

PENNDOT

Abbreviated Safety Report

North Main Street (SR 0086) Safety Improvements Project

Meadville, PA

February 2017

WRA

Table of Contents

1 Introduction 3
1.1 Project Background 3
2 Existing Conditions 4
2.1 Site Description 4
2.2 Traffic Volumes 4
2.3 Safety Review 4
3 Safety Assessment of Potential Improvements 5
3.1 Potential Corridor-Wide Solutions 5
3.1.1 Roadway and Pedestrian Scale Lighting 5
3.1.2 Curb Extensions / Bump Outs 5
3.1.3 Chicanes 6
3.1.4 Chokers 7
3.1.5 Raised Pedestrian Crosswalks 7
3.1.6 Raised Intersections 8
3.1.7 Raised Median Island with Marked Crosswalk 8
3.1.8 Rectangular Rapid Flashing Beacon 9
3.1.9 Narrow Travel Way 9
3.1.10 Pedestrian Barrier 9
3.1.11 Sidewalk Realignment 10
3.1.12 Education/Outreach 11
3.1.13 Street Closure/Community Street 11
3.2 Potential Location-Specific Solutions 11
3.2.1 SR 86 at Allegheny/Limber Road 11
3.2.2 SR 86 at Loomis Street 12
3.3 Summary of Potential Countermeasures 14
4 Locally Preferred Alternative 17
5 Traffic Operations Analysis 23
5.1 Existing Conditions Analysis 23
5.2 Future Conditions Analysis 24
6 Safety Improvements Summary 25
6.1 Improvement Costs 25
6.2 Potential Funding Sources 26
6.3 Project Implementation Sheets 28

List of Figures

Figure 1: Project Study Area 1
Figure 2: Curb Extension Schematic 6
Figure 3: Chicanes 6
Figure 4: Choker 7
Figure 5: Raised Pedestrian Crosswalk 7
Figure 6: Raised Pedestrian Intersection 8
Figure 7: Raised Median Island 8
Figure 8: RRFB 9
Figure 9: Sidewalks Leading to Mid-block Locations 10

Figure 10: Gateway Treatment Examples **13**
Figure 11: Immediate Improvements Conceptual Design **18**
Figure 12: Short-term Alternative Conceptual Design **19**
Figure 13: Short-Term Alternative Northern Cross Section (Phase 1) **20**
Figure 14: Short-Term Alternative Southern Cross Section (Phase 3) **21**
Figure 15: Long-Term Alternative Conceptual Design **22**

List of Tables

Table 1: Annual Average Daily Traffic (AADT) Summary **5**
Table 2: Crash Reduction Summary of Potential Improvements **15**
Table 3: Existing Conditions LOS and Delay Summary **23**
Table 4: Future Conditions (2036) LOS and Delay Comparison **24**
Table 5: Construction Cost and Responsible Parties for Locally Preferred Alternatives **26**
Table 6: Potential Funding Sources **26**

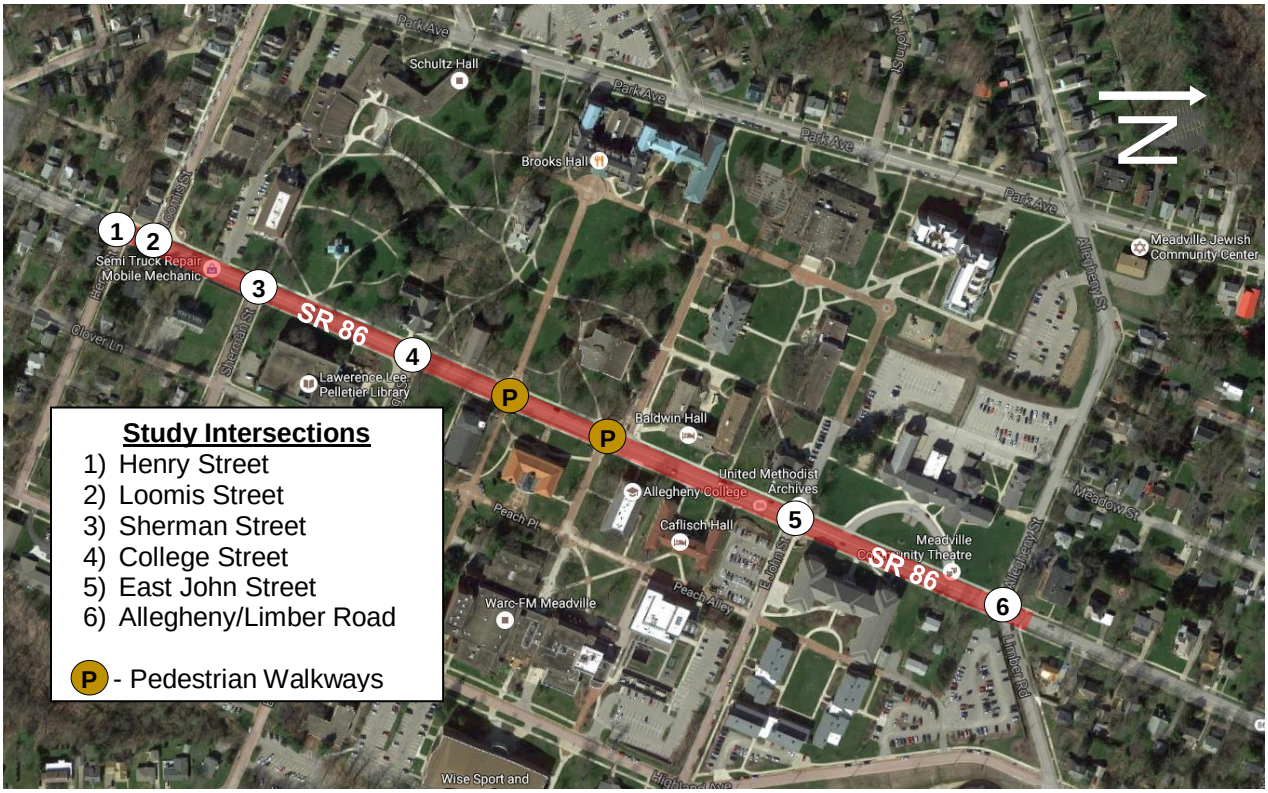
Appendices

Appendix A: Traffic Volume Data
Appendix B: October 20th Public Meeting Summary
Appendix C: Alternatives Presented to Steering Committee
Appendix D: Existing & Future Traffic Volumes
Appendix E: Traffic Analysis (HCM & SIDRA)
Appendix F: Improvement Cost Estimates
Appendix G: Project Implementation Sheets

1 Introduction

Pennsylvania Department of Transportation (PennDOT) District 1-0 requested Whitman, Requardt, & Associates, LLP (WRA) perform a safety study of SR 86 (North Main Street) in the City of Meadville from Henry Street to Limber/Allegheny Road (**Figure 1**) as part of the SR 0086 Safety Improvements Project. The safety study was to focus on improving pedestrian safety and pedestrian-vehicle interaction. This study provides a brief description of existing conditions, safety assessment of potential improvements, and locally preferred alternative for programming.

Figure 1 – Project Study Area



1.1 Project Background

SR 86 (North Main Street) is a two lane urban minor arterial that divides Allegheny College campus in half within the City of Meadville. Pedestrian and vehicle conflicts are common within the study area due to the campus having residence and class facilities on both sides of SR 86. These conflicts are problematic throughout the week, but class change intervals and sporting events are particularly heavy. Several pedestrian-vehicle crashes have been recorded since 2011 with one of the crashes resulting in a fatality between East John Street and Allegheny/Limber Roads.

In recent years PennDOT and the City of Meadville have installed high-visibility crosswalks and additional pedestrian signing to enhance pedestrian safety. Currently, Allegheny College is working with the City of Meadville to upgrade lighting for both vehicles and pedestrians within the study corridor. Preliminary plans for the lighting upgrades were developed and shared with the study team.

2 Existing Conditions

2.1 Site Description

SR 86 (North Main Street) is classified as an urban minor arterial and is the main north-south route into the City of Meadville business district from points north. Within the study limits, SR 86 is a two-lane roadway with 16-19 foot lanes posted at 35 MPH. According to PennDOT's *Internet Traffic Monitoring System* (iTMS), the AADT along the corridor is approximately 4,957 (Base Year 2014). There are 6 unsignalized intersections and 2 heavily utilized pedestrian walkway intersections near the center of campus within the study limits, see **Figure 1**. All of the unsignalized intersections are stop controlled on the side street approaches. Crosswalks (both striped and high-visibility) are provided at each of the unsignalized and pedestrian walkway intersections.

2.2 Traffic Volumes

Average Annual Daily Traffic (AADT) along SR 86 was calculated based on the 24-hour count on September 21, 2016. The 24-hour count volume of 5,964 vehicles was recorded on Wednesday therefore PennDOT's 2015 adjustment factor (0.901) for TPG 5's Wednesday in September was applied resulting in an AADT of 5,375 vehicles.

In addition to the 24-hr count, turning movement and pedestrian jaywalking counts were conducted on September 28, 2016 from 7:00-9:00 AM, 1:00-3:00 PM, and 3:30-5:30 PM. The turning movement and pedestrian count periods were determined using the 24-hour count data from Wednesday, September 21st. All raw traffic volume data can be found in **Appendix A**.

AADT's for roadways approaching SR 86 were calculated using K-factors and the highest peak hour from the turning movement counts. A K-factor of 11% was assumed in the calculation since SR 86 and adjacent roadways experienced a K-factor of 10-11%. **Table 2** summarizes the AADT's by intersection. The highest AADT volume was shown for minor street approaches.

Table 1 –Average Annual Daily Traffic (AADT) Summary

Intersection			Estimated Annual Average Daily Traffic (AADT)	
			Major Street	Minor Street
1	SR 86	Henry Street	5,375	198
2	SR 86	Loomis Street	5,375	550
3	SR 86	Sherman Street	5,375	330
4	SR 86	College Street	5,375	803
5	SR 86	East John Street	5,375	825
6	SR 86	Allegheny/Limber Road	5,375	3,773

2.3 Safety Review

Crash data from January 1, 2011 through September 8, 2015 was reviewed for SR 86 (North Main Street) from Henry Street to Allegheny/Limber Road to identify and summarize current crash trends. A total of 14 crashes were reported during the 68 month study period, including 6 (43 percent) angle crashes, 3 (21 percent) rear end crashes, and 3 (21 percent) pedestrian crashes. Even though there is not a significant number of crashes within the study corridor, there is increased potential for injury and fatal crashes due to the number of pedestrian and vehicle conflicts throughout the day. These conflicts are problematic throughout the week, but class change intervals and sporting events are of particular concern since SR 86 divides the Allegheny College campus in half.

3 Safety Assessment of Potential Improvements

A number of safety treatments beyond signage and pavement markings were considered along the study corridor as part of the project. Based on historic crash trends, adjacent land uses, and discussions with multiple stakeholders, pedestrian safety is a major focal point of the project; therefore, a majority of the improvements that were considered focus on pedestrian safety.

When available, improvements are discussed using crash modification factors (CMFs) from the *Highway Safety Manual (HSM)*, the *Pennsylvania CMF Guide,* and/or the *CMF Clearinghouse*. According to the PA CMF Guide, only "high-quality" CMFs are deemed appropriate for application in Pennsylvania. "High-quality" CMFs are those having a star rating of three or higher based on the star quality rating system used by FHWA's *CMF Clearinghouse*. As such, CMFs with star ratings of 1 or 2 were not considered for this study from a quantitative perspective; however, general trends demonstrated by these lower quality CMFs may be discussed from a qualitative perspective. As described by the *CMF Clearinghouse*, a CMF represents the long-term expected reduction in crashes and this estimate is based on the crash experience at a limited number of study sites; therefore, the actual reduction may vary.

3.1 Potential Corridor-Wide Solutions

A multitude of recommendations (e.g., lighting, curb extensions, etc.) were considered at several locations along the study corridor and have been discussed on a corridor-wide basis below.

3.1.1 Roadway and Pedestrian Scale Lighting

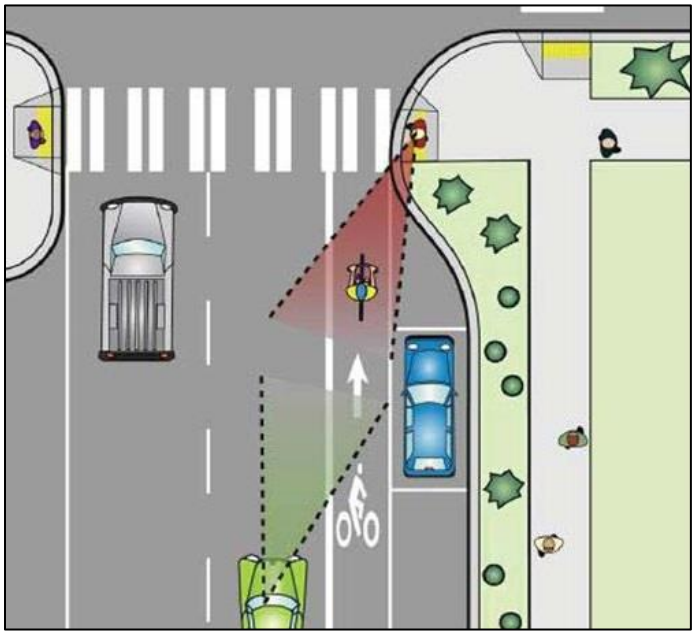
Providing adequate lighting is a proven method to increasing pedestrian safety. Several studies have been published which develop a CMF for the installation of lighting. Therefore, providing adequate roadway and pedestrian lighting along SR 86 from Henry Street to Allegheny/Limber Road is suggested. According to the *PA CMF Guide*, providing intersection lighting will potentially decrease all nighttime crashes by 12 percent. Furthermore, the HSM states that intersection illumination appears to have the greatest effect on fatal pedestrian nighttime crashes. The CMF clearinghouse indicates that nighttime vehicle-pedestrian injury crashes can be reduced up to 42 percent.

Allegheny College is currently working to enhance roadway and pedestrian scale lighting along the corridor. Preliminary plans for the lighting improvements have been provided to the study team and PennDOT District 1-0.

3.1.2 Curb Extensions / Bump Outs

Providing curb extensions/bump outs have several perceived safety benefits including increasing pedestrian visibility, decreasing crossing distance, reducing pedestrian exposure to traffic, slowing turning vehicles, and improving pedestrian's sight distance to approaching vehicles. The benefits of curb extensions is depicted in **Figure 2,** although curb extensions are typically only provided when on-street parking is present. A CMF for the installation of curb extensions does not currently exist; however, the installation of curb extensions is expected to have a positive safety benefit for pedestrians and bicyclists since the crossing distance will be shortened. Curb extensions are typically only installed where on-street parking is present but could be implemented if other traffic calming countermeasures are implemented mid-block to narrow the travel lanes.

Figure 2 – Curb Extensions Schematic



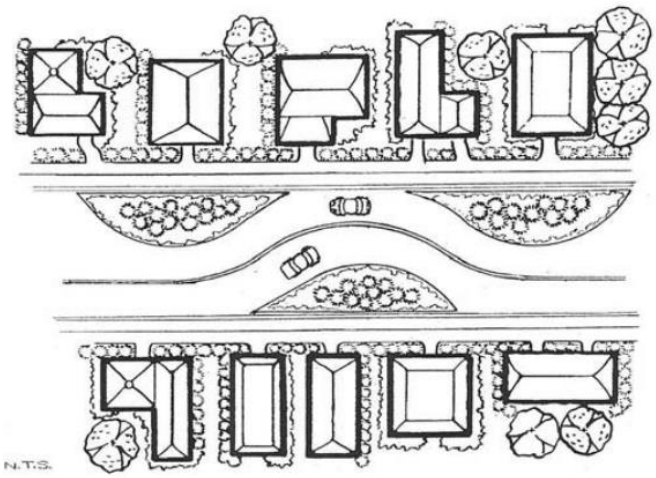
Source: Utah LTAP: On the Move, July 2011

3.1.3 Chicanes

A chicane is a series of three curb extensions staggered on alternating sides of the street, at a mid-block location, which forces vehicles to negotiate the narrowed roadway in a snake-like fashion **(see Figure 3)**. During the 1st public meeting a number of community members and college officials noted that speeding through the study corridor was a safety concern. PennDOT District 1-0 conducted a speed study within the study corridor and concluded that the current speed limit of 35 MPH is adequate, however, traffic calming measures such as chicanes should be considered to physically limit all motorist's speeds. In addition to limiting speeds, chicanes can provide a wider buffer between vehicles and pedestrians.

A CMF for the installation of chicanes does not currently exist; however, the installation of chicanes is expected to have a positive safety benefit for pedestrians and bicyclists by physically limiting motorist's speeds. PennDOT Publication 383 *Traffic Calming Handbook* notes that chicanes may reduce vehicle crashes based on a number of studies conducted by the Insurance Corporation of British Columbia.

Figure 3 – Chicanes

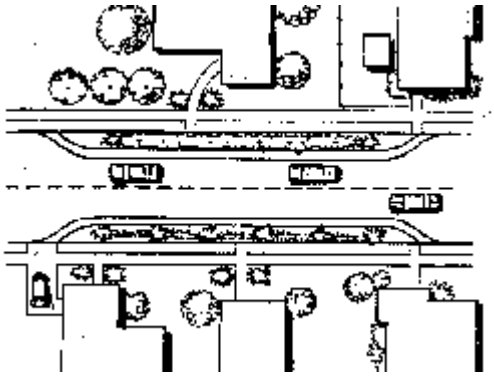


Source: PennDOT Pub 383

3.1.4 Chokers

A choker is curb extensions that narrows a street by widening the sidewalks or buffer area to create a "pinch point" **(see Figure 4)** encouraging vehicles to slow down. Chokers can be designed to narrow the roadway to one lane requiring opposing traffic to yield to one another in low volume circumstances but that application is not suggested on North Main Street. A CMF for the installation of chokers does not currently exist; however, the installation of chokers is expected to have a positive safety benefit for pedestrians and bicyclists by physically limiting motorist's speeds.

Figure 4 – Choker



Source: http://www.ite.org/traffic/choker.asp

3.1.5 Raised Pedestrian Crosswalks

Raised crosswalks (see **Figure 5**) aim to increase awareness of pedestrians at mid-block locations or intersections by implementing a speed table with crosswalk on the top. "High-quality" CMFs for the installation of raised pedestrian crosswalks are not currently available; however, a one-star CMF provided on the *CMF Clearinghouse* indicates that raised pedestrian crosswalks have shown 45 percent decrease in vehicle-pedestrian crashes. In addition to potential crash reductions, vehicle speeds can be reduced by as much as 6 MPH per PennDOT Publication 383.

Raised pedestrian crosswalks should be considered along the corridor where heavy pedestrian and vehicle conflicts exist and where speeding is a perceived concern. Since there are no signalized intersections, installing pedestrian warning signs with downward diagonal arrows or yield to pedestrian signs should be considered to increase driver awareness of the marked crosswalk.

Figure 5 – Raised Pedestrian Crosswalk



Source: chi.streetsblog.org

3.1.6 Raised Intersections

Similar to raised crosswalks, raised intersections (see **Figure 6**) aim to increase awareness of pedestrians and slow vehicles through intersections by creating a raised surface throughout the entire intersection. "High-quality" CMFs for the installation of raised intersections are not currently available; however, a one-star CMF provided on the *CMF Clearinghouse* indicates that raised intersections have shown a 9 percent increase in overall crashes. Raised intersections may bring potential safety benefits for pedestrians but need to be carefully considered since overall crashes have increased slightly where installed.

Figure 6 – Raised Pedestrian Intersection

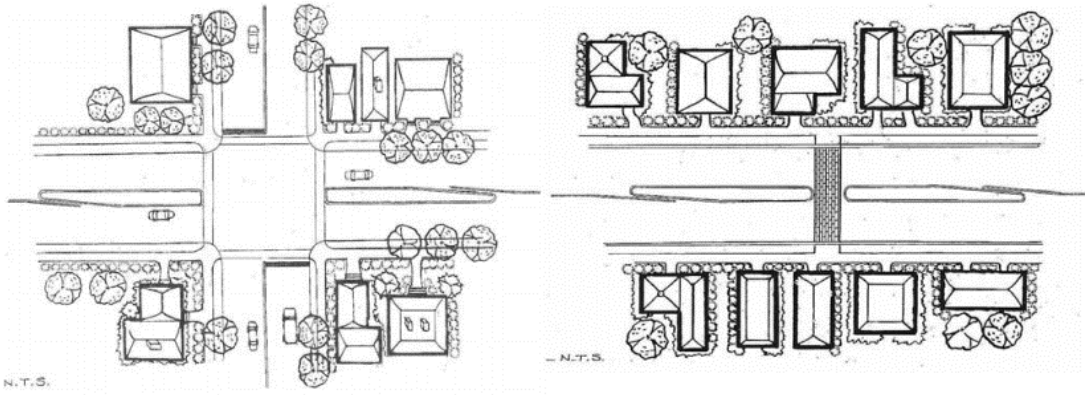


Source: FHWA Innovative Safety Improvement Strategies and Management Practices: A Domestic Scan

3.1.7 Raised Median Island with Marked Crosswalk

Raised median islands are narrow islands (6' to 8' wide) between travel lanes that can be designed with breaks in landscaping and curbing for pedestrians at either mid-block locations or intersections. Median islands can provide safe refuge areas for pedestrians when crossing several travel lanes therefore reducing crossing lengths for pedestrians. According to the CMF clearinghouse, a pedestrian-vehicle crash reduction of 46% can be expected for principal arterials with 3 to 8 travel lanes. Even though the North Main Street study corridor is only two lanes, a safety benefit can still be anticipated if installed. In addition to pedestrian-vehicle crash reduction, vehicle speeds may be reduced due to the narrowing of travel lanes by introducing a raised median. It is important to note that raised medians must provide ample space to accommodate the pedestrian crossing volumes. Raised median islands could be considered along the corridor where lower volumes of pedestrians are crossing.

Figure 7 – Raised Median Island



Source: PennDOT Publication 383

3.1.8 Rectangular Rapid Flashing Beacon

Figure 8 - RRFB



No traffic signals are present along the study corridor forcing pedestrians to cross SR 86 at unsignalized intersections where they must identify an acceptable gap in approaching vehicular traffic. Vehicles are required to yield to pedestrians within marked crosswalks; however, motorists do not always yield. Installing rectangular rapid flashing beacons (RRFB) is being considered to supplement other proposed improvements to increase driver yielding compliance to a crossing pedestrian at study intersections. A RRFB is a pedestrian-actuated warning device that uses rectangular-shaped high-intensity LED indications that flash rapidly in a wig-wag flashing pattern to notify drivers that a pedestrian may be crossing on an uncontrolled intersection approach. A CMF is not currently available for a RRFB; however, RRFB's have shown very high "yield to pedestrian" compliance rates (80 to 100 percent) compared to standard yellow beacons (15 to 20 percent) as outlined in FHWA's *Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)*. It is important to note that the majority of the studies only evaluated isolated mid-block crossings and not the implementation of RRFBs at multiple crosswalks within 0.5-1 mile segment. RRFB's can provide a safety benefit but the overall effectiveness of them may be compromised if installed at each intersection/crosswalk due to the high volume of pedestrian crossings during the day.

3.1.9 Narrow Travel Way

The current lane configuration through the corridor is two travel lanes that vary from 16'-19' in width. No on-street parking is permitted nor are shoulders striped creating extremely wide lanes for motorists (most suburban two lane roadways only provide 11'-12' travel lanes). Reducing the travel lane widths to 11' or 12' lanes can significantly reduce pedestrian crossing lengths and potentially reduce vehicle speeds by narrowing the roadway. Narrowing of the roadway can be done through pavement markings by striping shoulders/bike lanes or by physical relocation of curbing and sidewalk. Physical narrowing of the roadway is preferred since it physically narrows the road forcing motorists to slow down and provides an element of "protection" for pedestrians by increasing the buffer between curb and sidewalk.

