10th Street between Myers Ave and Grosscup Ave

ROAD SAFETY ASSESSMENT

Regional Intergovernmental Council

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Table of Contents

List of Figures

List of Photos

List of Tables

Appendices

1.0 Executive Summary

The purpose of this study is to analyze the existing safety and capacity conditions and to determine potential countermeasures to reduce crash frequency along 10th Street between Myers Avenue and Grosscup Avenue in Dunbar, West Virginia. A particular focus of this study is safety for vulnerable road users.

The study area is mainly commercial with large shopping centers, banks, gas stations, and restaurants along 10th Street. The area to the southeast of the study area is primarily residential with a large number of single-family residences, generating pedestrian traffic to the commercial areas. There is also an affordable housing apartment complex located on the northwest corner of 10th Street and Myers Avenue that adds to the pedestrian traffic along and across 10th Street.

The crosswalk across 10th Street on the northern side of the Grosscup Avenue intersection does not connect to the sidewalk with a curb ramp on the west side of the roadway. Generally, vehicles would not stop for pedestrians in the crosswalk. Instead, pedestrians had to be very vigilant while crossing 10th Street.

In the six-year study period, there were 88 crashes with 19 (22 percent) resulting in injury and one fatality. The fatality occurred on May 19, 2021, at 11:13 AM when a pedestrian was illegally crossing 10th Street just north of the Myers Avenue intersection and was struck by a vehicle turning out of the City Bank Driveway to go southbound on 10th Street. Angle collisions were the most prominent crash type, accounting for 30 total collisions with seven (23 percent) resulting in injury. Pedestrian collisions were also prevalent in the study area with 10 pedestrian collisions occurring in the last six years. All of these pedestrian collisions resulted in injury, and one resulted in a fatality.

Out of the 10 pedestrian collisions in the study area, six occurred in the northern crosswalk of the intersection of 10th Street and Myers Avenue. The largest crash pattern was due to eastbound vehicles on Myers Avenue failing to yield to pedestrians in the crosswalk as they were turning left onto northbound 10th Street. One of the pedestrian collisions in this crosswalk involved an individual using an electric wheelchair and another involved a driver under the influence of a controlled substance.

Based on the crash patterns and traffic operations in the study corridor, the following countermeasures are recommended:

<u>Short-Term</u>

- Add “Yield to Pedestrian” signage at 10th Street and Myers Avenue on the span wire of the signal ($1,700 – 2022 Dollars).
- Restripe the Myers Avenue approach to provide a combined left-through-right lane ($2,400 – 2022 Dollars).
- Install ground-mounted and overhead lane-use signage in the study area ($56,300 – 2022 Dollars).

Medium-Term

- Close McDonald's driveway/Dunbar Village Plaza driveway ($22,700 – 2025 Dollars).
- Add a curb bump out on the southwest side of the intersection of 10th Street and Myers Avenue ($28,000 – 2025 Dollars).
- Modify crosswalk across 10th Street at Grosscup Avenue; install pedestrian refuge islands/medians and RRFB ($147,000 –2025 Dollars).

2.0 Purpose

The purpose of this study is to analyze the existing safety and capacity conditions and to determine potential countermeasures to reduce crash frequency along 10th Street between Myers Avenue and Grosscup Avenue in Dunbar, West Virginia. A particular focus of this study is safety for vulnerable road users. The study area is shown below in **Figure 1.**

