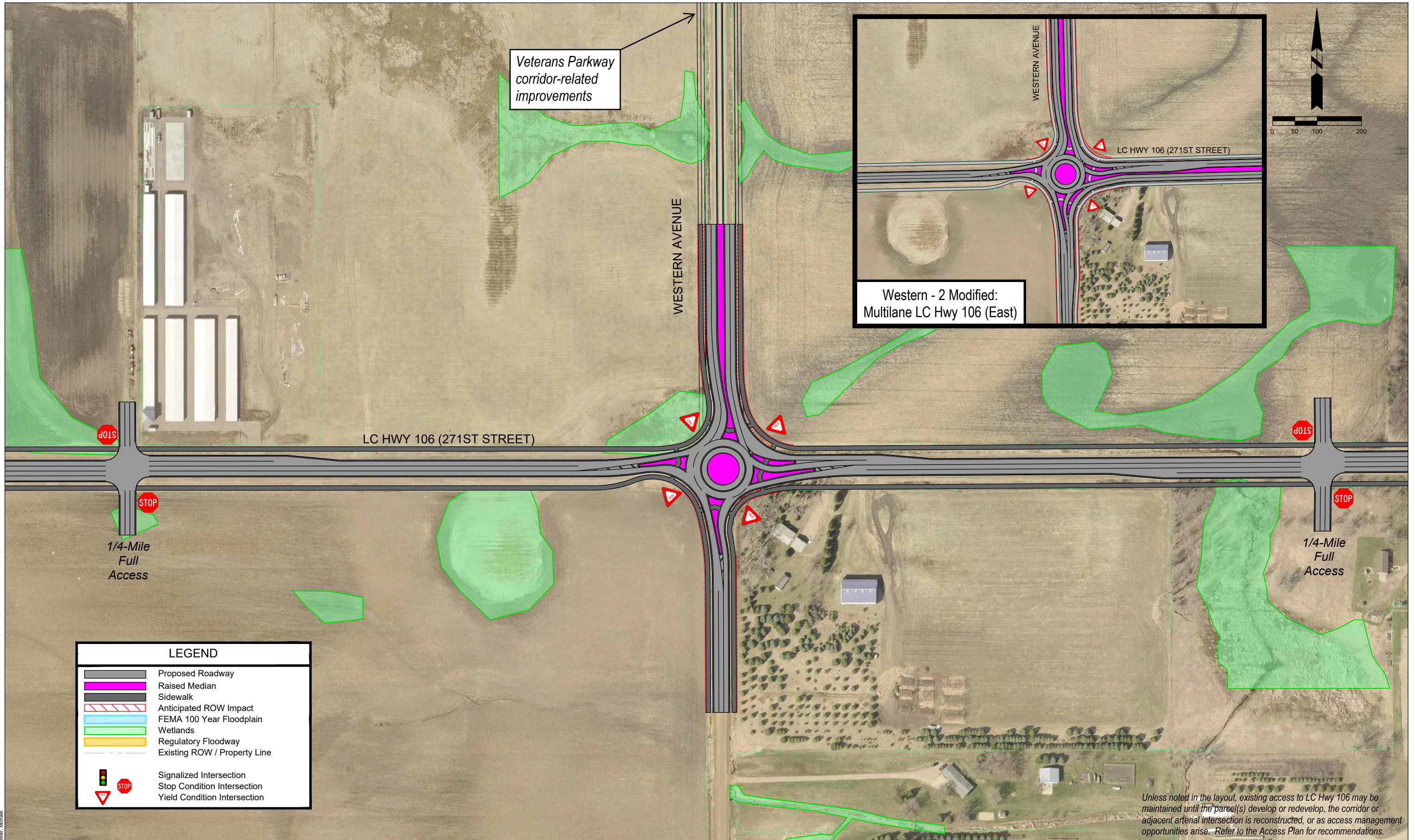
**Recommended Short-Term
and Mid-Term Corridor**

Louise Avenue to Western Avenue (Lincoln County Highway 106 Segment)

LC Hwy 106 Corridor Section: 3-Lane

Alternative
Louise-Western A

Figure
28.b
Rev: 6/23/2023



LEGEND

Proposed Roadway

Raised Median

Sidewalk

Anticipated ROW Impact

FEMA 100 Year Floodplain

Wetlands

Regulatory Floodway

Existing ROW / Property Line

Signalized Intersection

Stop Condition Intersection

Yield Condition Intersection

Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

Recommended Short-Term
and Mid-Term Corridor

Western Avenue & Lincoln County Highway 106 Intersection

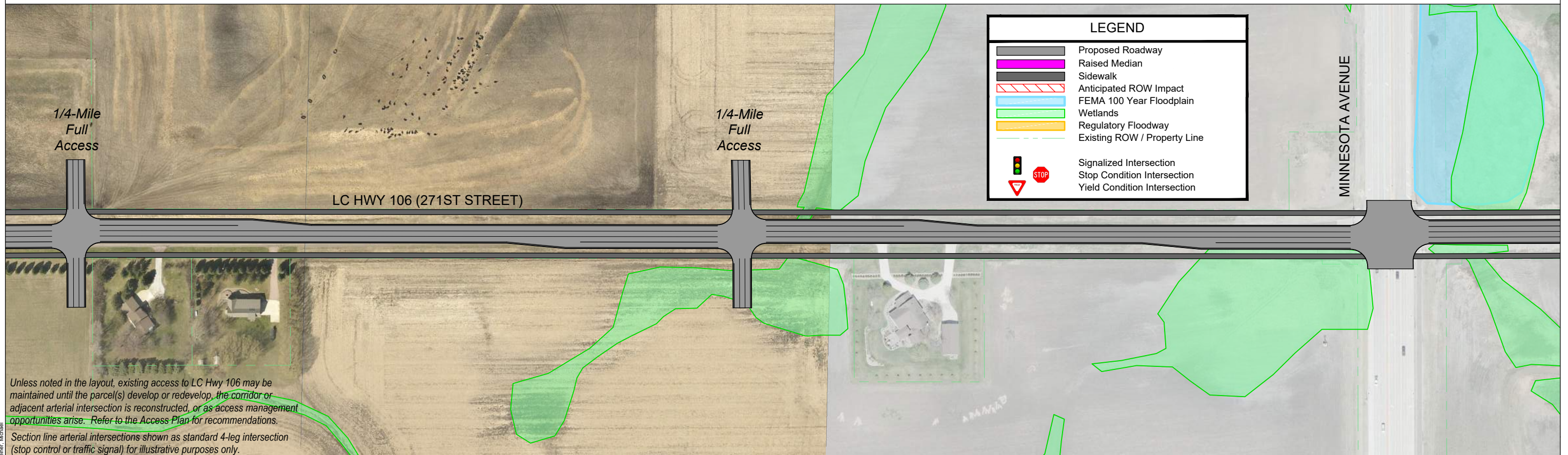
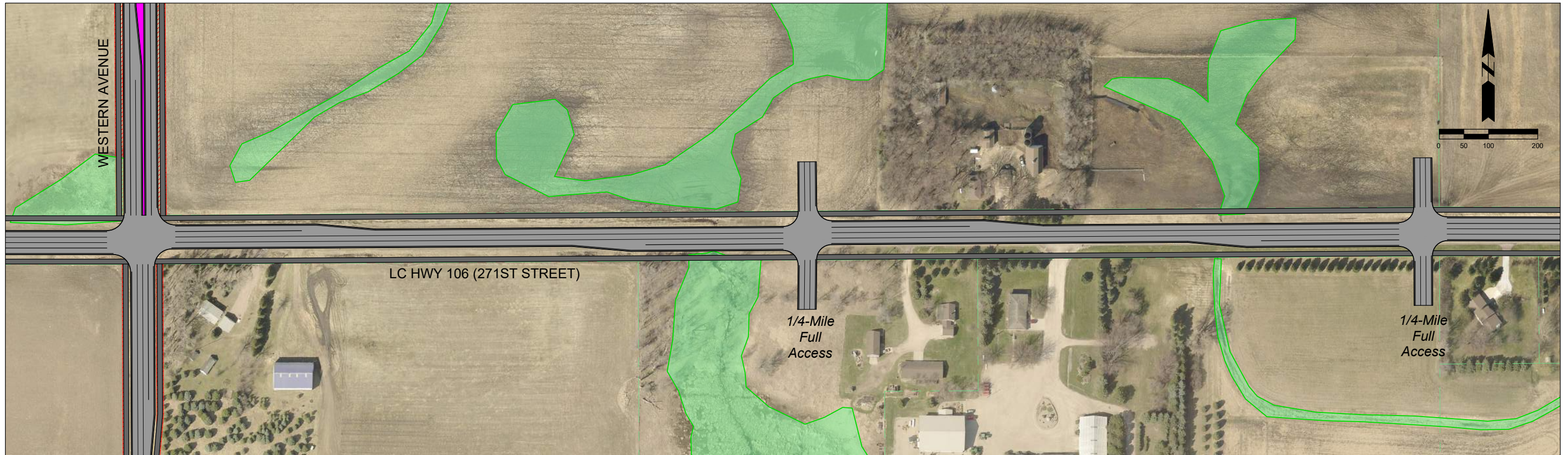
Intersection Type: Multilane Roundabout

LC Hwy 106 Corridor Section: 3-Lane

Alternative
Western - 2

Figure
28.c
Rev: 6/23/2023

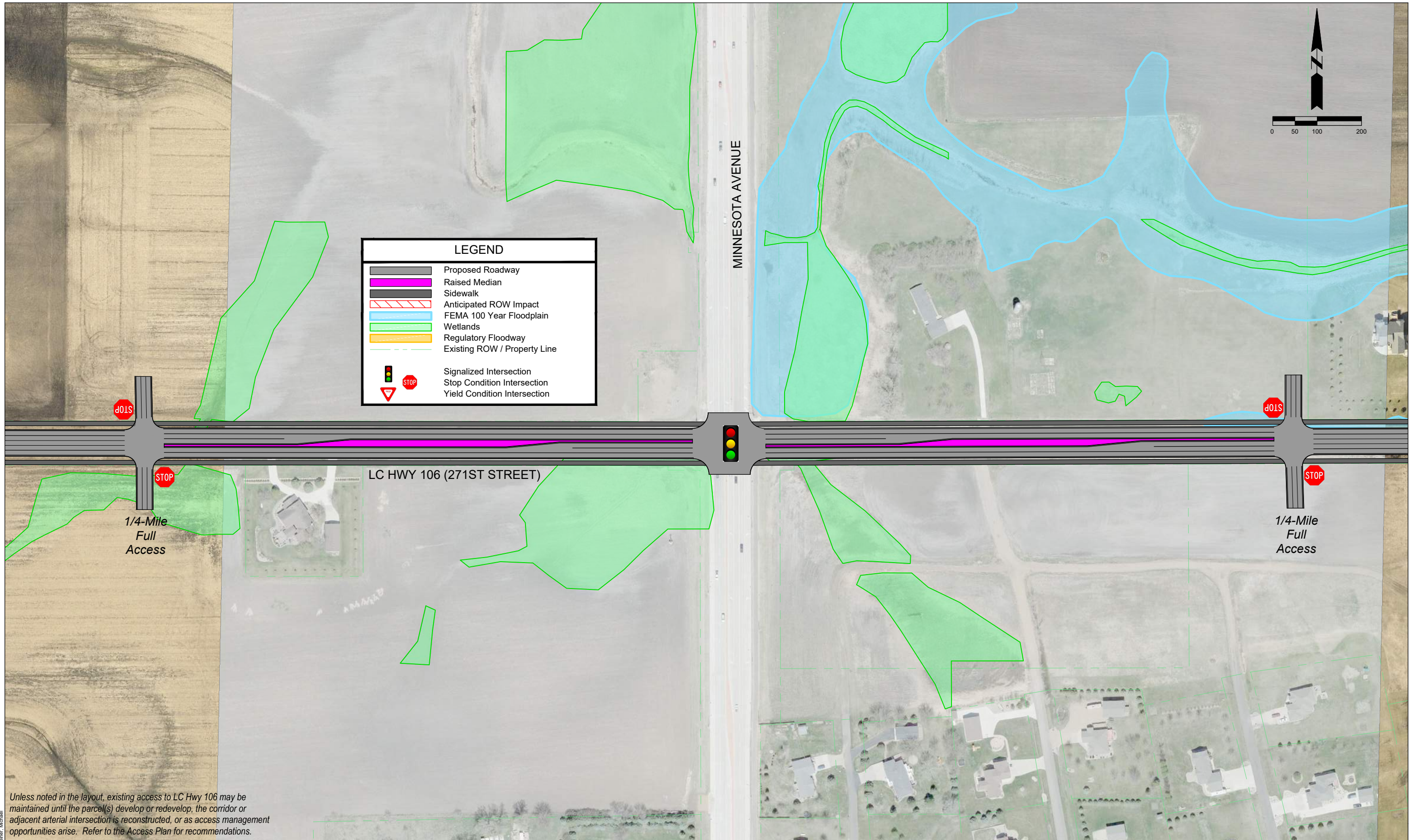
C:\working\central\013063525\County 106 RA Op2 Figures.dwg
PLOT DATE: 6/23/2023 11:55 AM Sener, Michael



Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

Section line arterial intersections shown as standard 4-leg intersection (stop control or traffic signal) for illustrative purposes only.

C:\pwworking\central\0143063525\County 106 3 Line Figures.dwg PLOT DATE: 6/23/2023 12:02 PM Senior: Michael



Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

Recommended Short-Term and Mid-Term Corridor

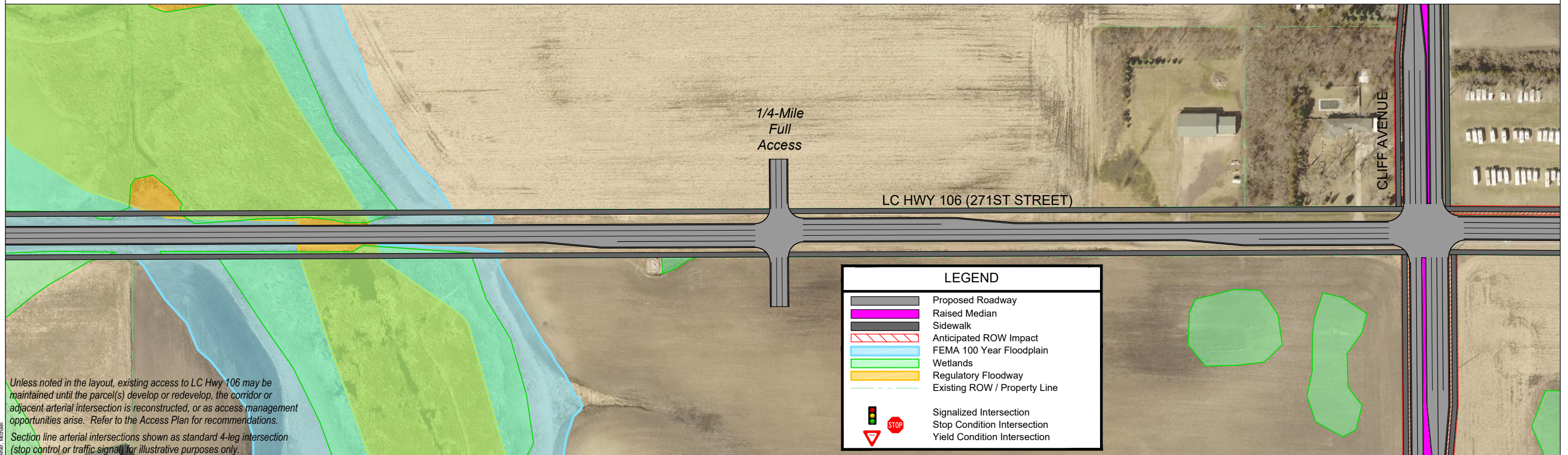
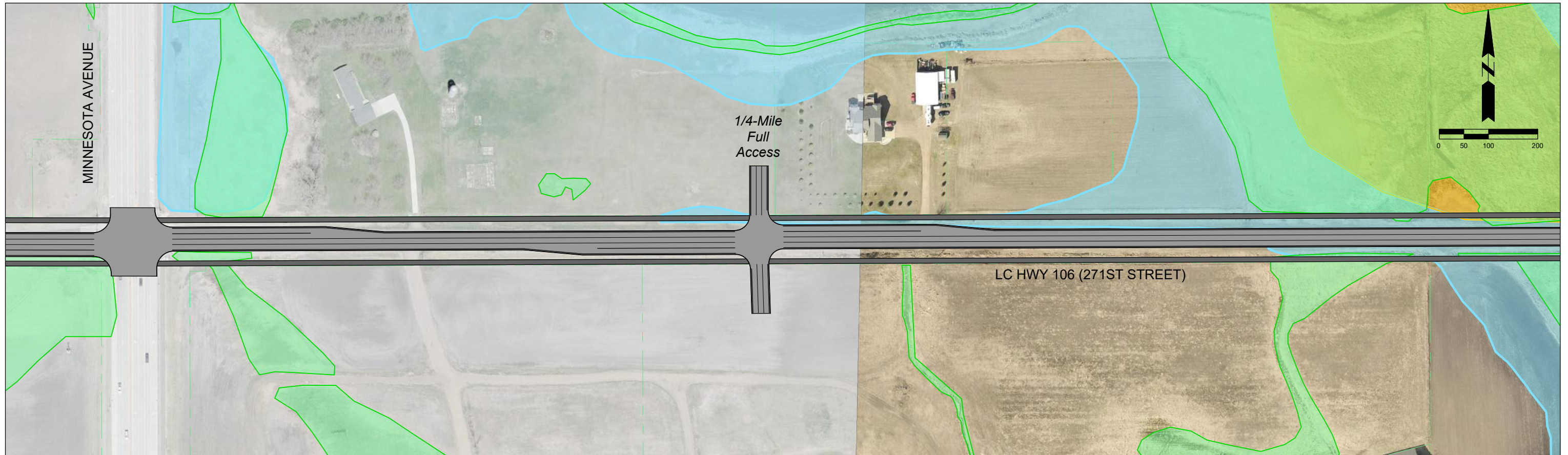
Minnesota Avenue (SD115) & Lincoln County Highway 106 Intersection