A number of high-quality CMFs are provided for travel lane and shoulder width adjustments but there is not a CMF specific to reducing a travel lane from 16'+ to 12' or changing 16' lane to a 12' lane with 4' shoulder. When examining the existing CMFs for decreasing lane widths, there is typically a slight increase in overall crashes; however, when shoulders are provided or widened, there is typically a decrease in overall crashes. Due to the tangential nature of the corridor and the heavy pedestrian volumes when school is in session, a safety benefit is to be expected if the travel lane widths were to be reduced by striping or infrastructure.

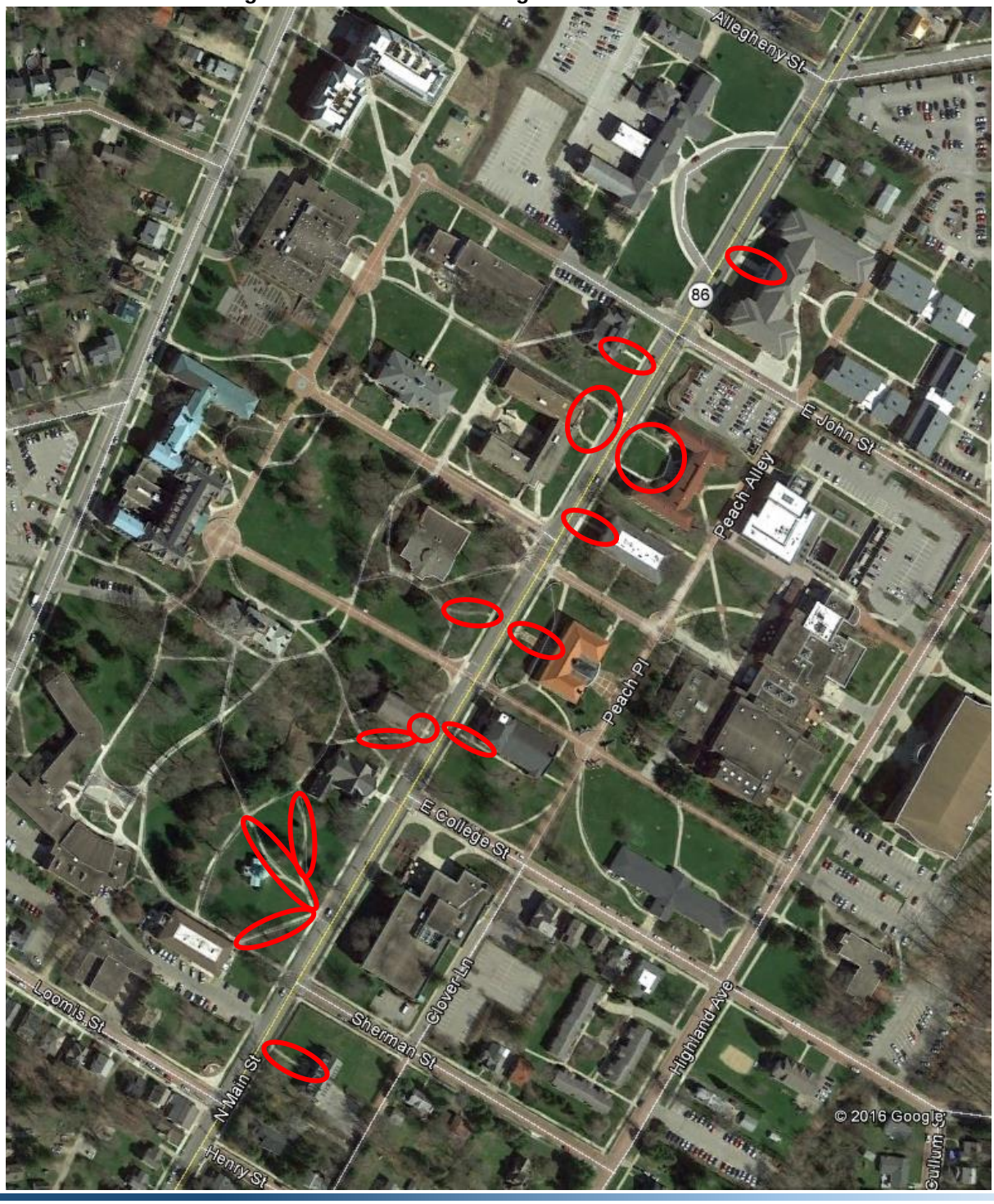
3.1.10 Pedestrian Barrier

Pedestrian barriers are physical elements (railings, landscaping, etc.) used to deter or inhibit pedestrians from crossing at undesirable locations. Pedestrian barriers are typically installed along the sidewalk or within medians to "funnel" pedestrians to preferred or safer crossing locations. A number of jaywalkers were documented during data collection and the lone fatal pedestrian-vehicle crash that occurred along the corridor was just north of a high-visibility crosswalk. Installing a pedestrian barrier along both sides of SR 86 between marked crosswalks should be considered to limit the number of jaywalking pedestrians crossing SR 86. CMFs are currently unavailable for installing a pedestrian barrier; however, this is anticipated to have a positive safety benefit by reducing/eliminating the number of midblock pedestrian crossings along the corridor.

3.1.11 Sidewalk Realignment

At each mid-block location within the study corridor, sidewalk is provided on Allegheny Campus connecting building entrances/exits to the sidewalk along SR 86 encouraging pedestrians to cross mid-block (see **Figure 9**). Sidewalk should be realigned to guide pedestrians from buildings entrances/exits to the preferred crossings locations. No CMFs are currently available for relocating sidewalk; however, this is anticipated to have a positive safety benefit by reducing/eliminating the number of midblock pedestrian crossings along the corridor.

Figure 9 – Sidewalks Leading to Mid-block Locations



3.1.12 Education/Outreach

During the 1st public meeting a number of community members expressed concerns regarding distracted walking and jaywalking amongst campus students. Allegheny College indicated that they educate students currently, but a revised or enhanced program may be necessary. Educational/outreach programs can be a successful tool in changing pedestrian behavior if implemented correctly. It's critical that the program be tailored to relate to specific student population needs and interests. Partnerships and incentives should also be a part of the program to help sustain interest and momentum.

A CMF for pedestrian safety education campaigns and outreach does not currently exist; however, the implementation of an annual or bi-annual education campaign geared towards college students is expected to have a positive safety benefit. A pedestrian safety education campaign should be implemented along with infrastructure improvements to improve safety along the corridor.

3.1.13 Street Closure/Community Street

The Allegheny College campus is divided in half by North Main Street which results in hundreds of pedestrian-vehicle interactions per day. For as many pedestrian-vehicle interactions per day, there is a low number of reportable pedestrian-vehicle crashes along the corridor. Even though there is a low number of reportable pedestrian-vehicle crashes, the potential for crashes is extremely high due to the campus being divided in half. During the 1st public meeting a few community members inquired about the feasibility to completely close North Main Street to traffic within Allegheny College. A complete closure and implementation of community street/pedestrian plaza would eliminate almost all crash potential within the study corridor, however, the redistributed North Main Street traffic may result in new problems along neighboring side streets and parallel routes. The road most likely to experience the most negative impact from diverted North Main Street traffic is Park Avenue.

Park Avenue is considered an urban minor arterial/collector with an ADT of 2,884 (2012 data from PennDOT ITMS) which forms the western boundary of Allegheny College. Diverting all of the North Main Street traffic (5,830 ADT) will triple the current vehicle volume experienced along Park Avenue potentially pushing safety concerns from North Main Street to Park Avenue. Before considering such a significant countermeasure, additional operational and safety analysis beyond the scope of this study should be conducted along Park Avenue. In addition to additional analysis, surrounding residents and business owners should be consulted before pursuing.

3.2 Potential Location-Specific Solutions

Location-specific crash countermeasures are discussed by location and evaluated from a safety benefit perspective.

3.2.1 SR 86 at Allegheny/Limber Road

The intersection of SR 86 at Allegheny/Limber Road had the highest amount of reported crashes along the corridor (6 crashes). Fifty percent of those crashes were due to vehicles proceeding without clearance on Allegheny Street or Limber Road. Several improvements are suggested to improve safety as discussed below:

Install CROSS TRAFFIC DOES NOT STOP signage – CROSS TRAFFIC DOES NOT STOP signs should be considered on the eastbound and westbound approaches. Fifty percent of the crashes at this intersection were due to vehicles proceeding without clearance. A CMF for installing CROSS TRAFFIC DOES NOT STOP sign does not currently exist; however, the installation of a these signs are expected to have a positive safety benefit by reinforcing the traffic control at the intersection.

Install Overhead Gateway Treatment – A gateway treatment should be considered on the south side of the intersection. No pedestrian crashes were reported at the intersection but this intersection serves as the "gateway" to Allegheny College from the north. Motorists driving from the north have no visual cues to alert them that they are entering a high pedestrian volume area, like a college campus.

Gateways are special entrance treatments (landscaping, signing, and/or pavement treatments) that provide identity to a neighborhood by using a combination of physical and textural changes. **Figure 10** provides some examples of gateway treatments for similar neighborhoods and roadways. The intent of gateways is to increase driver awareness of the upcoming or changing environment. A CMF for overhead gateway treatments does not currently exist; however, the *PA CMF Guide* indicates a 2% crash reduction for side mounted gateway monuments on state roads. The installation of an overhead gateway is expected to have a similar positive safety benefit by increasing driver awareness of the changing environment.

Construct a Roundabout – Limber Road intersects SR 86 at an angle which creates more difficult turning movements and limits motorist sight lines due to the skew. Six crashes have occurred at this location with all of the crashes being classified as angle crashes and two of those crashes resulting in injuries. A roundabout should be considered at this location to eliminate safety concerns created by the skew and to improve turning movements. A roundabout at this location could also help establish a new gateway for Allegheny College on the north side of campus. Several high-quality CMFs are available for the conversion of an unsignalized intersection to roundabout. A reduction in injury crashes of 13-44 percent can be expected if a roundabout is constructed at this location.

It's important to note that right-of-way will need to be acquired and a parking lot in the southeast corner of the intersection will be impacted, as well as a number of utilities if this improvement is implemented.

3.2.2 SR 86 at Loomis Street

Additional gateway treatments should be considered on the north side of the intersection. No pedestrian crashes were reported at the intersection but this intersection serves as the "gateway" to Allegheny College from the south. Motorists driving from the south only have a sign on the left hand side of the road to alert them that they are entering a college campus. Since the sign is only on the left side of the road, motorists may assume that the campus is only on the west side of SR 86 when actuality SR 86 divides the campus in half. Additional overhead gateway signs and textured pavements should be considered to cue motorists they are entering a college campus. See **Figure 10** for some examples of overhead gateway treatments.

Figure 10 – Gateway Treatment Examples



http://designworkshopinc.com/project/architectural-signage/

3.3 Summary of Potential Countermeasures

Since the majority of the potential countermeasures do not have CMFs available, best practice research was conducted to compare potential benefits, concerns, and implementation considerations of all potential countermeasures. **Table 2** provides a summary of the best practice research for each potential countermeasure considered in **Sections 3.1-3.2**. PennDOT Publication 383 *Pennsylvania's Traffic Calming Handbook*, ITE, FHWA, pedbikeinfo.org, and pedpikesafe.org were all referenced when populating the information in **Table 2**.

Table 2 – Crash Reduction Summary of Potential Improvements

Description of Countermeasure	Benefits			Cons	Implementation Considerations
	Quantitative		Qualitative		
	CMF[1] (Quality)	Anticipated Crash Reduction			
Lighting (Pedestrian & Vehicular)	0.88 – All crashes (3 star) 0.58 – Ped/ veh crashes (4 star)	• 12% reduction all nighttime crashes • 42% reduction in nighttime pedestrian/vehicle crashes at intersections • 38% reduction in all crashes at intersections	• Increase pedestrian visibility • Increase yield rates • Increase motorist comfort • Enhance ambiance of area • Enhance security/safety • May reduce glare to motorists	• Annual cost to illuminate • Maintenance	• Nighttime pedestrian activity • Nighttime crash history • Security concerns
Curb Extensions/Bulb-outs	N/A	• 20% increase in yield rates at mid-block crossings with YIELD control	• Reduce pedestrian exposure • Reduce crossing lengths • Increase pedestrian visibility • Speed reduction (1-2 mph) • May slow turning vehicles	• Snow removal • Drainage • Can impact bike lanes	• ADT: <15,000 • Speed: 40 mph or lower • Significant pedestrian volumes • Intersections and mid-block
Chicanes	N/A	• N/A	• Reduce vehicle speeds • May reduce crashes • Enhance ambiance of area • Provides wider buffer for pedestrians	• Reduce traffic volumes • Motorists may attempt to increase speeds by crossing centerline • Snow removal • Limits heavy truck operation • Increases emergency response time • Drainage	• Speeds below 40 mph • Avoid driveways • Avoid grades >8% • Traffic volumes should be balanced • ADT: <3,500 • Low truck volumes •
Choker	N/A	• N/A	• Reduce vehicle speeds • May reduce crashes • Enhance ambiance of area • Provides wider buffer for pedestrians	• Reduce traffic volumes • May encourage mid-block pedestrian crossings • Snow removal • Drainage	• Local/collector streets or main roads through small communities • Avoid driveways
Raised Crosswalk	0.64 – All crashes (1 star) 0.55 – Ped/veh crashes (1 star)	• Up to a 46% reduction in pedestrian/vehicle crashes • Up to a 40% increase in yield rates to pedestrians • 11-38% increase in pedestrians using crosswalk instead of jaywalking	• Speed reduction • Conflict reduction (pedestrian-vehicle) • Improve pedestrian visibility	• Volume reduction (12%) • Emergency response reduction (4-6 seconds) • Maintenance • Snow removal • Drainage	• ADT: <10,000 • Significant pedestrian volumes
Raised Intersection	1.05 – All crashes (1 star)	• Slight increase (5%) in all injury crashes	• Speed reduction • Conflict reduction (pedestrian-vehicle) • Improve pedestrian visibility • Increase yield rates to pedestrians	• Emergency response reduction (4-6 seconds) • Cost • Maintenance • Snow removal	• Local/collector streets with high pedestrian activity • ADT: <10,000 • Significant pedestrian volumes
Raised Median Island with Crosswalk	0.54 – Ped/veh crashes (3 star)	• 46% reduction in pedestrian/vehicle crashes • 40% reduction in all crashes	• Speed reduction (2-3 mph) • Conflict reduction (pedestrian-vehicle) • Improve pedestrian visibility • Shorten crossing lengths • Separates opposing travel lanes	• Maintenance • Snow removal	• Speed: 35 mph or higher • ADT: 9,000+ • No. of lanes: 4-6 • Crossing distance: >60ft
Install RRFB	N/A	• 20%-80% yield rates	• Conflict reduction (pedestrian-vehicle) • Reduction of “trapped” pedestrians within roadway • Improved pedestrian visibility • May increase safety effectiveness of other pedestrian treatments	• Maintenance	• Mid-block crosswalks • Uncontrolled intersection approaches • Limit to locations of most critical safety concerns • Not as effective on wider or higher speed multilane streets

Description of Countermeasure		Benefits			Cons	Implementation Considerations
		Quantitative		Qualitative		
		CMF[1] (Quality)	Anticipated Crash Reduction			
Narrow Travel Way	On-Street Parking	N/A	• N/A	• Speed reduction • Provides buffer for pedestrians	• Reduced pedestrian visibility mid-block • Encourages mid-block crossings	• Business districts • Surrounding land uses
	Bicycle Track	1.04 – All fatal/injury crashes [Urban] (3 star)	• Slight increase (4%) in all fatal/injury crash in an urban setting	• Speed reduction • Encourages bicycle use • Decreases bicyclist on sidewalks • Provides buffer for pedestrians	• Maintenance	• Bicyclist presence
	Bike Lane	1.05 – All crashes [Urban] (3 star)	• Slight increase (5%) in all crashes in an urban setting			
	Relocation of Curb	N/A	• N/A	• Speed reduction • Shorten crossing lengths	• Cost (Relocation of curb)	• ADT: <20,000 • Significant pedestrian volumes
Pedestrian Barrier		N/A	• N/A	• Eliminates jaywalking • Encourages pedestrians to cross at safer locations	• High installation costs • Maintenance	• Documented jaywalking problem • High probability of jaywalking due to surrounding land uses
Sidewalk Realignment		N/A	• N/A	• Encourage pedestrians to cross at preferred locations • Decrease jaywalking	• Cost • Maintenance	• Pedestrian desire lines • Preferred crossing locations
Education/Outreach		N/A	• N/A	• Reduce distracted walking • Improve pedestrian safety	• Cost to implement program and conduct quarterly or bi-annually	• Significant pedestrian-vehicle conflicts • Pedestrian crash history • Jaywalking
Overhead Gateway Signage		0.98 – All crashes (3 star)	• 2% reduction in all crashes	• Alert drivers of changing environment • Reduce distracted driving • Enhance ambiance of area • May reduce speeds	• Maintenance	• Physical change in roadway character or environment • Jurisdictional boundary demarcation
Roundabout		0.22 – All crashes (4 star)	• 78% reduction in all crashes	• Reduce crashes and severity • Reduce conflict points • Eliminate left turn movements • Speed reduction • Improve intersection operation • Enhance ambiance of area	• Initial construction costs • May increase difficulty for visually impaired pedestrian	• ADT: <20,000 total volume for both major/minor roadways (single lane roundabout) • Entering/circulating flow <1,800 veh/hr (single lane roundabout) • Intersections with high delay • Skewed intersections • Gateway treatments

[1] Crash Modification Factor (for example, a CMF = 0.8 represents a potential crash reduction of 20 percent)

4 Locally Preferred Alternative

A number of improvements were considered to improve safety along the study corridor including, but not limited to, installing lighting, curb extensions, raised crosswalks, and narrowing lanes. Pedestrian safety was the primary focus of the project; therefore, a majority of the improvements that were considered focus on pedestrian safety. All of the countermeasures previously identified in **Table 5** are applicable to North Main Street and should improve safety if implemented. However, if several of the countermeasures are implemented together through a comprehensive project, substantial safety benefits could be achieved.

To assist the steering committee in selecting appropriate countermeasures, a public meeting was held on October 20th in Schultz Hall on Allegheny College. The study team hosted both public officials and members of the community to get their input on areas of concern along the corridor and potential countermeasures. During the meeting a number of major themes emerged amongst participants which included, poor lighting, speeding, jaywalking near East John Street and distracted walking. In addition to the major themes, public officials and community members identified potential countermeasures of which were all considered and documented in **Section 3** and **Table 2**. For the full meeting summary refer to **Appendix B**.

The study team utilized the information in **Section 3** and public input to develop seven (7) alternatives. The locally preferred alternatives were developed based on public input, pedestrian-vehicle counts, constructability, shared long-term vision for the corridor, and potential to improve pedestrian safety while reducing vehicles speeds. Each of the alternatives were presented to the steering committee to garner feedback and select a preferred short-term and long-term alternative. Of the seven alternatives presented, no one specific alternative was selected. However, members of the steering committee preferred to create a hybrid alternative which utilized specific countermeasures from several of the original alternatives. The specific countermeasures selected for the hybrid short- and long-term alternatives were overhead gateway signs, bulb-outs with roadway narrowing, raised crosswalks, raised intersections, raised median, and a roundabout at the intersection of Allegheny/Limber Road. All seven alternatives presented to the steering committee can be found in **Appendix C**.

In addition to the preferred short- and long-term alternatives, immediate improvements were developed to improve safety along North Main Street within 2017. Immediate improvements along the study corridor include installation of high visibility “continental style” crosswalks where standard transverse markings exist, PEDESTRIAN CROSSING NEXT ½ MILE signs at the northern and southern boundaries of campus, and additional in-roadway pedestrian crossing signs. A conceptual layout of the immediate improvements can be found in **Figure 11**.

Since the project programming process can take several years to secure funding for construction, it is the study team’s intent for the short-term alternative to be implemented in three phases as funding becomes available over the next 10 years. The project phasing is interchangeable but the improvements on the northern section of the corridor are expected to be the most impactful regarding changing driver and pedestrian behavior in the near term. Refer to **Figures 12-14** for the conceptual layout/phasing and typical cross sections of the short-term alternative.

Implementation of the long-term alternative, single lane roundabout at Allegheny/Limber Road, is not expected for another 10-15 years. However, it is important to note that the long-term alternative utilizes all of the improvements in the short-term alternative. Therefore it is important that at least phase 1 of the short-term improvements are constructed prior to the single lane roundabout. A conceptual layout of the proposed long-term alternative can be found in **Figure 15**.

