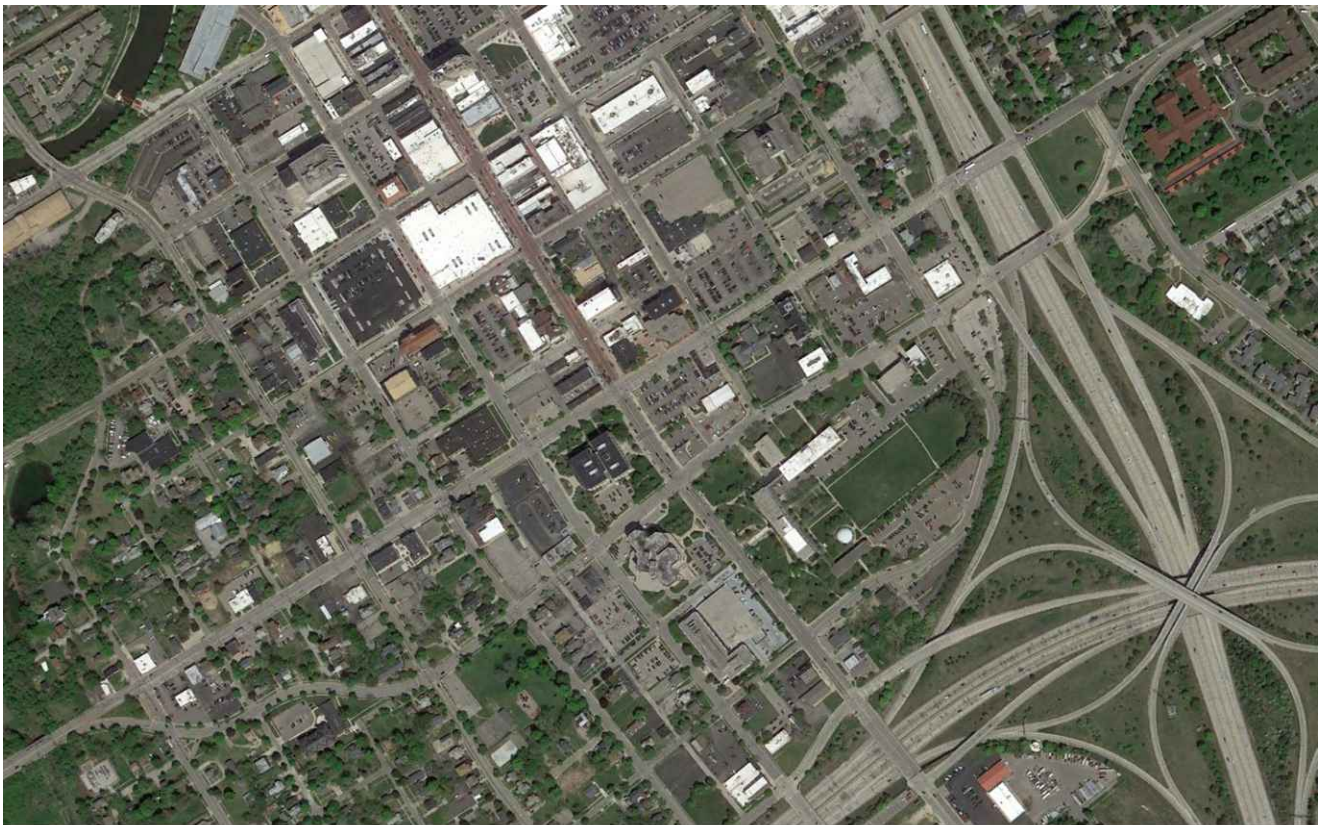
M-21

CORRIDOR STUDY - DRAFT

August 18, 2021



ROWE PROFESSIONAL SERVICES COMPANY

MDOT Michigan Department of Transportation

CHARLES STEWART MOTT FOUNDATION

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ACRONYMS

HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
LOS	Level of Service
MD	mid-day
MDOT	Michigan Department of Transportation
MPH	miles per hour
MPO	Metropolitan Planning Organization
MTA	Mass Transportation Authority
MTCF	Michigan Traffic Crash Facts
TMC	Turning Movement Count
TSC	Transportation Service Centers
TWLTL	Two-Way Left Turn Lane
PDO	personal damage only
PEL	Planning and Environmental Linkages
ROW	right-of-way

EXECUTIVE SUMMARY

ROWE Professional Services Company has completed a corridor study for M-21 through the City of Flint, Michigan from Ann Arbor Street to Lapeer Road. M-21 (approximately 1 mile), is split into two one-way pair streets for the entirety of the studied corridor with M-21 (Court Street) traveling westbound and M-21 (5th Street) traveling eastbound. The decision to separate M-21 into two one-way pairs occurred in 1963 based on anticipated traffic volumes through the 1980s. The purpose of the study was to review existing operations and determine several alternative roadway designs to improve mobility and safety for all modes of transportation.

The study included analysis of the following intersections:

WB M-21 (Court Street)	EB M-21 (5th Street)
• Ann Arbor Street	• Ann Arbor Street
• Grand Traverse Street	• Grand Traverse Street
• Church Street	• Church Street
• Beach Street	• Beach Street
• Saginaw Street	• Saginaw Street
• Harrison Street	• Stevens Street
• Stevens Street	• SB Chavez Drive
• SB Chavez Drive	• NB Chavez Drive
• NB Chavez Drive	• Lapeer Road
• Lapeer Road	

Vehicle, pedestrian, and cyclist turning movement counts (TMCs) were collected at the study intersections during the weekday AM (7 to 9 a.m.), mid-day (11 a.m. to 1 p.m.), and PM (2 to 5 p.m.) peak periods of the roadway network on October 27-28, 2020.

Due to the impacts of COVID-19, the collected traffic volumes are not representative of typical traffic conditions. Historical traffic data provided by the Michigan Department of Transportation (MDOT) was referenced to determine an applicable growth rate to adjust the TMCs collected for this project to "Pre-Covid-19" levels. These factors varied by roadway within the network.

According to the most recent edition of the Highway Capacity Manual (The Highway Capacity Manual, 6th Edition, 2016), level of service (LOS) is a qualitative measure describing operational conditions of a traffic stream or intersection. LOS ranges from A to F, with LOS A representing desirable traffic operations characterized by low delay (free flow) and LOS F representing extremely poor traffic operations characterized by excessive delays and long vehicle queues. LOS D or above is generally considered to be acceptable in an urban/suburban area with some delays.

Three alternates were developed for the M-21 corridor. These alternates are:

- Alternate A: One-Way Pair Restriping
- Alternate B: Two-Way Conversion
    - Alternate B-1
        - Signal at west end of Corridor
        - Tee 5th Street into NB Chavez Drive

    - Alternate B-2
        - Tee 5th Street into Ann Arbor Street
        - Tee 5th Street into SB Chavez Drive
- Alternate C: One-Way Pair Reconstruction

Alternate A was identified as a short-term project that could potentially be completed in the next 5 years with the use of pavement markings. Alternate C is similar in nature to Alternate A; however, Alternate C is a long-term project that could potentially be completed within a 20-year forecast in conjunction with a full reconstruction of the roadway. Alternate B can potentially be completed as a short-term project within the next 5 years with pavement markings or could potentially be a long-term project that could be completed within a 20-year forecast in conjunction with a full reconstruction of the roadway.

LOS analyses during the AM peak, mid-day (MD) off-peak, and PM peak hours was performed for all the intersections within the study limits for existing, no build (year 2045), Alternate A, Alternate B, and Alternate C conditions. The results of this analysis revealed that most intersections would operate at LOS C or better during all studied time periods and scenarios. In Alternate B-2 the eastbound right turn movement at the intersection of M-21 (Court Street) and Ann Arbor Street and the southbound right turn movement at the intersection of M-21 (5th Street) and Ann Arbor Street would operate at LOS D in the PM peak hour.

A review of the existing non-motorized network along the studied corridor was completed to identify any deficiencies in the existing facilities. Most intersections have existing pedestrian signals and crosswalks. The intersections of M-21 (Court Street) and Lapeer Road and M-21 (5th Street) and Lapeer Road do not have pedestrian signals, crosswalks, sidewalk, and curb cuts in all quadrants of the intersection.