Intersection Type: Traffic Signal LC Hwy 106 Corridor Section: Multilane

Alternative
Minnesota - 2

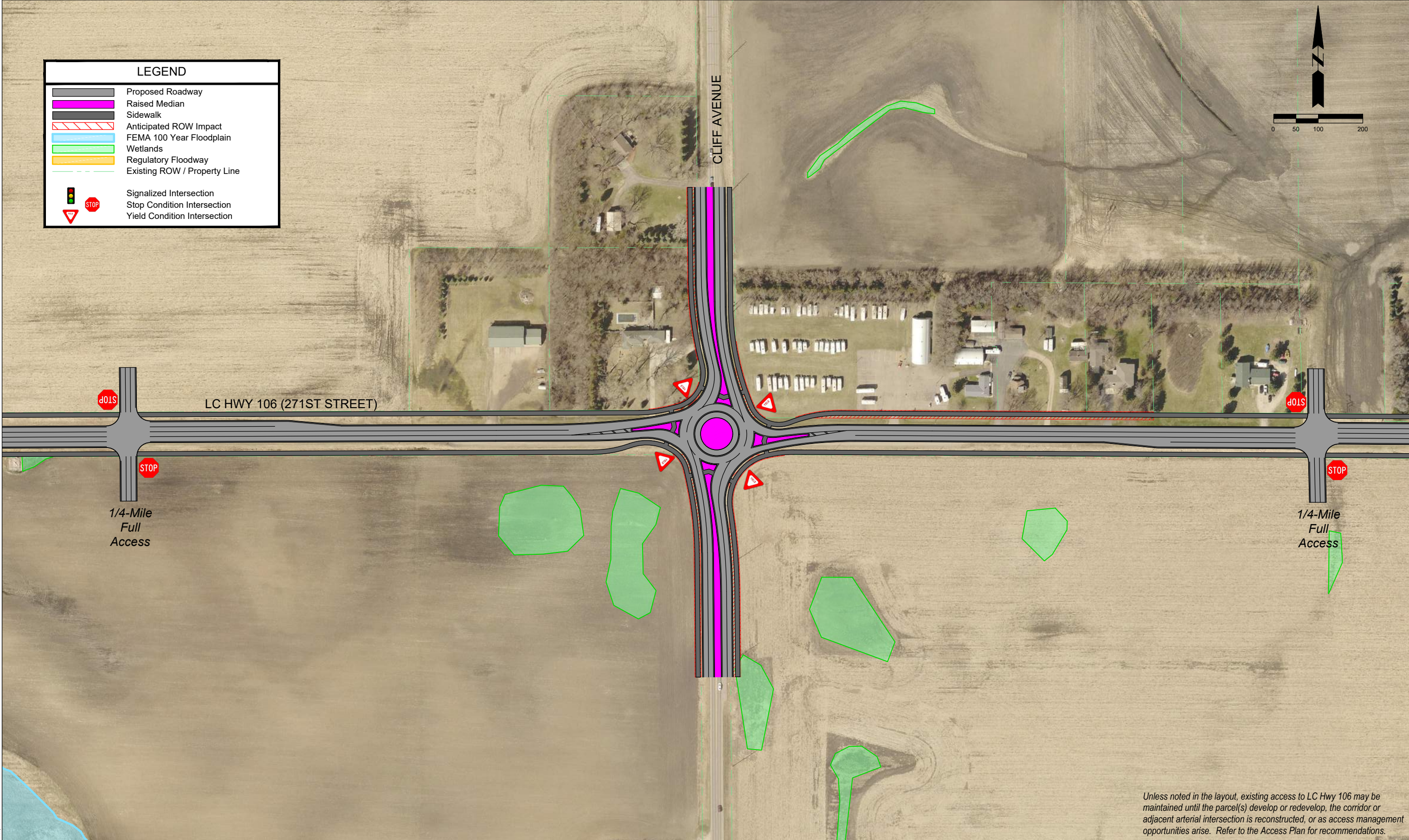
Figure
28.e

Rev: 6/23/2023



Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

Section line arterial intersections shown as standard 4-leg intersection (stop control or traffic signal) for illustrative purposes only.



LEGEND

Proposed Roadway

Raised Median

Sidewalk

Anticipated ROW Impact

FEMA 100 Year Floodplain

Wetlands

Regulatory Floodway

Existing ROW / Property Line

Signalized Intersection

STOP

Stop Condition Intersection

Yield Condition Intersection

Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

C:\pwworking\central\0143063529\County 106 RA Opt Figures.dwg
PLOT DATE: 6/23/2023 11:55 AM
Sener, Michael

SECOG

SOUTH EASTERN COUNCIL OF GOVERNMENTS

SOUTH DAKOTA

LINCOLN COUNTY

SIoux FALLS

SOUTH DAKOTA

SD DOT

Recommended Short-Term
and Mid-Term Corridor

Cliff Avenue & Lincoln County Highway 106 Intersection

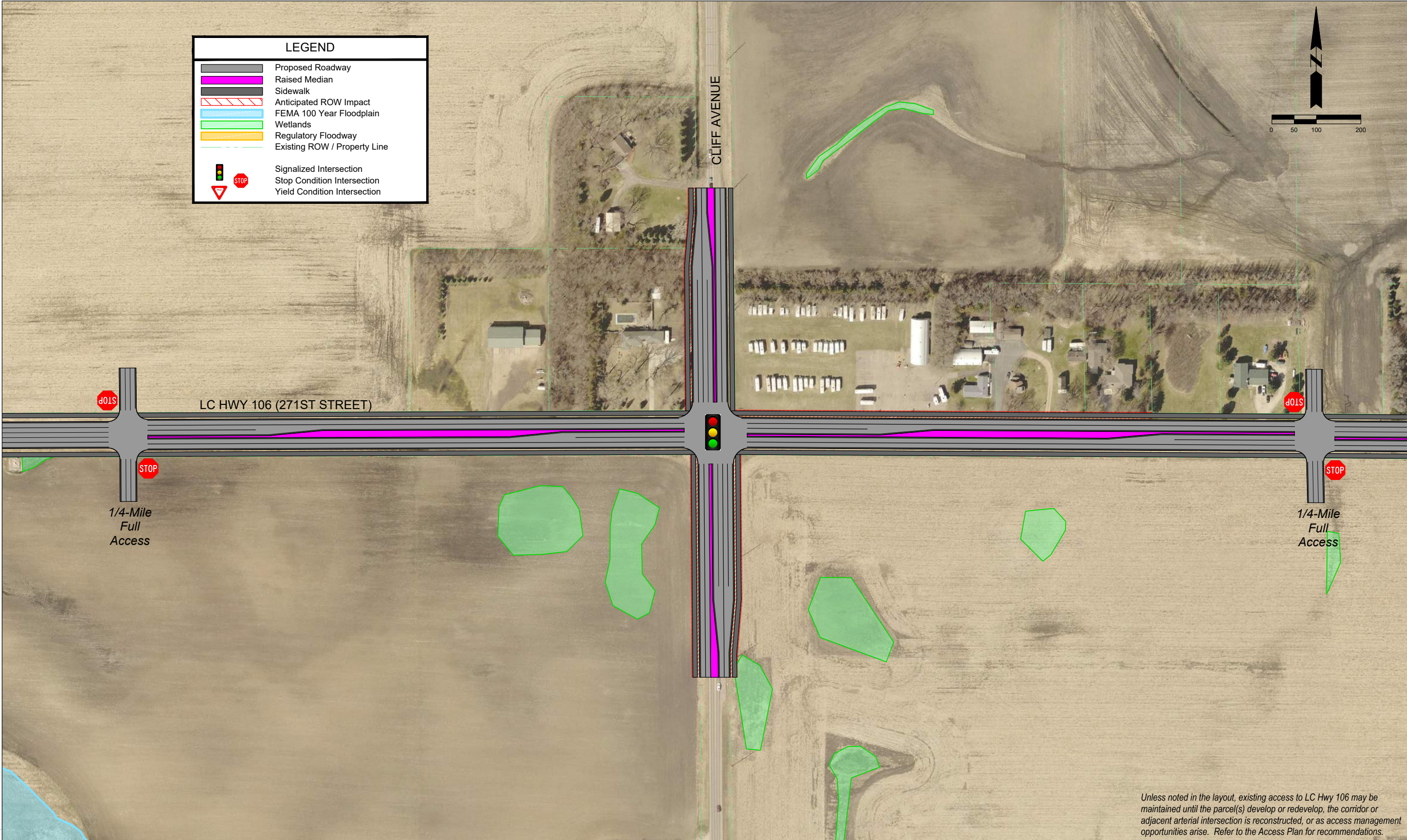
Intersection Type: Multilane Roundabout

LC Hwy 106 Corridor Section: 3-Lane

Alternative
Cliff - 2

Figure
28.g

Rev: 6/23/2023



LEGEND

Proposed Roadway

Raised Median

Sidewalk

Anticipated ROW Impact

FEMA 100 Year Floodplain

Wetlands

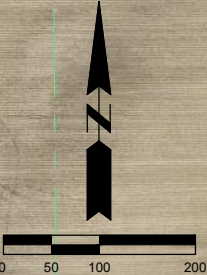
Regulatory Floodway

Existing ROW / Property Line

Signalized Intersection

Stop Condition Intersection

Yield Condition Intersection



Cliff Avenue & Lincoln County Highway 106 Intersection

Intersection Type: Traffic Signal LC Hwy 106 Corridor Section: Multilane

Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

Alternative
Cliff - 4

Figure
28.h

Rev: 6/23/2023

SECOCG

SOUTH EASTERN COUNCIL OF GOVERNMENTS

LINCOLN COUNTY

SIoux FALLS

SOUTH DAKOTA

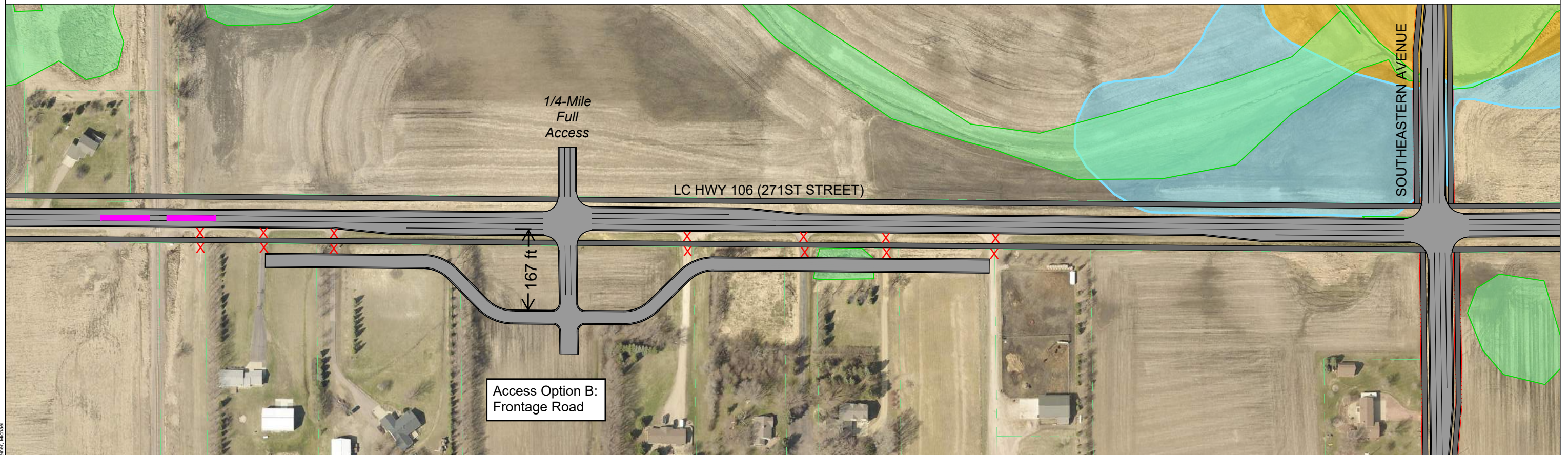
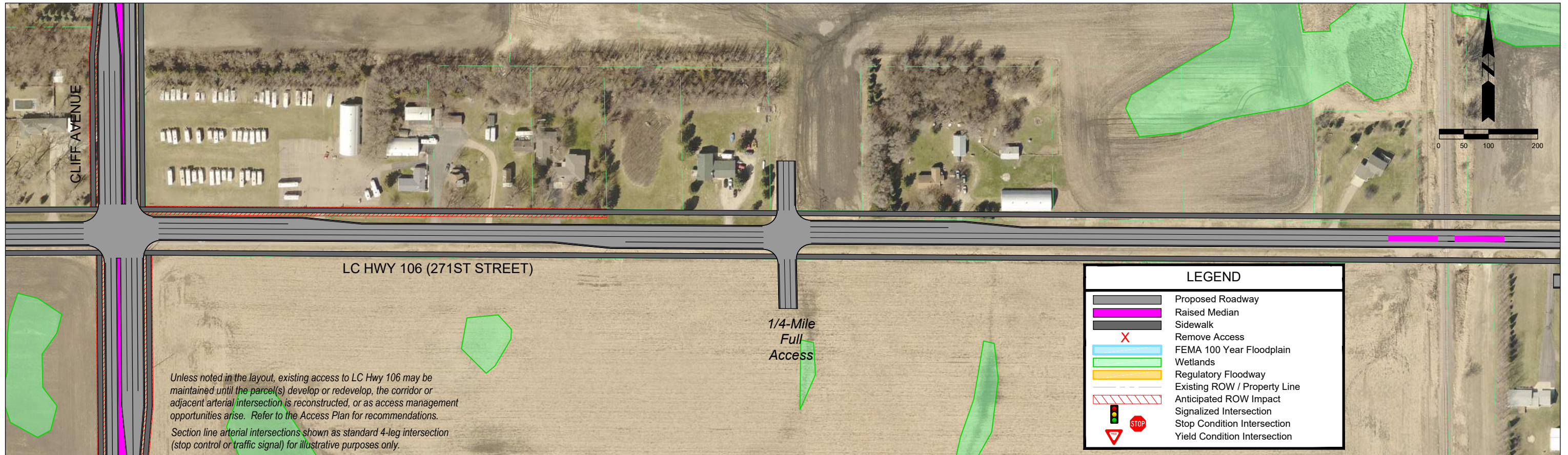
SD DOT

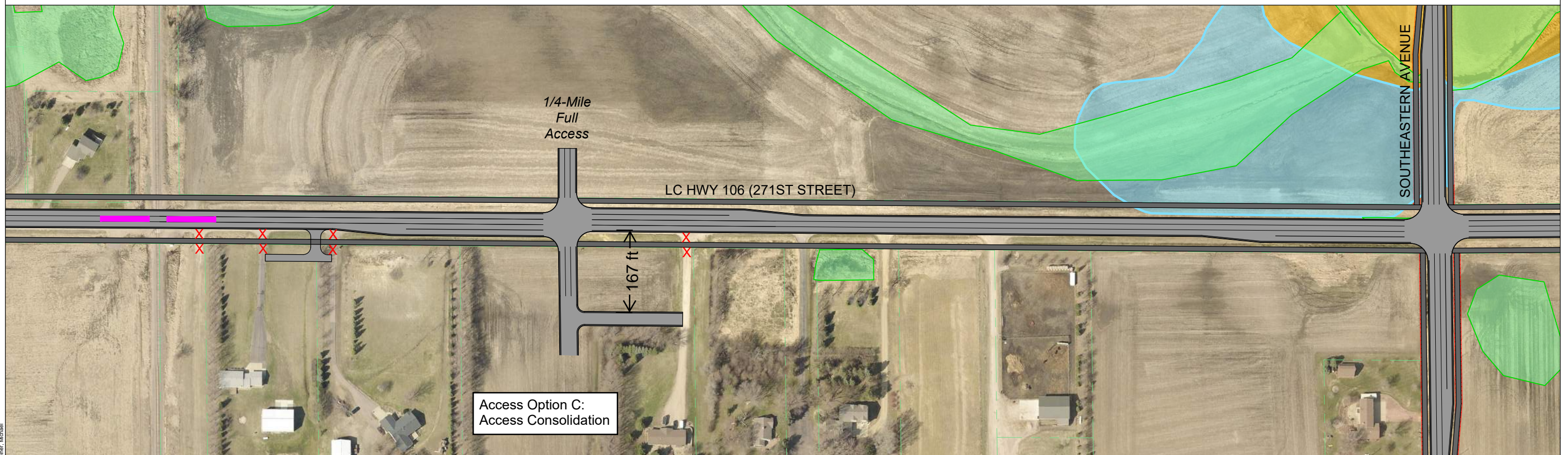
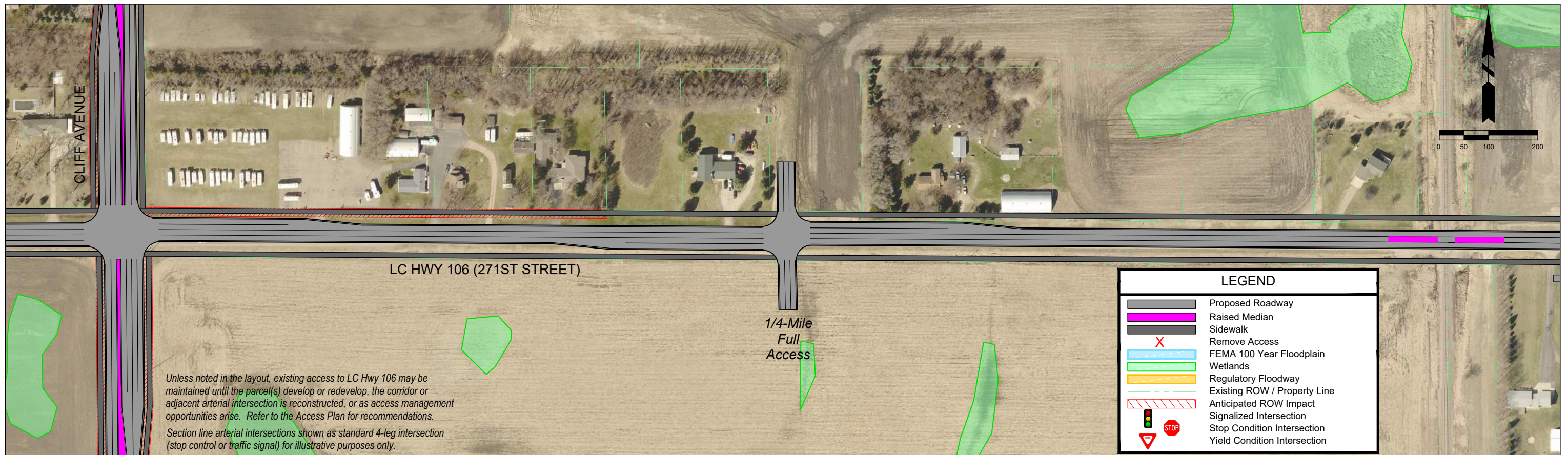
Recommended Short-Term
and Mid-Term Corridor