Figure 12: Immediate Improvements Conceptual Design

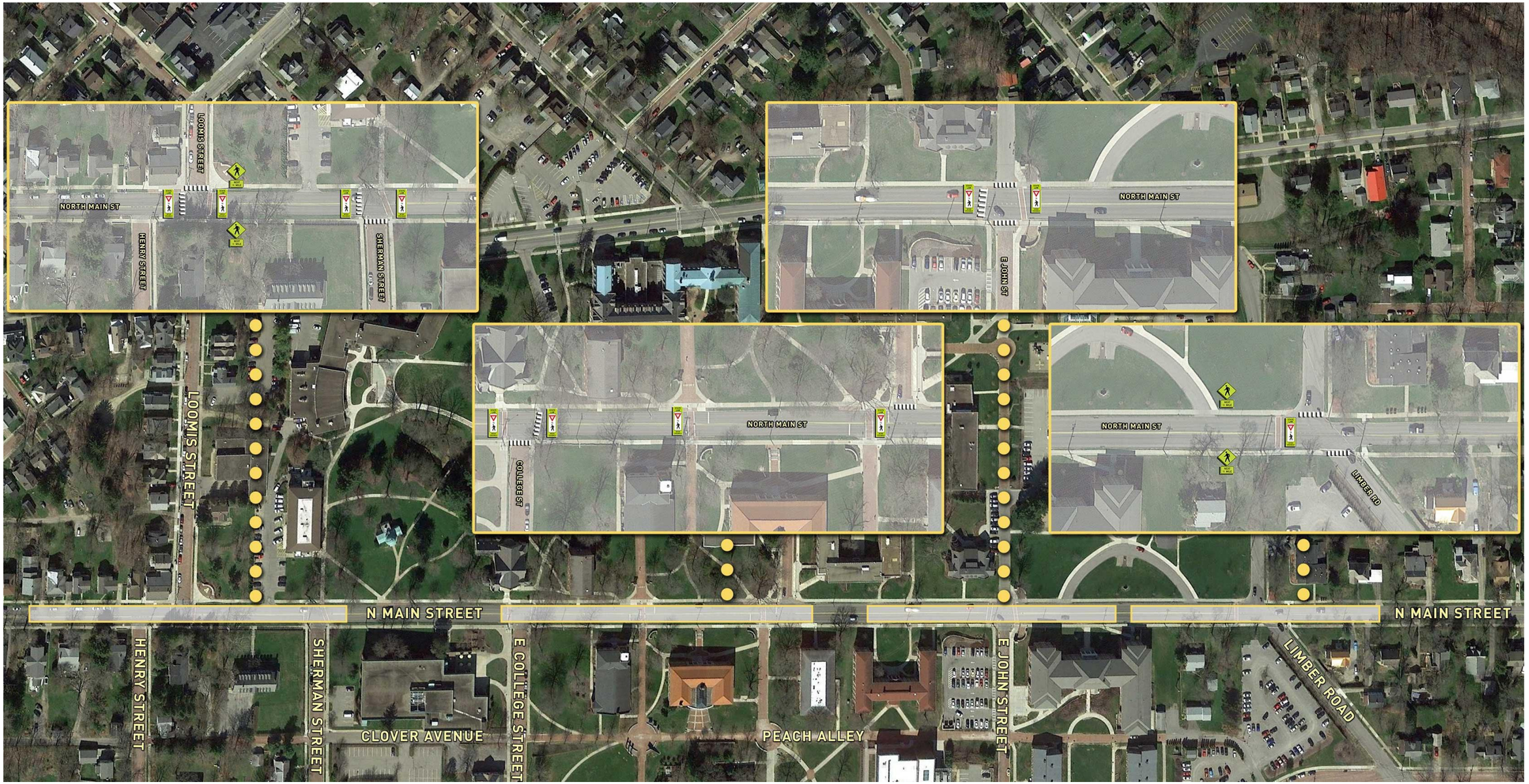


Figure 13: Short-Term Alternative Conceptual Design

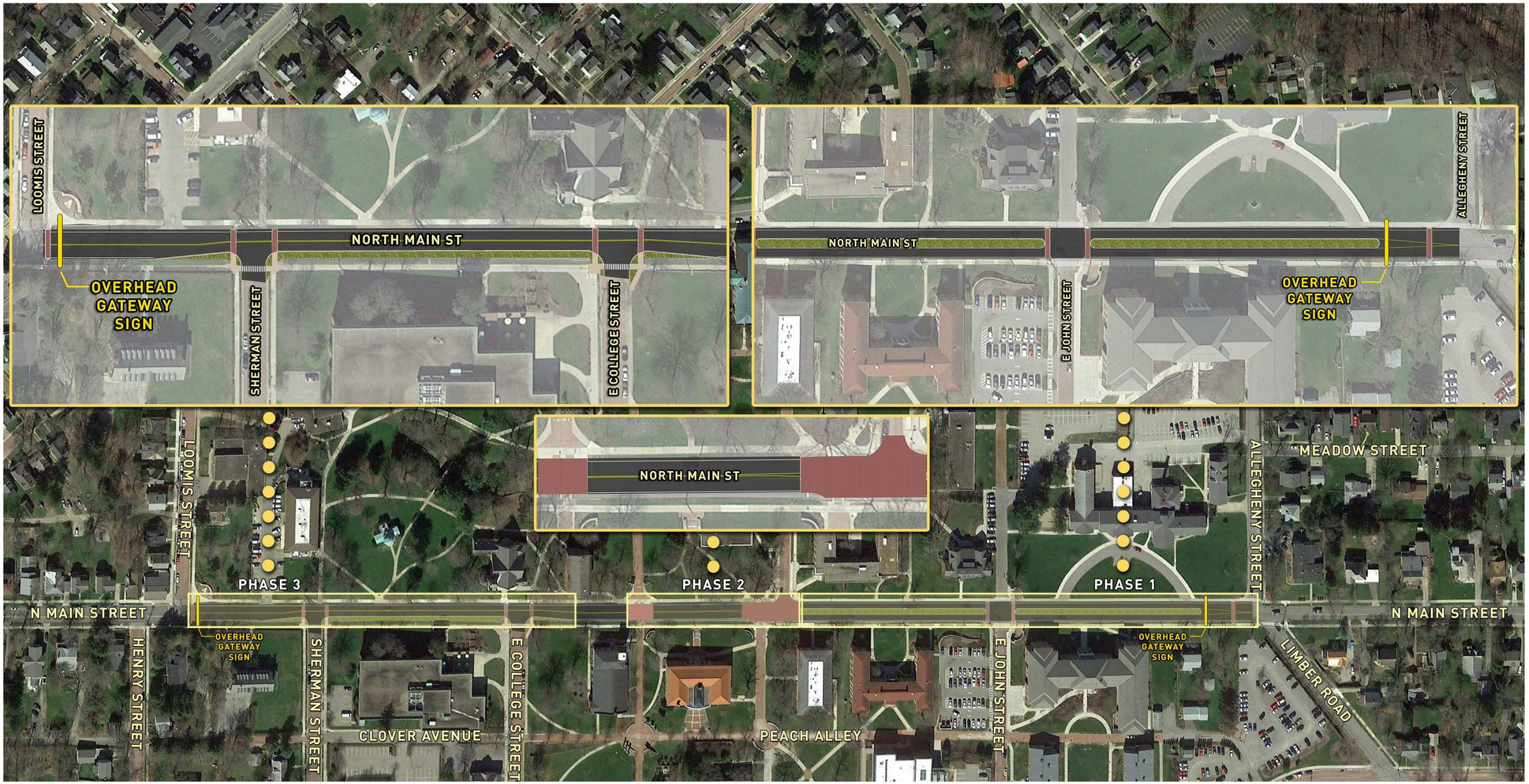


Figure 14: Short-Term Alternative Northern Cross Section (Phase 1)

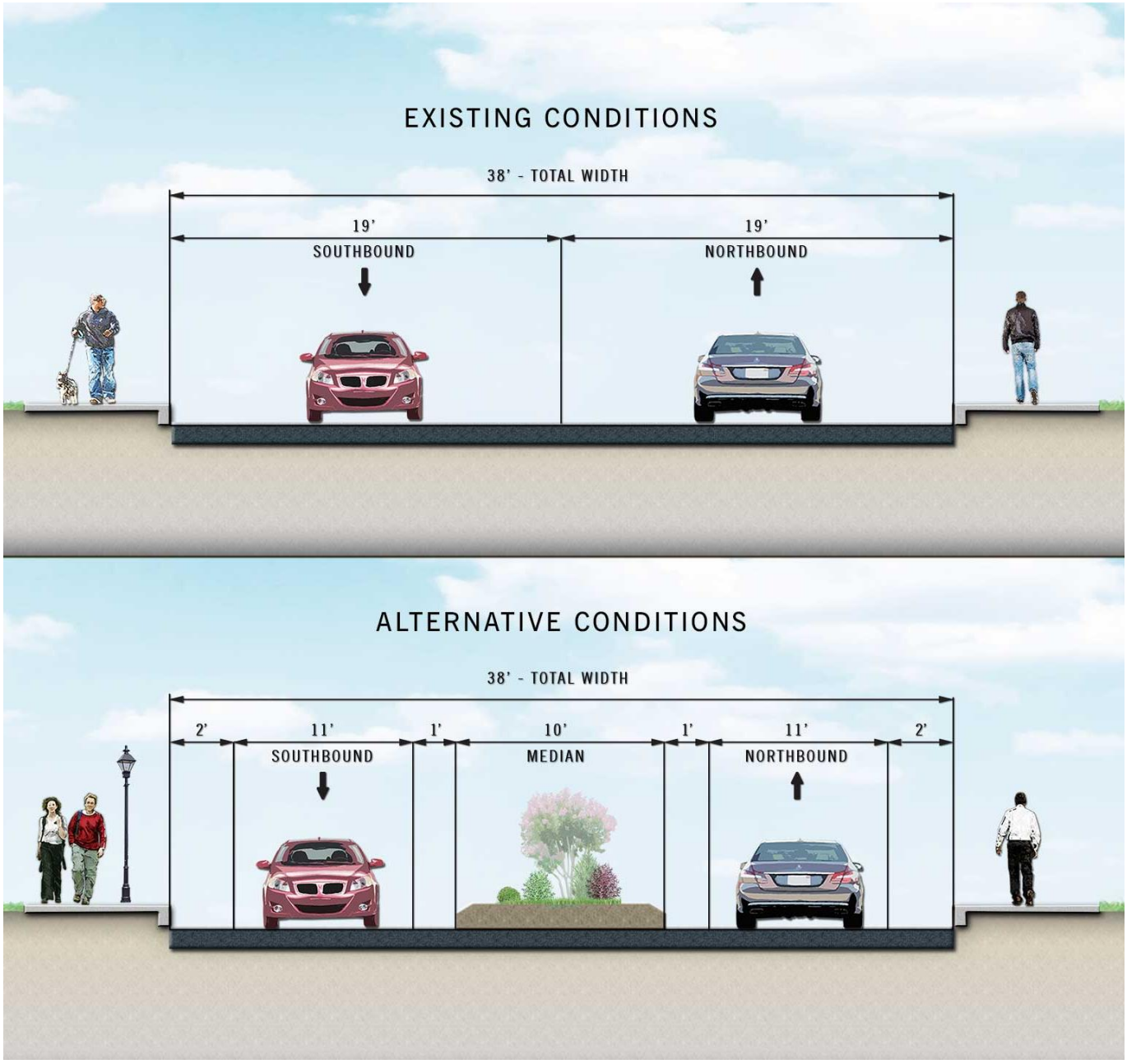


Figure 15: Short-Term Alternative Southern Cross Section (Phase 3)

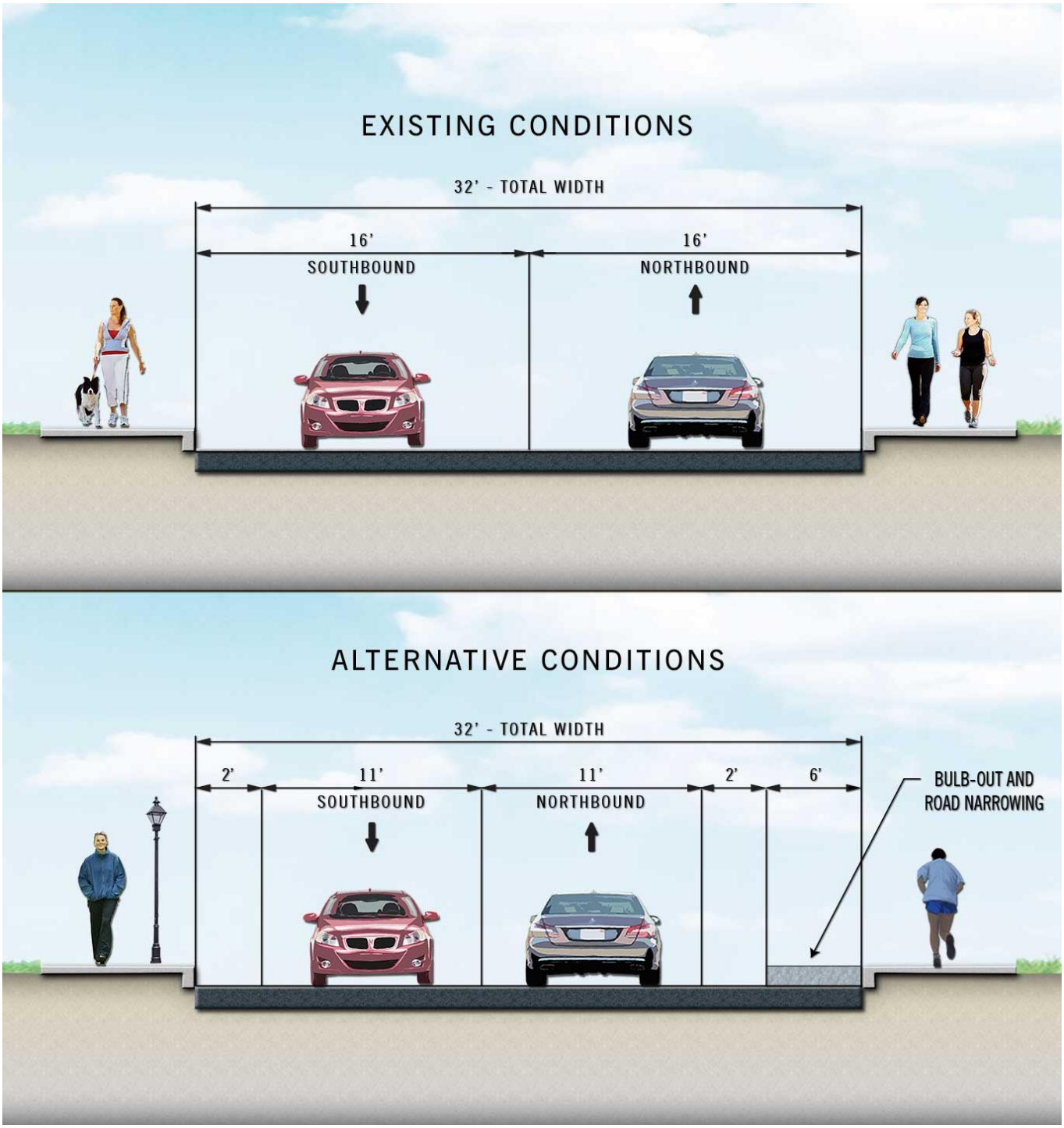


Figure 16: Long-Term Alternative Conceptual Design



5 Traffic Operations Analysis

Traffic congestion and safety are interrelated to one another. Generally, as traffic congestion increases on a roadway, the number of crashes also increase until the transportation network becomes saturated. Even though North Main Street is not considered a congested corridor, if proposed improvements create congestion, the full potential of the locally preferred alternative may not be realized. To verify that congestion and delay will not result from the safety countermeasures, the existing and future traffic conditions were evaluated using Highway Capacity Software (HCS 2010) for unsignalized intersections and SIDRA for roundabouts.

5.1 Existing Conditions Analysis

Turning movement counts were conducted along the corridor on Wednesday, September 28th from 7:00-9:00 AM, 1:00-3:00 PM and 3:30-5:30 PM using MioVision cameras. The turning movement count periods were determined by a 24-hour count on Wednesday, September 21st. The traffic volumes used for the existing conditions analysis can be found in **Appendix D**. It should be noted that a minimum volume of five vehicles was established for all allowable movements in the peak hour summary.

HCS was used to analyze the existing peak hour volumes for the AM, MID and PM periods. **Table 3** provides a summary of the level of service and delay for each intersection.

Table 3 – Existing Conditions LOS and Delay Summary

Movement	AM PEAK	MID PEAK	PM PEAK
	Movement LOS (Delay, sec/veh)	Movement LOS (Delay, sec/veh)	Movement LOS (Delay, sec/veh)
SR 86 at Henry Street			
EB Left/Thru/Right	N/A	N/A	N/A
WB Left/Thru/Right	A (10.7)	B (11.1)	B (11.3)
NB Left/Thru/Right	A (0.0)	A (0.0)	A (0.0)
SB Left/Thru/Right	A (7.8)	A (8.3)	A (8.1)
SR 86 at Loomis Street			
EB Left/Thru/Right	B (11.5)	B (13.2)	B (12.6)
WB Left/Thru/Right	N/A	N/A	N/A
NB Left/Thru/Right	A (7.8)	A (7.9)	A (7.9)
SB Left/Thru/Right	A (0.0)	A (0.0)	A (0.0)
SR 86 at Sherman Street			
EB Left/Thru/Right	N/A	N/A	N/A
WB Left/Thru/Right	A (9.5)	B (10.8)	B (11.4)
NB Left/Thru/Right	A (0.0)	A (0.0)	A (0.0)
SB Left/Thru/Right	A (7.8)	A (8.0)	A (8.1)
SR 86 at College Street			
EB Left/Thru/Right	N/A	N/A	N/A
WB Left/Thru/Right	B (11.0)	B (13.4)	B (12.6)
NB Left/Thru/Right	A (0.0)	A (0.0)	A (0.0)
SB Left/Thru/Right	A (7.8)	A (7.8)	A (8.2)
SR 86 at East John Street			
EB Left/Thru/Right	B (12.8)	B (13.5)	C (15.7)
WB Left/Thru/Right	B (12.1)	B (11.6)	B (13.0)
NB Left/Thru/Right	A (7.8)	A (7.8)	A (7.8)
SB Left/Thru/Right	A (7.7)	A (7.8)	A (8.1)
SR 86 at Allegheny Street/Limber Road			
EB Left/Thru/Right	C (21.0)	C (18.9)	D (32.7)
WB Left/Thru/Right	C (19.4)	B (13.7)	C (17.4)
NB Left/Thru/Right	A (8.0)	A (7.8)	A (7.9)
SB Left/Thru/Right	A (7.6)	A (7.7)	A (7.9)

As depicted in the table above, all of the study intersections operate at an acceptable level of service (D or better) throughout the day under current conditions. North Main Street and Allegheny/Limber Road is the only intersection that experiences notable delay.

5.2 Future Conditions Analysis

To determine future conditions, a growth factor for Crawford County needed to be applied to the existing traffic volumes. Per PennDOT's 2016-2017 traffic growth factors supplied by District 1-0, Crawford County is expecting 0.00 growth on urban non-interstates. To be conservative, 0.5% growth factor was utilized to account for any unforeseen growth which is comparable to the 0.47 growth factor for rural non-interstates in Crawford County. Future traffic volumes used for the future analysis can be found in **Appendix D**.

HCS and SIDRA were used to analyze the future peak hour volumes for all time periods for both the Future No-Build and Long-term Alternative. SIDRA was only used for the proposed roundabout at Allegheny/Limber Road intersection in the Long-term Alternative. Since none of the proposed countermeasures in the Short-term Alternative will impact intersection operations, it is anticipated that the Short-term Alternative will experience comparable LOS and delay to the Future No-Build scenario. **Table 4** provides a summary of the level of service and delay for each intersection. Refer to **Appendix E** for traffic analysis details.

Table 4 – Future Conditions (2036) LOS and Delay Comparison

Movement	AM PEAK Movement LOS (Delay, sec/veh)		MID PEAK Movement LOS (Delay, sec/veh)		PM PEAK Movement LOS (Delay, sec/veh)	
	No-Build	Long-term Alternative	No-Build	Long-term Alternative	No-Build	Long-term Alternative
SR 86 at Henry Street						
EB Left/Thru/Right	N/A	N/A	N/A	N/A	N/A	N/A
WB Left/Thru/Right	A (11.0)	A (11.0)	B (11.4)	B (11.4)	B (11.7)	B (11.7)
NB Left/Thru/Right	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)
SB Left/Thru/Right	A (7.9)	A (7.9)	A (8.4)	A (8.4)	A (8.2)	A (8.2)
SR 86 at Loomis Street						
EB Left/Thru/Right	B (12.0)	B (12.0)	B (14.2)	B (14.2)	B (13.5)	B (13.5)
WB Left/Thru/Right	N/A	N/A	N/A	N/A	N/A	N/A
NB Left/Thru/Right	A (7.9)	A (7.9)	A (8.0)	A (8.0)	A (7.9)	A (7.9)
SB Left/Thru/Right	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)
SR 86 at Sherman Street						
EB Left/Thru/Right	N/A	N/A	N/A	N/A	N/A	N/A
WB Left/Thru/Right	B (10.5)	B (10.5)	B (11.2)	B (11.2)	B (11.8)	B (11.8)
NB Left/Thru/Right	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)
SB Left/Thru/Right	A (7.8)	A (7.8)	A (8.0)	A (8.0)	A (8.2)	A (8.2)
SR 86 at College Street						
EB Left/Thru/Right	N/A	N/A	N/A	N/A	N/A	N/A
WB Left/Thru/Right	B (11.4)	B (11.4)	B (14.3)	B (14.3)	B (13.3)	B (13.3)
NB Left/Thru/Right	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)	A (0.0)
SB Left/Thru/Right	A (7.8)	A (7.8)	A (7.9)	A (7.9)	A (8.3)	A (8.3)
SR 86 at East John Street						
EB Left/Thru/Right	B (13.3)	B (13.3)	B (14.2)	B (14.2)	C (16.8)	C (16.8)
WB Left/Thru/Right	B (12.6)	B (12.6)	B (12.0)	B (12.0)	B (13.8)	B (13.8)
NB Left/Thru/Right	A (7.9)	A (7.9)	A (7.8)	A (7.8)	A (7.9)	A (7.9)
SB Left/Thru/Right	A (7.8)	A (7.8)	A (7.9)	A (7.9)	A (8.2)	A (8.2)
SR 86 at Allegheny Street/Limber Road						
EB Left/Thru/Right	D (26.3)	A (6.1)	C (22.2)	A (6.0)	F (54.2)	A (6.2)
WB Left/Thru/Right	C (22.8)	A (5.6)	B (14.7)	A (5.4)	C (20.5)	A (6.5)
NB Left/Thru/Right	A (8.1)	A (6.0)	A (7.9)	A (7.0)	A (8.0)	A (8.8)
SB Left/Thru/Right	A (7.6)	A (7.5)	A (7.8)	A (6.4)	A (8.0)	A (6.6)

As depicted in the table on the previous page, all of the study intersections will operate at an acceptable level of service (D or better) in the future throughout the day except for the intersection of North Main Street and Allegheny/Limber Road. In the future, North Main Street and Allegheny/Limber Road will operate at a failing level of service (F) during the PM peak period. In order to improve level of service at this intersection to an acceptable level, an ALL-WAY STOP or roundabout will be necessary. As per the long-term alternative, a single lane roundabout is being proposed therefore the analysis results for a single lane roundabout are shown in the table on the previous page.

6 Safety Improvements Summary

As discussed in Section 4, three locally preferred alternatives (immediate, short-term and long-term) were developed to improve safety along North Main Street through Allegheny College. The three alternatives presented in this report provide potential infrastructure related solutions to improving safety along the corridor. It is important to note that additional "soft" improvements are necessary as well. Expansion or modification to the current Allegheny College pedestrian safety campaign is an important improvement as well to improve safety along the corridor. In addition to the pedestrian safety campaign, additional enforcement may be necessary throughout the year to ensure compliance with the vehicle code regarding pedestrian crossings. The infrastructure related solutions will improve safety but without the soft improvements mentioned above, the full potential of the infrastructure related solutions will not be realized.

Since the primary focus of this safety study was infrastructure related solutions, the remainder of this section focuses on anticipated improvement costs, potential funding sources, and project implementation sheets to expedite the project programming process.

6.1 Improvement Costs

Construction costs were estimated for all locally preferred alternatives using District 1-0 cost information from ECMS whenever possible. However, it should be noted that the cost estimates only assume an estimated value for right-of-way, utilities, drainage, and environmental impacts based on a percentage of the actual roadway improvements, therefore, the anticipated costs associated with any one of those categories will need to be addressed in more detail in preliminary design. An annual inflation rate of 3% was applied to the short- and long-term alternatives to provide a more conservative cost estimate assuming actual construction years 2020-2031. In addition to cost, responsible parties were identified for the implementation of the improvements. **Table 5** summarizes the anticipated construction cost and parties responsible for implementation. For detailed construction costs of each alternative refer to **Appendix F**.

Table 5 – Construction Cost and Responsible Parties for Locally Preferred Alternatives

Improvements		Construction Cost (2017 Dollars)	Construction Cost (Construction Yr Dollars)	Responsible Party	Project Partner
Immediate Improvements		$17,000	$17,000 (FY 2017)	Allegheny College/ City of Meadville	PennDOT
Short-term Alternative	Phase 1	$560,000	$640,000 (FY 2020)	PennDOT/City of Meadville	Allegheny College
	Phase 2	$465,000	$585,000 (FY 2024)	PennDOT/City of Meadville	Allegheny College
	Phase 3	$485,000	$690,000 (FY 2028)	PennDOT/City of Meadville	Allegheny College
Long-term Alternative		$1.6 M	$2.4 M (FY 2031)	PennDOT/City of Meadville	Allegheny College

6.2 Potential Funding Sources

Due to the potential safety implications of this project, it's important that available funding be secured to program the identified improvements sooner rather than later. It should be emphasized that most PennDOT-funded transportation projects must be reviewed and approved through the Northwest PA Regional Planning and Development Commission / PennDOT process before being placed on the Transportation Improvements Program (TIP) list. Realistically, this process could take five to seven years from proposal to project initiation. During the interim, the City of Meadville and Allegheny College should identify opportunities for privately-funded improvements or consider alternate sources of funding. A number of alternate funding sources and potential grants have been identified below to assist the City of Meadville and Allegheny College with the programming process.