A crash analysis was performed to determine if any discernable crash patterns could be identified at the studied intersections. The crash analysis revealed a total of 465 crashes within the study area over the 5-year period. There were eight crashes involving a pedestrian and two crashes involving a bicycle. Alcohol was not involved in any of the pedestrian or bicycle crashes.

Stakeholder input was a valuable factor considered as the team carried out the corridor study. As part of the corridor study, a steering committee was engaged to help identify the project purpose, project goals, known problems and constraints, future developments, opportunities within the corridor, non-motorized needs, and potential transportation improvement alternates. The steering committee consisted of representatives from MDOT Bay Region, MDOT Davison TSC, ROWE Professional Services Company, City of Flint, Mass Transportation Authority (MTA), Genesee County Metropolitan Planning Organization (MPO), Flint Cultural Center, Mott Community College, University of Michigan – Flint, and the CS Mott Foundation.

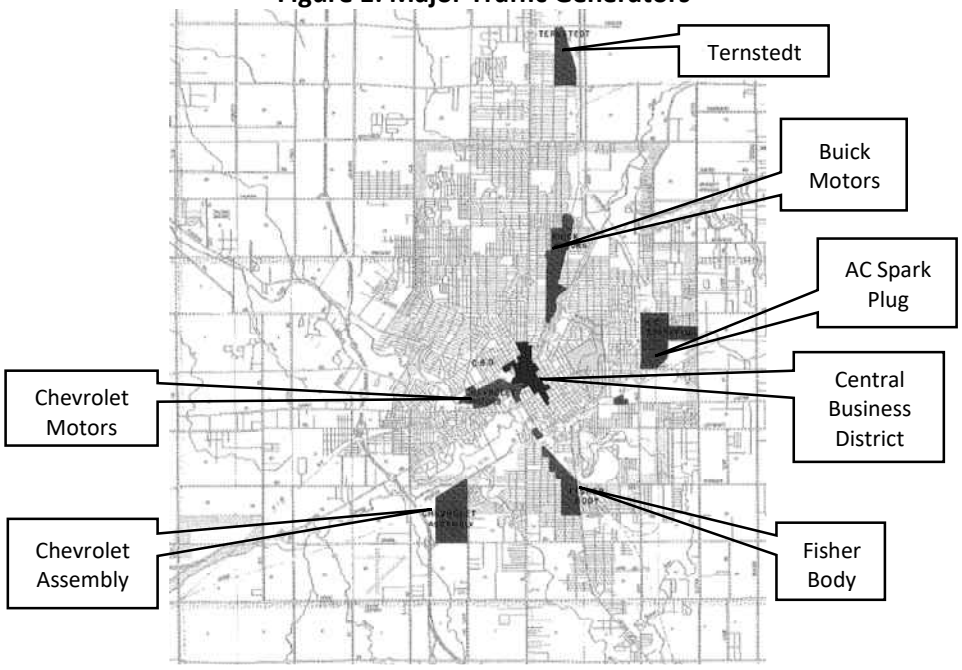
In addition to the steering committee meetings listed above, additional public input was sought at multiple points in the study process. A public meeting was conducted, and a survey was published on the project website. Presentations were also provided to the following neighborhood groups: Flint Neighborhoods United, the Central Park Neighborhood Association, and the Traffic Taming Taskforce.

INTRODUCTION

The M-21 Corridor Study was commissioned by MDOT. The purpose of the study was to review existing operations and determine several alternative roadway designs for the M-21 corridor through the City of Flint from Ann Arbor Street to Lapeer that improve mobility and safety for all modes of transportation. M-21 is currently split into two one-way pair streets for the entirety of the studied corridor with M-21 (Court Street) traveling westbound and M-21 (5th Street) traveling eastbound.

Before the creation of the interstate highway system, M-21 was the main roadway connecting the west and east sides of Michigan, running from Holland to Port Huron. Parts of M-21 were incorporated into I-196 and I-69. In 1963, MDOT completed a study titled "Freeways for Flint" and found that the City of Flint had a population of 278,000 residents and was expected to exceed 400,000 residents by 1980. One of the results of this study was the recommendation to pair Court Street and 5th Street into one-way pairs, due to the need for additional roadway capacity and the limited right-of-way (ROW). This study identified seven distinct districts that accounted for 30 percent of the total traffic, shown in Figure 1 below.

Figure 1: Major Traffic Generators



Today, only the Central Business District and Chevrolet Assembly remain as a scaled down version of their 1963 counterpart. Since the peak of traffic volumes in 1970 in the City of Flint, traffic volumes on M-21 have decreased roughly 50 percent, from 24,000-33,000 vehicles per day to 14,000-15,000 vehicles per day. These roadways are currently overdesigned for the current traffic conditions. The purpose of the study is to identify potential solutions for this corridor that promote connectivity and safety for all roadway users while "right-sizing" the roadway, which ensures that the size of the roadway meets the needs of all users. In addition, emphasis was placed on a "Complete Streets" and "Context Sensitive Solution" mindset, where all modes of traffic (vehicle, bicycle, and pedestrian) are considered while ensuring that the identity of the surrounding area is not compromised.

The original project scope included the I-475 Corridor through the City of Flint from M-21 to Broadway Blvd and the Robert T Longway Corridor adjacent to I-475 from E Boulevard Dr to Walnut St. Due to the complexity and breadth of analyzing these corridors and the implications of implementing large scale changes on an interstate, the I-475 Corridor was removed from this study in favor of a full Planning and Environmental Linkages (PEL) Study. The Robert T Longway Corridor was removed from this analysis as the design alternatives are highly dependent on the results of the I-475 PEL Study.

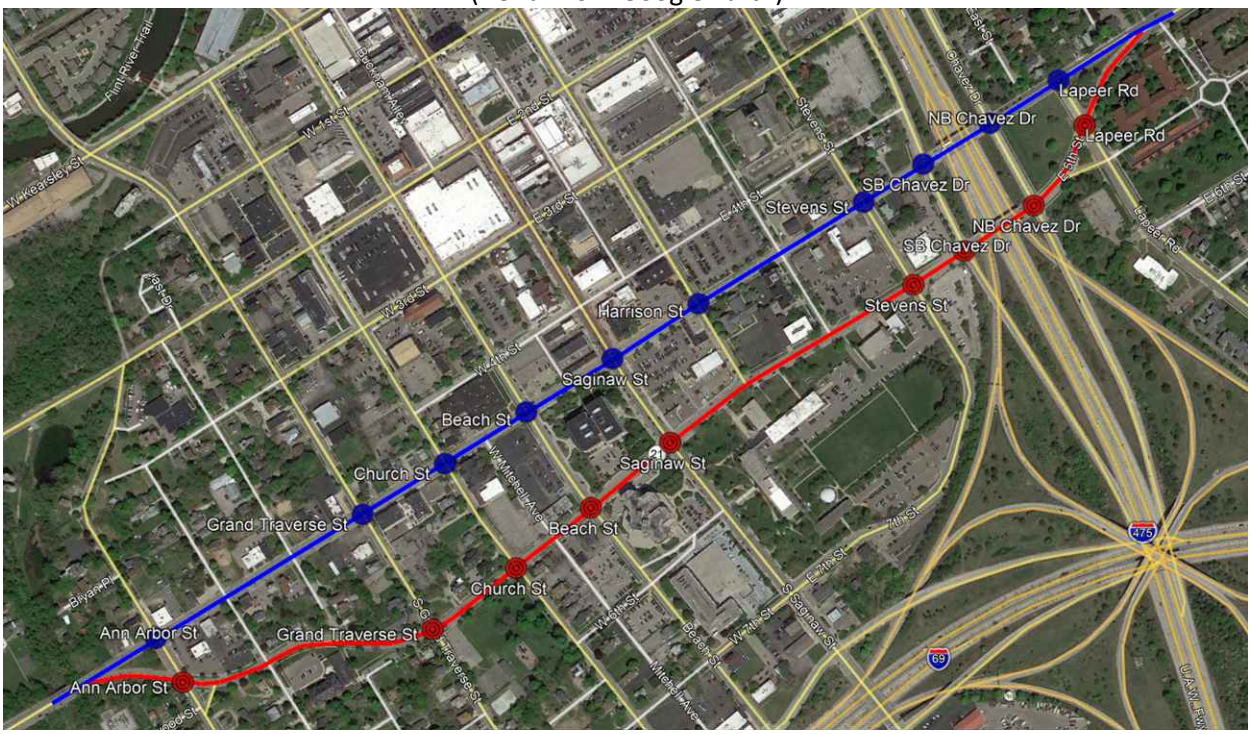
A Planning and Environment Linkages (PEL) study represents a collaborative and integrate approach to transportation decision-making that considers environmental, community, and economic goals early in the transportation planning process. The information analysis and products developed during the PEL study is then used to inform the formal federal National Environmental Policy Act (NEPA) environmental review process. Any improvements made to the M-21 corridor should be coordinated with the results of the PEL study.