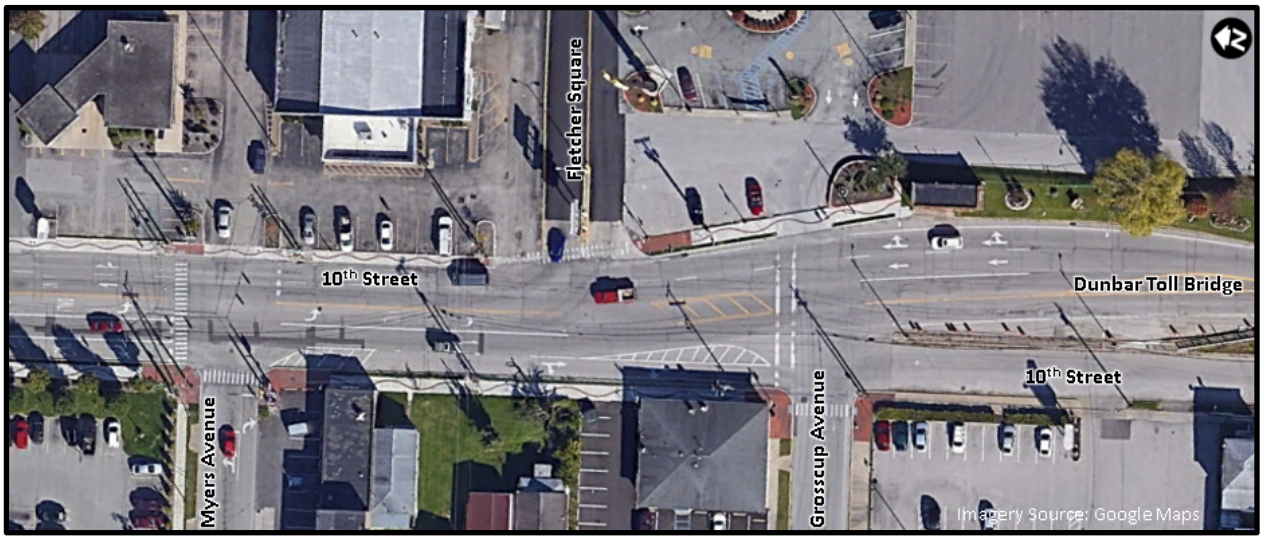


Figure 1: Study Area

3.0 Existing Conditions

The study area is mainly commercial with large shopping centers, banks, gas stations, and restaurants along 10th Street. The area to the southeast of the study is primarily residential with a large number of single-family residences, generating pedestrian traffic to the commercial areas. There is also an affordable housing apartment complex located on the northwest corner of 10th Street and Myers Avenue that adds to the pedestrian traffic along and across 10th Street. Additional pedestrian generators in the area are the Dunbar Public Library and Dunbar Intermediate School to the west of the study area along Myers Avenue.

A site visit was performed at the study area on August 24th, 2022 from 1:00 PM to 4:00 PM. The attendees were from Burgess & Niple and Regional Intergovernmental Council. Observations and pictures from the site visit are included in the following sections.

Roadway Conditions

10th Street is a two-way four-lane road with a speed limit of 30 mph. Sidewalk is provided on both the east and west sides of 10th Street. On-street parking is not provided. To the south of the study area, 10th Street splits to continue into a residential area and to connect to the Dunbar Toll Bridge over the Kanawha River. The overall corridor was lighted with some pedestrian-level streetlights not working. The lights from the surrounding shopping center illuminated the roadway very well, as shown in **Photo 1** and **Photo 2**. Pedestrians were observed crossing the study area at unmarked crossings, as shown in **Photo 3**. Dunbar Police Enforcement was observed in the area during the site visits.

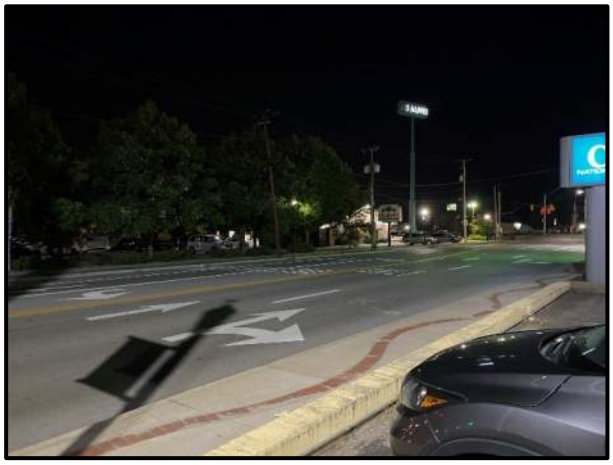


Photo 1: Lighting North of Myers Avenue

Photo 2: Lighting at Fletcher Square

Photo 3: Pedestrian Crossing Midblock

Intersection Conditions

10th Street and Myers Avenue

The lane configuration for this intersection is illustrated in **Figure 2**. All signal heads are suspended on span wire. There are high-visibility crosswalks on the northern and western sides of the intersection. The crosswalk lines on the western side of the intersection were faded during the field visit, as shown in **Photo 4**. The lighting provided at the intersection illuminates the northern crosswalk very well, as shown in **Photo 5**. The lighting is not as bright for the western crosswalk. All approaches have permissive-only left-turn operations. Auditory pedestrian push buttons and pedestrian signal heads are provided to cross both the western and northern legs of the intersection. Lane use signage is not provided at the intersection except for a "Right Lane Must Turn Right" sign approximately 125 feet north of the intersection on the southbound approach.

Figure 2: 10th Street and Myers Avenue Lane Configuration

Photo 4: Crosswalk on West Leg of 10th Street and Myers Avenue

Photo 5: Crosswalk on North Leg of 10th Street and Myers Avenue

10th Street and Fletcher Square

The lane configuration for this intersection is illustrated in **Figure 3**. The intersection is a minor stop-controlled three-legged intersection providing access to the Dunbar Village Plaza shopping center. The crosswalk across Fletcher Square was very faded at the time of the field visit. A concrete median separates the entrance and exit of Fletcher Square, containing the sign for the shopping center. Vehicles can turn left or right out of the shopping center, but longer delays were observed for those trying to turn left onto 10th Street. During the field visit, vehicles were observed creating two different turn lanes to exit Fletcher Square due to the wide width of the exit (18 feet). Another driveway is located just north of the entrance/exit to Fletcher Square, shown in **Photo 6**, creating additional conflict for those attempting to turn right out of Fletcher Square.