Table 6 – Potential Alternate Funding Sources

Source	Eligible Projects	Eligible Parties	Notes	Link
Automated Red Light Running Program	Wide-range of projects that must consider highway safety or mobility. Projects primarily focus on traffic signal upgrades but do include pedestrian mobility/ safety projects.	• Municipalities • Counties • County Planning Organizations • MPOs • RPOs • Commonwealth agencies	Intent is to award grants to projects that will be fully funded at the execution of the grant agreement date. No matching funds are required but if provided, matching funds must be made available at the time of the application.	http://www.dot.state.pa.us/public/Bureaus/BOMO/Portal/ARLE%20Funding%20Program%20Policy_5-22-15.pdf
Multimodal Transportation Fund	Funds may be used for the development, rehabilitation and enhancement of transportation assets to existing communities, streetscape, lighting, sidewalk enhancement, pedestrian safety, connectivity of transportation assets and transit-oriented development	• Municipalities • Councils of Governments • Businesses • Economic Development Organizations • Public Transportation Agencies • Ports-Rail/ Freight	Grants are available for projects with a total cost of $100,000 or more. Grants shall not exceed $3,000,000 for any project. Local match must be at least 30% of the federal share.	http://dced.pa.gov/programs/multimodal-transportation-fund/#.WBejai1rhEY

Source	Eligible Projects	Eligible Parties	Notes	Link
Transportation Alternatives Program	Provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, and environmental mitigation, trails that serve a transportation purpose, and safe routes to school projects.	• Municipalities	Construction projects must have a construction cost of at least $50,000, but may not exceed $1 million unless deemed "exceptional". No applicant match is necessary. Other criteria include, but are not limited to, consistency with local regional plans, collaboration with stakeholders, statewide or regional significance, and the sponsor's demonstrated ability to successfully deliver the project.	https://spportal.dot.pa.gov/Planning/AppReg/Pages/default.aspx
Community Develop Block Grants	Funding can be used for housing rehabilitation, public services, community facilities, infrastructure improvement, development and planning.	• Designated municipalities through the entitlement program • All non-federal entitlement municipalities and state Act 179 entitlement municipalities with <10,000 population	There are both formula grants and competitive funding cycles. Seventy percent of each entitlement grant must be used for activities that benefit low- and moderate-income persons.	http://www.penndot.gov/TravelInPA/Safety/SchoolResourcesAndPrograms/SafeRoutesToSchool/Pages/Funding.aspx
Pennsylvania Infrastructure Bank	All transportation projects.	• Municipalities • Counties • Transportation authorities • Economic development agencies	The Pennsylvania Infrastructure Bank (PIB) is a PennDOT program that provides low-interest loans to help fund transportation projects within the Commonwealth.	http://www.penndot.gov/ProjectAndPrograms/Planning/Pages/PA-Infrastructure-Bank.aspx
Allegheny College Funds/ Donations	All projects.	• Allegheny College		
Highway Safety Funds	Used to support state and community programs aimed at reducing crashes, deaths, injuries, and property damage.	• Municipalities • Councils of Governments • Businesses • Institutions • Public Transportation Agencies	Funds have been used to fund several bike and pedestrian safety programs across the country including school-based pedestrian/bike safety programs.	http://www.penndot.gov/TravelInPA/Safety/SchoolResourcesAndPrograms/SafeRoutesToSchool/Pages/Funding.aspx

6.3 Project Implementation Sheets

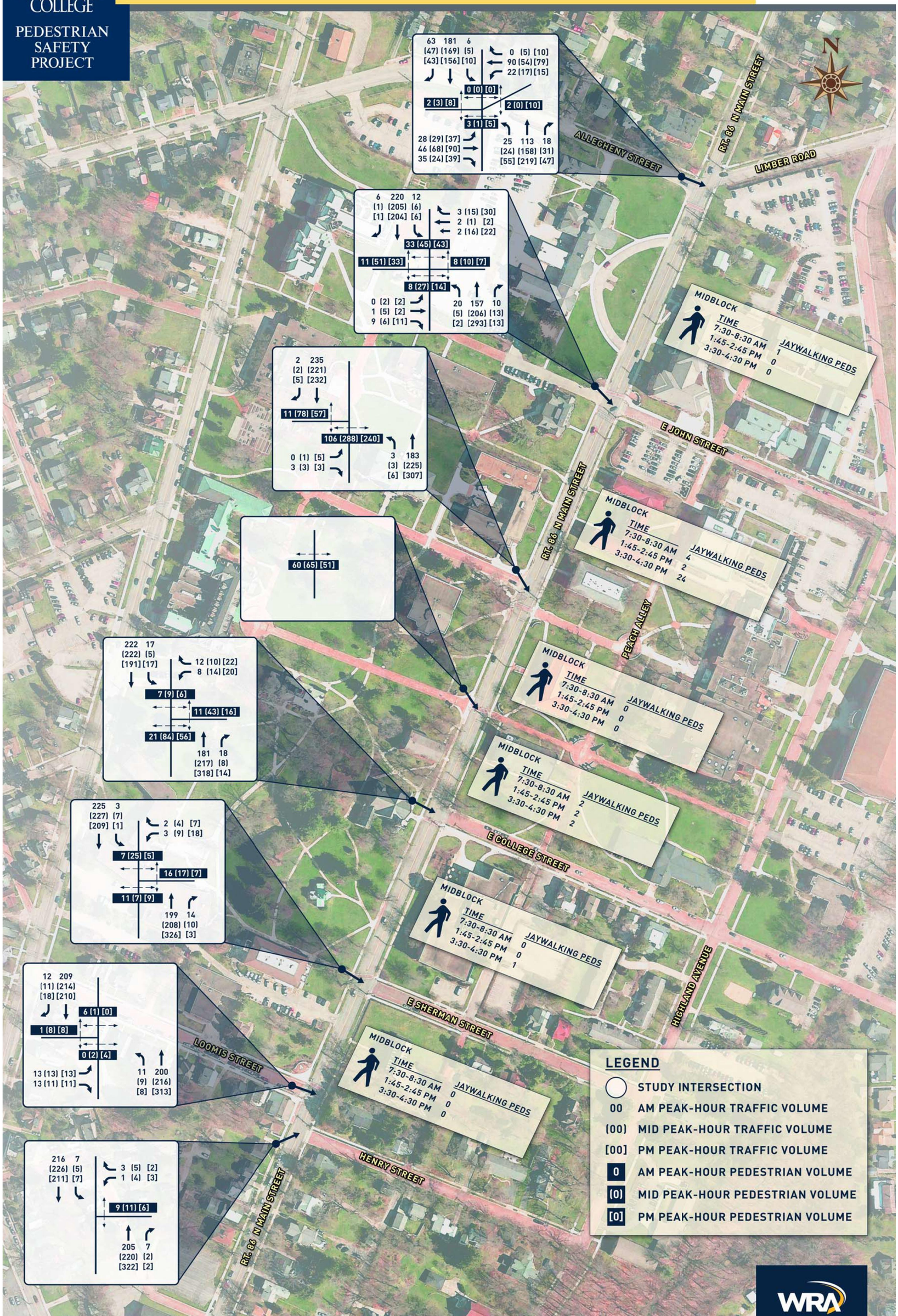
All locally preferred alternatives are summarized on project implementation sheets, refer to **Appendix G**, which are based on PennDOT's Level 1 and Level 2 Project Development Screening Forms. The Linking Planning and NEPA Screening Forms are tools to gather valuable information from the planning phase to be used in the environmental review process to deliver a better defined and more predictable project. This will reduce the overall level of effort for project delivery through more effective project programming and more efficient environmental review. The project implementation sheets provide the following information:

- Project improvement name
- Conceptual cost estimate – assumed for further planning or engineering purposes
- Priority rating – "A" for short-term", "B" for mid-term, "C" for long-term
- Responsible party – Project Champion; does not imply existing formal commitments or binding agreements
- Project partners – Cooperating agencies or bodies needed for project implementation/approval; does not imply existing formal commitments or binding agreements
- Project location – Identifies project location including state route numbers, segments, and offsets if applicable
- Project description – Description of what the project involves including physical construction details
- Purpose and need statement – the purpose is the reason for a project or problem description and the need is data and/or statistics behind the purpose
- Associated goals and objectives of the project – developed in the beginning of the project and serves as a way to measure the plan's performance and success
- Problem description / justification – identifies the problem encountered and justification for the project
- Land use linkage to transportation– how land use ties into the transportation components of the corridor and study area
- Land use / economic development opportunity – potential economic opportunities created from the improvement recommendations
- Community issues and opportunities – describes potential impacts and opportunities for community growth and development
- Public and agency involvement – describes key issues identified by the public or stakeholders and the outreach methods used
- Environmental impact – any potential impacts to environmental sensitive areas such as HQ/EV streams, wetlands, threatened or endangered species, historic properties or archaeological resources, or agricultural resources
- Potential approach and solutions – the locally preferred improvement alternative and solutions to mitigate existing deficiencies and/or areas of concern
- Alternative(s) studied – list of other improvement alternatives studied

Appendix A:
Traffic Volume Data

EXISTING PEAK HOUR TURNING MOVEMENT VOLUMES

ALLEGHENY COLLEGE
PEDESTRIAN SAFETY PROJECT



Automatic Traffic Recorder (ATR) Data Summary

Project: *Allegheny College Safety Study*
Location: *N Main Street*
Direction: *2-Way Combined*

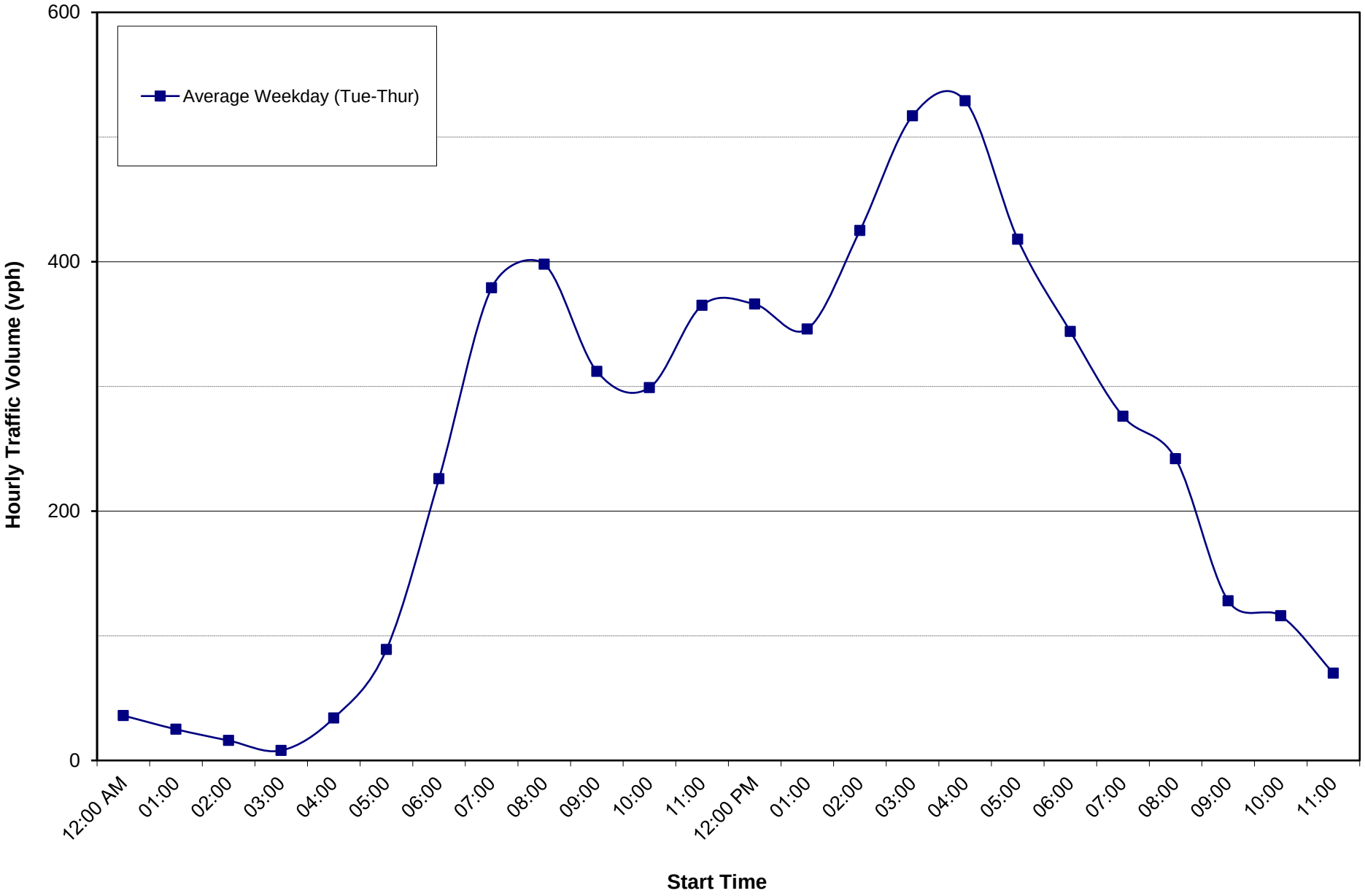
Work Order: *32055*
ATR Site Code: *#1*
QA/QC **Compiled By:** *LNW*
Reviewed By: *EMC*

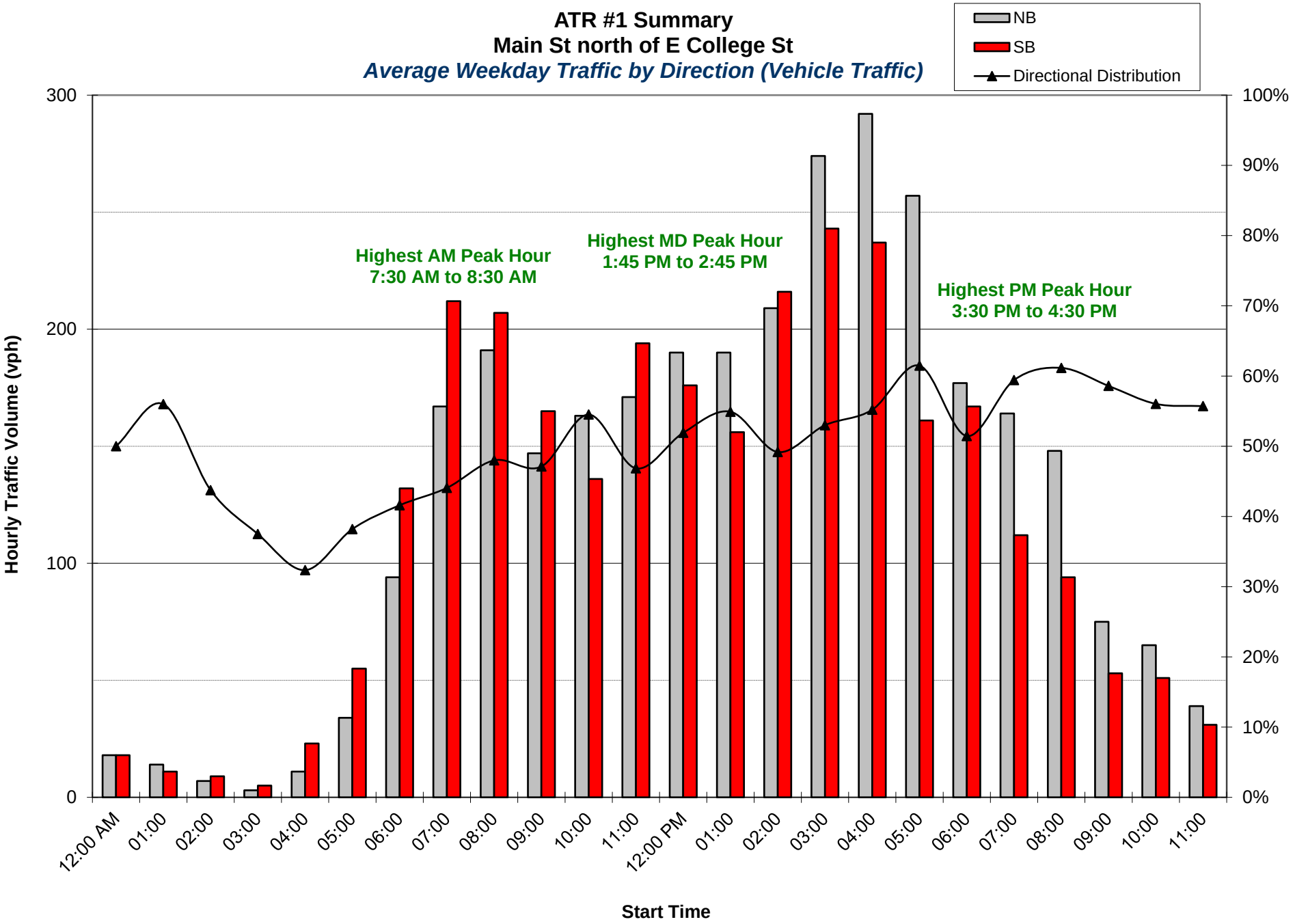
Start Time	Average Daily (7-Day)				Average Weekday (Tue-Thur)			
	NB	SB	Total	Dir Dist	NB	SB	Total	Dir Dist
12:00 AM	18	18	**36**	**50%**	18	18	**36**	**50%**
01:00	14	11	**25**	**56%**	14	11	**25**	**56%**
02:00	7	9	**16**	**44%**	7	9	**16**	**44%**
03:00	3	5	**8**	**38%**	3	5	**8**	**38%**
04:00	11	23	**34**	**32%**	11	23	**34**	**32%**
05:00	34	55	**89**	**38%**	34	55	**89**	**38%**
06:00	94	132	**226**	**42%**	94	132	**226**	**42%**
07:00	167	**212**	**379**	**44%**	167	**212**	**379**	**44%**
08:00	**191**	207	**398**	**48%**	**191**	207	**398**	**48%**
09:00	147	165	**312**	**47%**	147	165	**312**	**47%**
10:00	163	136	**299**	**55%**	163	136	**299**	**55%**
11:00	171	194	**365**	**47%**	171	194	**365**	**47%**
12:00 PM	190	176	**366**	**52%**	190	176	**366**	**52%**
01:00	190	156	**346**	**55%**	190	156	**346**	**55%**
02:00	**209**	**216**	**425**	**49%**	**209**	**216**	**425**	**49%**
03:00	274	**243**	**517**	**53%**	274	**243**	**517**	**53%**
04:00	**292**	237	**529**	**55%**	**292**	237	**529**	**55%**
05:00	257	161	**418**	**61%**	257	161	**418**	**61%**
06:00	177	167	**344**	**51%**	177	167	**344**	**51%**
07:00	164	112	**276**	**59%**	164	112	**276**	**59%**
08:00	148	94	**242**	**61%**	148	94	**242**	**61%**
09:00	75	53	**128**	**59%**	75	53	**128**	**59%**
10:00	65	51	**116**	**56%**	65	51	**116**	**56%**
11:00	39	31	**70**	**56%**	39	31	**70**	**56%**
Day Total	3,100	2,864	**5,964**	**52%**	3,100	2,864	**5,964**	**52%**
% Avg Daily	100%	100%	**100%**	**-**	100%	100%	**100%**	**-**
% Avg WkDay	100%	100%	**100%**	**-**	100%	100%	**100%**	**-**
AM Peak Volume	191	212	**398**	-	191	212	**398**	-
MD Peak Volume	209	216	**425**	-	209	216	**425**	-
PM Peak Volume	292	243	**529**	-	292	243	**529**	-

Avg Wkdy ADT:	**5,964**	**AADT Adjust:**	**0.79**	**AADT:**	**4,690**

NOTES: *AADT Adjust based on TPG 5's Wednesday for September per PennDOT's 2014 Traffic Data Manual.*

ATR #1 Summary
Main St north of E College St
Two-Way Hourly Volumes by Day (Vehicle Traffic)




ATR #1 Summary
Main St north of E College St
Average Weekday Traffic by Direction (Vehicle Traffic)
NB
SB
Directional Distribution
Highest AM Peak Hour
7:30 AM to 8:30 AM
Highest MD Peak Hour
1:45 PM to 2:45 PM
Highest PM Peak Hour
3:30 PM to 4:30 PM
Hourly Traffic Volume (vph)
300
200
100
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
12:00 AM
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00 PM
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
Start Time

Whitman, Requardt, and Associates, LLP
2009 MacKenzie Way
Suite 240
Cranberry Twp, Pennsylvania, United States 16066
724-779-7940 lweimer@wrallp.com
People Focused - Project Driven

Count Name: TMC - Main St @ Henry
Site Code: 100
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				
	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	1	30	0	31	0	2	0	2	26	0	0	26	59
7:15 AM	0	36	0	36	0	1	0	1	19	0	0	19	56
7:30 AM	2	54	0	56	0	1	2	1	41	0	0	41	98
7:45 AM	4	61	0	65	0	2	4	2	63	3	0	66	133
Hourly Total	7	181	0	188	0	6	6	6	149	3	0	152	346
8:00 AM	1	44	0	45	0	1	1	1	42	1	0	43	89
8:15 AM	2	52	0	54	0	0	2	0	53	3	0	56	110
8:30 AM	0	59	0	59	1	0	3	1	47	0	0	47	107
8:45 AM	1	45	1	46	0	0	8	0	39	1	0	40	86
Hourly Total	4	200	1	204	1	1	14	2	181	5	0	186	392
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	1	57	0	58	1	0	2	1	48	1	0	49	108
1:15 PM	2	42	0	44	0	2	5	2	49	0	0	49	95
1:30 PM	0	32	0	32	0	1	0	1	52	1	0	53	86
1:45 PM	0	27	0	27	1	0	3	1	56	0	0	56	84
Hourly Total	3	158	0	161	2	3	10	5	205	2	0	207	373
2:00 PM	0	56	0	56	2	1	3	3	45	0	0	45	104
2:15 PM	0	39	0	39	0	1	5	1	55	1	0	56	96
2:30 PM	3	75	0	78	0	2	0	2	52	0	0	52	132
2:45 PM	2	56	0	58	2	1	3	3	68	1	0	69	130
Hourly Total	5	226	0	231	4	5	11	9	220	2	0	222	462
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	2	54	0	56	0	1	2	1	67	0	0	67	124
3:45 PM	2	57	0	59	2	0	2	2	60	2	0	62	123
Hourly Total	4	111	0	115	2	1	4	3	127	2	0	129	247
4:00 PM	0	69	0	69	1	0	1	1	73	0	0	73	143
4:15 PM	0	61	0	61	0	0	1	0	74	1	0	75	136
4:30 PM	1	35	0	36	2	0	3	2	91	0	0	91	129
4:45 PM	4	55	0	59	0	1	4	1	65	0	0	65	125
Hourly Total	5	220	0	225	3	1	9	4	303	1	0	304	533
5:00 PM	2	60	0	62	1	1	2	2	92	1	0	93	157
5:15 PM	0	48	0	48	0	0	2	0	71	1	0	72	120
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0

Grand Total	30	1204	1	1234	13	18	58	31	1348	17	0	1365	2630
Approach %	2.4	97.6	-	-	41.9	58.1	-	-	98.8	1.2	-	-	-
Total %	1.1	45.8	-	46.9	0.5	0.7	-	1.2	51.3	0.6	-	51.9	-
Lights	27	1174	-	1201	10	18	-	28	1309	14	-	1323	2552
% Lights	90.0	97.5	-	97.3	76.9	100.0	-	90.3	97.1	82.4	-	96.9	97.0
Bicycles on Road	0	3	-	3	0	0	-	0	0	0	-	0	3
% Bicycles on Road	0.0	0.2	-	0.2	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.1
All Pedestrians	-	-	1	-	-	-	58	-	-	-	0	-	-
% All Pedestrians	-	-	100.0	-	-	-	100.0	-	-	-	-	-	-
Trucks	3	27	-	30	3	0	-	3	39	3	-	42	75
% Trucks	10.0	2.2	-	2.4	23.1	0.0	-	9.7	2.9	17.6	-	3.1	2.9