The study included analysis of the following intersections:

M-21 (Court Street)	M-21 (5th Street)
• Ann Arbor Street	• Ann Arbor Street
• Grand Traverse Street	• Grand Traverse Street
• Church Street	• Church Street
• Beach Street	• Beach Street
• Saginaw Street	• Saginaw Street
• Harrison Street	• Stevens Street
• Stevens Street	• SB Chavez Drive
• SB Chavez Drive	• NB Chavez Drive
• NB Chavez Drive	• Lapeer Road
• Lapeer Road	

The study intersections along Court Street are shown in blue and the intersections along 5th Street are shown in red in Figure 2 below.

Figure 2: Study Intersection Locations
(Aerial from Google Earth)



EXISTING CONDITIONS

A. Capacity Analysis

M-21 currently operates as a set of two roadways, one that serves westbound traffic (Court Street), and one that serves eastbound traffic (5th Street). These streets currently split into one-way pairs west of Ann Arbor Street and rejoin east of Lapeer Road. Court Street is currently a 4-lane cross section. 5th Street varies between a 3-lane and 4-lane cross section, with occasional on-street parking. Court Street and 5th Street have a posted speed limit of 30 MPH.

Vehicle, pedestrian, and cyclist TMCs were collected at the study intersections during the weekday AM (7 to 9 a.m.), mid-day (11 a.m. to 1 p.m.), and PM (2 to 5 p.m.) peak periods of the roadway network on October 27 - 28, 2020. The collected TMCs are included in Appendix B.

Due to the impacts of COVID-19, the collected traffic volumes are not representative of typical traffic conditions. Historical traffic data provided by MDOT was referenced to determine an applicable growth rate to adjust the TMCs collected for this project to "Pre-Covid-19" levels, as shown in Table 1below. These factors varied by roadway within the network. All traffic counts are shown by alternate in Appendix A.

Table 1: COVID-19 Adjustment Factors

Scenario	Court Street	5th Street
AM Peak Hour	1.37	1.60
MD Off-Peak	1.38	1.36
PM Peak Hour	1.31	1.30

LOS analyses during the AM peak, MD off-peak, and PM peak hours were performed for all the intersections within the study limits for existing, no build (year 2045), Alternate A, Alternate B, and Alternate C conditions.

According to the most recent edition of the Highway Capacity Manual (The Highway Capacity Manual, 6th Edition, 2016), LOS is a qualitative measure describing operational conditions of a traffic stream or intersection. LOS ranges from A to F, with LOS A representing desirable traffic operations characterized by low delay and LOS F representing extremely poor traffic operations characterized by excessive delays and long vehicle queues. LOS D or above is generally considered to be acceptable in an urban/suburban area. Table 2 presents the criteria for defining the various levels of service for unsignalized and signalized intersections, respectively.

Table 2: LOS Criteria

LOS	Average Control Delay/Vehicle (seconds)	
	Signalized Intersection	Unsignalized Intersection
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Note: LOS D or better is considered acceptable in urban/suburban areas.

The results of the LOS analyses for the intersections within the study limits are presented in Table 7. Full LOS output reports are provided in Appendix C.

The results of the LOS analyses for existing conditions reveal that all approaches and movements of the studied intersections operate at LOS C or better during the AM peak hour, MD off-peak, and PM peak hour.

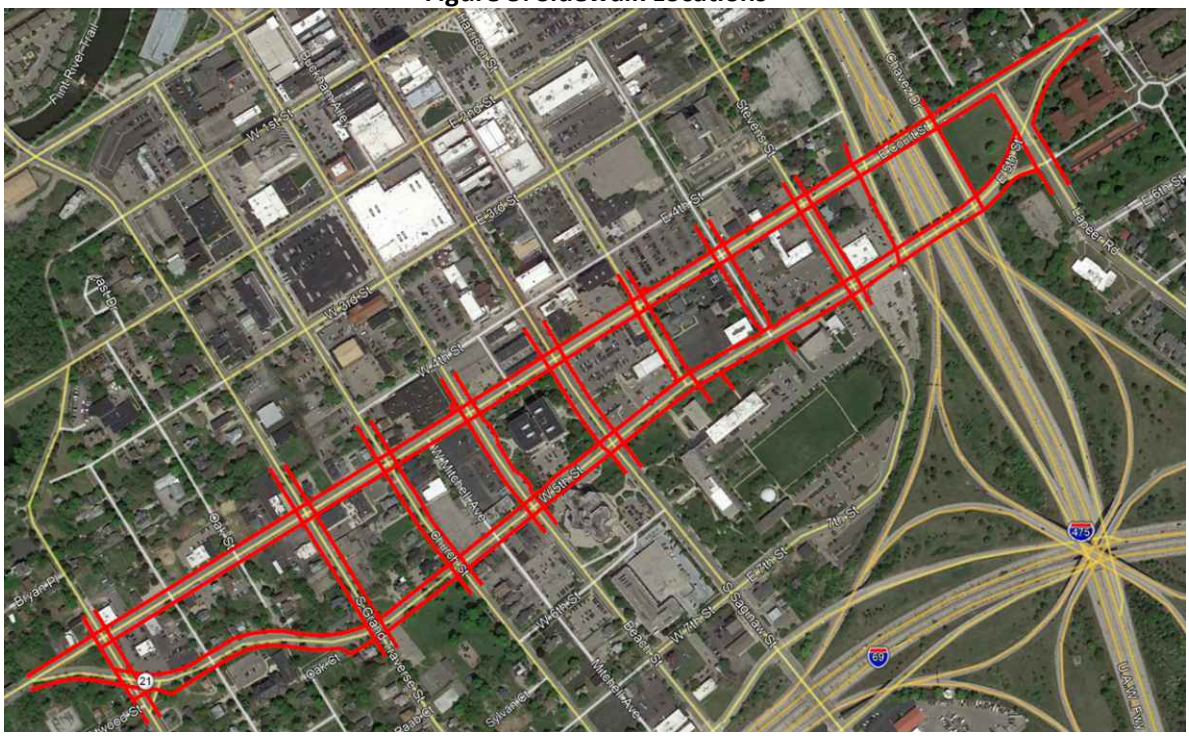
The 95th percentile queue lengths were reviewed at the studied intersections. No queue length exceeded 209 feet (8 vehicles) in the AM peak hour, 186 feet (7 vehicles) in the MD off-peak, and 253 feet (10 vehicles) in the PM peak hour. No queuing issues were observed in the traffic simulations, and all traffic queues clear within one signal cycle length.

The operational results for all scenarios are presented in Table 7.

B. Non-Motorized Facilities

Existing non-motorized facilities were reviewed throughout the study area. There is existing sidewalk on the north and south sides of both Court Street and 5th Street, as shown in Figure 3. This sidewalk is typically 5 feet wide and is located between 0 and 10 feet from the back of curb. There are pedestrian signals and marked crosswalks at most of the studied intersections.

Figure 3: Sidewalk Locations



At the intersection of Court Street and Lapeer Road, there are no pedestrian signals or marked crosswalks. Only the southwest corner has a curb cut to allow pedestrians to cross the street. Additionally, there is no sidewalk in the southeast corner of this intersection. At the intersection of 5th Street and Lapeer Road, there are no pedestrian signals and the only marked crosswalk is adjacent to the southbound lanes. This side of the intersection has curb cuts to allow pedestrians to travel north or south only. There are no curb cuts on any other approach that would allow pedestrians to cross Lapeer Road and continue on 5th Street. There is no sidewalk in the northeast corner of this intersection. These sidewalk deficiencies will be addressed in all of the studied alternatives.