Figure 3: 10th Street and Fletcher Square Lane Configuration

Photo 6: Driveway to North of Fletcher Square

10th Street and Grosscup Avenue

The lane configuration for this intersection is illustrated in **Figure 4**. The intersection is a minor stop-controlled four-legged intersection. There is high visibility crosswalk striping on the northern and western legs of the intersection. The crosswalk across 10th Street on the northern side of the intersection does not connect to the sidewalk with a curb ramp, as shown in **Photo 7**. The full crosswalk length is 77 feet across 10th Street. Generally, vehicles would not stop for pedestrians in the crosswalk. Instead, pedestrians had to be very vigilant while crossing 10th Street. A pedestrian was observed crossing 10th Street slowly during the site visit, as shown in **Photo 8.** Vehicles on the westbound approach on the McDonald's/Shopping Center driveway are only permitted to turn right at the intersection. Some vehicles were observed turning left onto the Dunbar Toll Bridge illegally.

Figure 4: 10th Street and Grosscup Avenue Lane Configuration

Vehicles on the eastbound approach of Grosscup Avenue can turn right onto 10th Street or the Dunbar Toll Bridge. Vehicles traveling northbound on 10th Street to the left of the Dunbar Toll Bridge are only permitted to turn left onto westbound Grosscup Avenue.

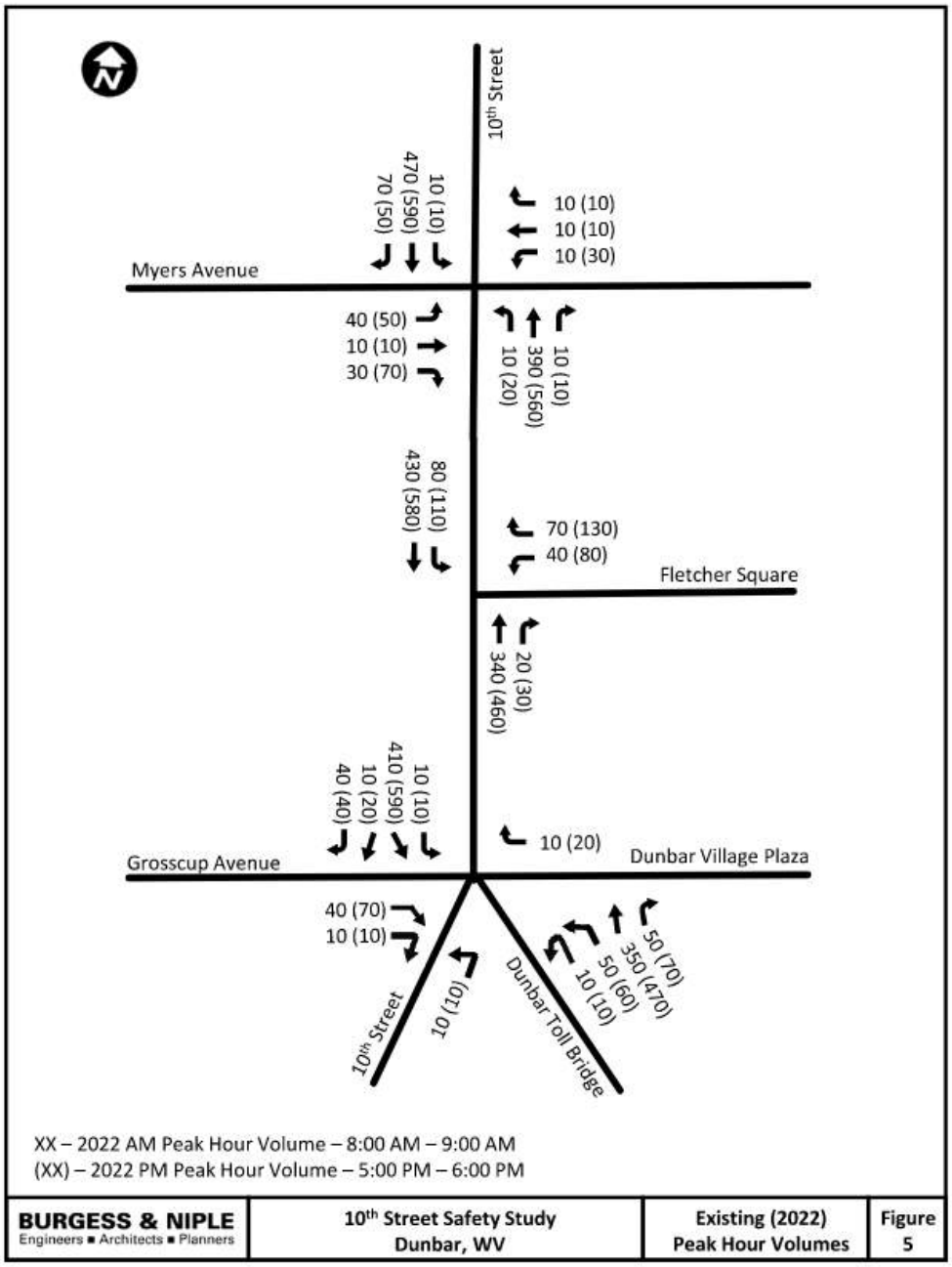
Photo 7: Northwest Corner of Grosscup Avenue