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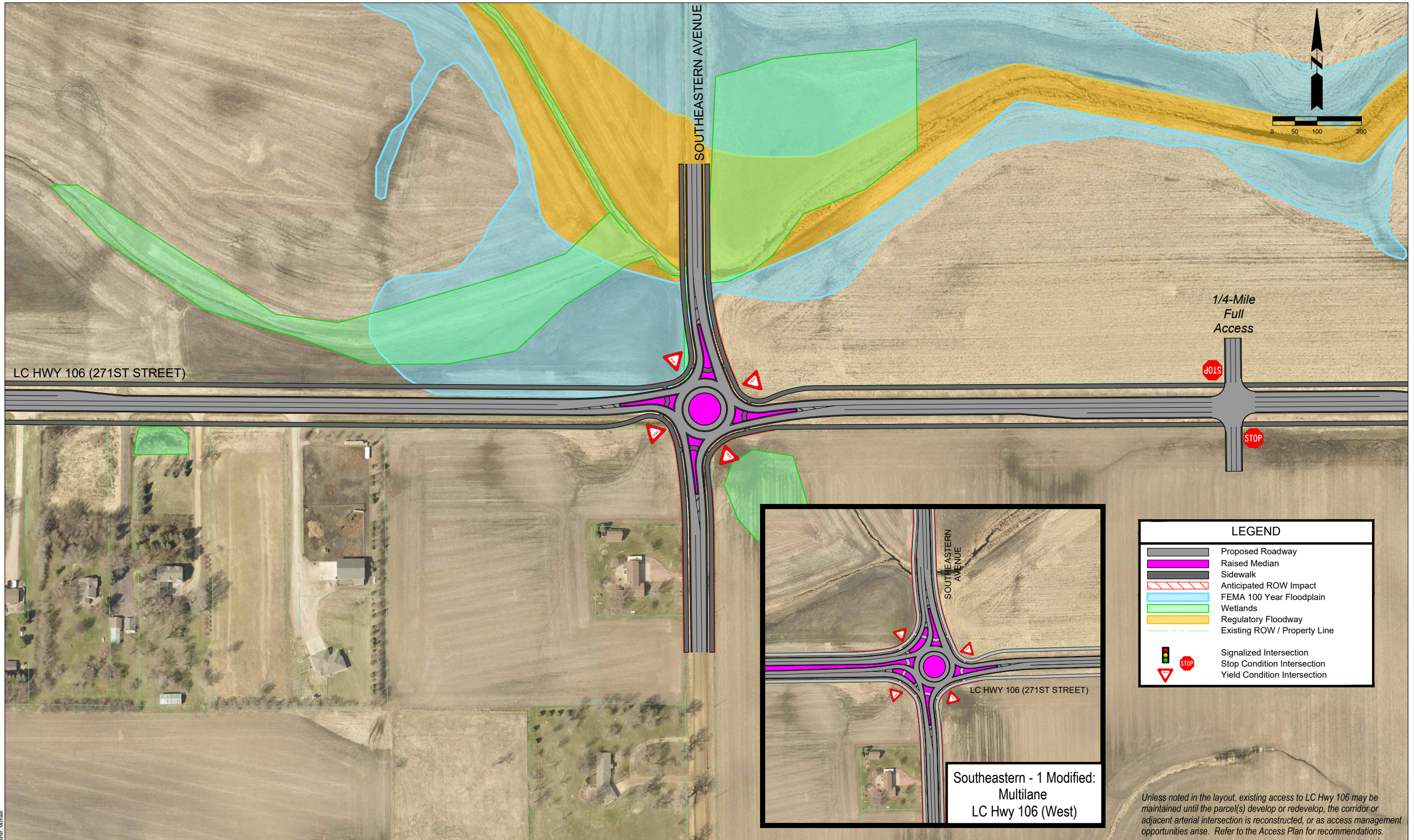
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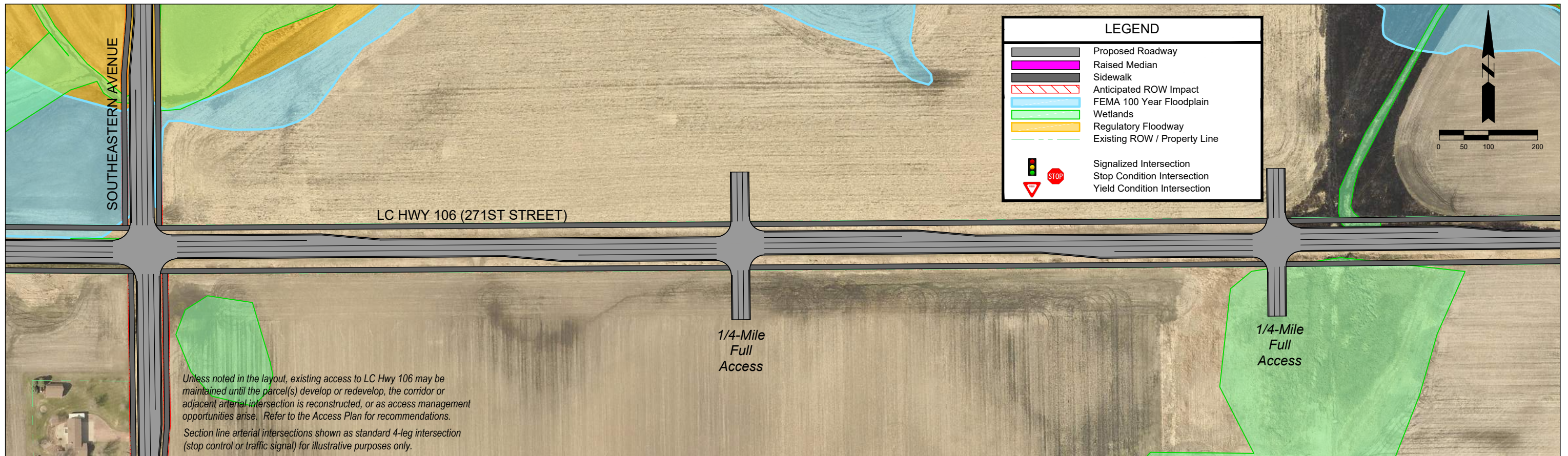
Seiner, Michael

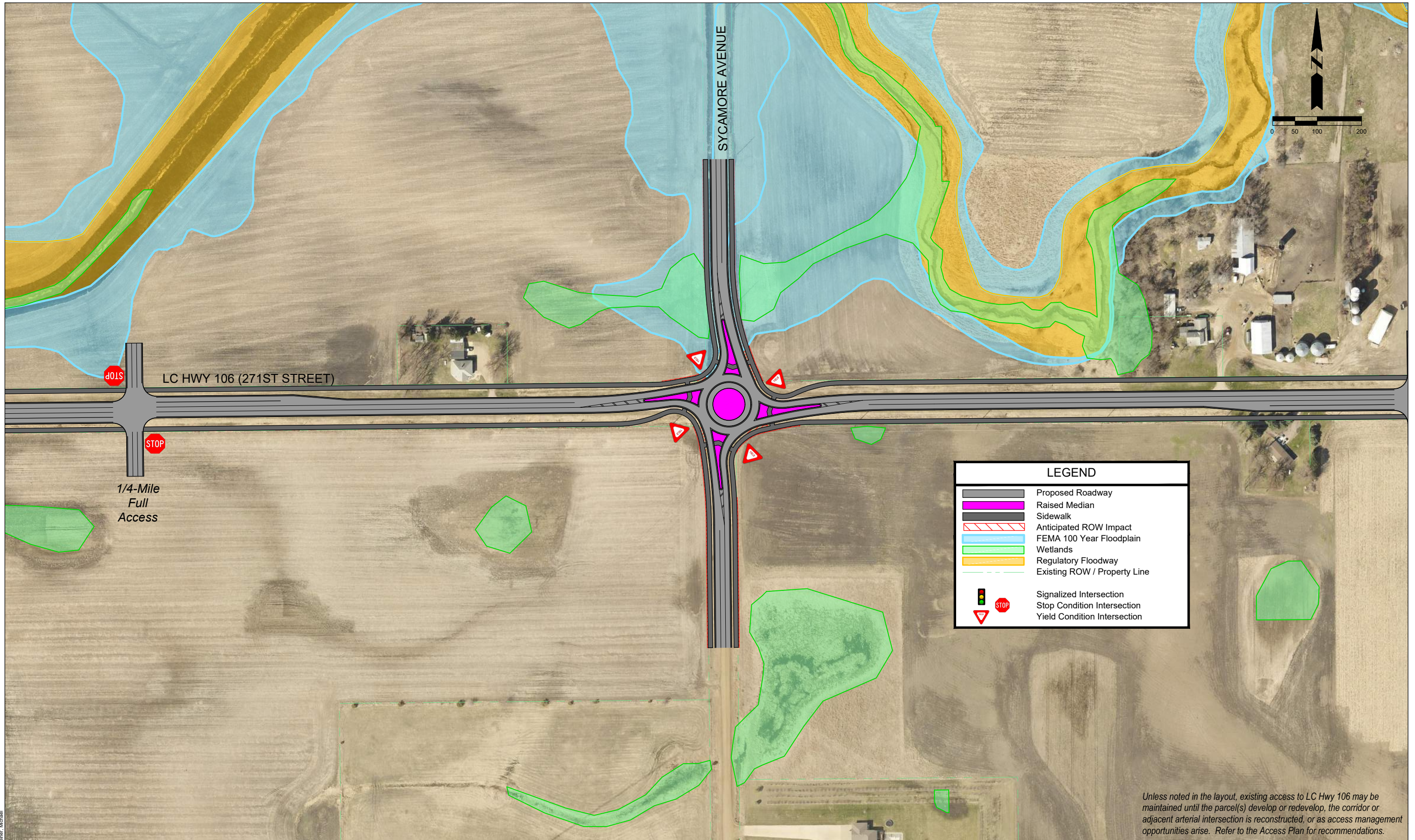




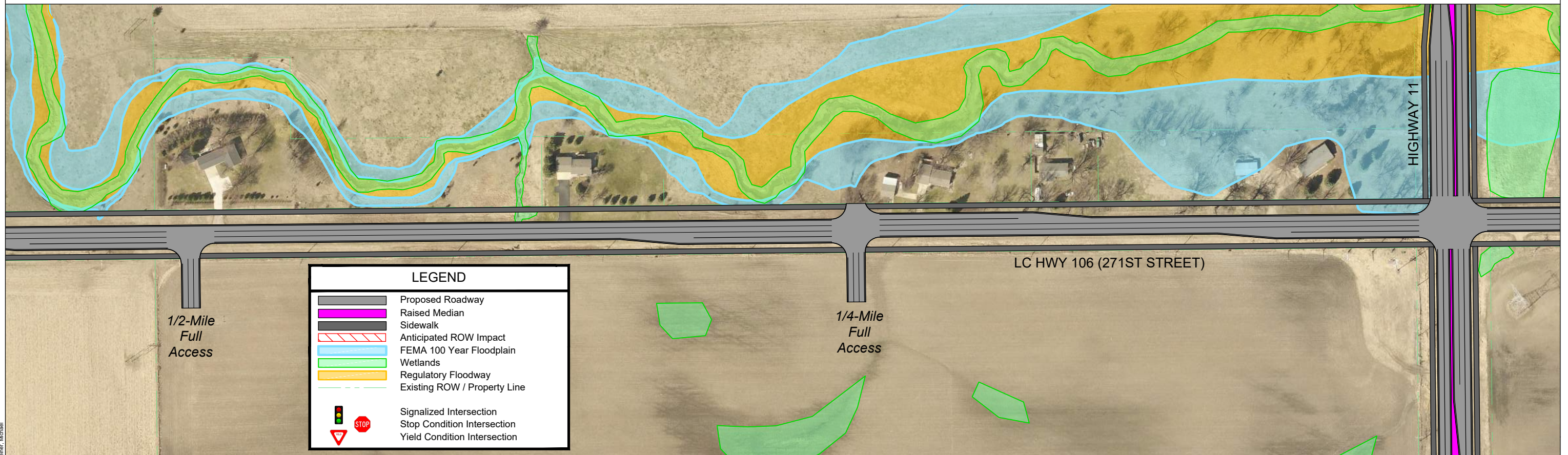
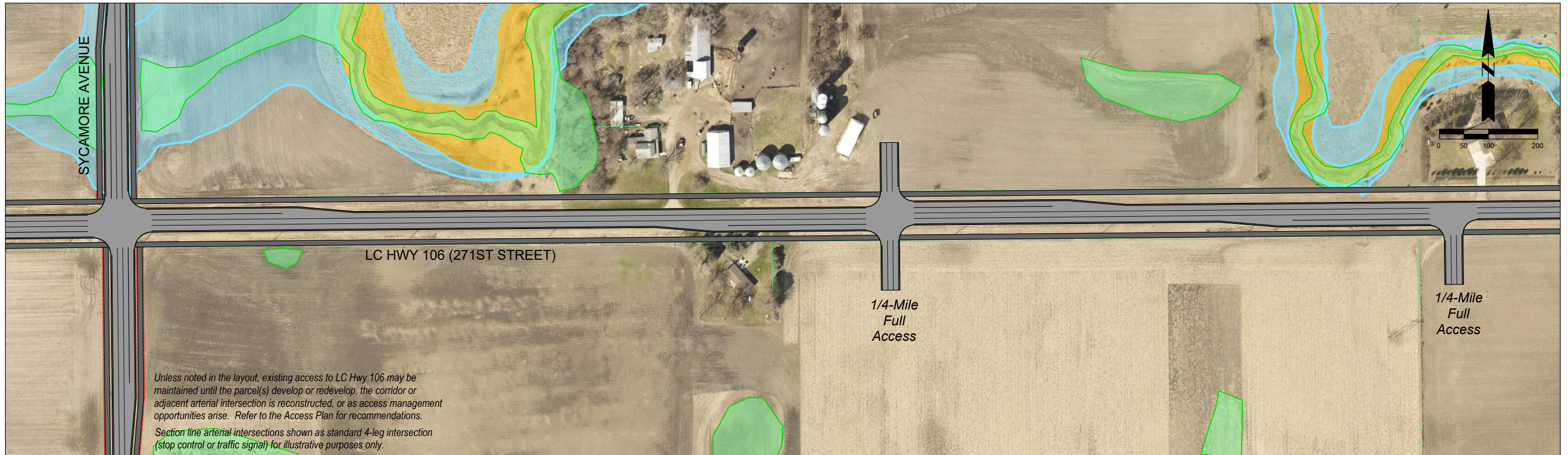
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PLOT DATE: 6/23/2023 12:03 PM, Sener, Michael

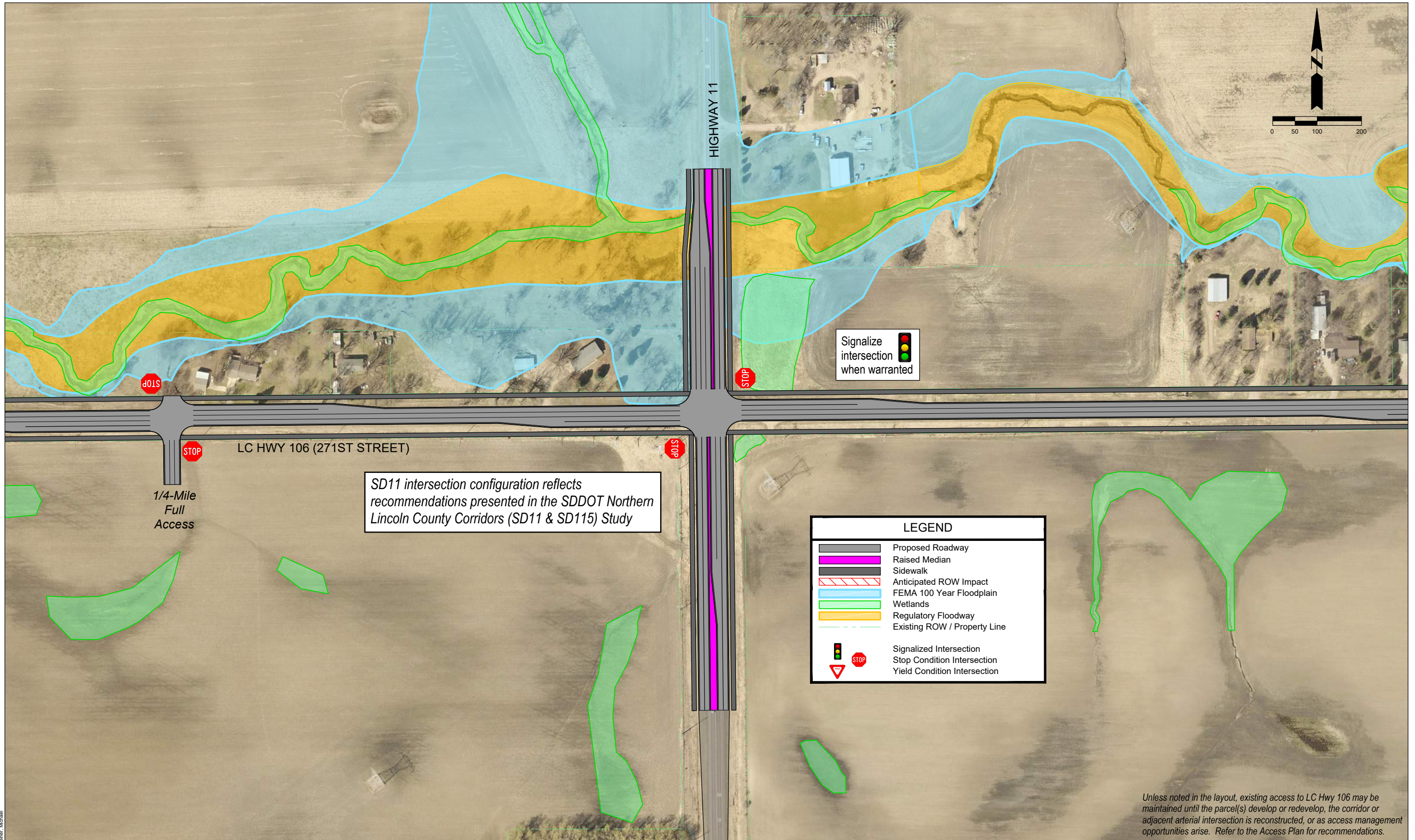






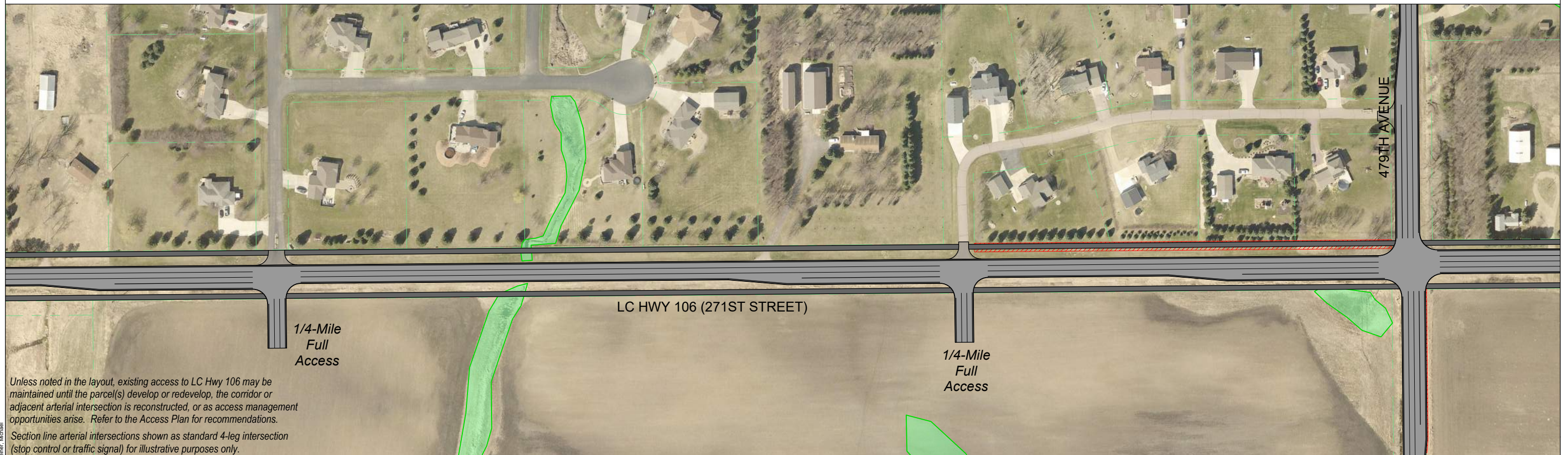
Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.