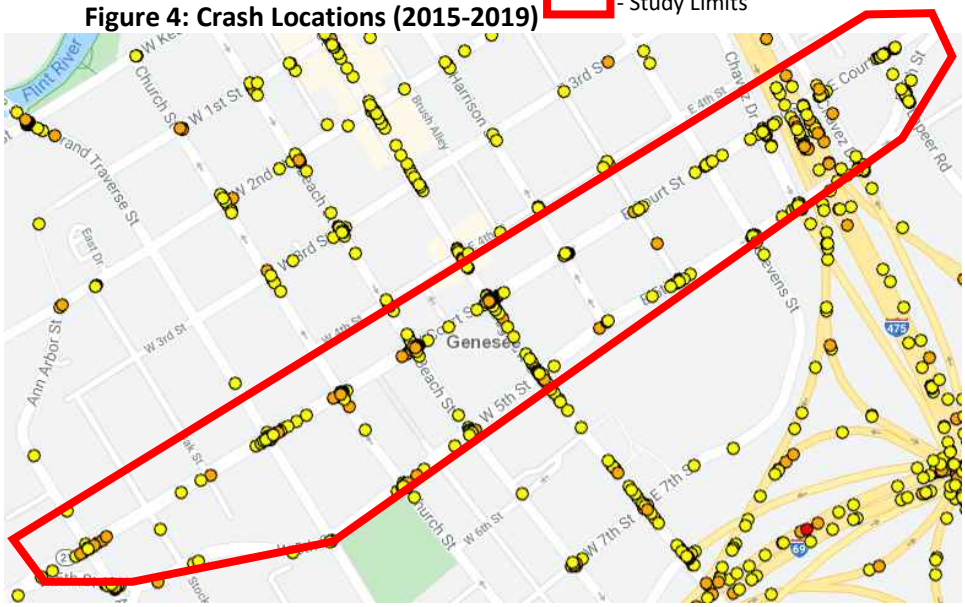
There are existing on-street bicycle facilities adjacent to the studied corridor along Saginaw Street. The crash analysis below will outline any crashes that involved a pedestrian or bicycle.

C. Crash Analysis

A crash analysis was performed to determine if any discernable crash patterns could be identified at the studied intersections. Five years of crash data (2015-2019) was provided by the Michigan Traffic Crash Facts (MTCF) website for crashes that occurred within 250-feet of the studied intersections.

The crash analysis revealed a total of 465 crashes within the study area over the 5-year period. See Table 3 and Table 4 for a summary of all crashes by intersection. There were no fatal crashes during this timeframe. There was 1 incapacitating injury (Level-A), 16 minor injuries (Level-B), 108 potential injuries (Level-C), and 340 property damage only (PDO) crashes. There were eight crashes involving a pedestrian, two crashes involving a bicycle, and six crashes involving alcohol. Alcohol was not involved in any of the incapacitating injury, pedestrian, or bicycle crashes. The crash locations are shown in Figure 4 below.

Figure 4: Crash Locations (2015-2019) - Study Limits



As shown in Table 5, angle crashes are the highest occurring crash type throughout the study area, comprising of 47 percent of the total crashes. Sideswipe same direction was the second highest occurring crash type at 30 percent of the total crashes and rear-end was the third highest occurring crash type at 11 percent of the total crashes.

The Level-A crash occurred at the intersection of M-21 (Court Street) and southbound Chavez Drive and involved both vehicles disregarding a red light. One of the vehicles then struck a building.

All of the crashes that involved a bicycle occurred when the bicycle was located in an established crosswalk. One of the crashes involved a vehicle attempting to turn and failing to stop for the bicycle who had the right-of-way while the other crash did not determine which party was at fault, it was unclear if bicyclist or the vehicle had the right-of-way at a signalized intersection.

Seven of the eight crashes that involved a pedestrian occurred when the pedestrian was located in an established crosswalk. Of these seven crashes, four involved a vehicle attempting to turn and failing to stop for the pedestrian who had the right-of-way, two involved a pedestrian who did not check for traffic or disregarded the “Don’t Walk” signal, and the final crash involved a vehicle that did not check their surroundings before backing out of a private driveway. The final pedestrian crash occurred in the roadway and involved a vehicle disregarding an emergency barricade and hitting two Flint Fire Fighters who were responding to a downed power line.

The high number of angle crashes are typically caused by vehicles at an intersection turning into or from the incorrect lane. A reduction in number of lanes could help reduce the number of angle crashes as it reduces the number of conflict points. Additionally, the high number of side-swipe same direction crashes could be reduced with a reduction in the number of through lanes, which would reduce the number of merging movements that occur. Rear-end crashes are common at signalized intersections, and signal warrants should be reviewed at low volume intersections to determine the best intersection control option for each intersection. A summary of all crash data and the UD-10s for all incapacitating injury (Level-A), pedestrian, and bicycle crashes are provided in Appendix D.

Table 3: Crash Summary: By Intersection

Intersection		Number of Crashes		Crash	Injuries				Contributing Factors		
		Total	Per Year	Rate	A	B	C	PDO	Alcohol	Pedestrian	Bike
M-21 (Court St)	Ann Arbor St	15	3	0.59	-	-	4	11	-	-	-
	Grand Traverse St	42	8.4	1.65	-	1	7	34	1	2	1
	Church St	23	4.6	0.91	-	2	5	16	-	1	-
	Beach St	45	9	1.77	-	-	10	35	1	1	-
	Saginaw St	50	10	1.12	-	1	9	40	1	1	-
	Harrison St	12	2.4	0.27	-	-	3	9	-	-	-
	Stevens St	13	2.6	0.29	-	-	2	11	-	-	-
	SB Chavez Dr	41	8.2	0.92	1	3	10	27	1	-	1
	NB Chavez Dr	37	7.4	0.83	-	1	14	22	-	-	-
	Lapeer Rd	18	3.6	0.40	-	-	2	16	-	1	-
M-21 (5th St)	Ann Arbor St	28	5.6	0.86	-	1	6	21	1	-	-
	Grand Traverse St	4	0.8	0.12	-	-	3	1	-	-	-
	Church St	23	4.6	0.71	-	2	9	12	-	-	-
	Beach St	28	5.6	0.86	-	3	3	22	-	2	-
	Saginaw St	38	7.6	0.95	-	1	9	28	-	-	-
	Stevens St	5	1	0.12	-	-	2	3	-	-	-
	SB Chavez Dr	16	3.2	0.40	-	-	4	12	-	-	-
	NB Chavez Dr	11	2.2	0.27	-	1	2	8	1	-	-
	Lapeer Rd	16	3.2	0.40	-	-	4	12	-	-	-
Total		**465**	**93**	**-**	**1**	**16**	**108**	**340**	**6**	**8**	**2**

Table 4: Crash Type - By Intersection

Intersection		Angle	Backing	Head On	Head On Left Turn	Other	Rear End	Rear End Left Turn	Rear End Right Turn	Sideswipe Opposite Direction	Sideswipe Same Direction	Single Motor Vehicle
M-21 (Court St)	Ann Arbor St	5	1	-	1	-	4	-	1	-	1	2
	Grand Traverse St	11	-	-	-	5	7	-	-	-	16	3
	Church St	12	-	1	-	1	1	-	-	-	7	1
	Beach St	17	-	-	-	-	2	-	-	-	24	2
	Saginaw St	11	-	-	-	4	6	-	-	1	26	2
	Harrison St	8	-	-	-	-	-	-	-	-	2	2
	Stevens St	7	-	-	-	-	2	-	-	-	4	-
	SB Chavez Dr	32	-	-	-	1	1	1	1	-	4	1
	NB Chavez Dr	23	-	-	1	-	4	-	-	-	9	-
	Lapeer Rd	4	-	-	-	-	-	1	-	1	10	2
M-21 (5th St)	Ann Arbor St	16	-	-	1	2	9	-	-	-	-	-
	Grand Traverse St	2	-	-	-	-	-	-	-	-	2	-
	Church St	11	-	-	-	1	-	-	-	-	11	-
	Beach St	14	-	-	-	1	1	-	-	-	10	2
	Saginaw St	12	-	-	5	-	11	1	-	-	7	2
	Stevens St	3	-	-	-	-	-	-	-	1	1	-
	SB Chavez Dr	10	-	-	-	-	1	1	-	-	4	-
	NB Chavez Dr	11	-	-	-	-	-	-	-	-	-	-
	Lapeer Rd	11	-	-	-	1	2	-	-	-	-	2
Total		**220**	**1**	**1**	**8**	**16**	**51**	**4**	**2**	**3**	**138**	**21**