Photo 8: Pedestrian Crossing 10th Street at Grosscup Avenue

4.0 Data Collection

Turning movement and pedestrian counts were collected between 8:00 AM and 10:00 AM on Wednesday, August 24th, 2022, and 5:00 PM and 7:00 PM on Thursday, August 25th, 2022 for the intersections of 10th Street with Flecher Square and Grosscup Avenue. The intersection of 10th Street and Myers Avenue was counted during the same AM and PM hours on Thursday, August 25th, 2022, and Friday, August 26th, 2022. All counts were done by Burgess & Niple.

The corridor peak hours were determined to be 8:00 AM to 9:00 AM and 5:00 PM to 6:00 PM. The rounded peak hour counts are shown in **Figure 5.** Raw traffic counts are provided in **Appendix A**.



5.0 Existing Capacity Analysis

Intersection capacity was evaluated at all study intersections using the existing peak hour traffic volumes, existing lane configurations, and existing traffic control using *Synchro*, version 11. *SimTraffic* was used to obtain 95th percentile queue lengths. *SimTraffic* is the microsimulation package included with *Synchro.* The results of five microsimulation runs were averaged together to obtain the results provided herein. Analysis results are from the *Highway Capacity Manual (HCM) 6th Edition Module* within *Synchro*. The existing signal timings were provided for 10th Street and Myers Avenue by the West Virginia Department of Highways (WVDOH) and were utilized in the analysis. The 2022 existing condition analysis is summarized in **Table 1, Table 2,** and **Table 3** with analysis output provided in **Appendix B.**

10th Street and Myers Avenue

Table 1: Existing Capacity Analysis at 10th Street and Myers Avenue

	Overall Intersection	Eastbound Myers Ave		Westbound Myers Ave	Northbound 10th St	Southbound 10th St		
		LT/TH	RT	LT/TH/RT	LT/TH/RT	LT	TH	RT
AM Peak Hour								
LOS	A	D	D	D	A	A	A	A
Delay	7.6	53.1	52.7	52.1	2.1	2.2	2.9	1.8
v/c		0.30	0.26	0.19	0.16	0.01	0.33	0.06
95th % Queue		91'	43'	60'	69'	26'	127'	31'
		D – 53.0		D – 52.1	A – 2.1	A – 2.7		
PM Peak Hour								
LOS	A	D	E	E	A	A	A	A
Delay	9.6	53.8	56.2	56.5	2.5	2.7	3.5	1.9
v/c		0.37	0.56	0.43	0.22	0.02	0.42	0.04
95th % Queue		100'	57'	90'	96'	38'	179'	28'
		E – 55.1		E – 56.5	A – 2.5	A – 3.3		

Currently, the overall intersection operates at level of service (LOS) A in both peak hours. The eastbound right turn movement and the westbound approach both operate at LOS E in the PM peak hour due to the signal timings favoring the mainline traffic on 10th Street. Based on the volume-to-capacity ratios, the intersection is operating well under capacity with the highest volume-to-capacity ratio being 0.56. The longest queue lengths are occurring in the southbound through-lane for both the AM and PM peak hours.

10th Street and Fletcher Square

Table 2: Existing Capacity Analysis at 10th Street and Fletcher Square

	Westbound Fletcher Square	Northbound 10th Street	Southbound 10th Street	
	LT/RT	TH/RT	LT	TH
AM Peak Hour				
LOS	B	--	A	--
Delay	14.9	--	8.4	--
v/c	0.25	--	0.08	--
95th % Queue	76'	--	52'	--
	B – 14.9	--	--	
PM Peak Hour				
LOS	D	--	A	--
Delay	28.3	--	8.9	--
v/c	0.60	--	0.11	--
95th % Queue	149'	--	59'	--
	D – 28.3	--	--	

Currently, the intersection and all movements operate at LOS D or better during both peak hours. Based on the volume-to-capacity ratios, the intersection is operating well under capacity with the highest volume-to-capacity ratio being 0.60.