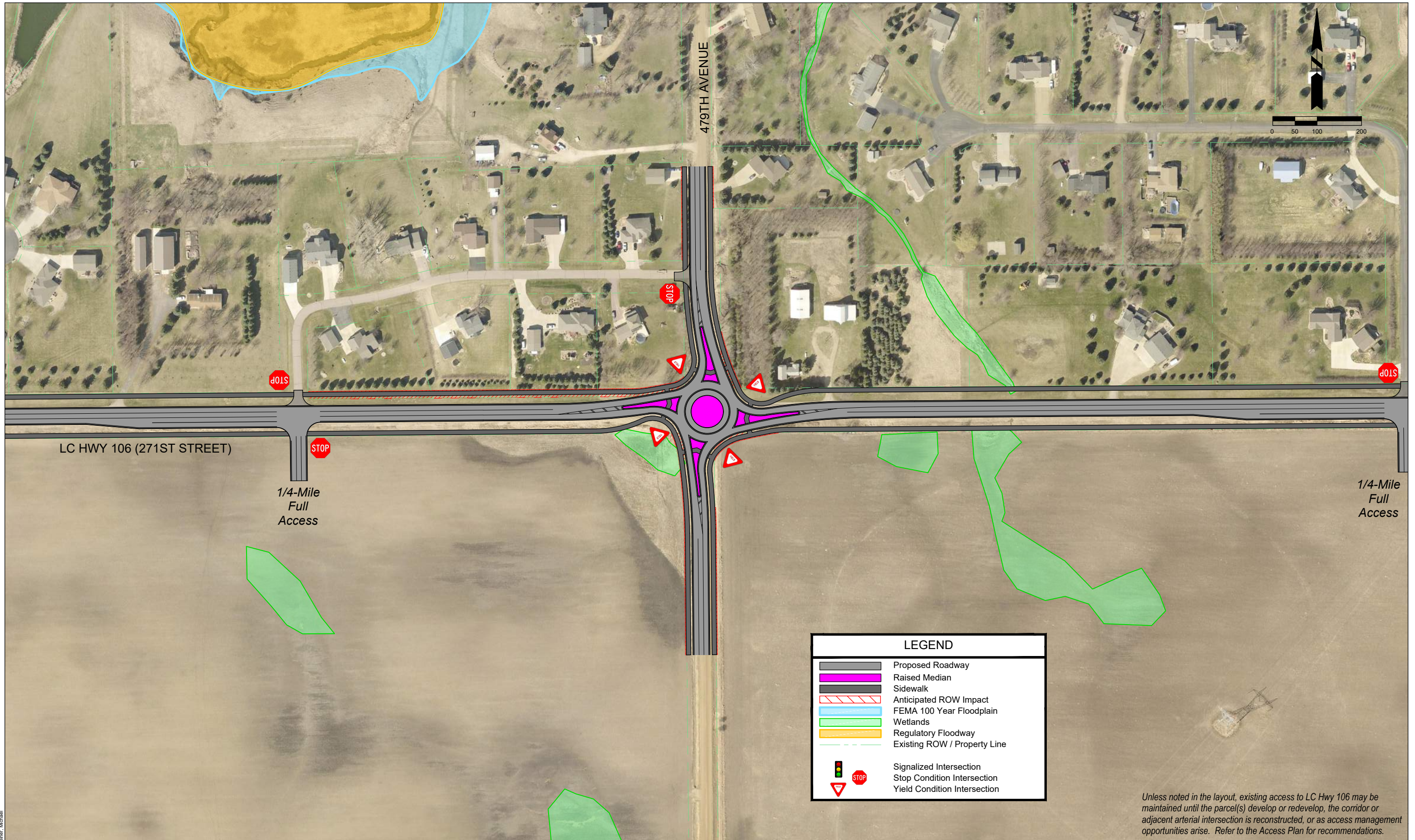
Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

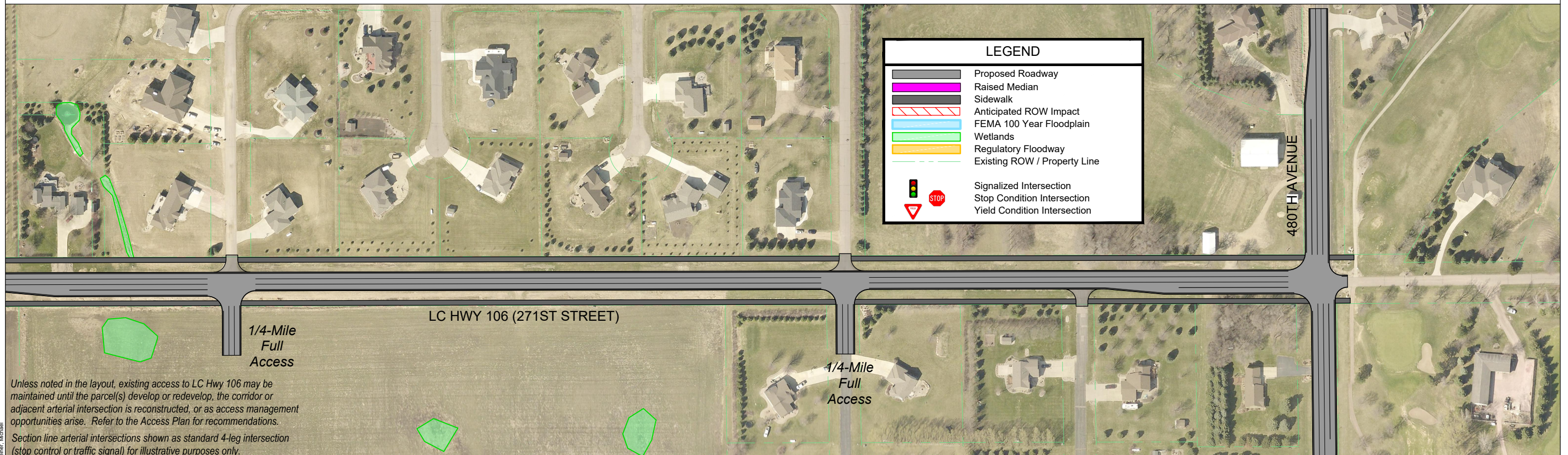
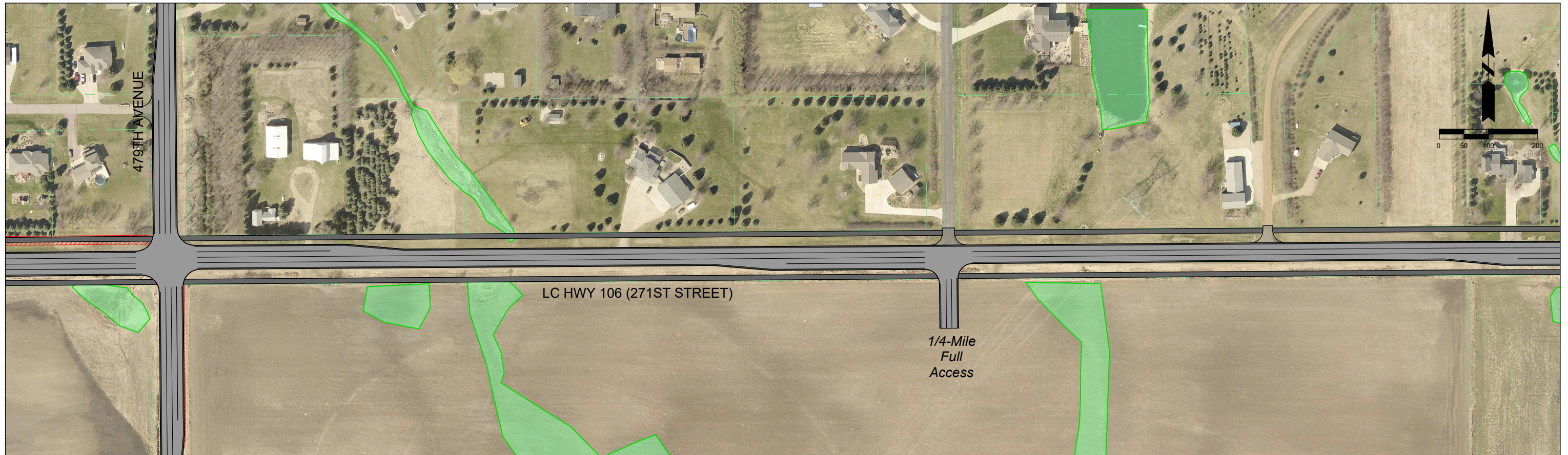
C:\working\central\01306525\County 106 3 Line Figures.dwg
PLOT DATE: 6/23/2023 12:04 PM, Sener, Michael



Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

Section line arterial intersections shown as standard 4-leg intersection (stop control or traffic signal) for illustrative purposes only.

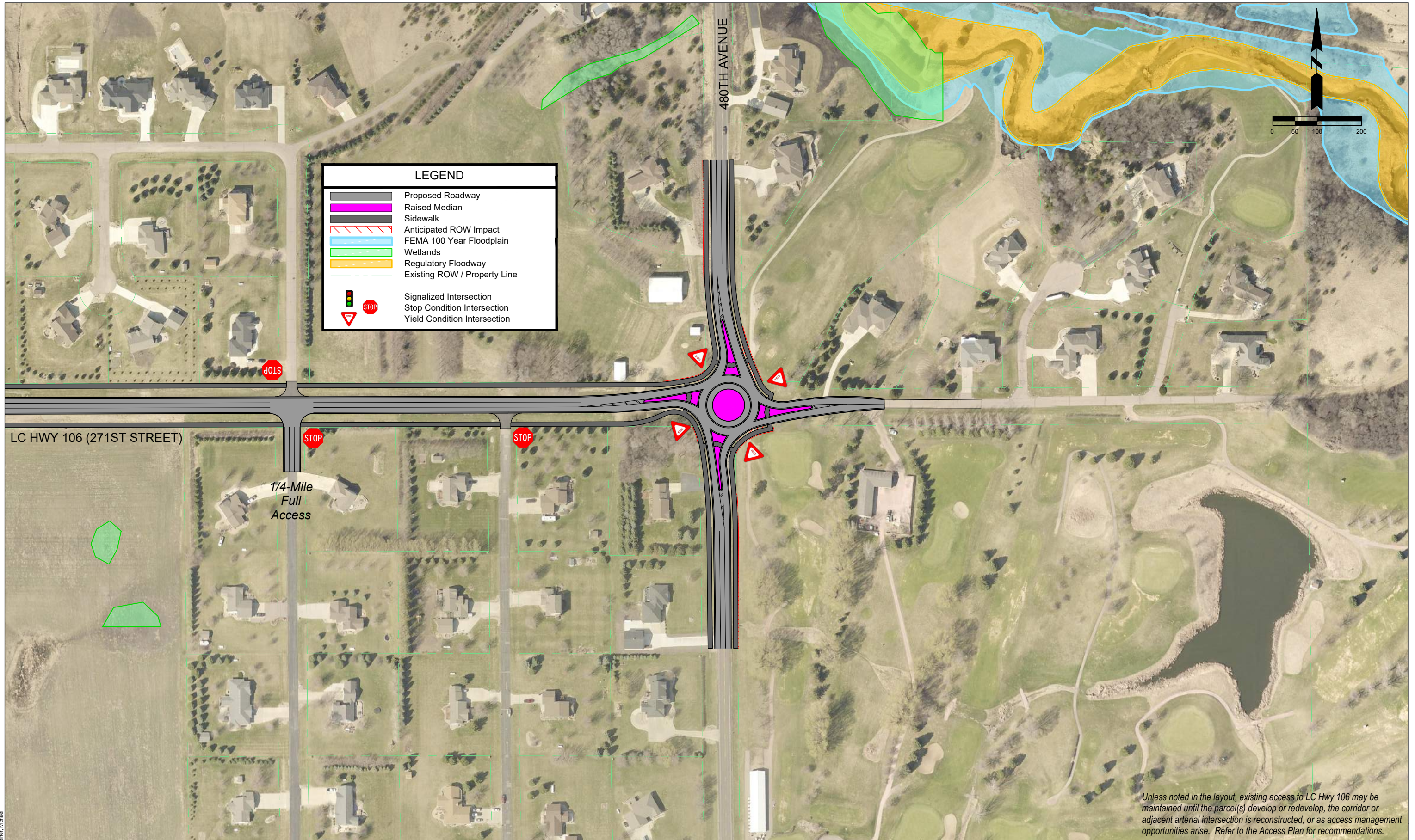




Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

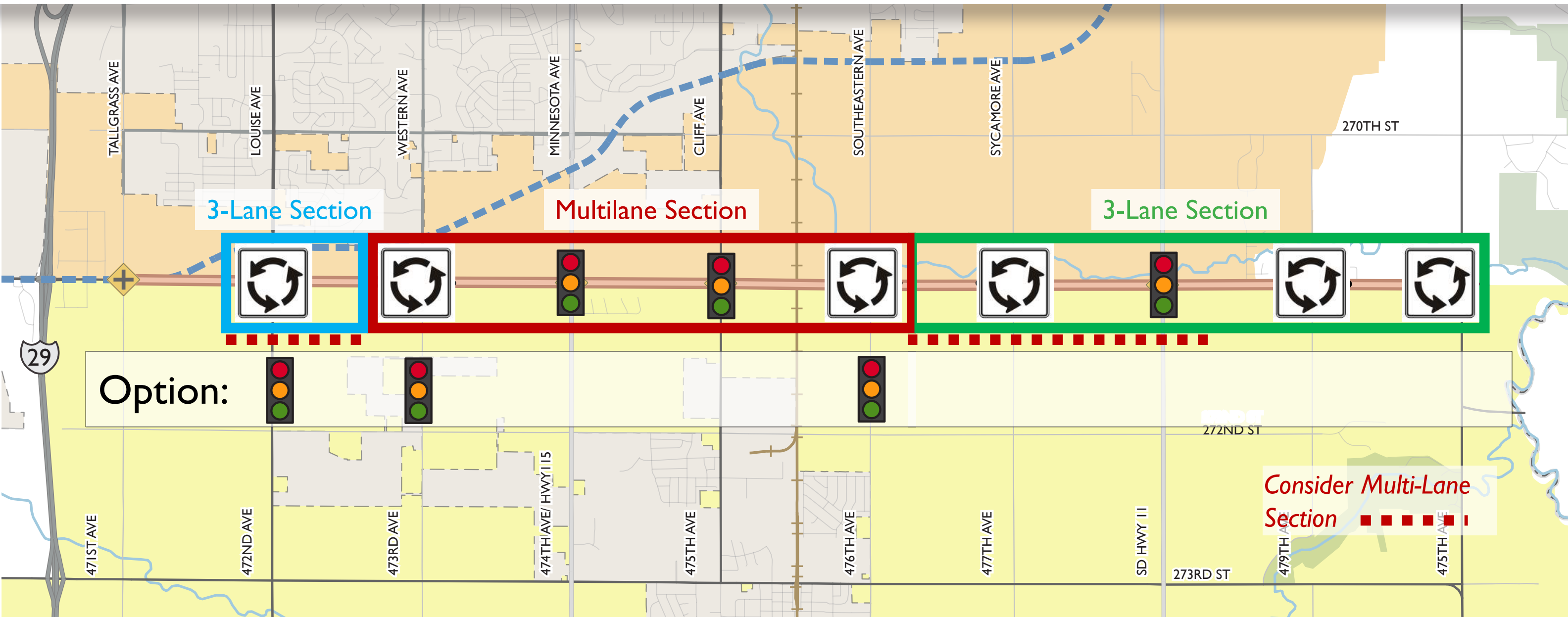
Section line arterial intersections shown as standard 4-leg intersection (stop control or traffic signal) for illustrative purposes only.