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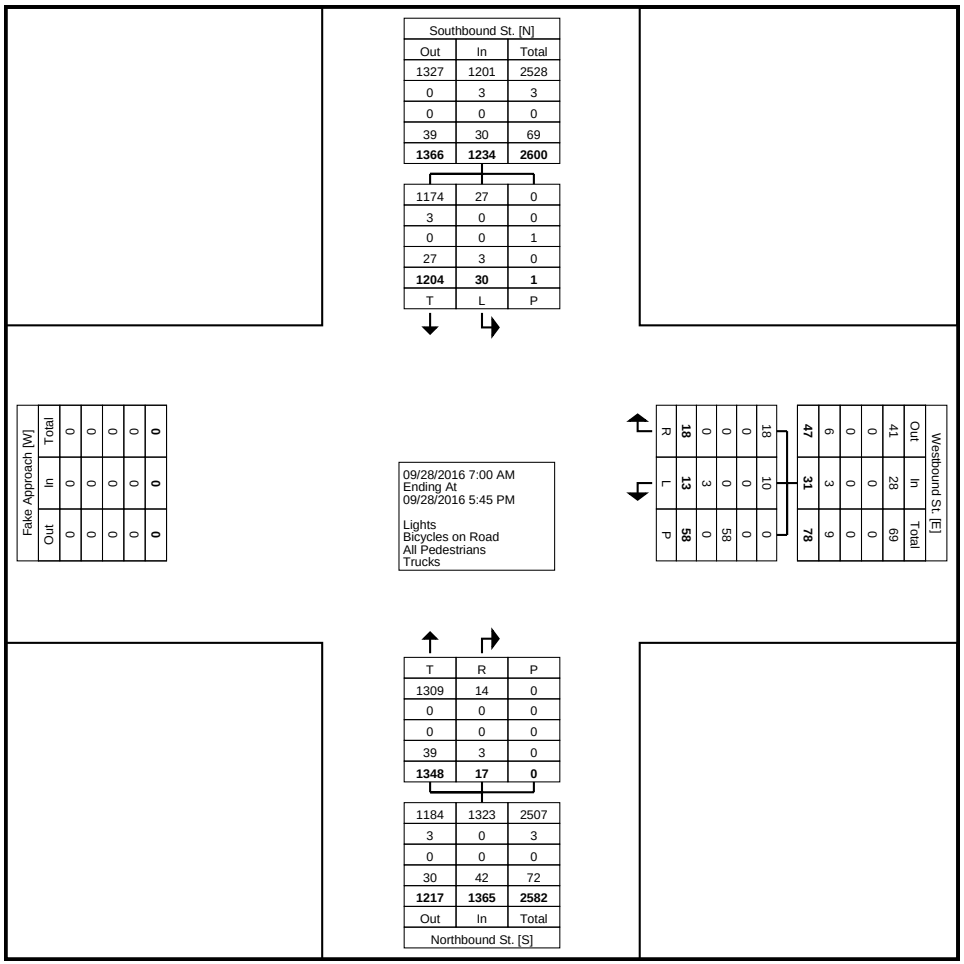

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Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				
	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
7:45 AM	4	61	0	65	0	2	4	2	63	3	0	66	133
8:00 AM	1	44	0	45	0	1	1	1	42	1	0	43	89
8:15 AM	2	52	0	54	0	0	2	0	53	3	0	56	110
8:30 AM	0	59	0	59	1	0	3	1	47	0	0	47	107
Total	7	216	0	223	1	3	10	4	205	7	0	212	439
Approach %	3.1	96.9	-	-	25.0	75.0	-	-	96.7	3.3	-	-	-
Total %	1.6	49.2	-	50.8	0.2	0.7	-	0.9	46.7	1.6	-	48.3	-
PHF	0.438	0.885	-	0.858	0.250	0.375	-	0.500	0.813	0.583	-	0.803	0.825
Lights	7	211	-	218	0	3	-	3	198	5	-	203	424
% Lights	100.0	97.7	-	97.8	0.0	100.0	-	75.0	96.6	71.4	-	95.8	96.6
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
All Pedestrians	-	-	0	-	-	-	10	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	-	-	100.0	-	-	-	-	-	-
Trucks	0	5	-	5	1	0	-	1	7	2	-	9	15
% Trucks	0.0	2.3	-	2.2	100.0	0.0	-	25.0	3.4	28.6	-	4.2	3.4

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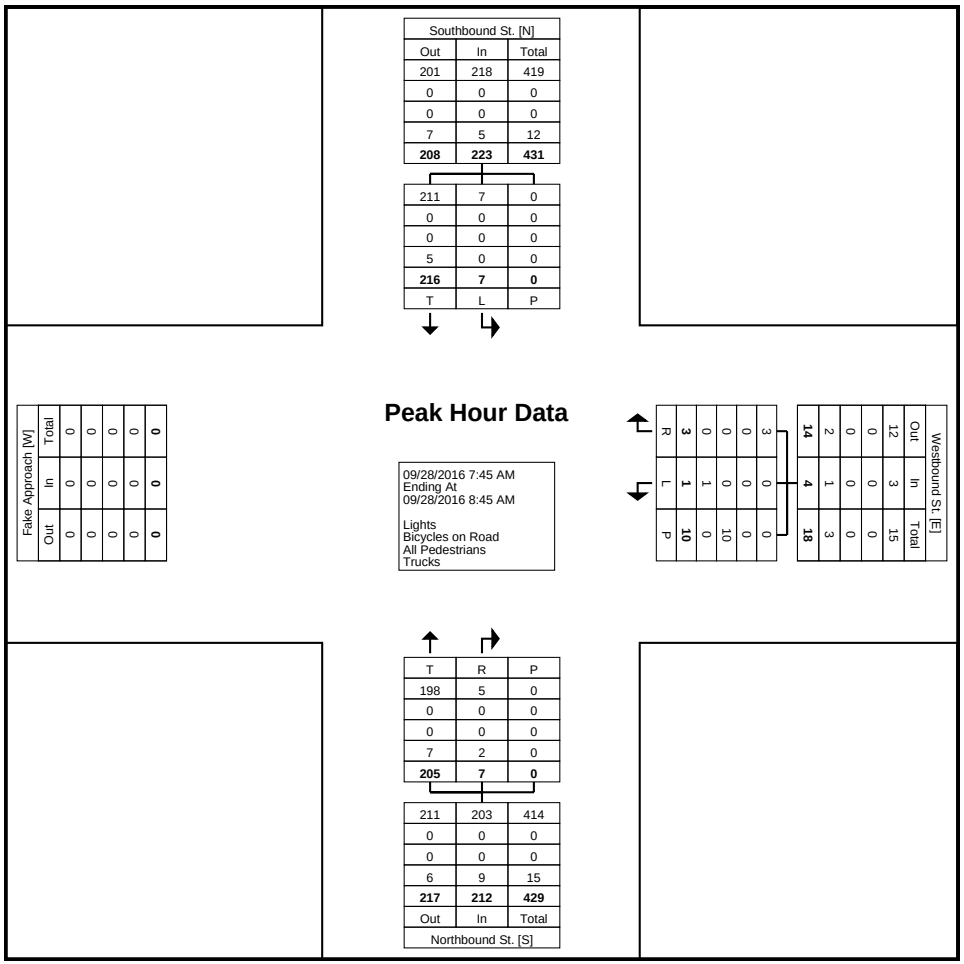

Turning Movement Peak Hour Data Plot (7:45 AM)

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Count Name: TMC - Main St @ Henry
Site Code: 100
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				
	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
2:00 PM	0	56	0	56	2	1	3	3	45	0	0	45	104
2:15 PM	0	39	0	39	0	1	5	1	55	1	0	56	96
2:30 PM	3	75	0	78	0	2	0	2	52	0	0	52	132
2:45 PM	2	56	0	58	2	1	3	3	68	1	0	69	130
Total	5	226	0	231	4	5	11	9	220	2	0	222	462
Approach %	2.2	97.8	-	-	44.4	55.6	-	-	99.1	0.9	-	-	-
Total %	1.1	48.9	-	50.0	0.9	1.1	-	1.9	47.6	0.4	-	48.1	-
PHF	0.417	0.753	-	0.740	0.500	0.625	-	0.750	0.809	0.500	-	0.804	0.875
Lights	3	219	-	222	3	5	-	8	208	2	-	210	440
% Lights	60.0	96.9	-	96.1	75.0	100.0	-	88.9	94.5	100.0	-	94.6	95.2
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
All Pedestrians	-	-	0	-	-	-	11	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	-	-	100.0	-	-	-	-	-	-
Trucks	2	7	-	9	1	0	-	1	12	0	-	12	22
% Trucks	40.0	3.1	-	3.9	25.0	0.0	-	11.1	5.5	0.0	-	5.4	4.8

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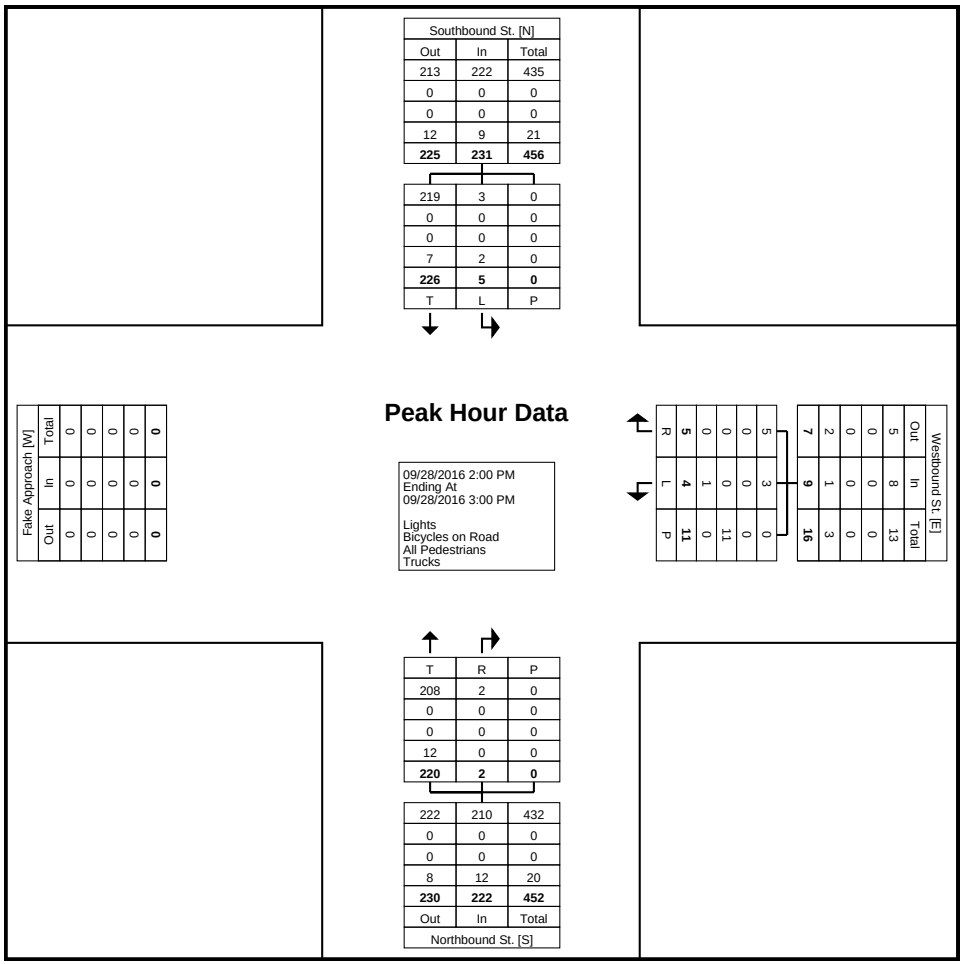

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Turning Movement Peak Hour Data (4:15 PM)

Start Time	Southbound St. Southbound				Westbound St. Westbound				Northbound St. Northbound				
	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Thru	Right	Peds	App. Total	Int. Total
4:15 PM	0	61	0	61	0	0	1	0	74	1	0	75	136
4:30 PM	1	35	0	36	2	0	3	2	91	0	0	91	129
4:45 PM	4	55	0	59	0	1	4	1	65	0	0	65	125
5:00 PM	2	60	0	62	1	1	2	2	92	1	0	93	157
Total	7	211	0	218	3	2	10	5	322	2	0	324	547
Approach %	3.2	96.8	-	-	60.0	40.0	-	-	99.4	0.6	-	-	-
Total %	1.3	38.6	-	39.9	0.5	0.4	-	0.9	58.9	0.4	-	59.2	-
PHF	0.438	0.865	-	0.879	0.375	0.500	-	0.625	0.875	0.500	-	0.871	0.871
Lights	7	207	-	214	3	2	-	5	320	2	-	322	541
% Lights	100.0	98.1	-	98.2	100.0	100.0	-	100.0	99.4	100.0	-	99.4	98.9
Bicycles on Road	0	1	-	1	0	0	-	0	0	0	-	0	1
% Bicycles on Road	0.0	0.5	-	0.5	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.2
All Pedestrians	-	-	0	-	-	-	10	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	-	-	100.0	-	-	-	-	-	-
Trucks	0	3	-	3	0	0	-	0	2	0	-	2	5
% Trucks	0.0	1.4	-	1.4	0.0	0.0	-	0.0	0.6	0.0	-	0.6	0.9

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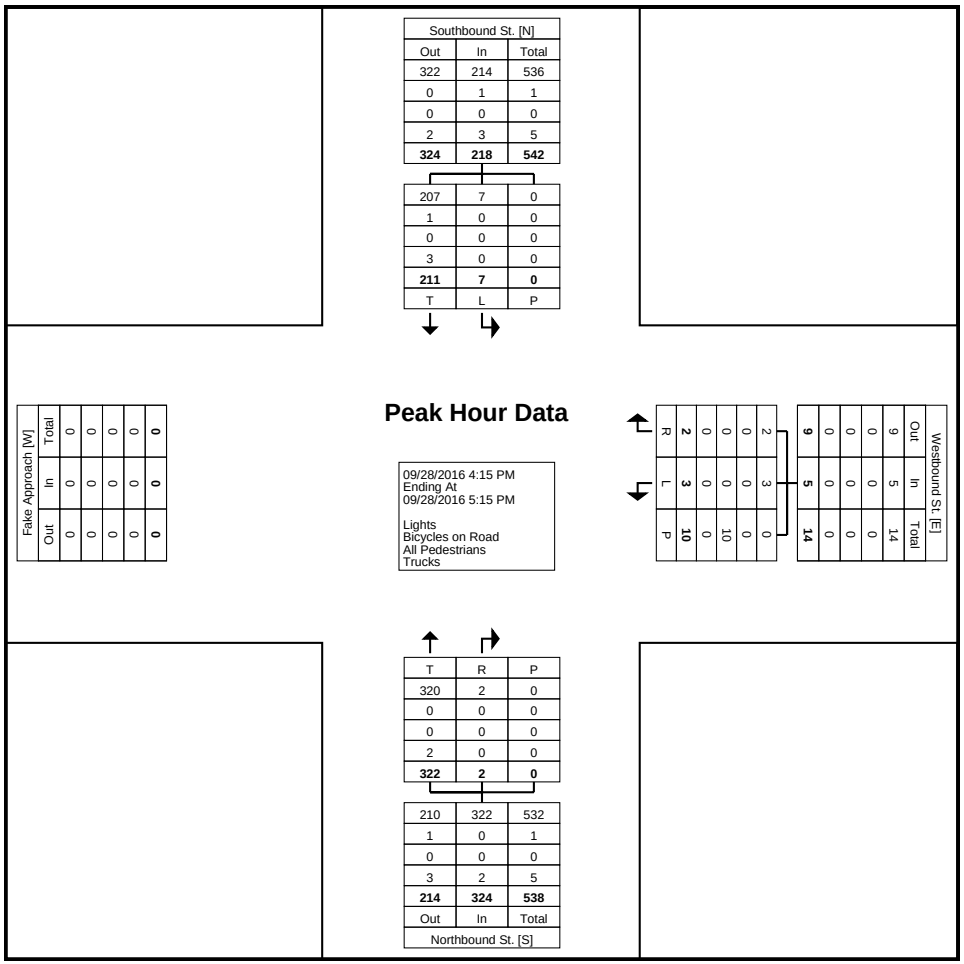

Turning Movement Peak Hour Data Plot (4:15 PM)

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Count Name: TMC - Main St @ Loomis St
Site Code: 100
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound					Northbound St. Northbound					Eastbound St. Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
7:00 AM	3	29	0	0	32	27	0	0	0	27	1	2	0	0	3	62
7:15 AM	3	37	0	0	40	20	1	0	0	21	1	2	0	0	3	64
7:30 AM	3	51	0	3	54	37	1	0	0	38	1	4	0	0	5	97
7:45 AM	5	61	0	1	66	55	8	0	0	63	7	5	0	1	12	141
Hourly Total	14	178	0	4	192	139	10	0	0	149	10	13	0	1	23	364
8:00 AM	3	44	0	0	47	42	1	0	0	43	3	3	0	0	6	96
8:15 AM	3	51	0	2	54	52	0	0	0	52	2	4	0	0	6	112
8:30 AM	1	53	0	1	54	51	2	0	0	53	1	1	0	0	2	109
8:45 AM	1	46	0	0	47	36	0	0	1	36	2	5	0	1	7	90
Hourly Total	8	194	0	3	202	181	3	0	1	184	8	13	0	1	21	407
9:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
1:00 PM	2	52	0	0	54	48	1	0	0	49	3	7	0	0	10	113
1:15 PM	4	39	0	2	43	51	1	0	0	52	4	3	0	4	7	102
1:30 PM	2	35	0	0	37	49	3	0	0	52	1	3	0	1	4	93
1:45 PM	8	33	0	0	41	53	1	0	1	54	0	3	0	2	3	98
Hourly Total	16	159	0	2	175	201	6	0	1	207	8	16	0	7	24	406
2:00 PM	1	49	0	0	50	43	1	0	0	44	2	1	0	0	3	97
2:15 PM	5	36	0	0	41	56	3	1	1	60	1	6	0	3	7	108
2:30 PM	5	74	0	1	79	52	0	0	0	52	5	4	0	3	9	140
2:45 PM	0	55	0	0	55	65	5	0	0	70	3	2	0	4	5	130
Hourly Total	11	214	0	1	225	216	9	1	1	226	11	13	0	10	24	475
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	4	46	0	0	50	67	1	0	1	68	6	2	0	2	8	126
3:45 PM	10	59	0	0	69	60	2	0	2	62	1	2	0	4	3	134
Hourly Total	14	105	0	0	119	127	3	0	3	130	7	4	0	6	11	260
4:00 PM	8	64	0	0	72	73	3	0	1	76	4	5	0	1	9	157
4:15 PM	3	59	0	0	62	72	2	0	0	74	2	4	0	1	6	142
4:30 PM	4	39	0	0	43	80	2	0	0	82	1	4	0	1	5	130
4:45 PM	2	59	0	0	61	65	3	0	0	68	3	3	0	1	6	135
Hourly Total	17	221	0	0	238	290	10	0	1	300	10	16	0	4	26	564
5:00 PM	9	53	0	1	62	96	1	0	0	97	5	2	0	2	7	166
5:15 PM	3	43	0	0	46	70	2	0	0	72	4	3	0	0	7	125
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	92	1168	0	11	1260	1320	44	1	7	1365	63	80	0	31	143	2768

Approach %	7.3	92.7	0.0	-	-	96.7	3.2	0.1	-	-	44.1	55.9	0.0	-	-	-
Total %	3.3	42.2	0.0	-	45.5	47.7	1.6	0.0	-	49.3	2.3	2.9	0.0	-	5.2	-
Lights	92	1139	0	-	1231	1281	44	1	-	1326	61	80	0	-	141	2698
% Lights	100.0	97.5	-	-	97.7	97.0	100.0	100.0	-	97.1	96.8	100.0	-	-	98.6	97.5
Buses	0	7	0	-	7	20	0	0	-	20	1	0	0	-	1	28
% Buses	0.0	0.6	-	-	0.6	1.5	0.0	0.0	-	1.5	1.6	0.0	-	-	0.7	1.0
Trucks	0	19	0	-	19	19	0	0	-	19	1	0	0	-	1	39
% Trucks	0.0	1.6	-	-	1.5	1.4	0.0	0.0	-	1.4	1.6	0.0	-	-	0.7	1.4
Bicycles on Road	0	3	0	-	3	0	0	0	-	0	0	0	0	-	0	3
% Bicycles on Road	0.0	0.3	-	-	0.2	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	3.2	-	-
Pedestrians	-	-	-	11	-	-	-	-	7	-	-	-	-	30	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	96.8	-	-

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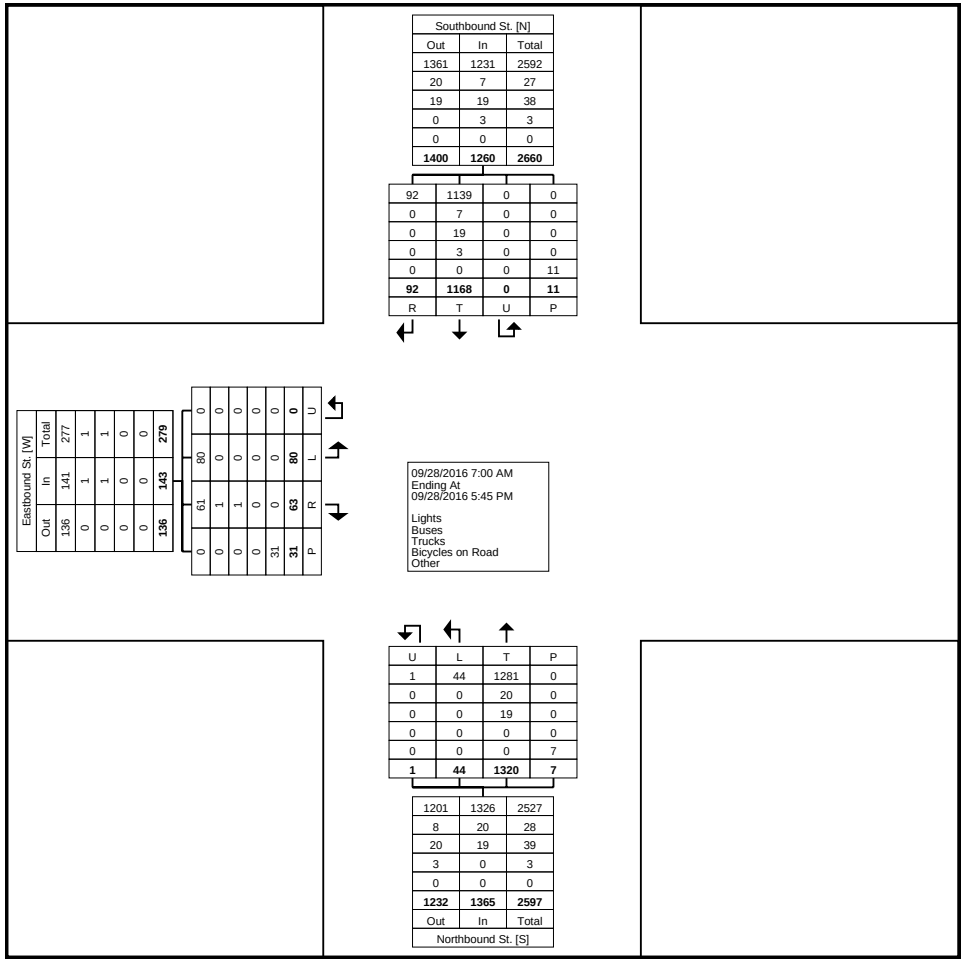
Site Code: 100
Start Date: 09/28/2016



Turning Movement Data Plot

Whitman, Requardt, and Associates, LLP
2009 MacKenzie Way
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724-779-7940 lweimer@wrallp.com
People Focused - Project Driven

Count Name: TMC - Main St @ Loomis St
Site Code: 100
Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound					Northbound St. Northbound					Eastbound St. Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
7:45 AM	5	61	0	1	66	55	8	0	0	63	7	5	0	1	12	141
8:00 AM	3	44	0	0	47	42	1	0	0	43	3	3	0	0	6	96
8:15 AM	3	51	0	2	54	52	0	0	0	52	2	4	0	0	6	112
8:30 AM	1	53	0	1	54	51	2	0	0	53	1	1	0	0	2	109
Total	12	209	0	4	221	200	11	0	0	211	13	13	0	1	26	458
Approach %	5.4	94.6	0.0	-	-	94.8	5.2	0.0	-	-	50.0	50.0	0.0	-	-	-
Total %	2.6	45.6	0.0	-	48.3	43.7	2.4	0.0	-	46.1	2.8	2.8	0.0	-	5.7	-
PHF	0.600	0.857	0.000	-	0.837	0.909	0.344	0.000	-	0.837	0.464	0.650	0.000	-	0.542	0.812
Lights	12	204	0	-	216	192	11	0	-	203	13	13	0	-	26	445
% Lights	100.0	97.6	-	-	97.7	96.0	100.0	-	-	96.2	100.0	100.0	-	-	100.0	97.2
Buses	0	0	0	-	0	5	0	0	-	5	0	0	0	-	0	5
% Buses	0.0	0.0	-	-	0.0	2.5	0.0	-	-	2.4	0.0	0.0	-	-	0.0	1.1
Trucks	0	5	0	-	5	3	0	0	-	3	0	0	0	-	0	8
% Trucks	0.0	2.4	-	-	2.3	1.5	0.0	-	-	1.4	0.0	0.0	-	-	0.0	1.7
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	4	-	-	-	-	0	-	-	-	-	1	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	100.0	-	-