10th Street and Grosscup Avenue

HCM methodology cannot analyze the unsignalized five-leg intersection at 10th Street and Grosscup Avenue. Therefore, the southwest leg (10th Street northbound between the CVS and the Dunbar Toll Bridge) was removed from the intersection. Volumes on the southwest leg were combined with nearby legs with similar movements. Note that the existing volumes have been adjusted to a minimum of 10 vehicles per hour. For example, in both existing peak hour counts there was one vehicle turning from the southwest leg (10th Street) onto the west leg (Grosscup Avenue). For analysis purposes, this movement is illustrated by adding 10 vehicles to the south leg (Dunbar Toll Bridge) as a northbound left-turn movement.

Table 3: Existing Capacity Analysis at 10th Street and Grosscup Avenue/Dunbar Village Plaza

	Eastbound Grosscup Ave	Westbound Dunbar Village Plaza	Northbound 10th St/ Toll Bridge		Southbound 10th St	
	RT	RT	LT	TH/RT	LT/TH	RT
AM Peak Hour						
LOS	B	A	A	--	A	--
Delay	11.7	9.7	8.7	--	8.3	--
v/c	0.09	0.01	0.06	--	0.01	--
95th % Queue	45'	31'	52'	--	30'	--
	B – 11.7	A – 9.7	--		--	
PM Peak Hour						
LOS	C	B	A	--	A	--
Delay	15.3	10.5	9.7	--	8.8	--
v/c	0.21	0.03	0.10	--	0.01	--
95th % Queue	53'	41'	57'	--	40'	--
	C – 15.3	B – 10.5	--		--	

The intersection and all movements operate at LOS C or better during both peak hours. Based on the volume-to-capacity ratios, the intersection is operating well under capacity.

6.0 Existing Safety Analysis

Crash Analysis

Crash data from January 1, 2016 through December 31, 2021 was downloaded from the ReportBeam website. Each crash report was reviewed to determine potential factors contributing to crashes. A collision diagram that shows crash patterns by illustrating the approximate location of each reported crash is provided in **Appendix C**. In the six-year study period, there were 88 crashes with 19 (22 percent) resulting in injury and one fatality. The fatality occurred on May 19, 2021, at 11:13 AM when a pedestrian was illegally crossing 10th Street just north of the Myers Avenue intersection and was struck by a vehicle turning out of the City Bank Driveway to go southbound on 10th Street. **Figure 6** shows the frequency of crashes by severity per year. Injury collisions have been increasing in recent years.

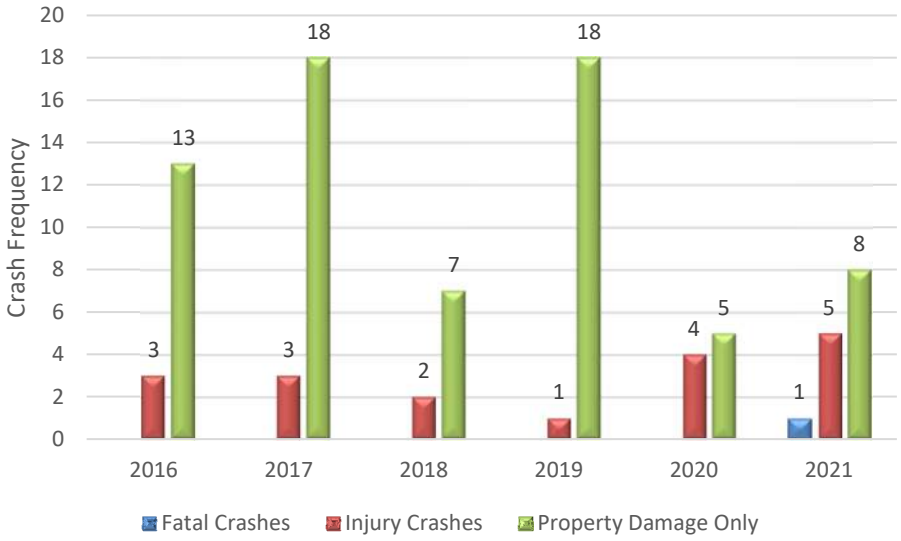


Figure 6: Crash Frequency by Severity and Year

Figure 7 shows the crash frequency in the study area by the crash type. Angle collisions were the most prominent crash type, accounting for 30 total collisions with seven (23 percent) resulting in injury. Pedestrian collisions were also prevalent in the study area with 10 pedestrian collisions occurring in the last six years. All of these pedestrian collisions resulted in injury, and one resulted in a fatality.