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PLOT DATE: 6/23/2023 12:00 PM, Senior: Michael

LONG-TERM RECOMMENDATIONS



INTERSECTIONS:

Roundabout 

Traffic Signal 

Stop Signs 

ROAD SEGMENTS:

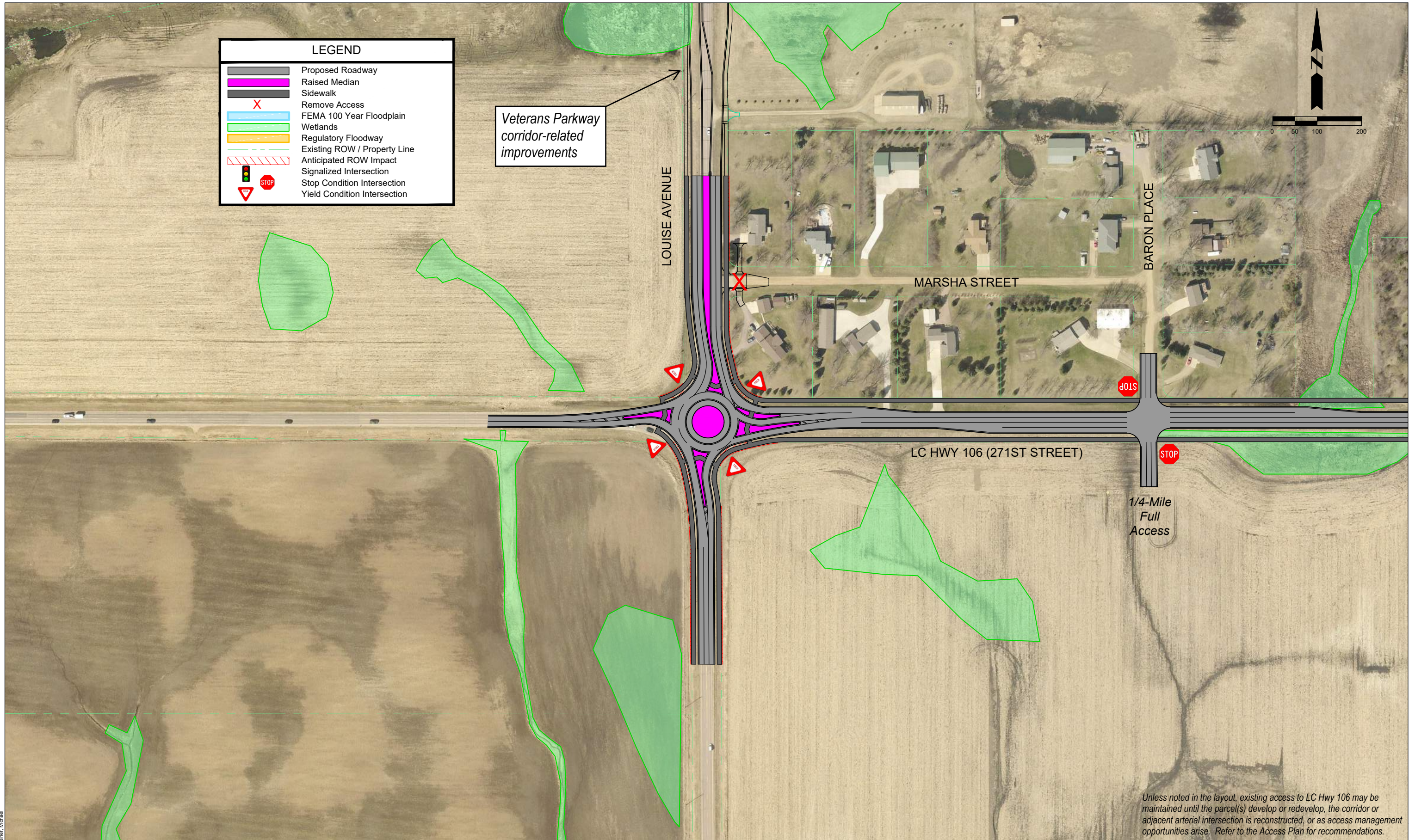
Urban 3-Lane Section: 1 lane each direction plus center left turn lane

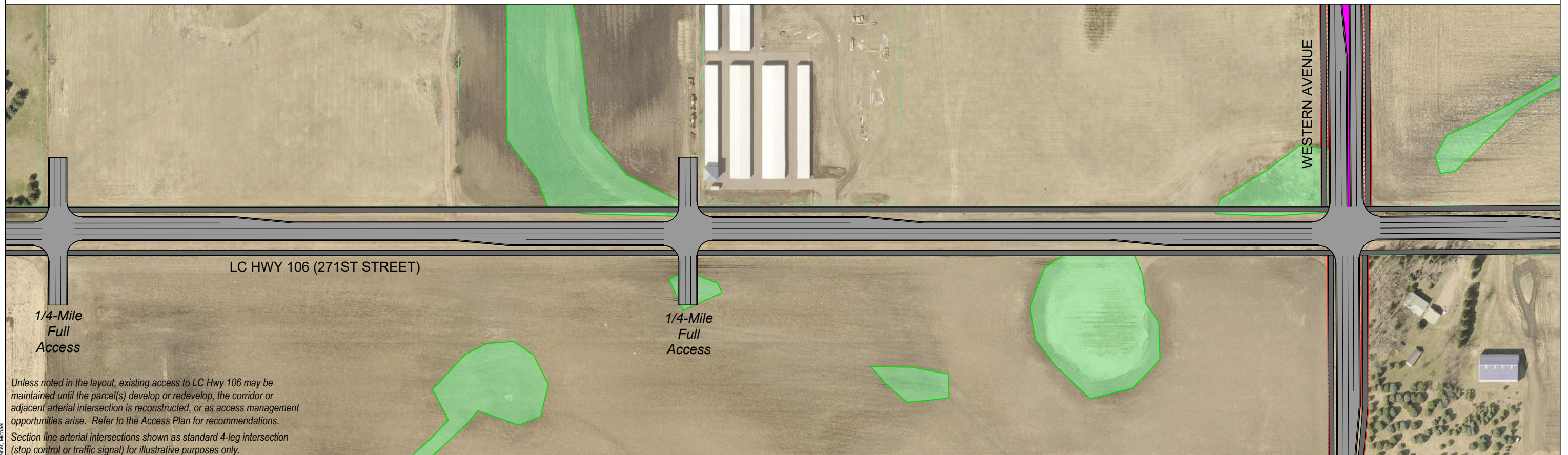
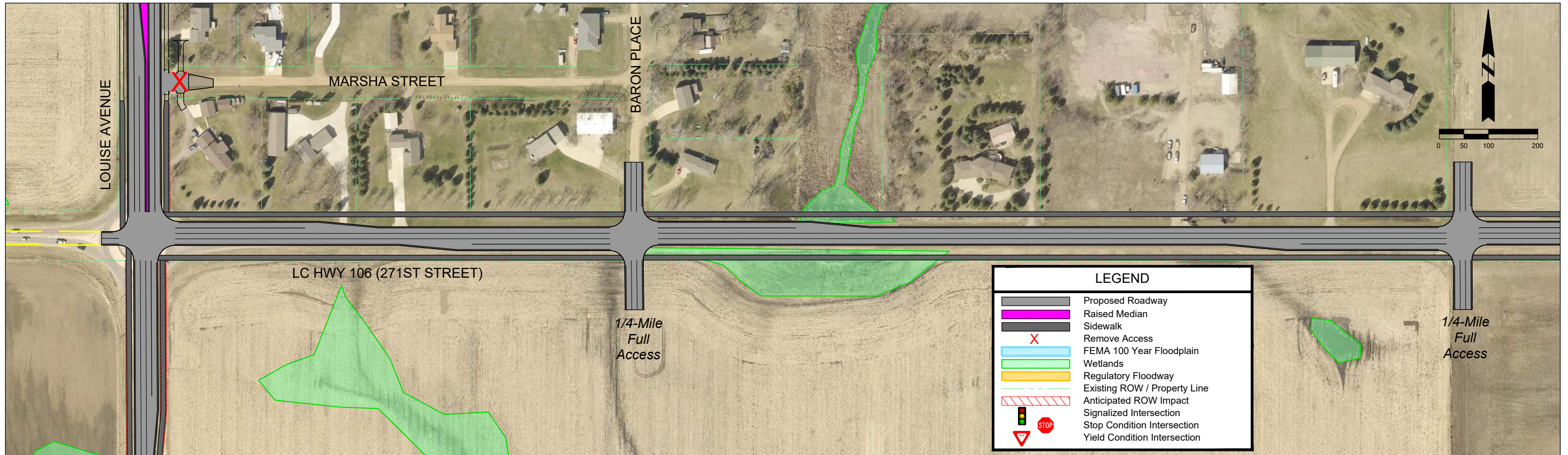
Urban Multilane Section: 2 lanes each direction plus center left turn lane

FIGURE 29

Lincoln County Highway 106 Corridor Study

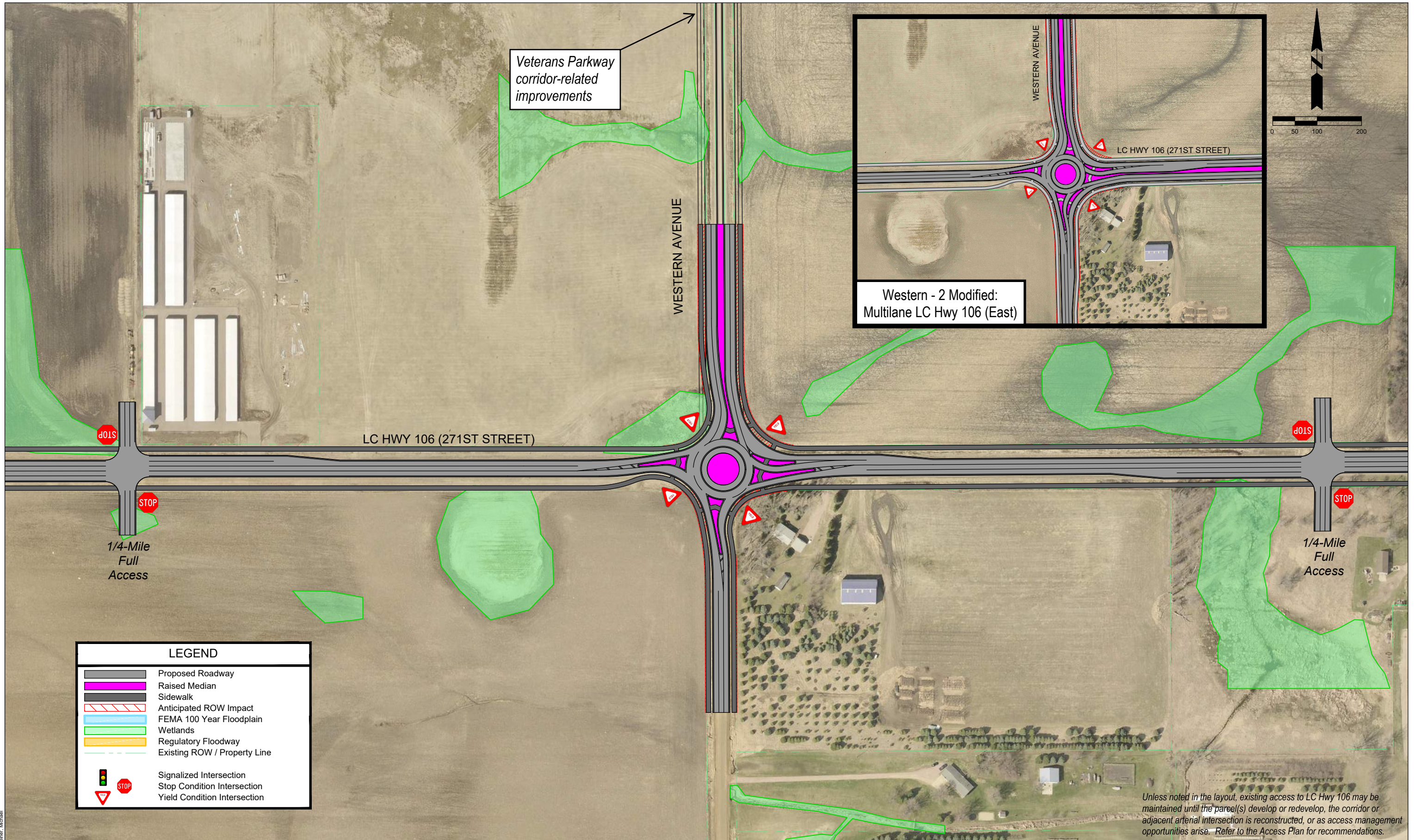


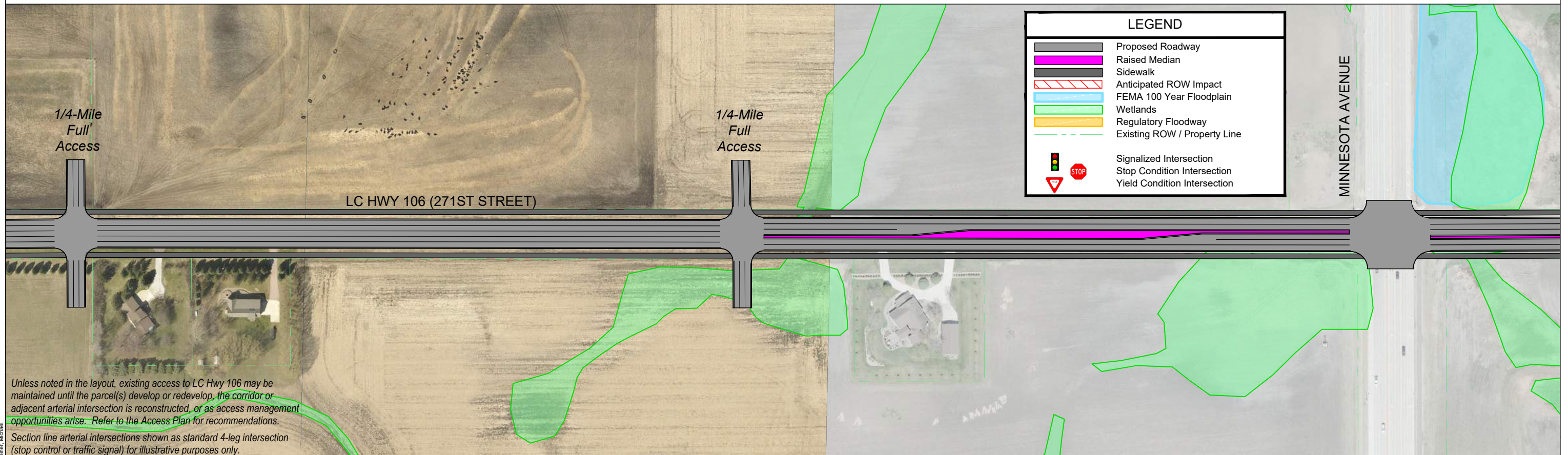
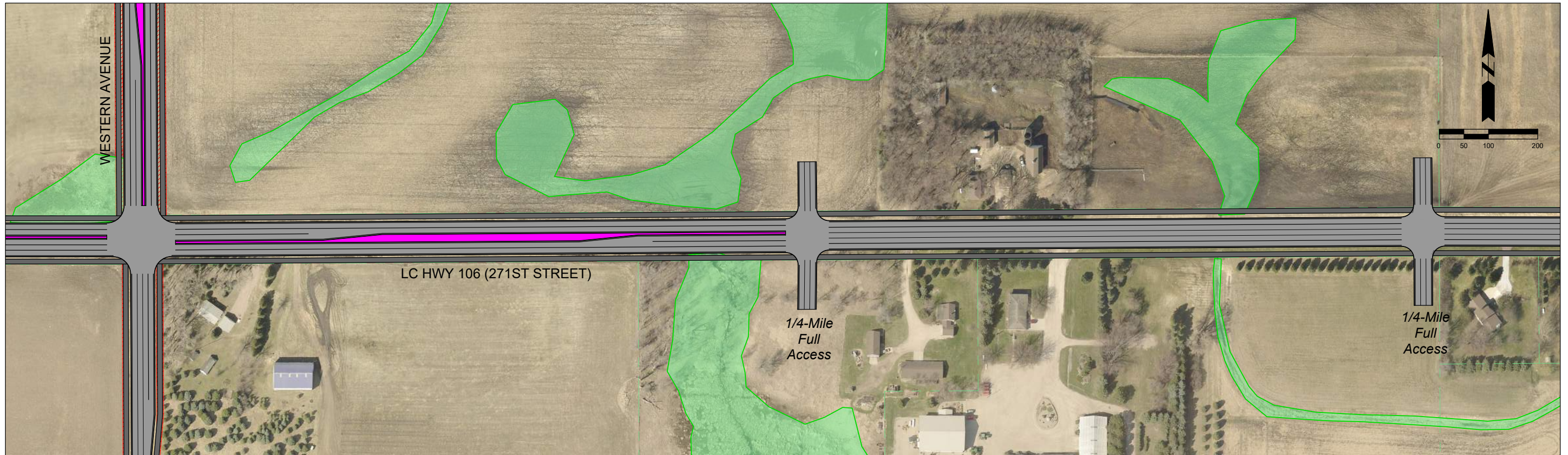




Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

Section line arterial intersections shown as standard 4-leg intersection (stop control or traffic signal) for illustrative purposes only.

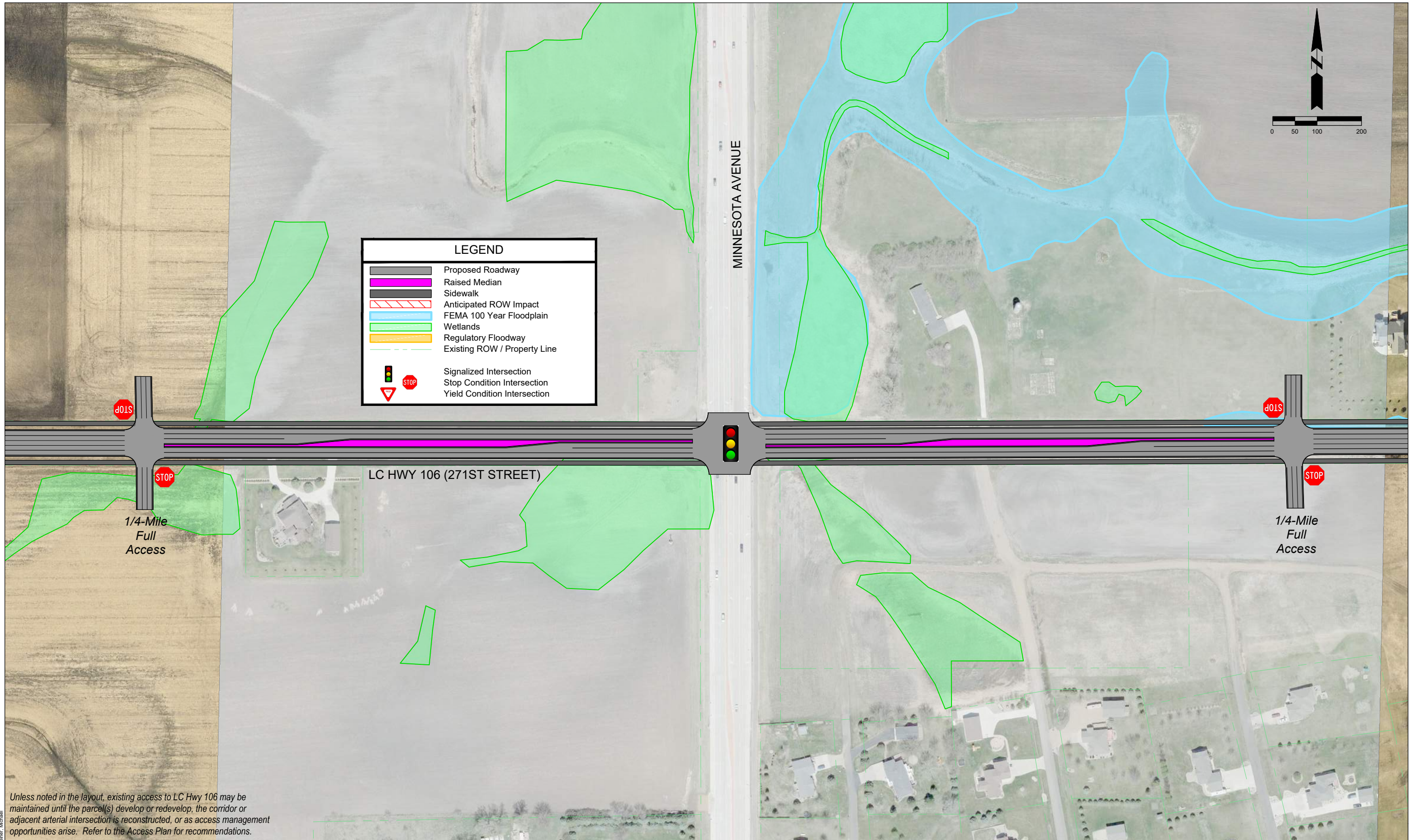




Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

Section line arterial intersections shown as standard 4-leg intersection (stop control or traffic signal) for illustrative purposes only.