Table 5: Crash Summary - By Type

Crash Type	Number of Crashes by Type						Percentage
	Fatal	A-Level	B-Level	C-Level	PDO	Total	
Alcohol	-	-	1	2	3	6	1.3%
Pedestrian	-	-	2	4	2	8	1.7%
Bike	-	-	1	1	-	2	0.4%
Total	**-**	**-**	**4**	**7**	**5**	**16**	**3.4%**
Angle	-	1	10	70	139	220	47.3%
Backing	-	-	-	1	-	1	0.2%
Head On	-	-	-	-	1	1	0.2%
Head On Left Turn	-	-	-	3	5	8	1.7%
Other	-	-	-	6	10	16	3.4%
Rear End	-	-	1	7	43	51	11.0%
Rear End Left Turn	-	-	-	-	4	4	0.9%
Rear End Right Turn	-	-	-	-	2	2	0.4%
Sideswipe Opposite Direction	-	-	-	2	1	3	0.6%
Sideswipe Same Direction	-	-	1	15	122	138	29.7%
Single Motor Vehicle	-		4	4	13	21	4.5%
Total	**-**	**1**	**16**	**108**	**340**	**465**	**100%**

FUTURE NO-BUILD CONDITIONS (YEAR 2045)

Historical traffic data provided by MDOT was referenced in order to determine the applicable growth rate for the existing traffic volumes to the project horizon study year in 2045. Based on this review, a background growth rate of 0.5 percent was utilized.

The results of the LOS analyses for no-build conditions reveal that all approaches and movements of the studied intersections would continue to operate at LOS C or better during the AM peak hour, MD off-peak, and PM peak hour.

The 95th percentile queue lengths were reviewed at the studied intersections. No queue length exceeded 206 feet (10 vehicles) in the AM peak hour, 445 feet (22 vehicles) in the MD off-peak, and 422 feet (21 vehicles) in the PM peak hour. While queue lengths increased in the MD off-peak and PM peak hour, no long-lasting queuing issues were observed in the traffic simulations. All traffic queues clear within one signal cycle length.

The operational results for all scenarios are presented in Table 7.

M-21 IMPROVEMENT ALTERNATIVES

A. Alternate A: One-Way Pair Restriping

In this alternative, the two-way pairs will remain, but the cross-section of each roadway will be reduced to a two-lane cross section. This will be achieved by the use of pavement markings. The existing curb lines will remain in their current locations, as shown in Figure 5 below. The excess pavement areas created by reducing the roadway to two lanes is highlighted in orange in Figure 5 below. This area can be repurposed in several ways. Some examples include bike lanes, on-street parking, outdoor dining areas, and flowerbed areas.

A rough cost estimate was generated for each alternate. This alternate is the least expensive at $350,000 to $400,000 This alternate was identified as a short-term project that could be completed in the next 5-years with the use of pavement markings.

Figure 5: Alternate A - One-Way Pair Restriping Concept

The results of the LOS analyses for Alternate A conditions reveal that all approaches and movements of the studied intersections would continue to operate at LOS C or better during the AM peak hour, MD off-peak, and PM peak hour.

The 95th percentile queue lengths were reviewed at the studied intersections. No queue length exceeded 193 feet (8 vehicles) in the AM peak hour, 424 feet (17 vehicles) in the MD off-peak, and 384 feet (15 vehicles) in the PM peak hour. No long-lasting queuing issues were observed in the traffic simulations and all traffic queues clear within one signal cycle length.

The operational results for all scenarios are presented in Table 7.

B. Alternate B: Two-Way Conversion

In this alternative, each roadway will be modified to accommodate two-way traffic. Each roadway will be a three-lane cross section with one eastbound lane, one westbound lane, and a continuous

TWLTL, as shown in Figure 6 below. This can be completed using pavement markings where the existing curb lines will remain. This configuration could also be completed during a future reconstruction of the roadway.

MDOT completed a city-wide traffic flow model to determine how traffic patterns would split between the two roadways. While the traffic splits vary throughout the corridor, the traffic split was roughly 50 percent on each roadway. Court Street will remain as M-21, while 5th Street will be turned over to the City of Flint. The excess pavement areas created by converting the roadway to two-way traffic with a three-lane cross-section can be repurposed in several ways. Some examples include bike lanes, on-street parking, outdoor dining areas, and flowerbed areas. Bike lanes are shown for illustrative purposes only in Figure 6 below.

Figure 6: Alternate B - Two-Way Pair Conversion Concept

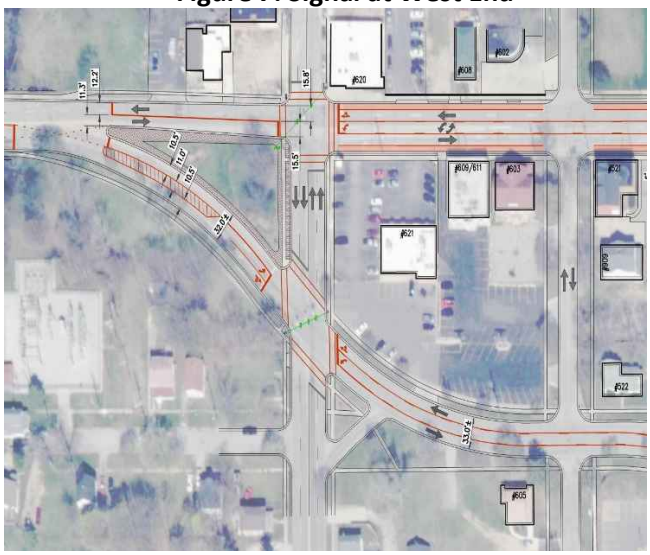
Several alternatives were reviewed at each end of the studied area to determine the best way to split and merge traffic onto the two separate roadways. Two alternates were developed for each end of the study area.

1. West End – West of Ann Arbor Street

   a. Signal

   One option at this location was the installation of a traffic signal that would be coordinated with the Court Street (M-21) and 5th Street corridors, as shown in Figure 7 below. A roundabout was reviewed for this site, but the high number of turning vehicles and restrictive right-of-way due to the bridge make a roundabout infeasible at this location. The modeling results for this option are shown in scenario B-1.

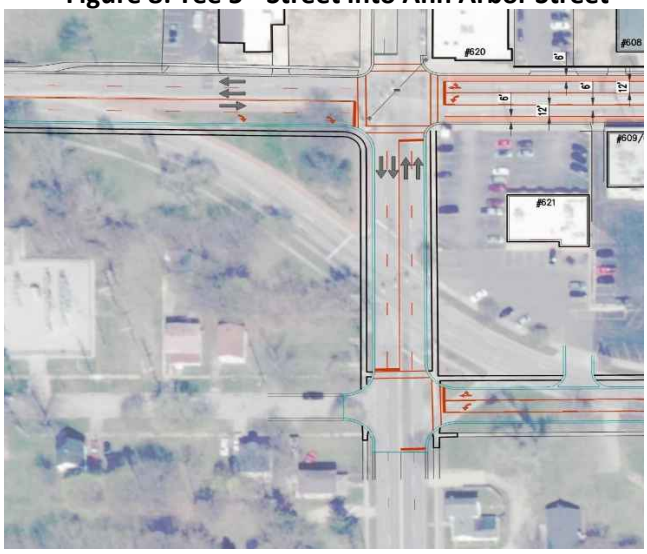
Figure 7: Signal at West End



   b. Tee 5th Street into Ann Arbor Street

   Another option at this location would be to tee 5th Street into Ann Arbor Street. All westbound traffic on 5th Street would use Ann Arbor Street to access westbound Court Street (M-21). Any eastbound traffic on Court Street (M-21) that wishes to use 5th Street would use Ann Arbor Street to access eastbound 5th Street. The modeling results for this option are shown in scenario B-2.