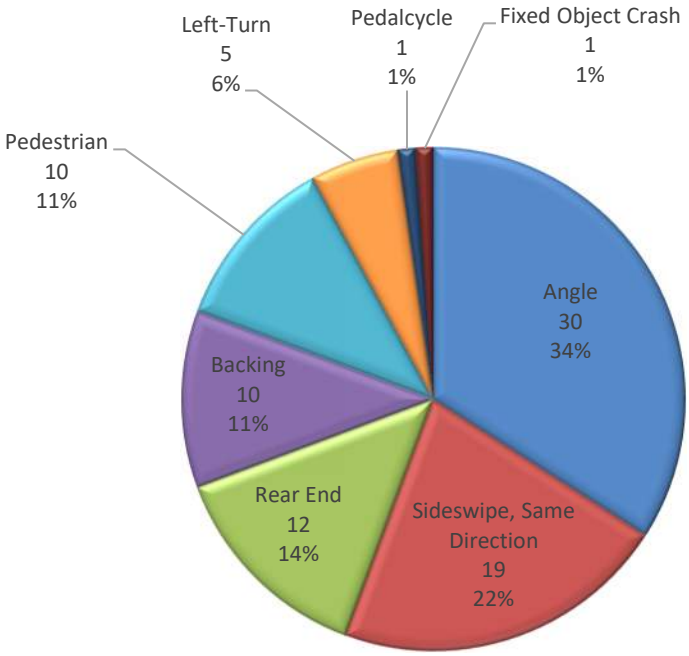


Figure 7: Crash Frequency by Crash Type

10th Street and Myers Avenue

The majority of the angle collisions occurred at the intersection of 10th Street and Myers Avenue, with the largest crash patterns due to northbound vehicles running the red light on 10th Street.

Backing collisions were very prevalent on the eastbound approach due to vehicles backing out of Smoker's Friendly and striking vehicles queued on Myers Avenue.

Out of the 10 pedestrian collisions in the study area, six occurred in the northern crosswalk of the intersection. The largest crash pattern was due to eastbound vehicles on Myers Avenue failing to yield to pedestrians in the crosswalk as they were turning left onto northbound 10th Street. One of the pedestrian collisions in this crosswalk involved an individual using an electric wheelchair and another involved a driver under the influence of a controlled substance.

A collision with a bicyclist also occurred just north of the intersection. The bicyclist illegally crossed 10th Street from Myers Avenue while northbound vehicles on 10th Street had the right-of-way.

10th Street and Fletcher Square

The most prevalent crash pattern at the intersection was between northbound vehicles and westbound vehicles leaving Fletcher Square. These crashes are likely occurring due to the high volume on 10th Street and the high speeds of the vehicles coming off of the Dunbar Toll Bridge, making it difficult for vehicles to find a gap in traffic and assess the length of the gap in traffic. Additionally, the turn lane lanes around the intersection and multiple through lanes create a lot of traffic friction throughout the area.

10th Street and Grosscup Avenue

The most prevalent crash type at the intersection was angle collisions, due to eastbound vehicles leaving the McDonald's Driveway/Dunbar Village Plaza Driveway and being struck by northbound vehicles from the Dunbar Toll Bridge. Vehicles are prohibited from turning left or going straight out of this driveway.

There was one pedestrian collision at this intersection in the northern crosswalk across 10th Street. The pedestrian was walking east across 10th Street in the crosswalk while the vehicle was sitting at the stop sign on Grosscup Avenue facing east. The vehicle then made an illegal left turn onto northbound 10th Street, striking the pedestrian in the crosswalk.

7.0 Countermeasures for Consideration

The following countermeasures were identified to mitigate crashes and improve safety within the study area.

- **Consider installing lane-use signage in the study area:** There is currently very limited lane use signage around the study area, creating some confusion for drivers in the area. Ground-mounted lane-use signage is recommended for all intersections in the study area.

  Overhead lane-use signage is recommended for southbound vehicles approaching 10th Street and Myers Avenue. Currently, is not clear for southbound vehicles traveling in the right lane of 10th Street that the outside through lane terminates into a right-turn lane. Vehicles were observed abruptly merging into the through lane. This confusion could be contributing to the sideswipe collisions that are occurring on the southbound approach to the intersection.

  Adding overhead signage across 10th Street also allows for northbound lane-use signage to be added in the adjacent northbound lanes for the I-64 Exit Ramps. Currently, due to the roadway curvature, the signs from each exit are obstructed as vehicles are traveling northbound.
- **Coordinate with the City of Dunbar to repair lighting on 10th Street:** During the site visit, one of the light poles along the sidewalk on 10th Street was missing a lightbulb, while another was not operational. These light poles should be repaired to improve pedestrian visibility in the area.

10th Street and Myers Avenue

- **Consider adding a curb bump out on the southwest corner of the intersection:** The pavement area to the west of the southbound 10th Street through lane, just past Myers Avenue, is currently striped out using paint to prohibit vehicles from driving in the area. By providing a physical barrier instead of a painted area, vehicle speeds will be slower through the area. Furthermore, this curb extension will reinforce that the southbound right-most lane is a right-turn only lane and may encourage drivers to change lanes prior to the intersection. A layout of this improvement is shown in **Figure 8.**
- **Consider relocating the crosswalk to the southern leg:** There is currently a crash pattern of eastbound vehicles on Myers Avenue, turning left and striking pedestrians in the northern crosswalk. The left-turn volume of westbound vehicles turning left out of Fletcher Square is less than the volume of eastbound vehicles turning left off of Myers Avenue, decreasing the possible number of conflicts in the southern crosswalk. Additionally, with the addition of the curb bump out, the crossing distance would be shorter with a southern crosswalk compared to the existing crosswalk location.