C:\pwworking\central\013063525\County 106 5 Line Figures.dwg
PLOT DATE: 6/23/2023 11:44 AM
Sener: Michael



Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

**Recommended
Long-Term Corridor**

Minnesota Avenue (SD115) & Lincoln County Highway 106 Intersection

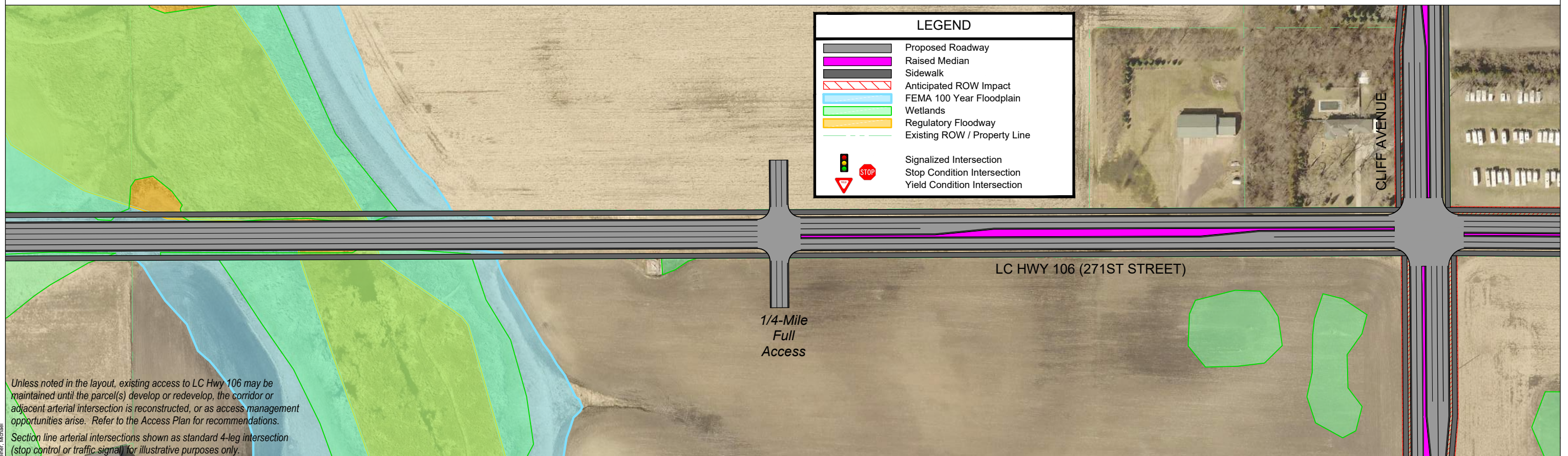
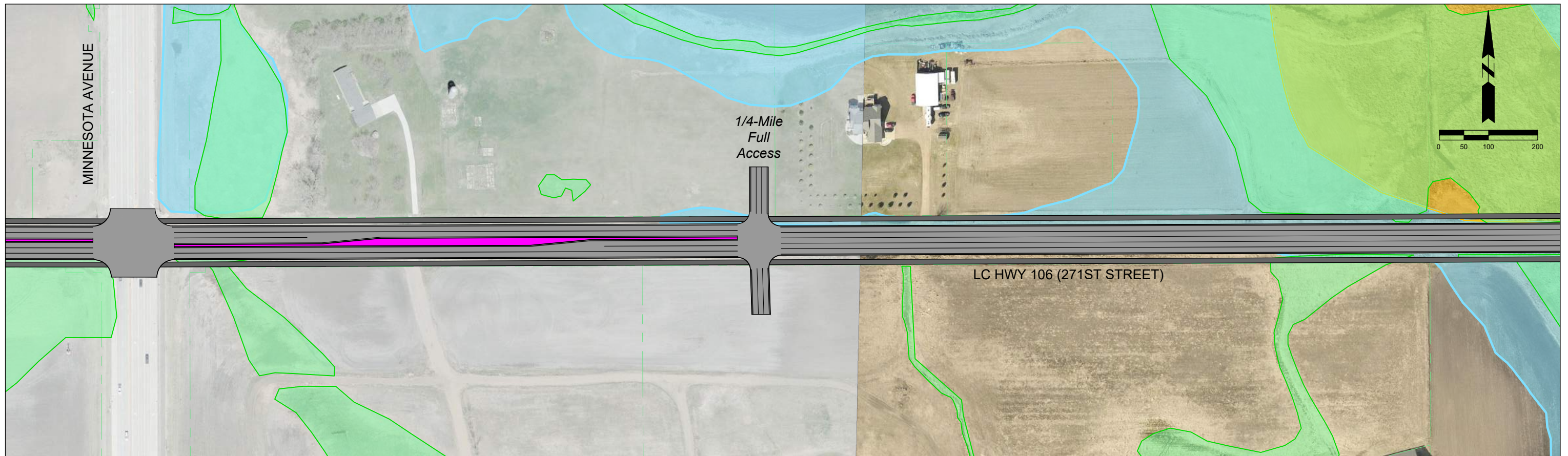
Intersection Type: Traffic Signal

LC Hwy 106 Corridor Section: Multilane

Alternative
Minnesota - 2

Figure
30.e

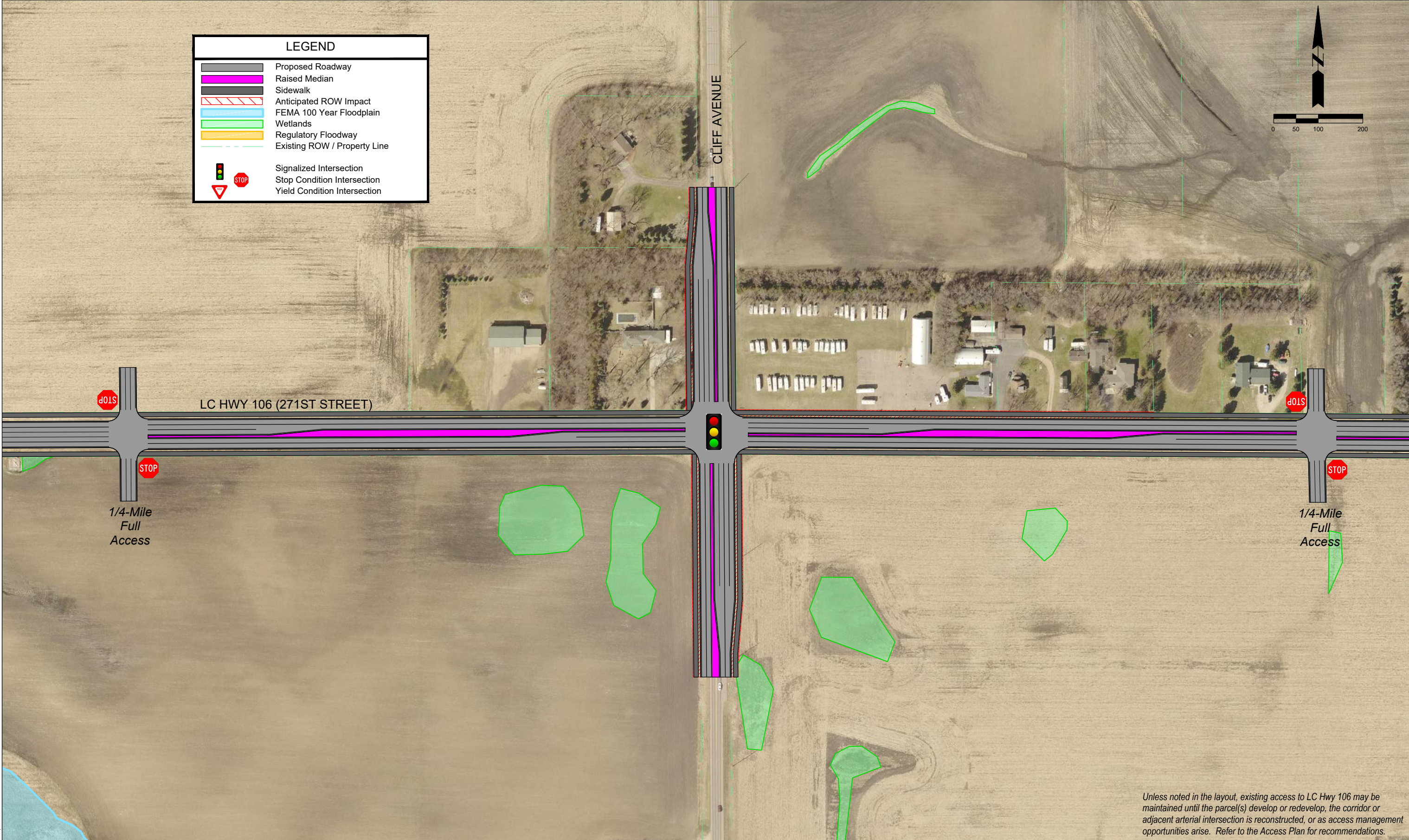
Rev: 6/23/2023



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Section line arterial intersections shown as standard 4-leg intersection (stop control or traffic signal) for illustrative purposes only.

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LEGEND

Proposed Roadway

Raised Median

Sidewalk

Anticipated ROW Impact

FEMA 100 Year Floodplain

Wetlands

Regulatory Floodway

Existing ROW / Property Line

Signalized Intersection

Stop Condition Intersection

Yield Condition Intersection

Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

C:\pwworking\central\01\3063529\County 106 5 Line Figures.dwg
PLOT DATE: 6/23/2023 11:45 AM
Sener, Michael

SECOG

SOUTH EASTERN COUNCIL OF GOVERNMENTS

SOUTH DAKOTA

LINCOLN COUNTY

SIoux FALLS

SOUTH DAKOTA

SD DOT

Recommended
Long-Term Corridor

Cliff Avenue & Lincoln County Highway 106 Intersection

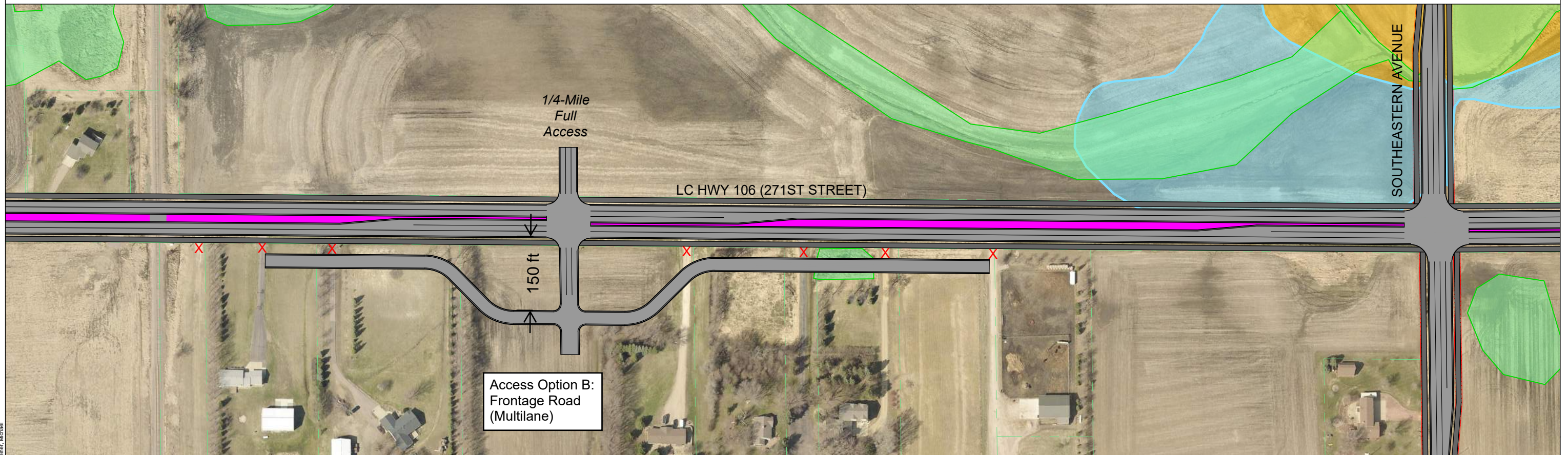
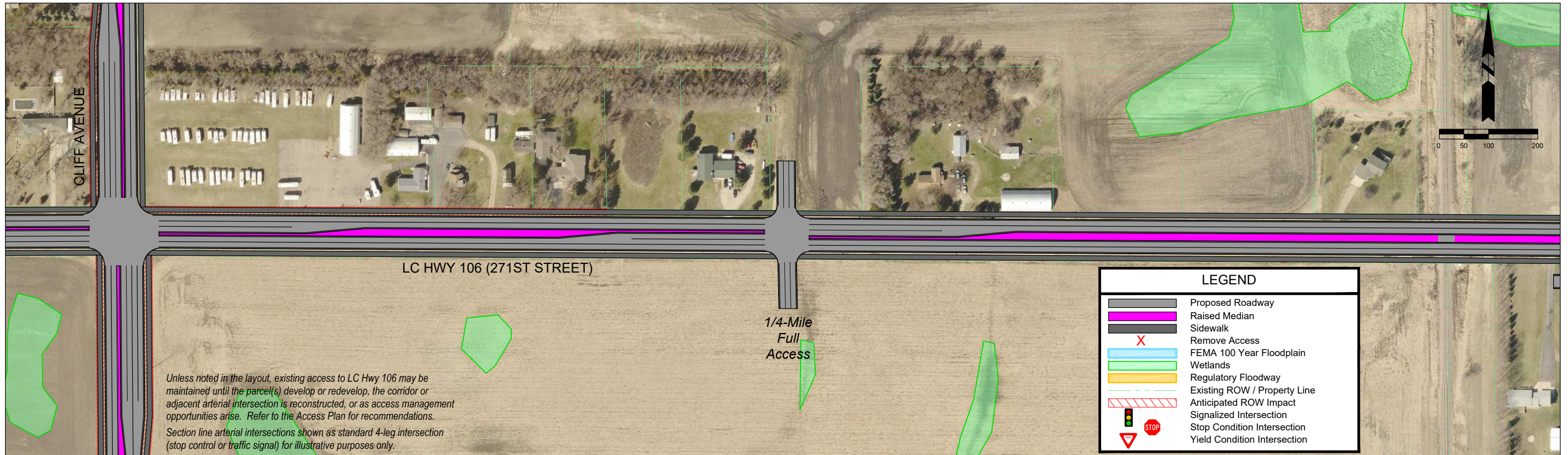
Intersection Type: Traffic Signal