Figure 8: Tee 5th Street into Ann Arbor Street



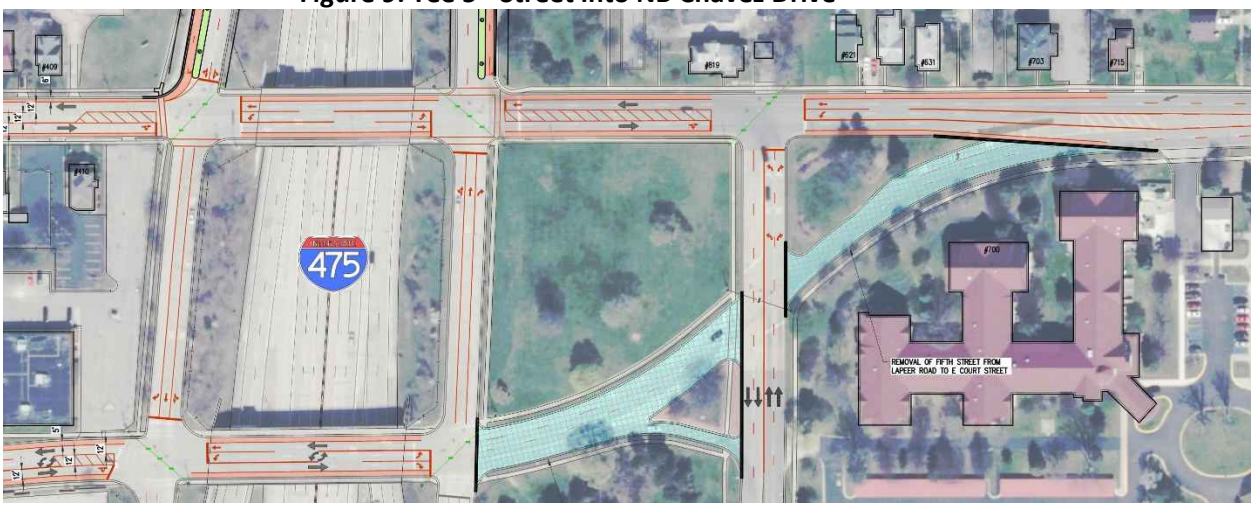
The implementation of this option would expand the available land between Court Street and Atwood Street by removing 5th Street between Court Street and Ann Arbor Street. This option would remove the triangle shaped park area that was identified by multiple groups as a maintenance issue. This triage shaped area would connect to the available land currently south of 5th Street, which could be used in multiple ways.

2. East End – East of Lapeer Road

a. Tee 5th Street into Northbound Chavez Drive

One option at this location would be to tee 5th Street into Northbound Chavez Drive. All eastbound traffic on 5th Street would use Northbound Chavez Drive to access eastbound Court Street (M-21). Any westbound traffic on Court Street (M-21) that wishes to use 5th Street would use Southbound Chavez Drive to access westbound 5th Street. The existing section of 5th Street between Northbound Chavez Drive and Court Street will be removed. The modeling results for this option are shown in scenario B-1.

Figure 9: Tee 5th Street into NB Chavez Drive



The implementation of this option would expand the available lane south of Court Street by removing 5th Street between northbound Chavez Drive and Court Street. This option would remove the triangle shaped park area that was identified by multiple groups as a maintenance issue. This option will create two parcels of land which could be used in multiple ways.

b. Tee 5th Street into Southbound Chavez Drive

Another option at this location would be to tee 5th Street into Southbound Chavez Drive. All eastbound traffic on 5th Street would use Stevens Street to access eastbound Court Street (M-21). Any westbound traffic on Court Street (M-21) that wishes to use 5th Street would use Southbound Chavez Drive to access westbound 5th Street. The existing section of 5th Street between southbound Chavez Drive and Court Street will be removed, including the bridge over I-475. The modeling results for this option are shown in scenario B-2.

Figure 10: Tee 5th Street into SB Chavez Drive

The implementation of this option would expand the available land south of Court Street by removing 5th Street between northbound Chavez Drive and Court Street. This option would remove the triangle shaped park area that was identified by multiple groups as a maintenance issue. This option will create two parcels of land which could be used in multiple ways. In addition, this option would remove the bridge over I-475, which would be a significant savings in maintenance costs for MDOT.

This alternate can be completed as a short-term project within the next 5 years with pavement markings or could be a long-term project that could be completed within a 20-year forecast in conjunction with a full reconstruction of the roadway.

A rough cost estimate was generated for each alternate. The results of this analysis as shown in Table 6 below.

Table 6: Alternate B Cost Estimates

	Resurfacing & Pavement Markings	Reconstruction
Alternate B-1	$4 - 4.5 M	$14 - 14.5 M
Alternate B-2	$5 - 5.5 M	

The results of the LOS analyses for Alternate B-1 conditions reveal that all approaches and movements of the studied intersections would continue to operate at LOS C or better during the AM peak hour, MD off-peak, and PM peak hour.

The 95th percentile queue lengths were reviewed at the studied intersections. No queue length exceeded 229 feet (9 vehicles) in the AM peak hour, 263 feet (11 vehicles) in the MD off-peak, and 370 feet (15 vehicles) in the PM peak hour. No long-lasting queuing issues were observed in the traffic simulations and all traffic queues clear within one signal cycle length.

The results of the LOS analyses for Alternate B-2 conditions reveals that all approaches and movements of the studied intersections would continue to operate at LOS C or better during the AM peak hour, MD off-peak, and PM peak hour with the following exceptions:

- M-21 (Court Street) and Ann Arbor Street
  - The eastbound right movement would operate at LOS D in the PM peak hour
- M-21 (5th Street) and Ann Arbor Street
  - The southbound right movement would operate at LOS D in the PM peak hour

The 95th percentile queue lengths were reviewed at the studied intersections. No queue length exceeded 217 feet (9 vehicles) in the AM peak hour, 256 feet (10 vehicles) in the MD off-peak, and 301 feet (12 vehicles) in the PM peak hour. No long-lasting queuing issues were observed in the traffic simulations and all traffic queues clear within one signal cycle length.

The operational results for all scenarios are presented in Table 7.

C. Alternate C: One-Way Pair Reconstruction

In this alternative, the two-way pairs will remain, but the cross-section of each roadway will be reduced to a two-lane cross section. This will be achieved by reconstructing the roadway, as shown in Figure 11. The existing curb lines will move. The excess pavement areas created by reducing the roadway to two lanes is highlighted in orange in Figure 11. The curb lines may move within the orange area dependent on how this area is repurposed. Some examples include bike lanes, on-street parking, outdoor dining areas, and flowerbed areas. A rough cost estimate was generated for each alternate. This alternate was identified as a long-term project that could be completed in the next 20 years in conjunction with a reconstruction of the roadway. This alternate would cost between $9,000,000 and $9,500,000.

Figure 11: Alternate C - One-Way Pair Reconstruction Concept

The results of the LOS analyses for Alternate C conditions reveals that all approaches and movements of the studied intersections would continue to operate at LOS C or better during the AM peak hour, MD Off-peak, and PM peak hour.

The 95th percentile queue lengths were reviewed at the studied intersections. No queue length exceeded 193 feet (8 vehicles) in the AM peak hour, 424 feet (17 vehicles) in the MD off-peak, and 384 feet (15 vehicles) in the PM peak hour. No long-lasting queuing issues were observed in the traffic simulations and all traffic queues clear within one signal cycle length.