  A catch basin is currently located where the crosswalk would be relocated. This catch basin is the only one in the surrounding area, meaning the profile of the roadway would need to be reconstructed with the crosswalk relocation. Additionally, an existing signal pole would conflict with new curb ramps in that area. With the crosswalk relocation, the stop bar for the northbound approach would also need to be relocated. As a result, the distance between the new stop bar location and the Fletcher Square intersection is shorter, which is not desired because of the potential for northbound traffic to queue past Fletcher Square. Due to the impacts associated with this improvement, it was not evaluated further.

- **Consider restriping the Myers Avenue approach to provide a combined left-through-right lane:** The current right-turn lane is very narrow and abuts the parking area for the Smoker Friendly's store. There was a crash pattern of vehicles backing out of the Smoker Friendly's parking into vehicles in the existing right-turn lane. By only providing one lane, a buffer can be striped on the right side of the road, giving vehicles more space to exit the driveway. Another benefit of this configuration includes a wider receiving lane for westbound vehicles on Myers Avenue. During the field review, it was observed that the curb radius on the northwest corner was so small that some vehicles, including some passenger cars, had difficulty making the southbound right-turn movement. With a larger receiving lane, most vehicles will be able to make this turning maneuver without difficulty and without driving over the curb which also improves safety for the pedestrians. A layout of this improvement is shown in **Figure 8.**
- **Consider adding a left-turn lane for northbound vehicles at 10th Street and Myers Avenue by shortening the left-turn lane at Fletcher Square:** During the field observations, northbound vehicles waiting to turn left onto Myers Avenue would block the leftmost through lane. This lane blockage likely causes some of the rear end collisions occurring on the northbound approach. This recommendation was considered but is not recommended due to the higher southbound left-turn volume into Fletcher Square compared to northbound left-turn volume at Myers Avenue. Long queues in the southbound left-turn lane could potentially block the single southbound through lane, creating additional congestion in the corridor.
- **Consider adding "Yield to Pedestrian" signage at 10th Street and Myers Avenue on the span wire of the signal**: Adding "yield to pedestrian" signage is recommended for the eastbound approach due to four pedestrian crashes that occurred in the crosswalk on the northern approach of 10th Street. Future structural analysis will need to be performed to determine if the signal can handle the additional loading.

10th Street and Grosscup Avenue

- **Consider closing McDonald's driveway/Dunbar Village Plaza driveway:** There is currently a crash pattern of angle collisions at this location due to vehicles turning out of this driveway and failing to yield to vehicles on 10th Street. Currently, there is a "Right Turn Only" sign at the driveway, but drivers often disregard this sign and turn left onto 10th Street. Vehicles arriving and departing from McDonald's have access to the intersection of 10th Street and Fletcher Square to the north which allows for better sight distance than at the McDonald's Driveway when turning onto 10th Street. This driveway also had a low volume in the AM and PM peak hours during the traffic counts, meaning a large number of drivers will not be affected by this closure. A layout of this improvement is shown in **Figure 9.**
- **Consider adding pedestrian refuge islands with Rectangular Rapid Flashing Beacons (RRFB) on the southbound approach:** These modifications will improve pedestrian safety and increase the overall comfortability when crossing the long crosswalk across 10th Street. Pedestrians would have two different refuge areas to stop and look for vehicles before they continue crossing. A layout of this improvement is shown in **Figure 9.** Adding the raised median where there is currently paint will also help channel vehicles into their appropriate lanes, along with helping prevent prohibited movements at the intersection, such as the eastbound left-turn movement. An ADA project is currently in progress for the Grosscup Avenue corridor. These improvements to the medians and crosswalks, along with the RRFB and ADA-compliant curb ramps, could be integrated into the current project.

RIC RSA
10th Street Improvements
At Myers Ave

BURGESS & NIPLE
Engineers ■ Architects ■ Planners

N

0 50
25 100
SCALE IN FEET

10th STREET

MYERS AVE

COMBINED TURN LANE

CURB BUMPOUT

FLETCHER SQUARE

Figure 8

RIC RSA
10th Street Improvements
At Grosscup Ave

BURGESS & NIPLE
Engineers ■ Architects ■ Planners

N

0 50
25 100
SCALE IN FEET

FLETCHER SQUARE

MEDIANS

CURB RAMP

DRIVEWAY CLOSURE

CURB RAMP

REALIGNED CROSSWALK

GROSSCUP AVE

10th STREET

Figure 9

8.0 Countermeasure Evaluation

8.1 Operational Evaluation

Operational analysis was conducted for the countermeasures discussed in **Section 7.0** of this report. The analysis was conducted with *Synchro*, version 11 utilizing the Highway Capacity Manual, 6th Edition module. The analysis utilized the 2022 existing traffic volumes for the AM and PM peak hours. The goal of this analysis is to confirm that the safety recommendations at the intersections can operate at acceptable levels of service. The signal timings at the intersection of 10th Street and Myers Avenue were optimized. Detailed operational analysis results are located in **Appendix D**.