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Count Name: TMC - Main St @ Loomis St
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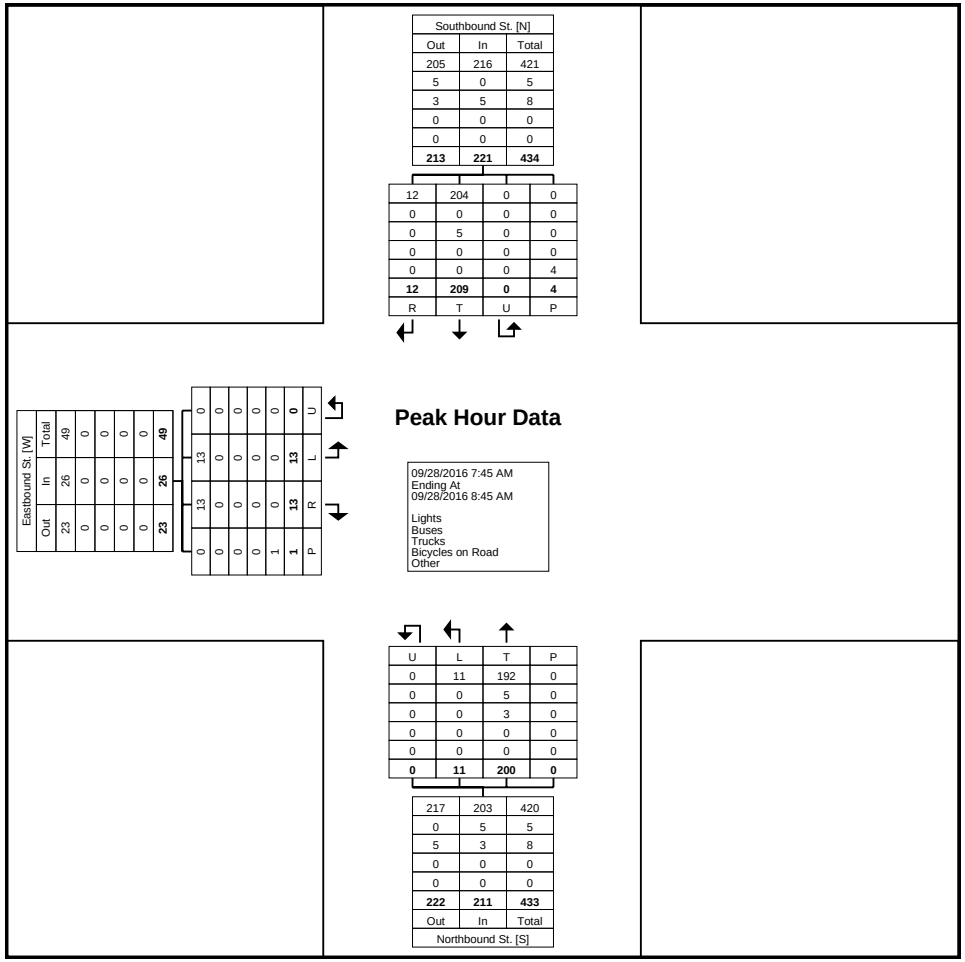
Start Date: 09/28/2016



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Count Name: TMC - Main St @ Loomis St
Site Code: 100
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound					Northbound St. Northbound					Eastbound St. Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
2:00 PM	1	49	0	0	50	43	1	0	0	44	2	1	0	0	3	97
2:15 PM	5	36	0	0	41	56	3	1	1	60	1	6	0	3	7	108
2:30 PM	5	74	0	1	79	52	0	0	0	52	5	4	0	3	9	140
2:45 PM	0	55	0	0	55	65	5	0	0	70	3	2	0	4	5	130
Total	11	214	0	1	225	216	9	1	1	226	11	13	0	10	24	475
Approach %	4.9	95.1	0.0	-	-	95.6	4.0	0.4	-	-	45.8	54.2	0.0	-	-	-
Total %	2.3	45.1	0.0	-	47.4	45.5	1.9	0.2	-	47.6	2.3	2.7	0.0	-	5.1	-
PHF	0.550	0.723	0.000	-	0.712	0.831	0.450	0.250	-	0.807	0.550	0.542	0.000	-	0.667	0.848
Lights	11	207	0	-	218	207	9	1	-	217	9	13	0	-	22	457
% Lights	100.0	96.7	-	-	96.9	95.8	100.0	100.0	-	96.0	81.8	100.0	-	-	91.7	96.2
Buses	0	2	0	-	2	5	0	0	-	5	1	0	0	-	1	8
% Buses	0.0	0.9	-	-	0.9	2.3	0.0	0.0	-	2.2	9.1	0.0	-	-	4.2	1.7
Trucks	0	5	0	-	5	4	0	0	-	4	1	0	0	-	1	10
% Trucks	0.0	2.3	-	-	2.2	1.9	0.0	0.0	-	1.8	9.1	0.0	-	-	4.2	2.1
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	1	-	-	-	-	1	-	-	-	-	10	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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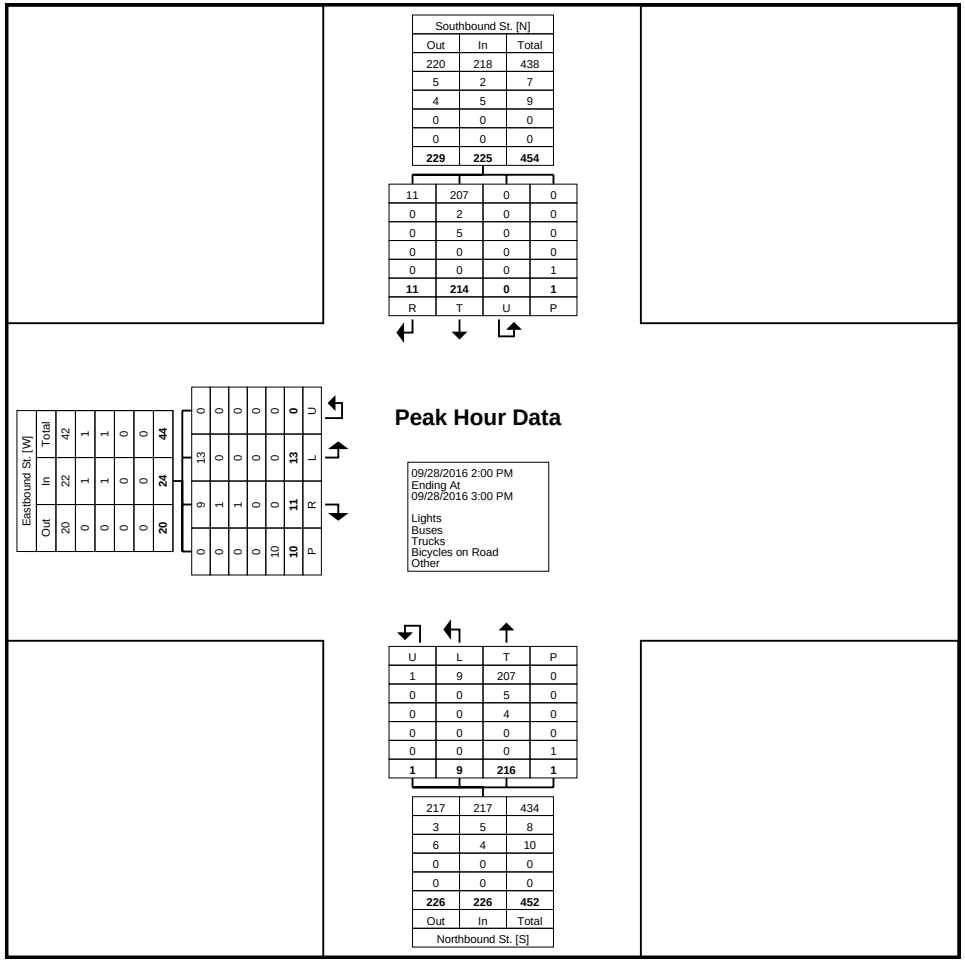
Site Code: 100
Start Date: 09/28/2016



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Count Name: TMC - Main St @ Loomis St
Site Code: 100
Start Date: 09/28/2016

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Southbound St. Southbound					Northbound St. Northbound					Eastbound St. Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
4:15 PM	3	59	0	0	62	72	2	0	0	74	2	4	0	1	6	142
4:30 PM	4	39	0	0	43	80	2	0	0	82	1	4	0	1	5	130
4:45 PM	2	59	0	0	61	65	3	0	0	68	3	3	0	1	6	135
5:00 PM	9	53	0	1	62	96	1	0	0	97	5	2	0	2	7	166
Total	18	210	0	1	228	313	8	0	0	321	11	13	0	5	24	573
Approach %	7.9	92.1	0.0	-	-	97.5	2.5	0.0	-	-	45.8	54.2	0.0	-	-	-
Total %	3.1	36.6	0.0	-	39.8	54.6	1.4	0.0	-	56.0	1.9	2.3	0.0	-	4.2	-
PHF	0.500	0.890	0.000	-	0.919	0.815	0.667	0.000	-	0.827	0.550	0.813	0.000	-	0.857	0.863
Lights	18	207	0	-	225	311	8	0	-	319	11	13	0	-	24	568
% Lights	100.0	98.6	-	-	98.7	99.4	100.0	-	-	99.4	100.0	100.0	-	-	100.0	99.1
Buses	0	1	0	-	1	1	0	0	-	1	0	0	0	-	0	2
% Buses	0.0	0.5	-	-	0.4	0.3	0.0	-	-	0.3	0.0	0.0	-	-	0.0	0.3
Trucks	0	2	0	-	2	1	0	0	-	1	0	0	0	-	0	3
% Trucks	0.0	1.0	-	-	0.9	0.3	0.0	-	-	0.3	0.0	0.0	-	-	0.0	0.5
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	5	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	100.0	-	-

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Count Name: TMC - Main St @ Loomis St
Site Code: 100
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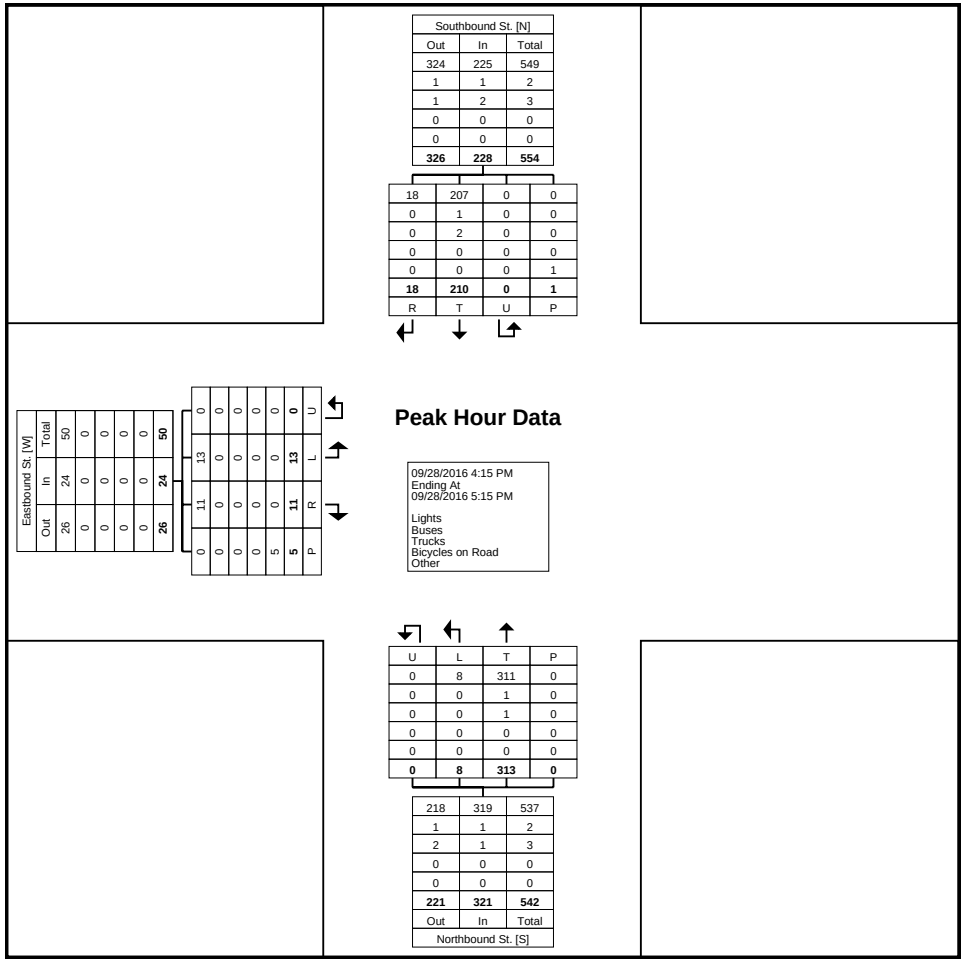

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Count Name: Main St @ MB 8
Site Code: 105
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound			Northbound St. Northbound				Eastbound St. Eastbound		
	Thru	U-Turn	App. Total	Thru	U-Turn	Peds	App. Total	Peds	App. Total	Int. Total
7:00 AM	30	0	30	31	0	0	31	0	0	61
7:15 AM	44	0	44	20	0	0	20	1	0	64
7:30 AM	53	0	53	45	0	0	45	1	0	98
7:45 AM	67	0	67	60	0	0	60	2	0	127
Hourly Total	194	0	194	156	0	0	156	4	0	350
8:00 AM	47	0	47	46	0	0	46	2	0	93
8:15 AM	54	0	54	56	0	0	56	1	0	110
8:30 AM	56	0	56	48	0	0	48	2	0	104
8:45 AM	50	0	50	42	0	0	42	9	0	92
Hourly Total	207	0	207	192	0	0	192	14	0	399
9:00 AM	0	0	0	1	0	0	1	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	1	0	0	1	0	0	1
1:00 PM	52	0	52	52	0	0	52	2	0	104
1:15 PM	42	0	42	52	0	0	52	7	0	94
1:30 PM	37	0	37	56	0	0	56	4	0	93
1:45 PM	38	0	38	53	0	0	53	3	0	91
Hourly Total	169	0	169	213	0	0	213	16	0	382
2:00 PM	52	0	52	48	0	0	48	1	0	100
2:15 PM	45	0	45	57	0	0	57	4	0	102
2:30 PM	79	0	79	58	0	0	58	6	0	137
2:45 PM	54	0	54	68	0	0	68	3	0	122
Hourly Total	230	0	230	231	0	0	231	14	0	461
3:00 PM	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-
3:30 PM	56	0	56	70	0	0	70	2	0	126
3:45 PM	71	0	71	60	0	0	60	4	0	131
Hourly Total	127	0	127	130	0	0	130	6	0	257
4:00 PM	70	0	70	75	0	0	75	2	0	145
4:15 PM	65	0	65	78	0	0	78	2	0	143
4:30 PM	34	0	34	89	0	1	89	1	0	123
4:45 PM	62	0	62	67	0	0	67	2	0	129
Hourly Total	231	0	231	309	0	1	309	7	0	540
5:00 PM	64	0	64	94	0	0	94	6	0	158
5:15 PM	47	0	47	71	0	0	71	3	0	118
5:30 PM	1	0	1	0	0	0	0	0	0	1
Grand Total	1270	0	1270	1397	0	1	1397	70	0	2667

Approach %	100.0	0.0	-	100.0	0.0	-	-	-	-	-
Total %	47.6	0.0	47.6	52.4	0.0	-	52.4	-	0.0	-
Lights	1234	0	1234	1357	0	-	1357	-	0	2591
% Lights	97.2	-	97.2	97.1	-	-	97.1	-	-	97.2
Buses	8	0	8	20	0	-	20	-	0	28
% Buses	0.6	-	0.6	1.4	-	-	1.4	-	-	1.0
Trucks	24	0	24	20	0	-	20	-	0	44
% Trucks	1.9	-	1.9	1.4	-	-	1.4	-	-	1.6
Bicycles on Road	4	0	4	0	0	-	0	-	0	4
% Bicycles on Road	0.3	-	0.3	0.0	-	-	0.0	-	-	0.1
Bicycles on Crosswalk	-	-	-	-	-	0	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	0.0	-	-
Pedestrians	-	-	-	-	-	1	-	70	-	-
% Pedestrians	-	-	-	-	-	100.0	-	100.0	-	-

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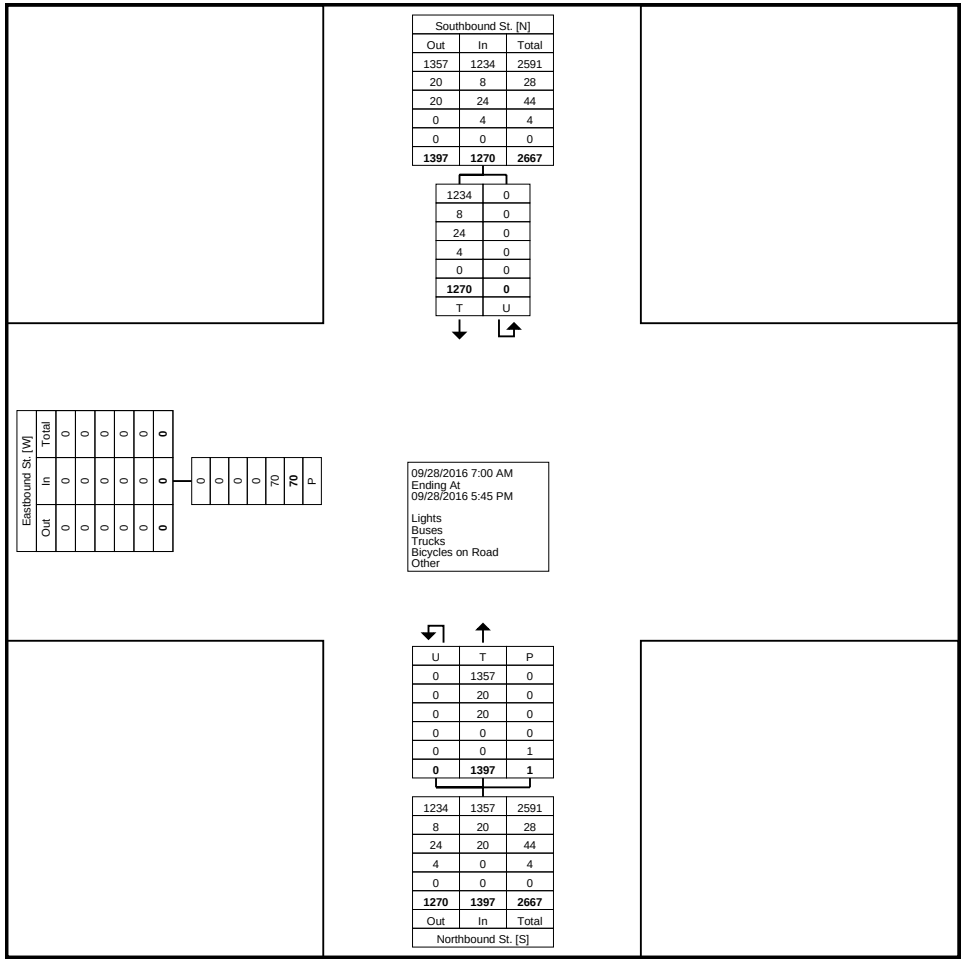
Count Name: Main St @ MB 8
Site Code: 105
Start Date: 09/28/2016



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Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound			Northbound St. Northbound				Eastbound St. Eastbound		
	Thru	U-Turn	App. Total	Thru	U-Turn	Peds	App. Total	Peds	App. Total	Int. Total
7:45 AM	67	0	67	60	0	0	60	2	0	127
8:00 AM	47	0	47	46	0	0	46	2	0	93
8:15 AM	54	0	54	56	0	0	56	1	0	110
8:30 AM	56	0	56	48	0	0	48	2	0	104
Total	224	0	224	210	0	0	210	7	0	434
Approach %	100.0	0.0	-	100.0	0.0	-	-	-	-	-
Total %	51.6	0.0	51.6	48.4	0.0	-	48.4	-	0.0	-
PHF	0.836	0.000	0.836	0.875	0.000	-	0.875	-	0.000	0.854
Lights	218	0	218	202	0	-	202	-	0	420
% Lights	97.3	-	97.3	96.2	-	-	96.2	-	-	96.8
Buses	1	0	1	5	0	-	5	-	0	6
% Buses	0.4	-	0.4	2.4	-	-	2.4	-	-	1.4
Trucks	5	0	5	3	0	-	3	-	0	8
% Trucks	2.2	-	2.2	1.4	-	-	1.4	-	-	1.8
Bicycles on Road	0	0	0	0	0	-	0	-	0	0
% Bicycles on Road	0.0	-	0.0	0.0	-	-	0.0	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	-	0	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	0	-	7	-	-
% Pedestrians	-	-	-	-	-	-	-	100.0	-	-

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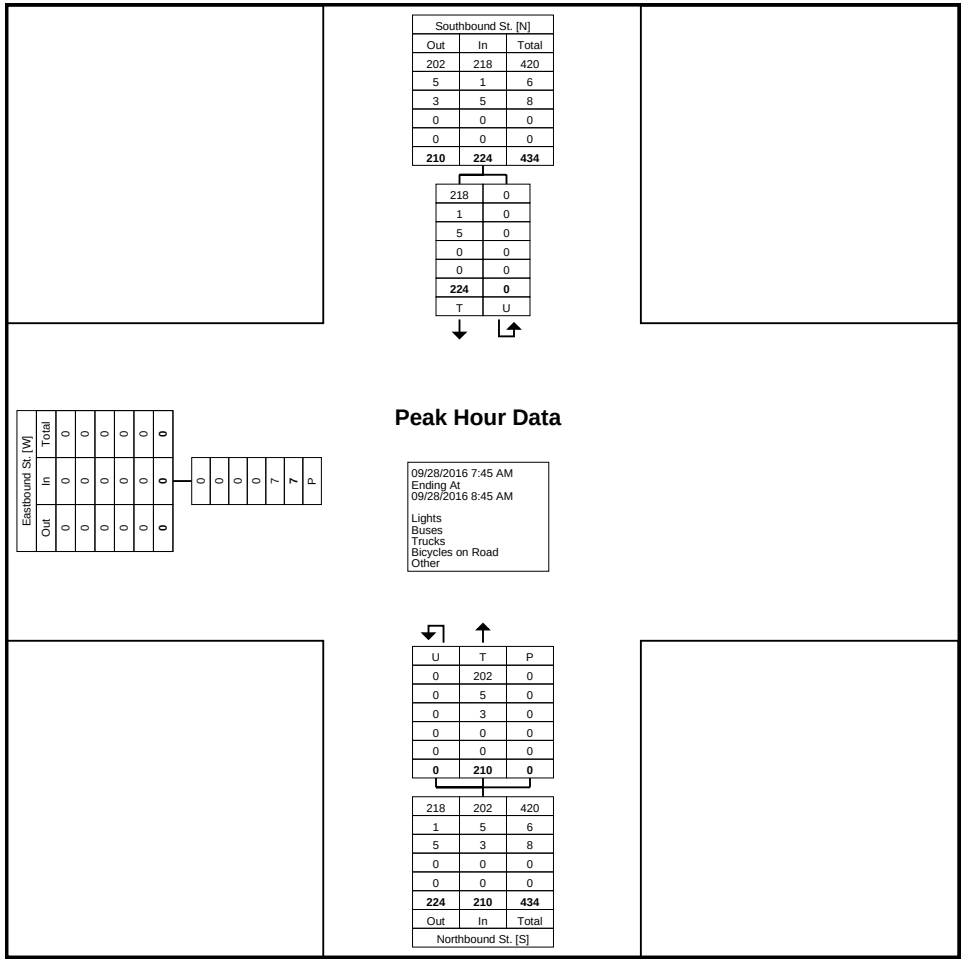