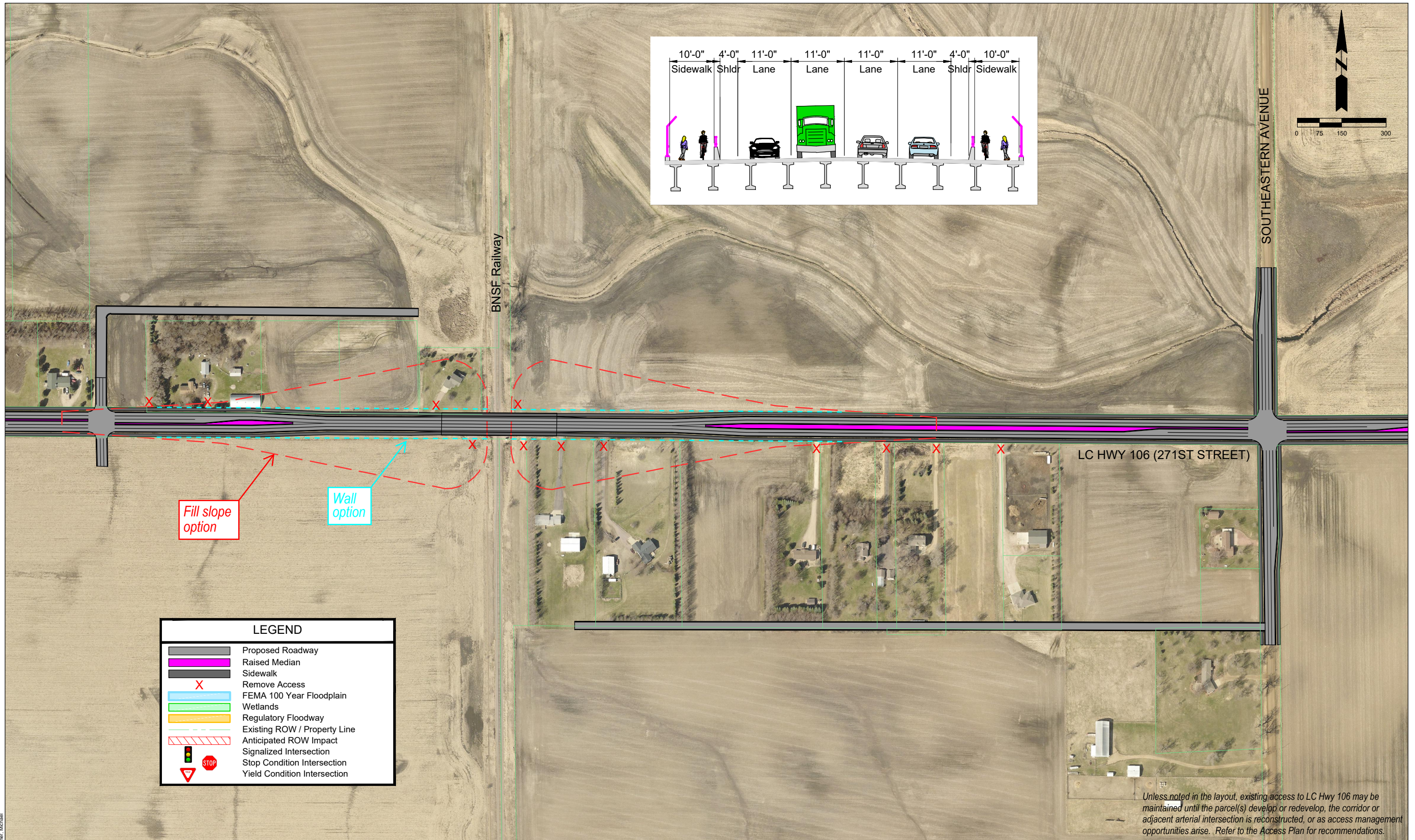
LC Hwy 106 Corridor Section: Multilane

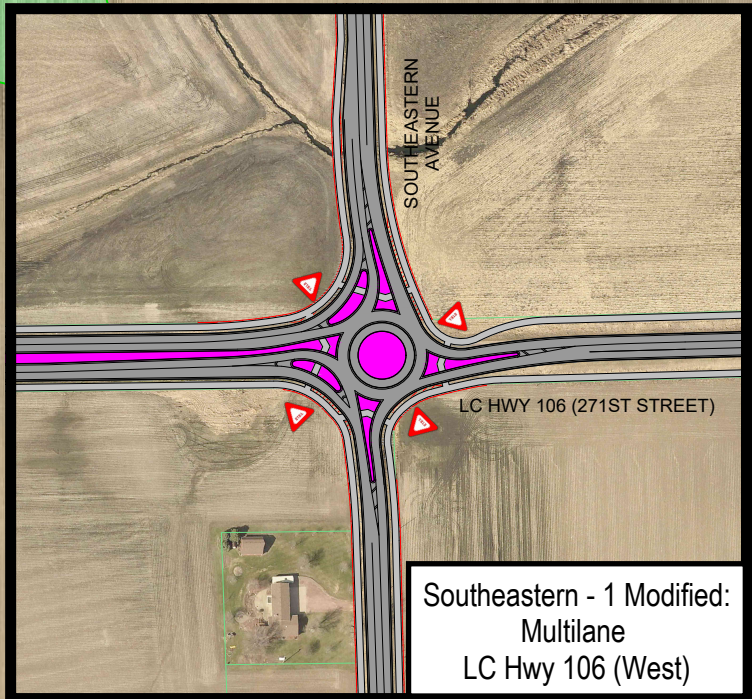
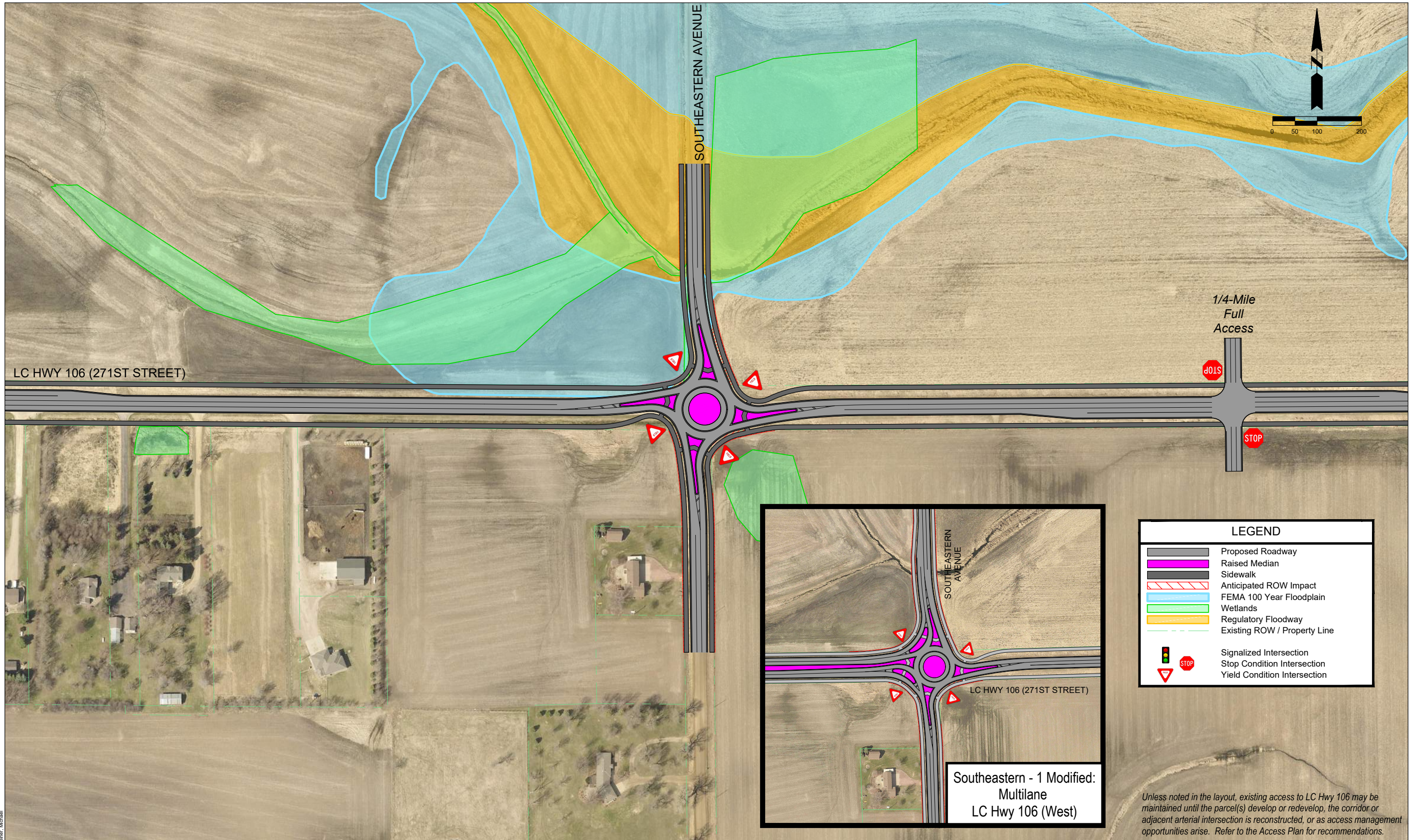
Alternative
Cliff - 4

Figure
30.g

Rev: 6/23/2023







LEGEND	
	Proposed Roadway
	Raised Median
	Sidewalk
	Anticipated ROW Impact
	FEMA 100 Year Floodplain
	Wetlands
	Regulatory Floodway
	Existing ROW / Property Line
	Signalized Intersection
	Stop Condition Intersection
	Yield Condition Intersection

Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

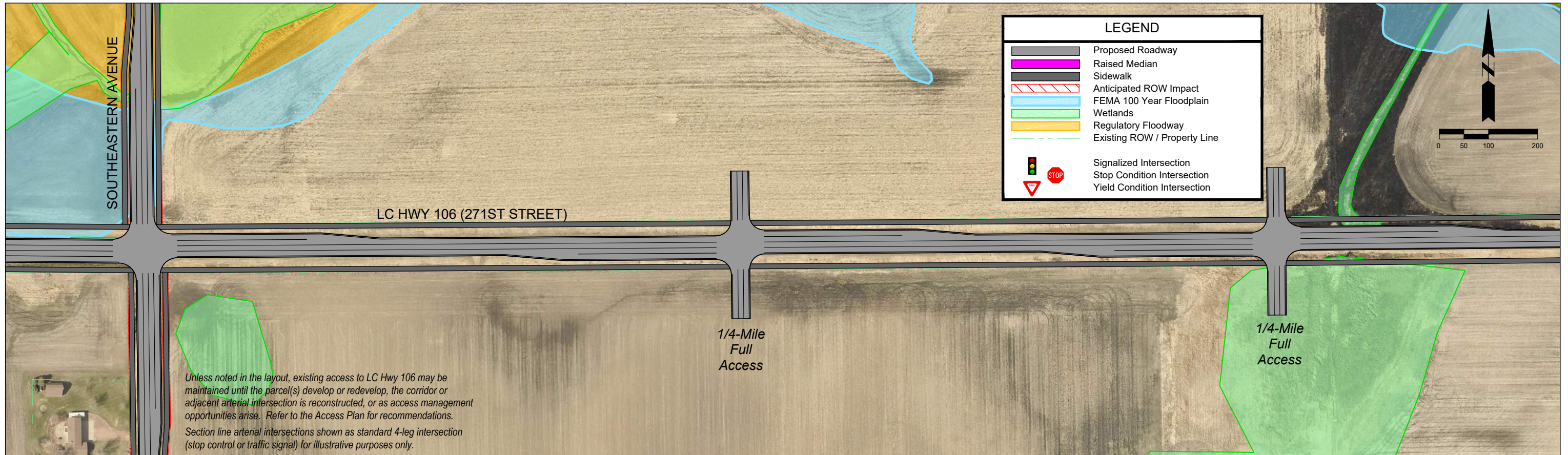
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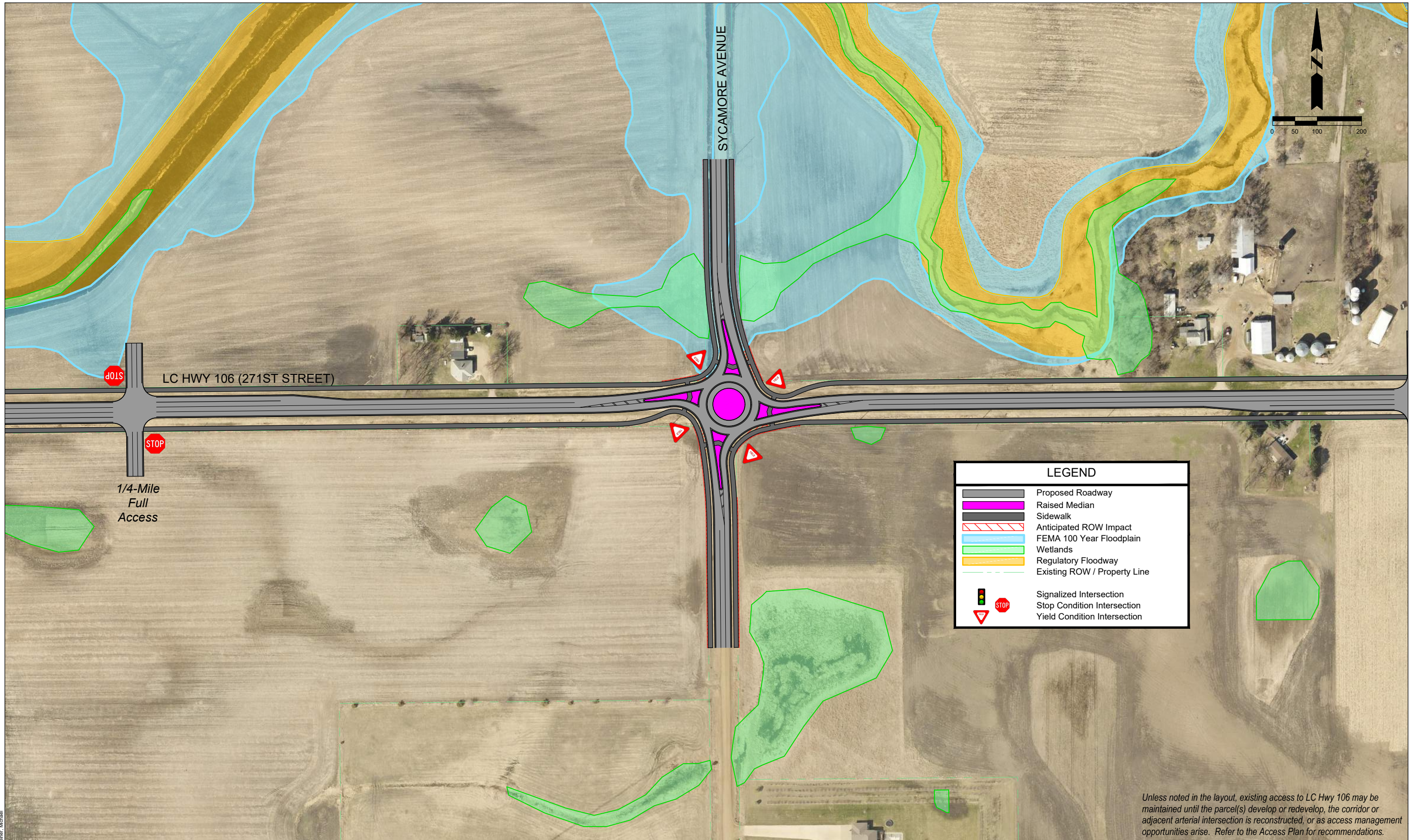


**Recommended
Long-Term Corridor**

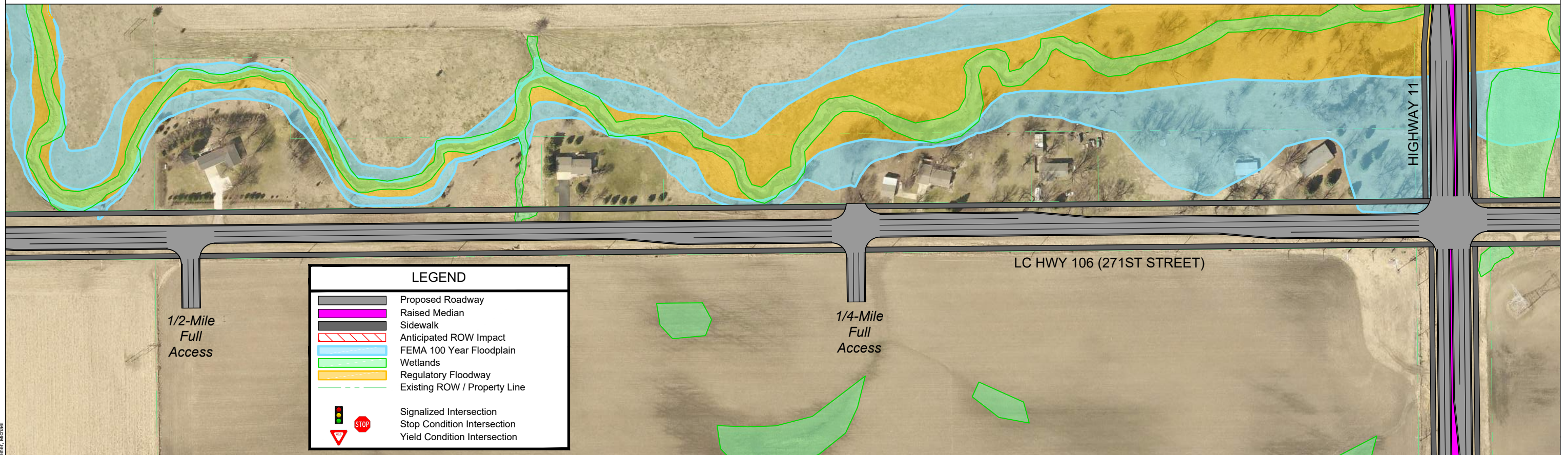
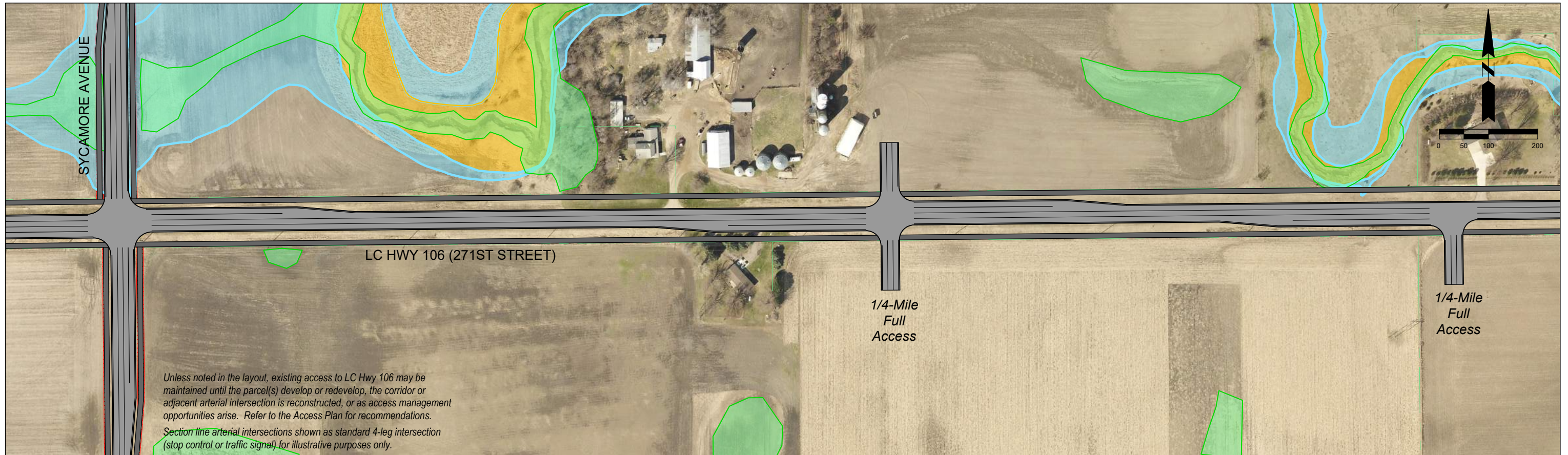
Southeastern Avenue & Lincoln County Highway 106 Intersection
Intersection Type: Single-Lane Roundabout LC Hwy 106 Corridor Section: 3-Lane

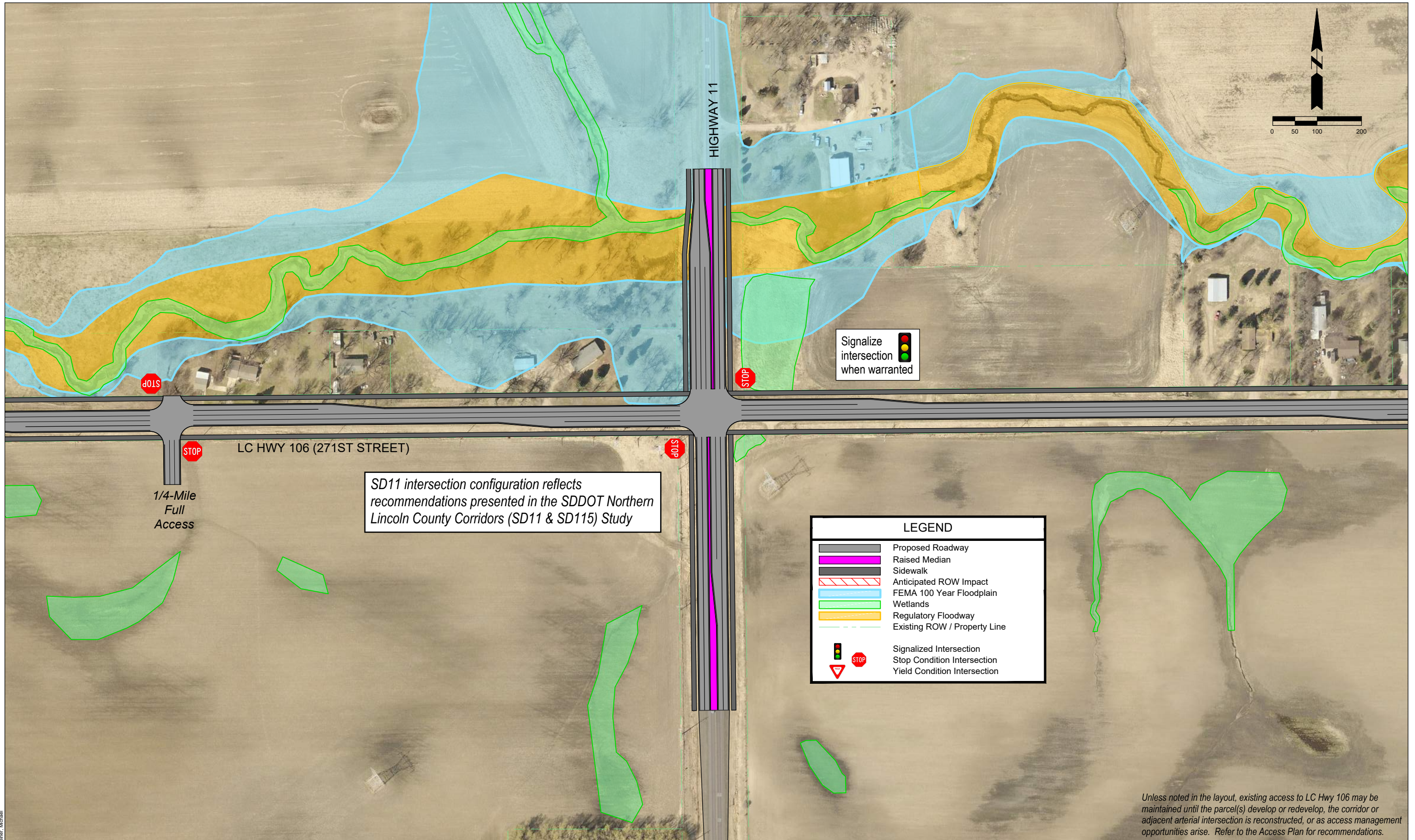
Alternative
Southeastern - 1
 Figure
30.j
 Rev: 6/23/2023