The operational analysis for the removal of the exclusive right-turn lane at 10th Street and Myers Avenue is summarized in **Table 4**.

Table 4: Exclusive Right-Turn Removal at 10th Street and Myers Avenue

	Overall Intersection	Eastbound Myers Ave	Westbound Myers Ave	Northbound 10th St	Southbound 10th St		
		LT/TH/RT	LT/TH/RT	LT/TH/RT	LT	TH	RT
AM Peak Hour							
LOS	A	E	D	A	A	A	A
Delay	7.8	55.9	52.0	2.1	2.2	2.9	1.8
v/c		0.51	0.18	0.16	0.01	0.33	0.06
95th % Queue		121'	61'	89'	21'	141'	39'
		E – 55.9	D – 52.0	A – 2.1	A – 2.7		
PM Peak Hour							
LOS	B	E	D	A	A	A	A
Delay	10.0	55.7	50.3	3.1	3.4	4.3	2.3
v/c		0.66	0.28	0.23	0.02	0.43	0.04
95th % Queue		153'	83'	109'	34'	199'	29'
		E – 55.7	D – 50.3	A – 3.1	A – 3.3		

Compared to existing conditions, the overall intersection in the AM peak hour remains at LOS A, while the PM peak hour is worsened operationally from LOS A to LOS B. However, even at LOS B, the intersection is operating well. Similar signal timings favoring the mainline traffic on 10th Street were used for the right-turn removal analysis.

The operational analysis for removing the McDonald's driveway/Dunbar Village Plaza driveway from the intersection of 10th Street and Grosscup Avenue is summarized in **Table 5**.

Table 5: Driveway Removal at 10th Street and Grosscup Avenue/Dunbar Village Plaza

	Eastbound Grosscup Ave	Northbound 10th St/ Toll Bridge		Southbound 10th St	
	RT	LT	TH/RT	TH	RT
AM Peak Hour					
LOS	B	A	--	--	--
Delay	11.7	8.7	--	--	--
v/c	0.09	0.06	--	--	--
95th % Queue	48'	49'	--	--	--
	B – 11.7	--		--	
PM Peak Hour					
LOS	C	A	--	--	--
Delay	15.3	9.7	--	--	--
v/c	0.21	0.10	--	--	--
95th % Queue	52'	56'	--	--	--
	C – 15.3	--		--	

The overall intersection and all movements at the intersection operate at LOS C or better during both peak hours. Compared to existing conditions, the operations for the northbound and eastbound movements remain the same.

8.2 Cost Estimate

The cost estimates for the proposed improvements are summarized in **Table 5**. A detailed breakdown of the construction cost estimates is provided in **Appendix E**. Cost estimates include a 30 percent contingency and 20 percent design cost. The medium-term improvements were inflated for a 2025 construction year. The cost estimates do not include utility relocation which may be required as a result of the improvements. Right-of-way will not need to be taken for any of the improvements.

Table 6: Cost Estimate Summary

Short-Term Improvements	
	Cost Estimate (FY 2022)
Ground-mounted lane-use signage	$1,100
"Yield to Pedestrian" signage at 10th Street and Myers Avenue	$1,700
Restripe Myers Avenue	$2,400
Overhead lane-use signage	$55,200
Medium-Term Improvements	
	Cost Estimate (FY 2025)
Close McDonald's driveway/Dunbar Village driveway	$22,700
Curb bump out at Myers Avenue	$28,000
Modify crosswalk across 10th Street at Grosscup Avenue; install pedestrian refuge islands/medians and RRFB	$147,000

9.0 Conclusions and Recommendations

Based on the crash patterns and traffic operations in the study corridor, the following countermeasures are recommended:

Short-Term

- Add "Yield to Pedestrian" signage at 10th Street and Myers Avenue on the span wire of the signal ($1,700 – 2022 Dollars).
- Restripe the Myers Avenue approach to provide a combined left-through-right lane ($2,400 – 2022 Dollars).
- Install ground-mounted and overhead lane-use signage in the study area ($56,300 – 2022 Dollars).

Medium-Term

- Close McDonald's driveway/Dunbar Village Plaza driveway ($22,700 – 2025 Dollars).
- Add a curb bump out on the southwest side of the intersection of 10th Street and Myers Avenue ($28,000 – 2025 Dollars).
- Modify crosswalk across 10th Street at Grosscup Avenue; install pedestrian refuge islands/medians and RRFB ($147,000 –2025 Dollars).