The operational results for all scenarios are presented in Table 7.
A

Table 7: LOS Analysis Results

	Intersection	Existing Conditions			No Build 2045			Alternate A & Alternate C			Alternate B-1			Alternate B-2		
		AM Peak	Mid-Day	PM Peak	AM Peak	Mid-Day	PM Peak	AM Peak	Mid-Day	PM Peak	AM Peak	Mid-Day	PM Peak	AM Peak	Mid-Day	PM Peak
M-21 (Court St)	Ann Arbor St	B 12.0	B 12.9	B 13.5	B 12.2	B 13.2	B 14.1	B 12.4	B 13.9	B 15.1	B 12.0	B 12.3	B 13.0	B 18.3	B 19.3	C 25.5
	Grand Traverse St	B 14.6	B 17.0	B 19.8	B 15.2	B 18.4	C 22.1	B 18.3	C 20.3	C 24.6	B 13.2	B 13.0	B 13.6	B 14.3	B 14.1	B 16.5
	Church St	B 11.7	B 16.3	B 16.7	B 11.8	B 16.6	B 17.1	B 16.9	B 19.8	C 21.2	B 12.7	A 7.8	A 8.7	B 12.7	A 7.8	A 8.7
	Beach St	B 11.8	B 16.1	B 16.6	B 16.6	B 16.4	B 17.0	B 19.1	B 19.4	C 21.1	B 12.9	B 14.2	B 15.4	B 12.9	B 14.2	B 15.4
	Saginaw St	B 13.8	B 14.8	B 16.9	B 14.6	B 18.1	B 18.0	B 17.9	B 19.4	B 19.5	B 15.3	B 14.6	B 15.2	B 15.3	B 14.6	B 15.2
	Harrison St	B 11.3	B 11.2	B 11.3	B 11.5	B 11.5	B 11.6	B 14.0	B 13.7	B 14.3	B 10.6	B 11.0	B 12.3	A 5.8	B 11.0	B 11.0
	Stevens St	B 17.0	B 16.2	B 16.4	B 17.4	B 16.5	B 16.7	C 21.6	B 19.4	B 19.8	A 9.3	B 11.5	B 14.2	C 20.0	B 16.0	C 20.6
	SB Chavez Dr	B 12.6	B 12.0	B 12.3	B 15.7	B 14.9	B 14.9	B 16.7	B 16.0	B 15.8	A 8.1	A 8.1	B 12.8	B 18.4	B 12.3	B 13.6
	NB Chavez Dr	B 18.0	B 12.0	B 16.2	B 18.6	B 15.5	B 16.6	B 18.8	B 19.1	B 20.0	B 16.0	B 16.8	B 19.1	B 16.0	B 16.1	C 23.9
	Lapeer Rd	B 13.6	B 14.1	B 14.3	B 13.7	B 14.3	B 14.5	B 13.8	B 14.3	B 14.6	B 17.7	C 23.2	B 14.0	B 17.7	B 13.3	B 14.0
M-21 (5th St)	Ann Arbor St	B 13.8	B 12.2	B 12.9	B 14.4	B 12.4	B 13.3	B 17.4	B 13.1	B 14.8	B 17.9	B 14.1	B 15.5	B 15.4	B 19.2	C 26.2
	Grand Traverse St	B 14.8	B 15.2	B 17.6	B 15.2	B 15.7	B 18.8	B 17.3	B 16.7	C 20.5	B 10.6	B 14.9	B 13.1	B 10.6	B 16.5	B 13.1
	Church St	B 16.3	B 15.8	B 16.3	B 16.7	B 16.1	B 16.7	C 20.0	B 18.5	C 20.2	B 11.1	A 6.8	A 7.4	B 11.1	A 6.8	A 7.4
	Beach St	B 16.8	B 15.4	B 15.6	B 17.2	B 15.6	B 16.0	C 21.6	B 17.7	B 18.7	B 16.0	B 11.6	A 7.9	B 16.0	A 9.4	A 7.9
	Saginaw St	B 15.5	B 14.7	B 15.3	B 16.5	B 15.7	B 16.4	B 18.9	B 17.2	B 18.3	B 12.1	B 15.7	B 13.5	B 12.1	B 14.4	B 14.3
	Stevens St	B 11.5	B 11.7	B 11.6	B 11.7	B 11.9	B 11.8	B 12.8	B 13.9	B 14.0	A 8.9	B 15.7	B 15.9	B 13.5	B 13.5	B 14.5
	SB Chavez Dr	B 11.8	B 16.3	B 18.4	B 16.3	B 16.6	B 18.8	B 18.7	B 19.7	C 22.4	B 10.2	B 15.7	C 20.9	A 9.2	A 9.0	B 10.3
	NB Chavez Dr	B 12.4	B 16.9	B 17.3	B 12.7	B 17.3	B 17.8	B 16.7	C 20.9	C 21.2	B 13.3	B 13.4	B 13.5	-	-	-
	Lapeer Rd	B 16.4	B 19.3	C 20.1	B 17.0	C 22.2	C 21.3	B 19.6	C 22.3	C 21.3	-	-	-	-	-	-

No change in LOS Grade, insignificant increase in delay
No Change in LOS Grade, insignificant decrease in delay
LOS Grade degrades by 1 Level (B to C)
LOS Grade improves by 1 Level (B to A or C to B)

PUBLIC INVOLVEMENT

Stakeholder input was a valuable factor considered as the team carried out the corridor study. As part of the corridor study, a steering committee was engaged to help identify the project purpose, project goals, known problems and constraints, future developments, opportunities within the corridor, non-motorized needs, and potential transportation improvement alternates. The steering committee consisted of representatives from MDOT Bay Region, MDOT Davison TSC, ROWE Professional Services Company, City of Flint, MTA, Genesee County MPO, Flint Cultural Center, Mott Community College, University of Michigan – Flint, and the CS Mott Foundation.

In addition to the steering committee meetings listed above, additional public input was sought at multiple points in the study process. The first public meeting was conducted via Microsoft Teams on May 11, 2021. This meeting included an overview of each roadway alternative. A survey was published on the project website to allow members of the public to express their opinions on the different alternatives and to provide input on how to redevelop the land that would be made available by the different roadway configurations. Presentations were also provided to the following neighborhood groups: Flint Neighborhoods United, the Central Park Neighborhood Association, and the Traffic Taming Taskforce.

In addition to the steering committee meetings listed above, additional public input was sought at multiple points in the study process. The first public meeting was conducted via Microsoft Teams on May 11, 2021. This meeting included an overview of each roadway alternative. A survey was published on the project website to allow members of the public to express their opinions on the different alternatives and to provide input on how to redevelop the land that would be made available by the different roadway configurations. A copy of the survey is included in Appendix E.

As of July 7, 2021, 55 responses have been received from the public input survey. The results of the survey questions are summarized in Figure 12 through Figure 15 below.

Figure 12: Which M-21 option do you prefer?

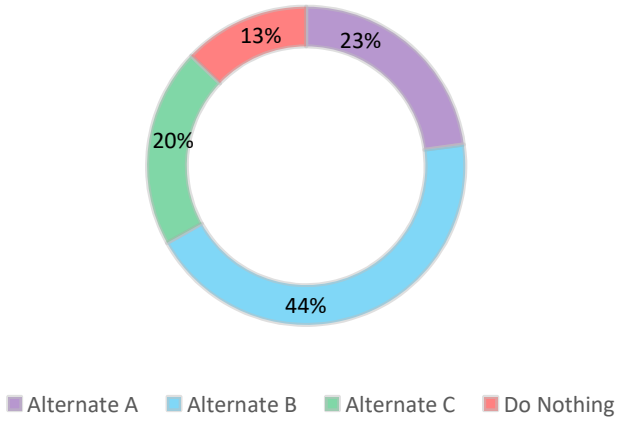


Figure 13: What should be done with the extra travel space?

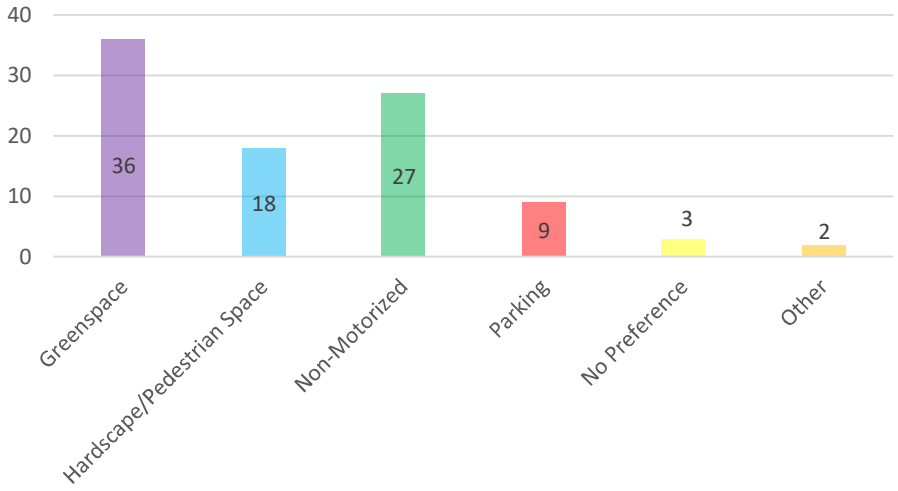


Figure 14: What intersection type should be constructed at the west end of the corridor?