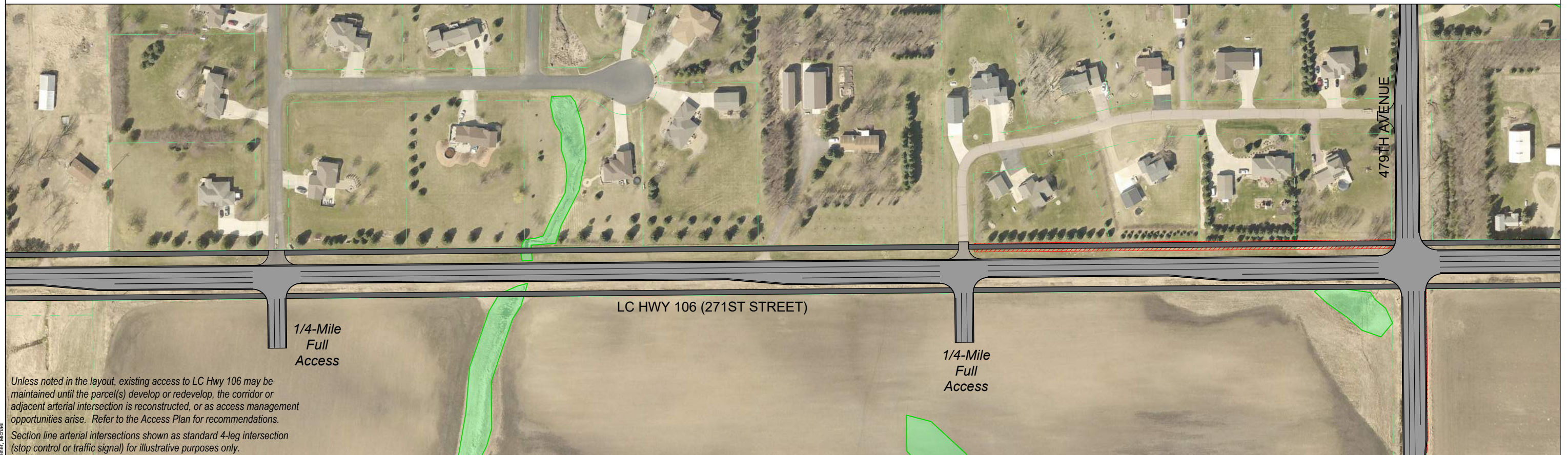
Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.





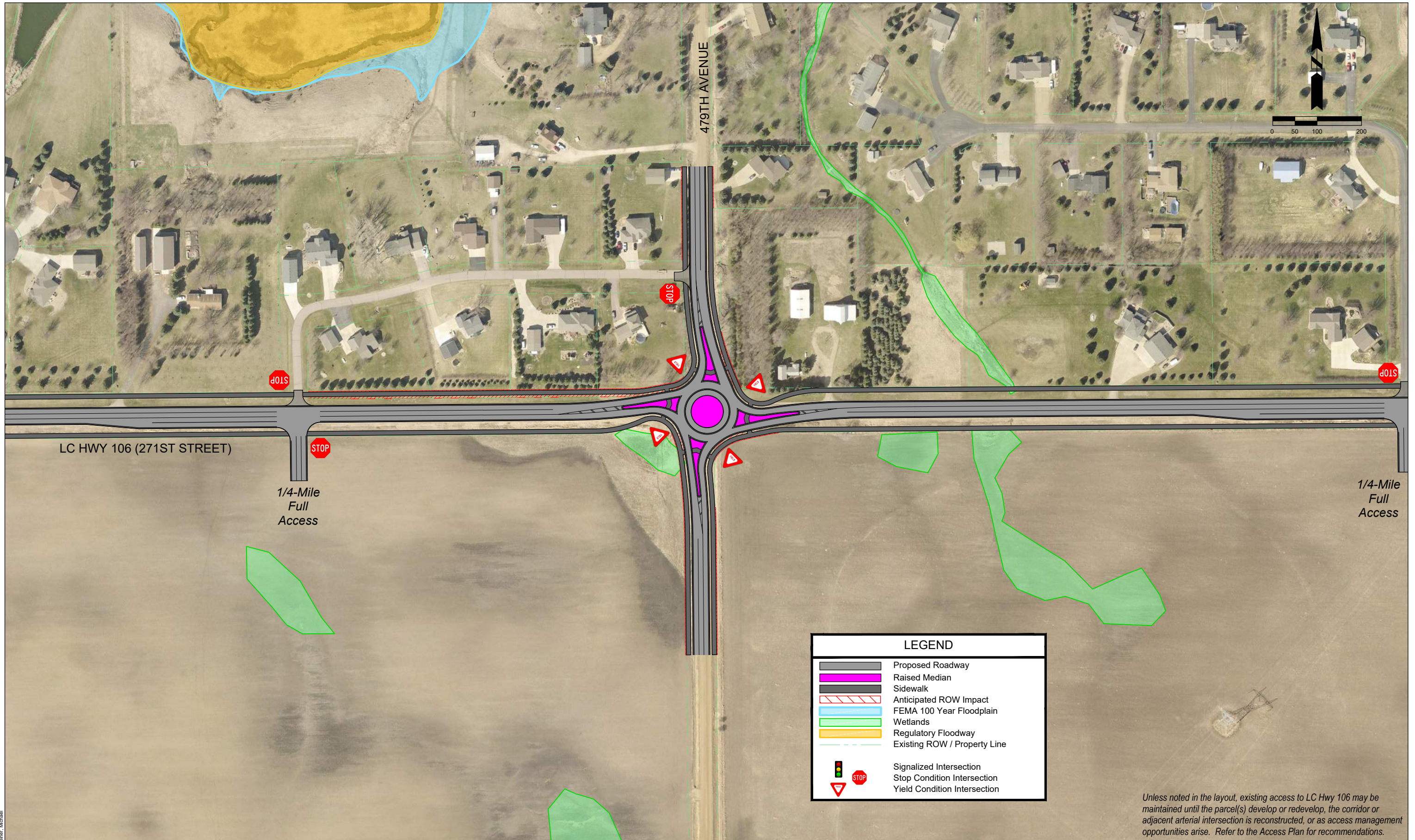
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 PLOT DATE: 6/23/2023 12:04 PM, Sener, Michael

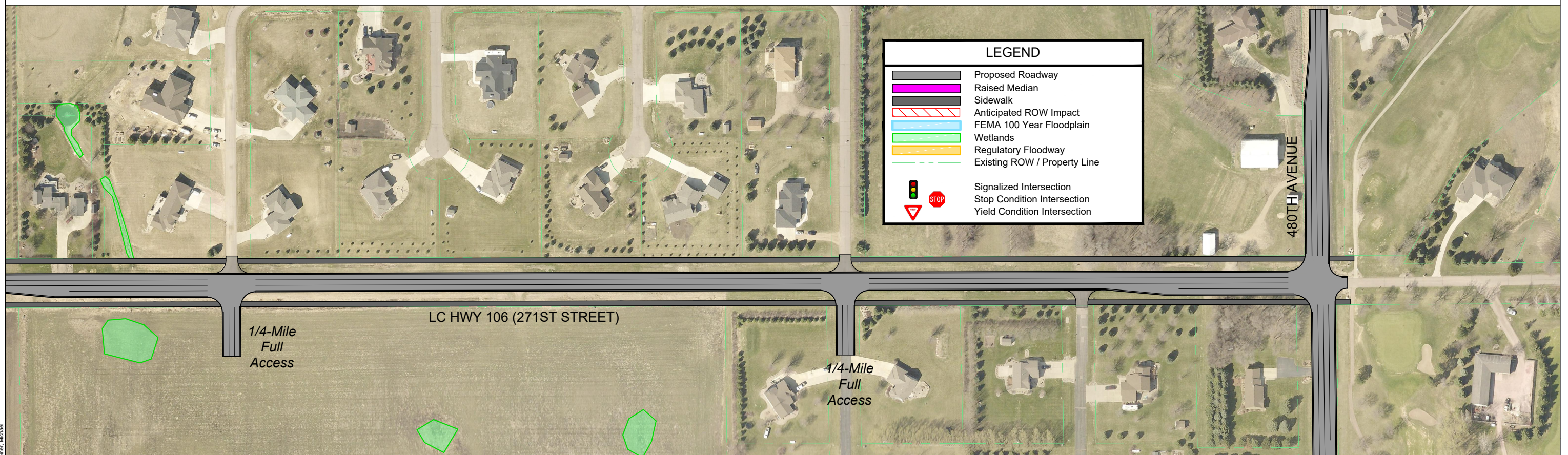
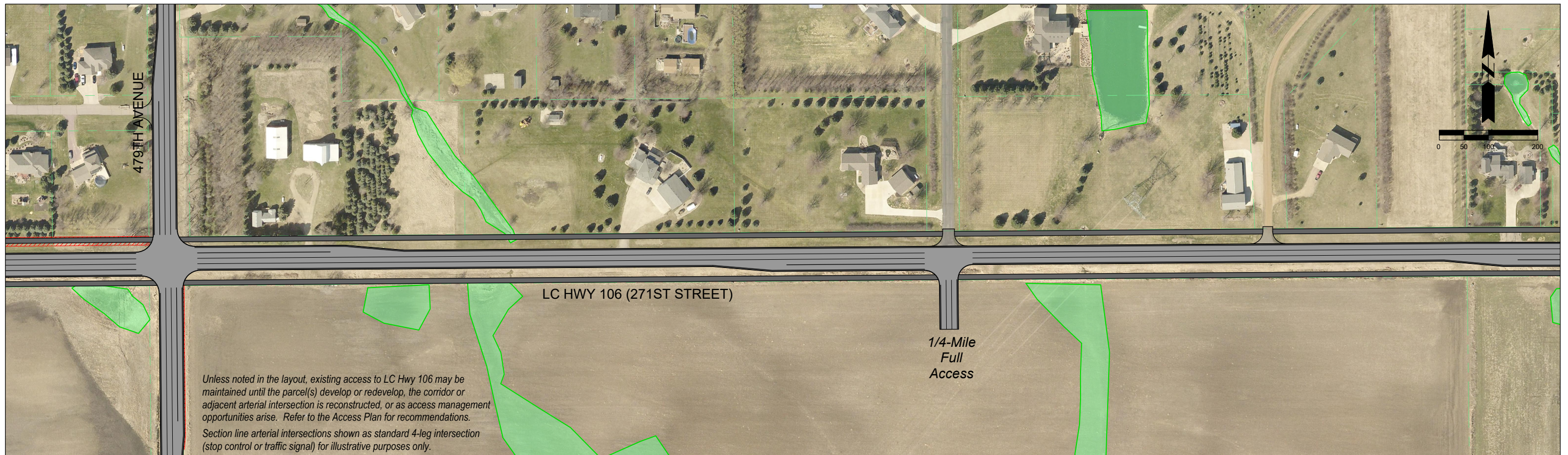
Unless noted in the layout, existing access to LC Hwy 106 may be maintained until the parcel(s) develop or redevelop, the corridor or adjacent arterial intersection is reconstructed, or as access management opportunities arise. Refer to the Access Plan for recommendations.

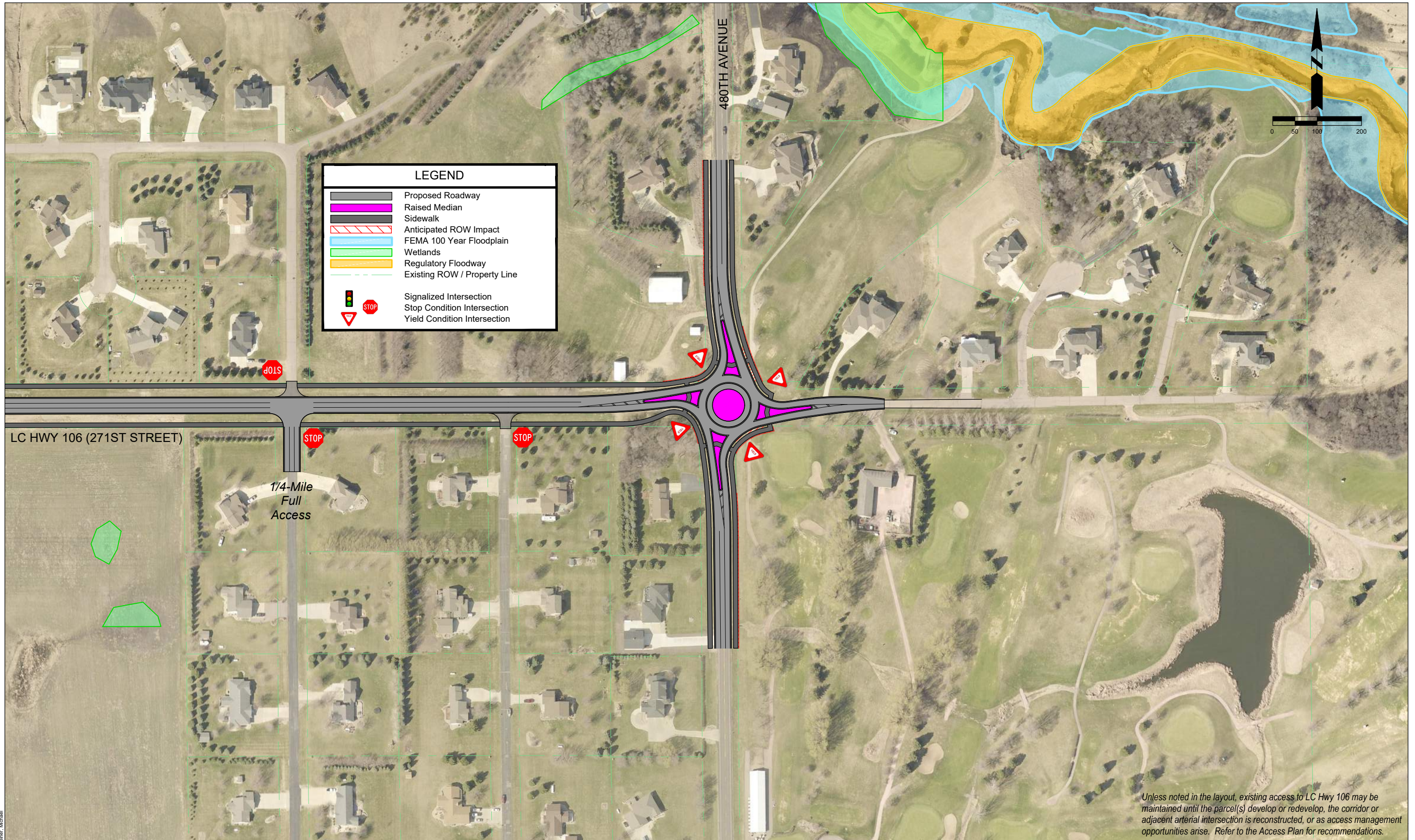


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PLOT DATE: 6/23/2023 12:00 PM, Senior: Michael

Near-Term Recommendations Summary

Near-term recommendations were identified to address existing transportation needs and reflect spot improvements not necessitating full reconstruction or significant investment. These recommendations are intended to serve as a bridge between existing needs and the short/mid/long-term investments.

Considerations with these near-term recommendations include:

- Supporting agency flexibility to address existing needs, the efficient use of funds, and maximizing large-scale investments
- Incremental opening of Veterans Parkway through construction of four segments will not fully shift traffic away from LC Hwy 106 until the completion in Fall 2027. However, a noticeable shift is anticipated when Veterans Parkway will be open between I-29 and Cliff Avenue following completion of Phase 2.
- Existing traffic operations and safety
- Supporting near-term development along the corridor

LC Hwy 106 Segment: Louise Avenue to 1/3-mile east of Louise Avenue

- **Need:** existing traffic operations and safety and supporting near-term development
- **Recommendation:** widen existing roadway to 3-lane section to provide center left turn lane

LC Hwy 106 & Minnesota Avenue intersection

- **Need:** existing traffic operations and safety due to long westbound queues during peak periods
- **Recommendation:** construct westbound right turn lane
- **Notes:** if adding a right turn lane requires extensive modifications to traffic signals and the east and west legs of the intersection, consider the Short-Term and Mid-Term recommendation

LC Hwy 106 & Cliff Avenue intersection

- **Need:** existing traffic operations and safety due to eastbound queues during peak periods
- **Recommendation:** construct eastbound right turn lane
- **Notes:** consider timing of Short-Term and Mid-Term recommendation project(s)

LC Hwy 106 railroad grade crossing (between Cliff Avenue and Southeastern Avenue)

- **Need:** crossing enhancements due to sight distance limitations, highway and rail speeds, and traffic volumes
- **Recommendation:** add crossing gates

Southeastern Avenue corridor

- **Recommendation:** agencies begin planning for Southeastern Avenue corridor improvements to determine future corridor elements, timing, and costs. As a long multi-jurisdictional corridor that is primarily a township gravel section, improvements will need to be coordinated to support route continuity and logical termini of future projects.

APPENDIX

A. METHODS AND ASSUMPTIONS DOCUMENT

B. TRAFFIC FORECASTS MEMO

C. EXISTING AND FUTURE NO BUILD CONDITION INTERSECTION TRAFFIC OPERATIONS ANALYSIS MEMO

D. CRASH HISTORY REVIEW MEMO

E. GRADE SEPARATION WARRANT REVIEW MEMO

F. PUBLIC OPEN HOUSE #1 AND PUBLIC OPEN HOUSE #2 SUMMARY MEMOS

G. LINCOLN COUNTY HIGHWAY 106 LAND USE AND ACCESS PLAN MEMO

H. RURAL AND URBAN TYPICAL SECTIONS

I. INTERSECTION ALTERNATIVES

J. CORRIDOR SEGMENT ALTERNATIVES

K. BUILD CONDITION TRAFFIC OPERATIONS ANALYSIS MEMO

L. CONCEPTUAL COSTS

M. UTILITY COORDINATION MEMO

N. ENVIRONMENTAL TECHNICAL MEMO