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Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound			Northbound St. Northbound				Eastbound St. Eastbound		
	Thru	U-Turn	App. Total	Thru	U-Turn	Peds	App. Total	Peds	App. Total	Int. Total
2:00 PM	52	0	52	48	0	0	48	1	0	100
2:15 PM	45	0	45	57	0	0	57	4	0	102
2:30 PM	79	0	79	58	0	0	58	6	0	137
2:45 PM	54	0	54	68	0	0	68	3	0	122
Total	230	0	230	231	0	0	231	14	0	461
Approach %	100.0	0.0	-	100.0	0.0	-	-	-	-	-
Total %	49.9	0.0	49.9	50.1	0.0	-	50.1	-	0.0	-
PHF	0.728	0.000	0.728	0.849	0.000	-	0.849	-	0.000	0.841
Lights	223	0	223	220	0	-	220	-	0	443
% Lights	97.0	-	97.0	95.2	-	-	95.2	-	-	96.1
Buses	2	0	2	5	0	-	5	-	0	7
% Buses	0.9	-	0.9	2.2	-	-	2.2	-	-	1.5
Trucks	5	0	5	6	0	-	6	-	0	11
% Trucks	2.2	-	2.2	2.6	-	-	2.6	-	-	2.4
Bicycles on Road	0	0	0	0	0	-	0	-	0	0
% Bicycles on Road	0.0	-	0.0	0.0	-	-	0.0	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	-	0	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	-	0	-	14	-	-
% Pedestrians	-	-	-	-	-	-	-	100.0	-	-

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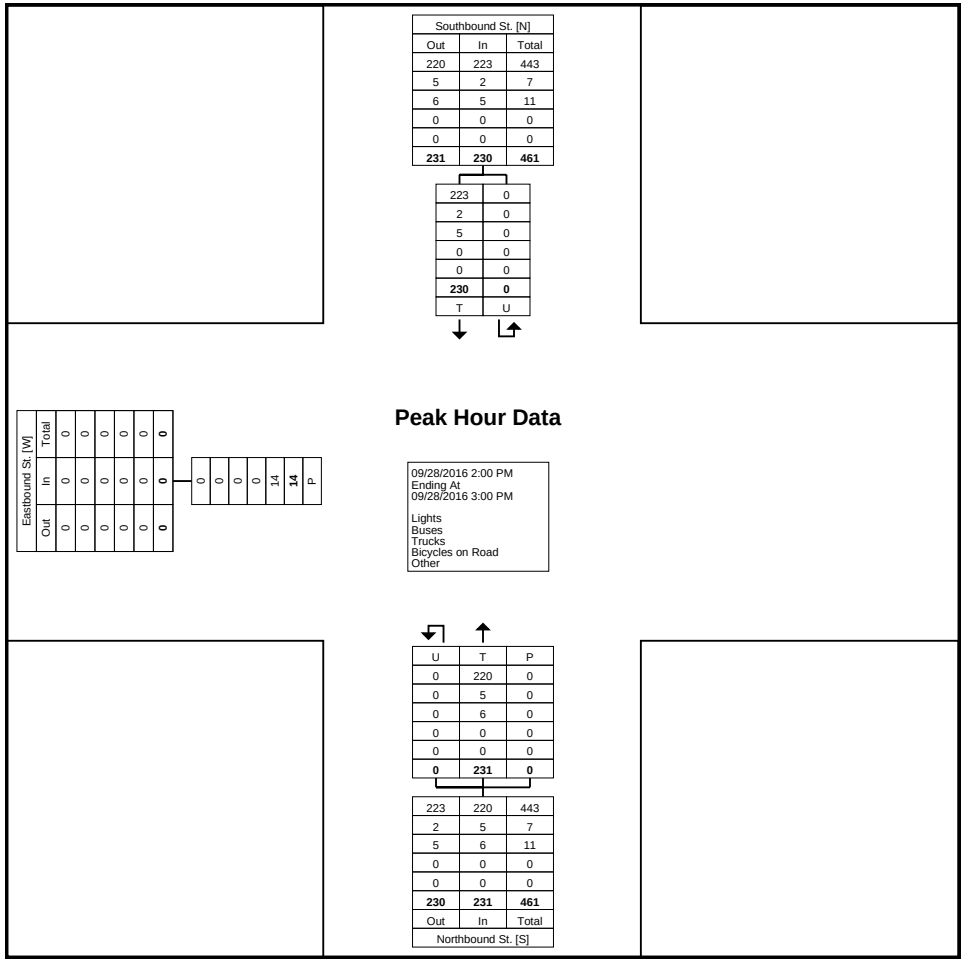

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Start Date: 09/28/2016

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Southbound St. Southbound			Northbound St. Northbound				Eastbound St. Eastbound		
	Thru	U-Turn	App. Total	Thru	U-Turn	Peds	App. Total	Peds	App. Total	Int. Total
4:15 PM	65	0	65	78	0	0	78	2	0	143
4:30 PM	34	0	34	89	0	1	89	1	0	123
4:45 PM	62	0	62	67	0	0	67	2	0	129
5:00 PM	64	0	64	94	0	0	94	6	0	158
Total	225	0	225	328	0	1	328	11	0	553
Approach %	100.0	0.0	-	100.0	0.0	-	-	-	-	-
Total %	40.7	0.0	40.7	59.3	0.0	-	59.3	-	0.0	-
PHF	0.865	0.000	0.865	0.872	0.000	-	0.872	-	0.000	0.875
Lights	221	0	221	326	0	-	326	-	0	547
% Lights	98.2	-	98.2	99.4	-	-	99.4	-	-	98.9
Buses	1	0	1	1	0	-	1	-	0	2
% Buses	0.4	-	0.4	0.3	-	-	0.3	-	-	0.4
Trucks	2	0	2	1	0	-	1	-	0	3
% Trucks	0.9	-	0.9	0.3	-	-	0.3	-	-	0.5
Bicycles on Road	1	0	1	0	0	-	0	-	0	1
% Bicycles on Road	0.4	-	0.4	0.0	-	-	0.0	-	-	0.2
Bicycles on Crosswalk	-	-	-	-	-	0	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	0.0	-	-
Pedestrians	-	-	-	-	-	1	-	11	-	-
% Pedestrians	-	-	-	-	-	100.0	-	100.0	-	-

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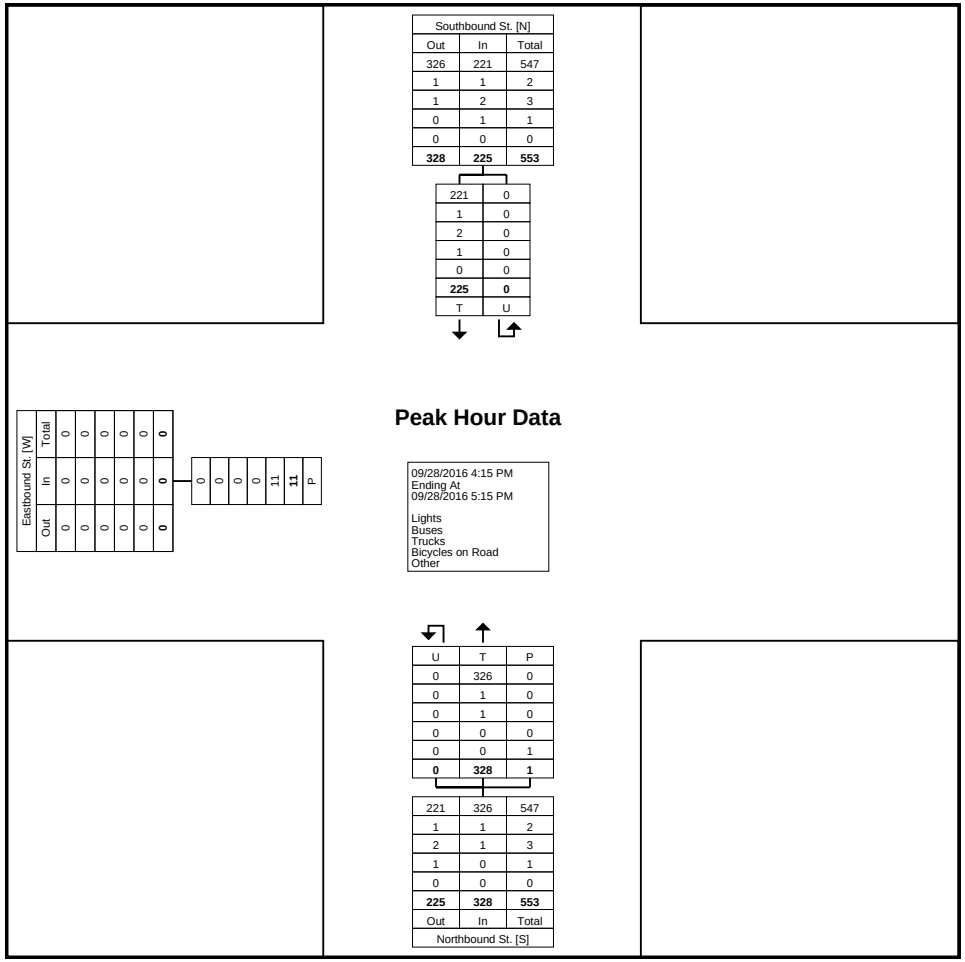
Count Name: Main St @ MB 8
Site Code: 105
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (4:15 PM)

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Count Name: TMC - Main St @ Sherman St
Site Code: 110
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound					Westbound St. Westbound					Northbound St. Northbound					
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	Int. Total
7:00 AM	31	1	0	5	32	0	1	0	0	1	0	32	0	1	32	65
7:15 AM	46	0	0	0	46	0	0	0	3	0	0	22	0	0	22	68
7:30 AM	58	1	0	2	59	0	1	0	7	1	1	45	0	2	46	106
7:45 AM	60	1	0	1	61	1	0	0	4	1	5	59	0	4	64	126
Hourly Total	195	3	0	8	198	1	2	0	14	3	6	158	0	7	164	365
8:00 AM	51	1	0	1	52	1	1	0	1	2	5	44	0	2	49	103
8:15 AM	56	0	0	3	56	1	0	0	4	1	6	51	0	3	57	114
8:30 AM	60	0	0	1	60	0	2	0	2	2	3	41	0	0	44	106
8:45 AM	47	0	0	9	47	0	1	0	17	1	6	43	0	2	49	97
Hourly Total	214	1	0	14	215	2	4	0	24	6	20	179	0	7	199	420
9:00 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
1:00 PM	47	1	0	5	48	0	6	0	6	6	4	51	0	5	55	109
1:15 PM	45	0	0	9	45	2	4	0	10	6	1	49	0	0	50	101
1:30 PM	30	1	0	1	31	1	2	0	1	3	3	60	0	1	63	97
1:45 PM	34	1	0	2	35	0	4	0	4	4	1	53	0	0	54	93
Hourly Total	156	3	0	17	159	3	16	0	21	19	9	213	0	6	222	400
2:00 PM	53	1	0	3	54	0	2	0	2	2	2	46	0	1	48	104
2:15 PM	44	3	0	16	47	0	4	0	10	4	3	58	0	6	61	112
2:30 PM	72	2	0	4	74	1	1	0	1	2	1	55	0	0	56	132
2:45 PM	58	1	0	3	59	3	2	0	7	5	4	61	0	0	65	129
Hourly Total	227	7	0	26	234	4	9	0	20	13	10	220	0	7	230	477
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	48	1	0	1	49	1	6	0	2	7	3	70	0	0	73	129
3:45 PM	64	1	0	1	65	2	3	0	2	5	1	62	0	1	63	133
Hourly Total	112	2	0	2	114	3	9	0	4	12	4	133	0	1	137	263
4:00 PM	69	1	0	1	70	1	2	0	1	3	3	74	0	5	77	150
4:15 PM	62	0	0	2	62	1	2	0	2	3	0	73	0	3	73	138
4:30 PM	37	0	0	3	37	1	0	0	6	1	2	92	0	0	94	132
4:45 PM	55	1	0	4	56	2	3	0	3	5	0	65	0	0	65	126
Hourly Total	223	2	0	10	225	5	7	0	12	12	5	304	0	8	309	546
5:00 PM	55	0	0	1	55	3	13	0	0	16	1	96	0	0	97	168
5:15 PM	47	0	0	6	47	1	3	0	6	4	0	71	0	0	71	122
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	1230	18	0	84	1248	22	63	0	101	85	55	1374	0	36	1429	2762

Approach %	98.6	1.4	0.0	-	-	25.9	74.1	0.0	-	-	3.8	96.2	0.0	-	-	-
Total %	44.5	0.7	0.0	-	45.2	0.8	2.3	0.0	-	3.1	2.0	49.7	0.0	-	51.7	-
Lights	1198	17	0	-	1215	21	60	0	-	81	54	1330	0	-	1384	2680
% Lights	97.4	94.4	-	-	97.4	95.5	95.2	-	-	95.3	98.2	96.8	-	-	96.9	97.0
Buses	4	0	0	-	4	0	1	0	-	1	0	20	0	-	20	25
% Buses	0.3	0.0	-	-	0.3	0.0	1.6	-	-	1.2	0.0	1.5	-	-	1.4	0.9
Trucks	25	1	0	-	26	1	2	0	-	3	1	24	0	-	25	54
% Trucks	2.0	5.6	-	-	2.1	4.5	3.2	-	-	3.5	1.8	1.7	-	-	1.7	2.0
Bicycles on Road	3	0	0	-	3	0	0	0	-	0	0	0	0	-	0	3
% Bicycles on Road	0.2	0.0	-	-	0.2	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	1	-	-	-	-	1	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	1.2	-	-	-	-	1.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	83	-	-	-	-	100	-	-	-	-	36	-	-
% Pedestrians	-	-	-	98.8	-	-	-	-	99.0	-	-	-	-	100.0	-	-

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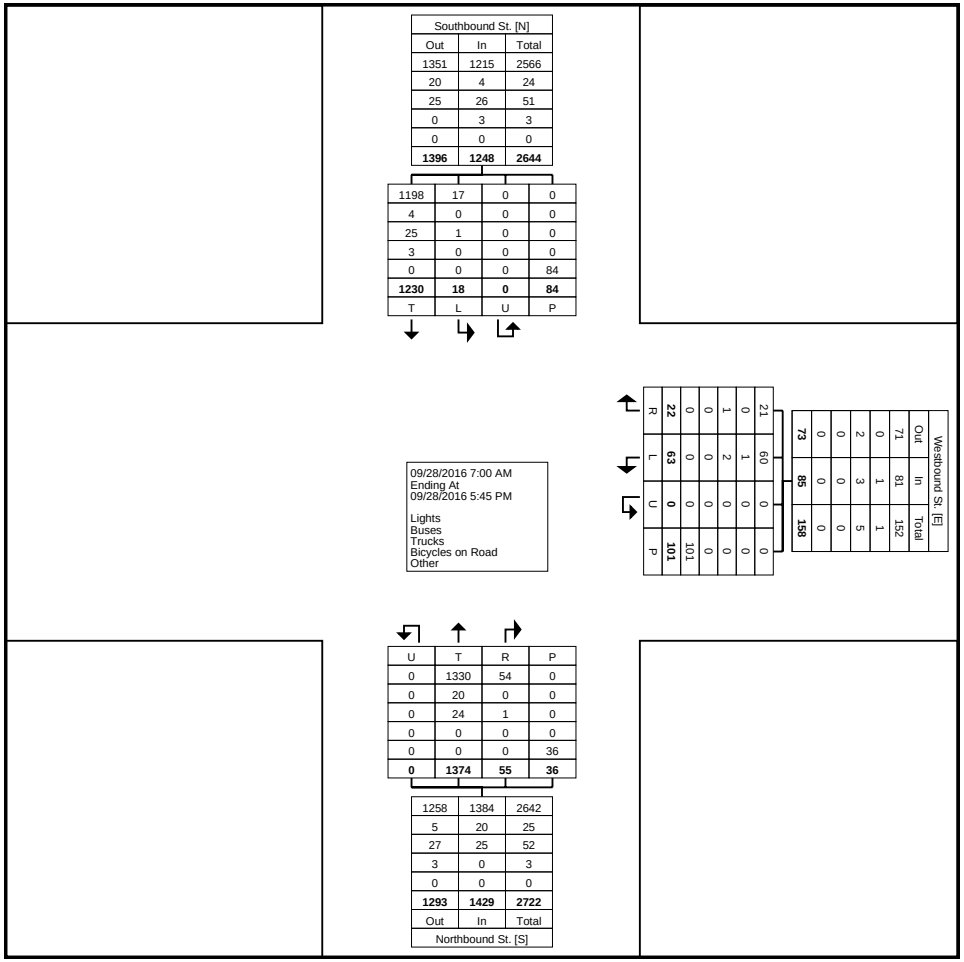
Count Name: TMC - Main St @ Sherman St
Site Code: 110
Start Date: 09/28/2016



Turning Movement Data Plot

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Count Name: TMC - Main St @ Sherman St
Site Code: 110
Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Southbound St. Southbound					Westbound St. Westbound					Northbound St. Northbound					
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	Int. Total
7:30 AM	58	1	0	2	59	0	1	0	7	1	1	45	0	2	46	106
7:45 AM	60	1	0	1	61	1	0	0	4	1	5	59	0	4	64	126
8:00 AM	51	1	0	1	52	1	1	0	1	2	5	44	0	2	49	103
8:15 AM	56	0	0	3	56	1	0	0	4	1	6	51	0	3	57	114
Total	225	3	0	7	228	3	2	0	16	5	17	199	0	11	216	449
Approach %	98.7	1.3	0.0	-	-	60.0	40.0	0.0	-	-	7.9	92.1	0.0	-	-	-
Total %	50.1	0.7	0.0	-	50.8	0.7	0.4	0.0	-	1.1	3.8	44.3	0.0	-	48.1	-
PHF	0.938	0.750	0.000	-	0.934	0.750	0.500	0.000	-	0.625	0.708	0.843	0.000	-	0.844	0.891
Lights	218	3	0	-	221	3	2	0	-	5	16	192	0	-	208	434
% Lights	96.9	100.0	-	-	96.9	100.0	100.0	-	-	100.0	94.1	96.5	-	-	96.3	96.7
Buses	1	0	0	-	1	0	0	0	-	0	0	5	0	-	5	6
% Buses	0.4	0.0	-	-	0.4	0.0	0.0	-	-	0.0	0.0	2.5	-	-	2.3	1.3
Trucks	6	0	0	-	6	0	0	0	-	0	1	2	0	-	3	9
% Trucks	2.7	0.0	-	-	2.6	0.0	0.0	-	-	0.0	5.9	1.0	-	-	1.4	2.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	7	-	-	-	-	16	-	-	-	-	11	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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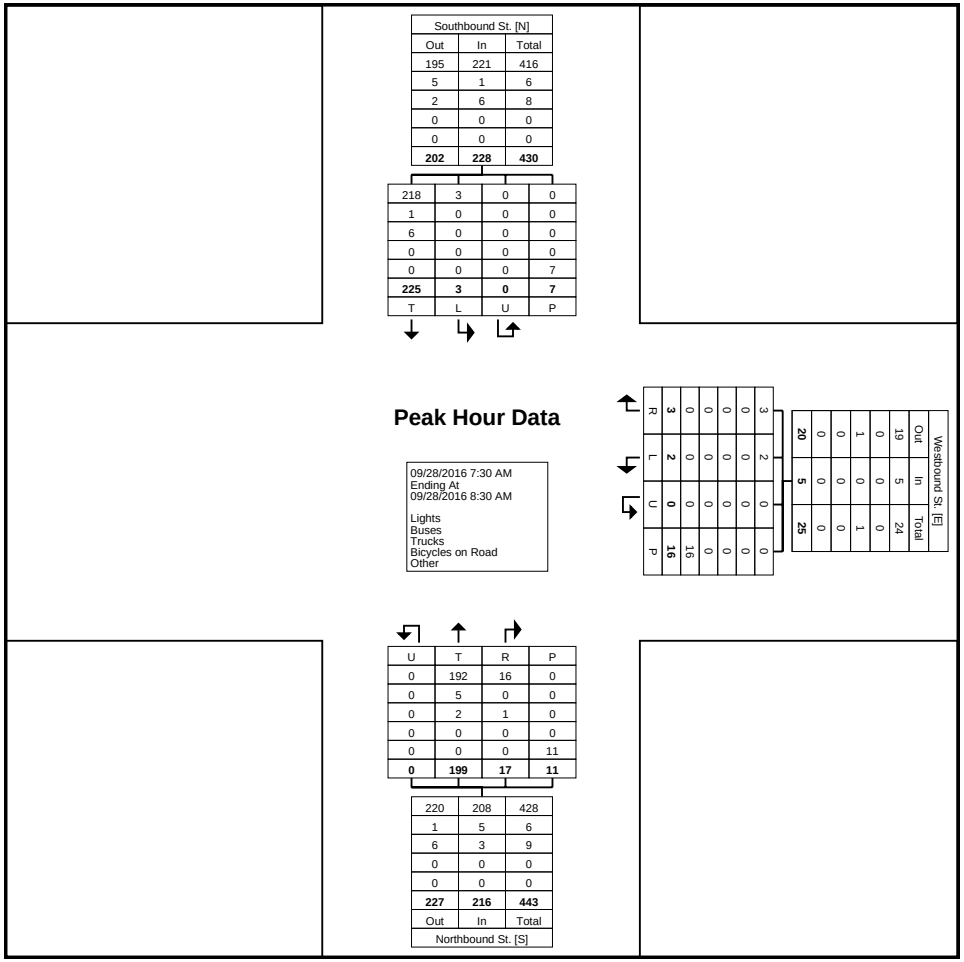
Count Name: TMC - Main St @ Sherman St
Site Code: 110
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (7:30 AM)

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Count Name: TMC - Main St @ Sherman St
Site Code: 110
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound					Westbound St. Westbound					Northbound St. Northbound					
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	Int. Total
2:00 PM	53	1	0	3	54	0	2	0	2	2	2	46	0	1	48	104
2:15 PM	44	3	0	16	47	0	4	0	10	4	3	58	0	6	61	112
2:30 PM	72	2	0	4	74	1	1	0	1	2	1	55	0	0	56	132
2:45 PM	58	1	0	3	59	3	2	0	7	5	4	61	0	0	65	129
Total	227	7	0	26	234	4	9	0	20	13	10	220	0	7	230	477
Approach %	97.0	3.0	0.0	-	-	30.8	69.2	0.0	-	-	4.3	95.7	0.0	-	-	-
Total %	47.6	1.5	0.0	-	49.1	0.8	1.9	0.0	-	2.7	2.1	46.1	0.0	-	48.2	-
PHF	0.788	0.583	0.000	-	0.791	0.333	0.563	0.000	-	0.650	0.625	0.902	0.000	-	0.885	0.903
Lights	220	6	0	-	226	3	8	0	-	11	10	208	0	-	218	455
% Lights	96.9	85.7	-	-	96.6	75.0	88.9	-	-	84.6	100.0	94.5	-	-	94.8	95.4
Buses	1	0	0	-	1	0	0	0	-	0	0	5	0	-	5	6
% Buses	0.4	0.0	-	-	0.4	0.0	0.0	-	-	0.0	0.0	2.3	-	-	2.2	1.3
Trucks	6	1	0	-	7	1	1	0	-	2	0	7	0	-	7	16
% Trucks	2.6	14.3	-	-	3.0	25.0	11.1	-	-	15.4	0.0	3.2	-	-	3.0	3.4
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	5.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	26	-	-	-	-	19	-	-	-	-	7	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	95.0	-	-	-	-	100.0	-	-