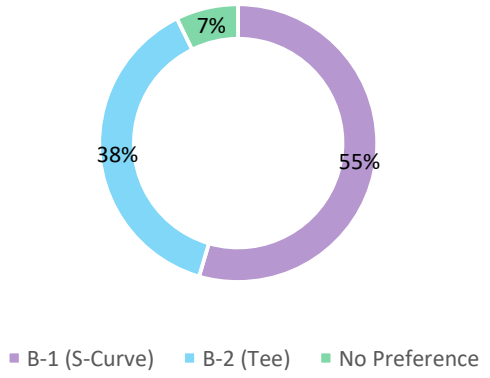
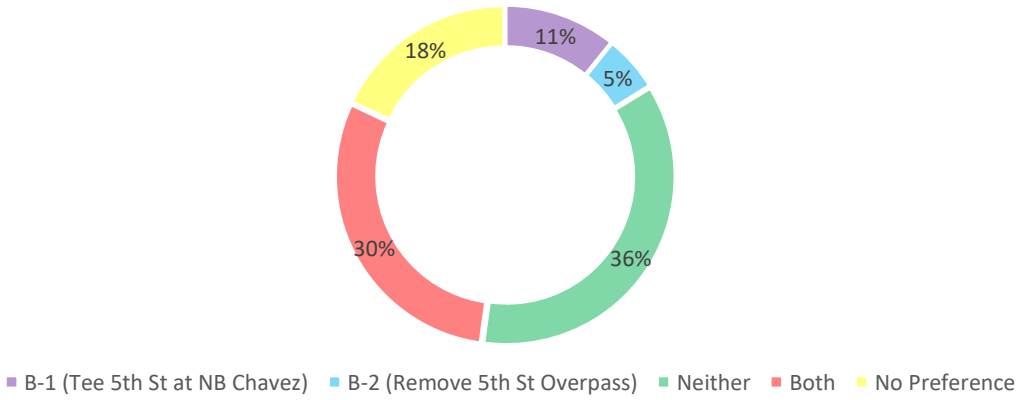


Figure 15: What should be done at the east end of the corridor?



Two additional comments were received through the public input survey. One of the comments requested that public transportation be considered, and that the excess area created in the various alternates could be used as a dedicated bus lane. The other comment requested that Court Street should be made two-way with a left turn lane while 5th Street is turned over to the City of Flint (Alternate B).

A second public meeting is tentatively scheduled for mid-August, and this study will be updated with the results of any public input received at that or subsequent meetings.

CONCLUSIONS

The M-21 Corridor Study was commissioned by MDOT. The purpose of the study was to review existing operations and determine several alternative roadway designs for the M-21 corridor through the City of Flint from Ann Arbor Street to Lapeer Road. M-21 is split into two one-way pair streets for the entirety of the studied corridor with M-21 (Court Street) traveling westbound and M-21 (5th Street) traveling eastbound.

A Planning and Environment Linkages (PEL) study represents a collaborative and integrate approach to transportation decision-making that considers environmental, community, and economic goals early in the transportation planning process. The information analysis and products developed during the PEL study is then used to inform the formal federal National Environmental Policy Act (NEPA) environmental review process. Any improvements made to the M-21 corridor should be coordinated with the results of the PEL study.

An operational analysis was performing during the AM peak, MD off-peak, and PM peak hours for existing, no build (year 2045), Alternate A, Alternate B, and Alternate C conditions at the following study intersections:

M-21 (Court Street)	M-21 (5th Street)
• Ann Arbor Street	• Ann Arbor Street
• Grand Traverse Street	• Grand Traverse Street
• Church Street	• Church Street
• Beach Street	• Beach Street
• Saginaw Street	• Saginaw Street
• Harrison Street	• Stevens Street
• Stevens Street	• SB Chavez Drive
• SB Chavez Drive	• NB Chavez Drive
• NB Chavez Drive	• Lapeer Road
• Lapeer Road	

The operational analysis indicated that most approaches and movements of the study intersection would operate at LOS C or better during the AM peak hour, MD off-peak, and PM peak hours. In Alternate B-2, the eastbound right movement at the intersection of M-21 (Court Street) and Ann Arbor Street, and the southbound right movement at the intersection of M-21 (5th Street) and Ann Arbor Street would operate at LOS D in the PM peak hour. A summary of the different alternates is shown in Table 8.

Each alternate was reviewed to determine if new land areas could be created by the redesign of the studied corridor. In Alternate B, new land areas could be created on the west end and east end of the

studied corridor dependent on which end treatment is selected. The removal of the 5th Street bridge over I-475 would be a significant maintenance cost savings for MDOT.

A review of the existing non-motorized facilities along the studied corridor was completed to identify any deficiencies in the existing facilities. Most intersections have existing pedestrian signals and crosswalks. The intersections of M-21 (Court Street) and Lapeer Road and M-21 (5th Street) and Lapeer Road do not have pedestrian signals, crosswalks, sidewalk, and curb cuts in all quadrants of the intersection.

A crash analysis was performed to determine if any discernable crash patterns could be identified at the studied intersections. The crash analysis revealed a total of 465 crashes within the study area over the 5-year period. There were eight crashes involving a pedestrian and two crashes involving a bicycle. Alcohol was not involved in any of the pedestrian or bicycle crashes.

Safety and mobility reviews were completed for each alternative. It was determined that any of the proposed alternatives would improve safety by reducing the number of vehicle lanes. All of the proposed alternatives would improve mobility for all road users by providing the opportunity to improve sidewalks and construct bicycle facilities.

Table 8: Alternate Comparison

Evaluation Criteria		Comments	Alternate			
			A: One-Way Part Restriping	B-1: Two-Way Conversion	B-2: Two-Way Conversion	C: One-Way Pair Reconstruction
Traffic Operations		Overall efficiency of traffic operations. Factors include intersection operations and changes to delays experienced by motorists.	High All movements would operate at LOS C or better.	High All movements would operate at LOS C or better.	High All movements would operate at LOS C or better except for two movements.	High All movements would operate at LOS C or better.
Safety		Degree to which alternates may reduce total crashes, injury crashes, and conflicts for vehicular and non-motorized users.	Moderate One-way traffic and a two-lane cross section would likely reduce the number of crashes along the corridor. Pedestrian crossing distance reduced to two lanes. Bicycle facilities may separate bicyclists from vehicular or pedestrian traffic.	Moderate Two-way traffic and a three-lane cross section would likely reduce the number of crashes along the corridor. Pedestrian crossing distance reduced to three lanes. Bicycle facilities may separate bicyclists from vehicular or pedestrian traffic.	Moderate Two-way traffic and a three-lane cross section would likely reduce the number of crashes along the corridor. Pedestrian crossing distance reduced to three lanes. Bicycle facilities may separate bicyclists from vehicular or pedestrian traffic.	Moderate One-way traffic and a two-lane cross section would likely reduce the number of crashes along the corridor. Pedestrian crossing distance reduced to two lanes. Bicycle facilities may separate bicyclists from vehicular or pedestrian traffic.
Non-Motorized Facilities	Pedestrians	Degree to which alternates accommodate pedestrians. Assessment is based upon presence of paths/sidewalks through the corridor.	High Pedestrians fully accommodated via existing and proposed sidewalks.	High Pedestrians fully accommodated via existing and proposed sidewalks.	High Pedestrians fully accommodated via existing and proposed sidewalks.	High Pedestrians fully accommodated via existing and proposed sidewalks.
	Bicyclists	Degree to which alternates accommodate bicyclists. Assessment is based upon presence of non-motorized facilities through the corridor.	Moderate to High Bicyclists may be fully accommodated via dedicated bicycle lanes.	Moderate to High Bicyclists may be fully accommodated via dedicated bicycle lanes.	Moderate to High Bicyclists may be fully accommodated via dedicated bicycle lanes.	Moderate to High Bicyclists may be fully accommodated via dedicated bicycle lanes.
Planning Level Construction Cost		Includes construction cost for improvements to M-21. All estimates in year 2021 dollars. Right-of-way cost (if any) not included in estimate.	$350,000 - 400,000	Restriping: $4.0 – 4.5M Reconstruction: $14 - 14.5M	Restriping: $5.0 – 5.5M Reconstruction: $14 – 14.5M	$9.0 – 9.5M
Long-Term Operational Cost		Cost of ongoing operations including electricity (lighting), signal adjustment, bulbs/other equipment, maintenance, pavement markings, etc.	Moderate to High	Moderate to High	Moderate to High	Moderate to High
Environmental Impacts		Degree to which alternates negatively impact surrounding resources (e.g., cultural resources, noise, parks, green space, etc.)	Low	Low	Low	Low
Context Sensitive Design		Opportunities for aesthetic enhancements.	High	High	High	High

Note: The low/moderate/high rankings provide a qualitative comparison of relative impacts among the alternates. These ranking were based on the professional judgement of the interdisciplinary project team.

Appendix A: Report Figures

Appendix B: Traffic Counts

Appendix C: Level of Service Output Reports

Appendix D: Crash Data

Appendix E: Public Input Survey