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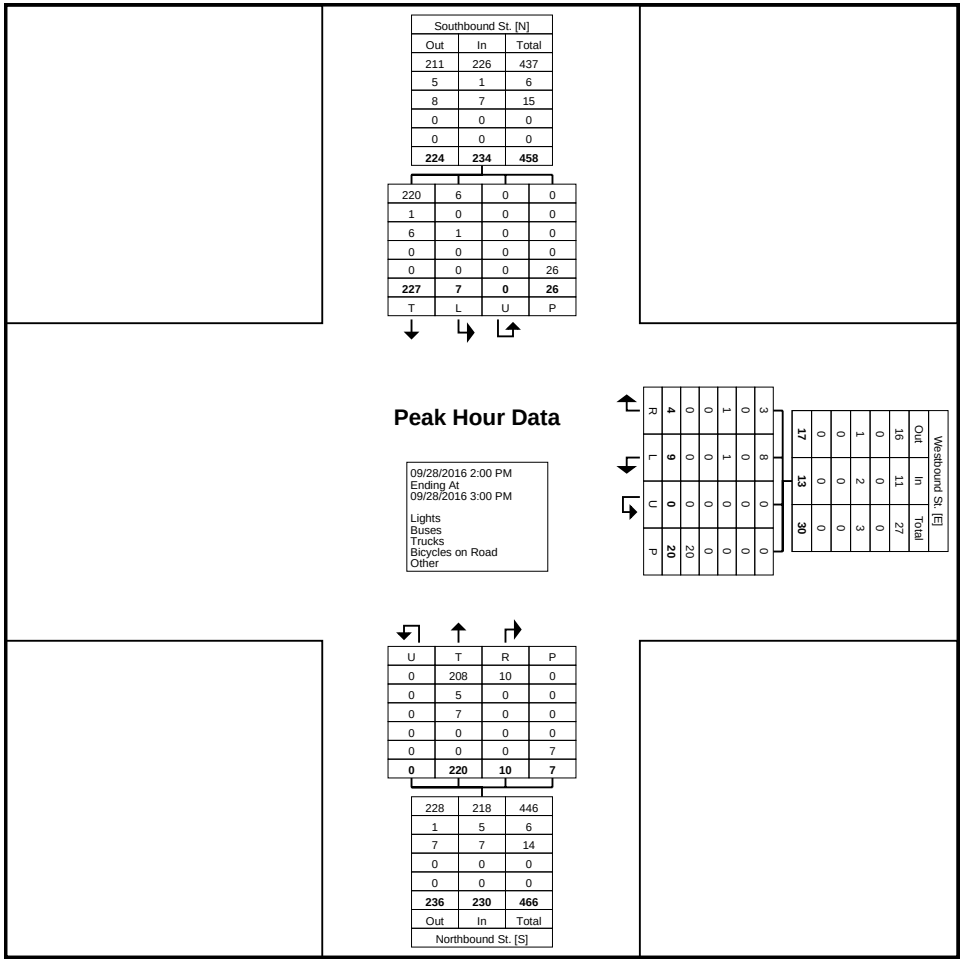
Count Name: TMC - Main St @ Sherman St
Site Code: 110
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (2:00 PM)

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Count Name: TMC - Main St @ Sherman St
Site Code: 110
Start Date: 09/28/2016

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Southbound St. Southbound					Westbound St. Westbound					Northbound St. Northbound					
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	Int. Total
4:15 PM	62	0	0	2	62	1	2	0	2	3	0	73	0	3	73	138
4:30 PM	37	0	0	3	37	1	0	0	6	1	2	92	0	0	94	132
4:45 PM	55	1	0	4	56	2	3	0	3	5	0	65	0	0	65	126
5:00 PM	55	0	0	1	55	3	13	0	0	16	1	96	0	0	97	168
Total	209	1	0	10	210	7	18	0	11	25	3	326	0	3	329	564
Approach %	99.5	0.5	0.0	-	-	28.0	72.0	0.0	-	-	0.9	99.1	0.0	-	-	-
Total %	37.1	0.2	0.0	-	37.2	1.2	3.2	0.0	-	4.4	0.5	57.8	0.0	-	58.3	-
PHF	0.843	0.250	0.000	-	0.847	0.583	0.346	0.000	-	0.391	0.375	0.849	0.000	-	0.848	0.839
Lights	206	1	0	-	207	7	17	0	-	24	3	324	0	-	327	558
% Lights	98.6	100.0	-	-	98.6	100.0	94.4	-	-	96.0	100.0	99.4	-	-	99.4	98.9
Buses	0	0	0	-	0	0	1	0	-	1	0	1	0	-	1	2
% Buses	0.0	0.0	-	-	0.0	0.0	5.6	-	-	4.0	0.0	0.3	-	-	0.3	0.4
Trucks	2	0	0	-	2	0	0	0	-	0	0	1	0	-	1	3
% Trucks	1.0	0.0	-	-	1.0	0.0	0.0	-	-	0.0	0.0	0.3	-	-	0.3	0.5
Bicycles on Road	1	0	0	-	1	0	0	0	-	0	0	0	0	-	0	1
% Bicycles on Road	0.5	0.0	-	-	0.5	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	10	-	-	-	-	11	-	-	-	-	3	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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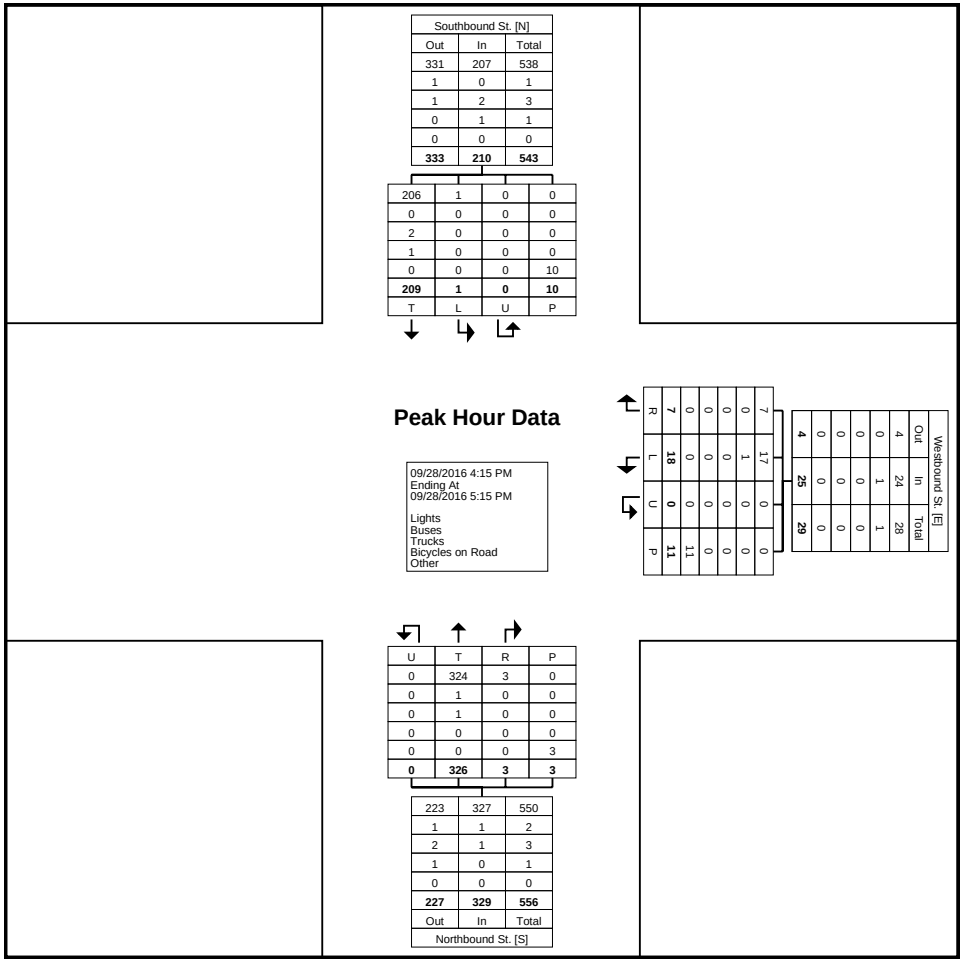
Count Name: TMC - Main St @ Sherman St
Site Code: 110
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (4:15 PM)

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Count Name: Main St @ MB 9
Site Code: 115
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:00 AM	0	31	0	0	0	31	0	0	0	0	0	0	0	33	0	0	0	33	0	0	0	0	1	0	64
7:15 AM	0	44	0	0	1	44	0	0	0	0	0	0	0	24	0	0	0	24	0	0	0	0	0	0	68
7:30 AM	0	57	0	0	0	57	0	0	0	0	0	0	0	42	0	0	0	42	0	0	0	0	3	0	99
7:45 AM	0	67	0	0	0	67	0	0	0	0	0	0	0	59	0	0	0	59	0	0	0	0	4	0	126
Hourly Total	0	199	0	0	1	199	0	0	0	0	0	0	0	158	0	0	0	158	0	0	0	0	8	0	357
8:00 AM	0	52	0	0	0	52	0	0	0	0	0	0	0	42	0	0	0	42	0	0	0	0	1	0	94
8:15 AM	0	56	0	0	0	56	0	0	0	0	0	0	0	53	0	0	0	53	0	0	0	0	1	0	109
8:30 AM	0	55	0	0	0	55	0	0	0	0	0	0	0	46	0	0	1	46	0	0	0	0	1	0	101
8:45 AM	0	48	0	0	0	48	0	0	0	0	0	0	0	39	0	0	0	39	0	0	0	0	8	0	87
Hourly Total	0	211	0	0	0	211	0	0	0	0	0	0	0	180	0	0	1	180	0	0	0	0	11	0	391
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	46	0	0	0	46	0	0	0	0	1	0	0	52	0	0	0	52	0	0	0	0	6	0	98
1:15 PM	0	38	0	0	0	38	0	0	0	0	0	0	0	55	0	0	0	55	0	0	0	0	7	0	93
1:30 PM	0	38	0	0	0	38	0	0	0	0	0	0	0	54	0	0	0	54	0	0	0	0	4	0	92
1:45 PM	0	37	0	0	0	37	0	0	0	0	1	0	0	51	0	0	0	51	0	0	0	0	4	0	88
Hourly Total	0	159	0	0	0	159	0	0	0	0	2	0	0	212	0	0	0	212	0	0	0	0	21	0	371
2:00 PM	0	53	0	0	0	53	0	0	0	0	0	0	0	46	0	0	0	46	0	0	0	0	2	0	99
2:15 PM	0	43	0	0	0	43	0	0	0	0	0	0	0	59	0	0	0	59	0	0	0	0	5	0	102
2:30 PM	0	79	0	0	0	79	0	0	0	0	0	0	0	56	0	0	0	56	0	0	0	0	3	0	135
2:45 PM	0	59	0	0	0	59	0	0	0	0	0	0	0	64	0	0	0	64	0	0	0	0	6	0	123
Hourly Total	0	234	0	0	0	234	0	0	0	0	0	0	0	225	0	0	0	225	0	0	0	0	16	0	459
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	0	46	0	0	0	46	0	0	0	0	0	0	0	69	0	0	0	69	0	0	0	0	6	0	115
3:45 PM	0	68	0	0	0	68	0	0	0	0	0	0	0	63	0	0	0	63	0	0	0	0	1	0	131
Hourly Total	0	114	0	0	0	114	0	0	0	0	0	0	0	132	0	0	0	132	0	0	0	0	7	0	246
4:00 PM	0	69	0	0	0	69	0	0	0	0	0	0	0	76	0	0	0	76	0	0	0	0	2	0	145
4:15 PM	0	59	0	0	0	59	0	0	0	0	0	0	0	78	0	0	0	78	0	0	0	0	7	0	137
4:30 PM	0	39	0	0	0	39	0	0	0	0	0	0	0	86	0	0	0	86	0	0	0	0	1	0	125
4:45 PM	0	62	0	0	0	62	0	0	0	0	0	0	0	70	0	0	0	70	0	0	0	0	1	0	132
Hourly Total	0	229	0	0	0	229	0	0	0	0	0	0	0	310	0	0	0	310	0	0	0	0	11	0	539
5:00 PM	0	51	0	0	0	51	0	0	0	0	0	0	0	97	0	0	0	97	0	0	0	0	5	0	148
5:15 PM	0	43	0	0	0	43	0	0	0	0	0	0	0	71	0	0	0	71	0	0	0	0	8	0	114
5:30 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	2

Grand Total	0	1241	0	0	1	1241	0	0	0	0	2	0	0	1386	0	0	1	1386	0	0	0	0	87	0	2627
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	47.2	0.0	0.0	-	47.2	0.0	0.0	0.0	0.0	-	0.0	0.0	52.8	0.0	0.0	-	52.8	0.0	0.0	0.0	0.0	-	0.0	-
Lights	0	1211	0	0	-	1211	0	0	0	0	-	0	0	1339	0	0	-	1339	0	0	0	0	-	0	2550
% Lights	-	97.6	-	-	-	97.6	-	-	-	-	-	-	-	96.6	-	-	-	96.6	-	-	-	-	-	-	97.1
Buses	0	4	0	0	-	4	0	0	0	0	-	0	0	20	0	0	-	20	0	0	0	0	-	0	24
% Buses	-	0.3	-	-	-	0.3	-	-	-	-	-	-	-	1.4	-	-	-	1.4	-	-	-	-	-	-	0.9
Trucks	0	22	0	0	-	22	0	0	0	0	-	0	0	27	0	0	-	27	0	0	0	0	-	0	49
% Trucks	-	1.8	-	-	-	1.8	-	-	-	-	-	-	-	1.9	-	-	-	1.9	-	-	-	-	-	-	1.9
Bicycles on Road	0	4	0	0	-	4	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	4
% Bicycles on Road	-	0.3	-	-	-	0.3	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.2
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	50.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	87	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	50.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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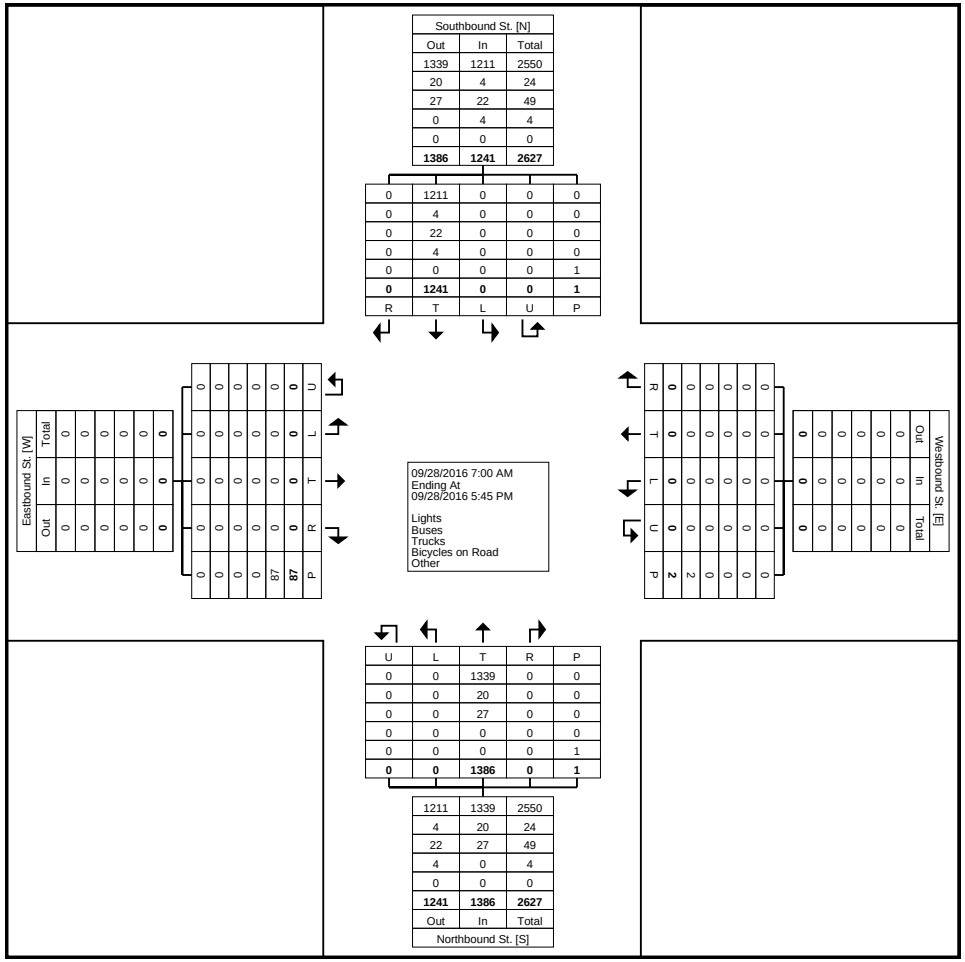
Count Name: Main St @ MB 9
Site Code: 115
Start Date: 09/28/2016



Turning Movement Data Plot

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Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
7:45 AM	0	67	0	0	0	67	0	0	0	0	0	0	0	59	0	0	0	59	0	0	0	0	4	0	126
8:00 AM	0	52	0	0	0	52	0	0	0	0	0	0	0	42	0	0	0	42	0	0	0	0	1	0	94
8:15 AM	0	56	0	0	0	56	0	0	0	0	0	0	0	53	0	0	0	53	0	0	0	0	1	0	109
8:30 AM	0	55	0	0	0	55	0	0	0	0	0	0	0	46	0	0	1	46	0	0	0	0	1	0	101
Total	0	230	0	0	0	230	0	0	0	0	0	0	0	200	0	0	1	200	0	0	0	0	7	0	430
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	53.5	0.0	0.0	-	53.5	0.0	0.0	0.0	0.0	-	0.0	0.0	46.5	0.0	0.0	-	46.5	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.858	0.000	0.000	-	0.858	0.000	0.000	0.000	0.000	-	0.000	0.000	0.847	0.000	0.000	-	0.847	0.000	0.000	0.000	0.000	-	0.000	0.853
Lights	0	224	0	0	-	224	0	0	0	0	-	0	0	189	0	0	-	189	0	0	0	0	-	0	413
% Lights	-	97.4	-	-	-	97.4	-	-	-	-	-	-	-	94.5	-	-	-	94.5	-	-	-	-	-	-	96.0
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	5
% Buses	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	2.5	-	-	-	2.5	-	-	-	-	-	-	1.2
Trucks	0	6	0	0	-	6	0	0	0	0	-	0	0	6	0	0	-	6	0	0	0	0	-	0	12
% Trucks	-	2.6	-	-	-	2.6	-	-	-	-	-	-	-	3.0	-	-	-	3.0	-	-	-	-	-	-	2.8
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	7	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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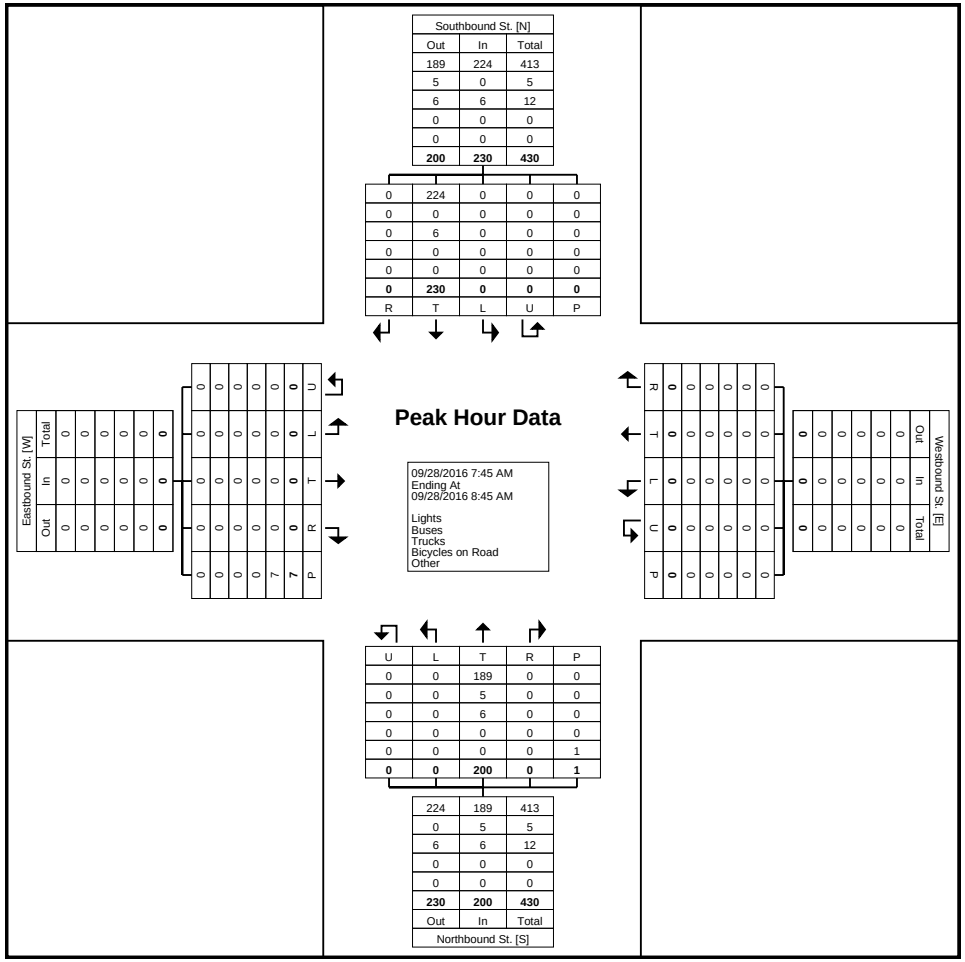

Turning Movement Peak Hour Data Plot (7:45 AM)

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Site Code: 115
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
2:00 PM	0	53	0	0	0	53	0	0	0	0	0	0	0	46	0	0	0	46	0	0	0	0	2	0	99
2:15 PM	0	43	0	0	0	43	0	0	0	0	0	0	0	59	0	0	0	59	0	0	0	0	5	0	102
2:30 PM	0	79	0	0	0	79	0	0	0	0	0	0	0	56	0	0	0	56	0	0	0	0	3	0	135
2:45 PM	0	59	0	0	0	59	0	0	0	0	0	0	0	64	0	0	0	64	0	0	0	0	6	0	123
Total	0	234	0	0	0	234	0	0	0	0	0	0	0	225	0	0	0	225	0	0	0	0	16	0	459
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	51.0	0.0	0.0	-	51.0	0.0	0.0	0.0	0.0	-	0.0	0.0	49.0	0.0	0.0	-	49.0	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.741	0.000	0.000	-	0.741	0.000	0.000	0.000	0.000	-	0.000	0.000	0.879	0.000	0.000	-	0.879	0.000	0.000	0.000	0.000	-	0.000	0.850
Lights	0	227	0	0	-	227	0	0	0	0	-	0	0	214	0	0	-	214	0	0	0	0	-	0	441
% Lights	-	97.0	-	-	-	97.0	-	-	-	-	-	-	-	95.1	-	-	-	95.1	-	-	-	-	-	-	96.1
Buses	0	1	0	0	-	1	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	6
% Buses	-	0.4	-	-	-	0.4	-	-	-	-	-	-	-	2.2	-	-	-	2.2	-	-	-	-	-	-	1.3
Trucks	0	5	0	0	-	5	0	0	0	0	-	0	0	6	0	0	-	6	0	0	0	0	-	0	11
% Trucks	-	2.1	-	-	-	2.1	-	-	-	-	-	-	-	2.7	-	-	-	2.7	-	-	-	-	-	-	2.4
Bicycles on Road	0	1	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1
% Bicycles on Road	-	0.4	-	-	-	0.4	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.2
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	16	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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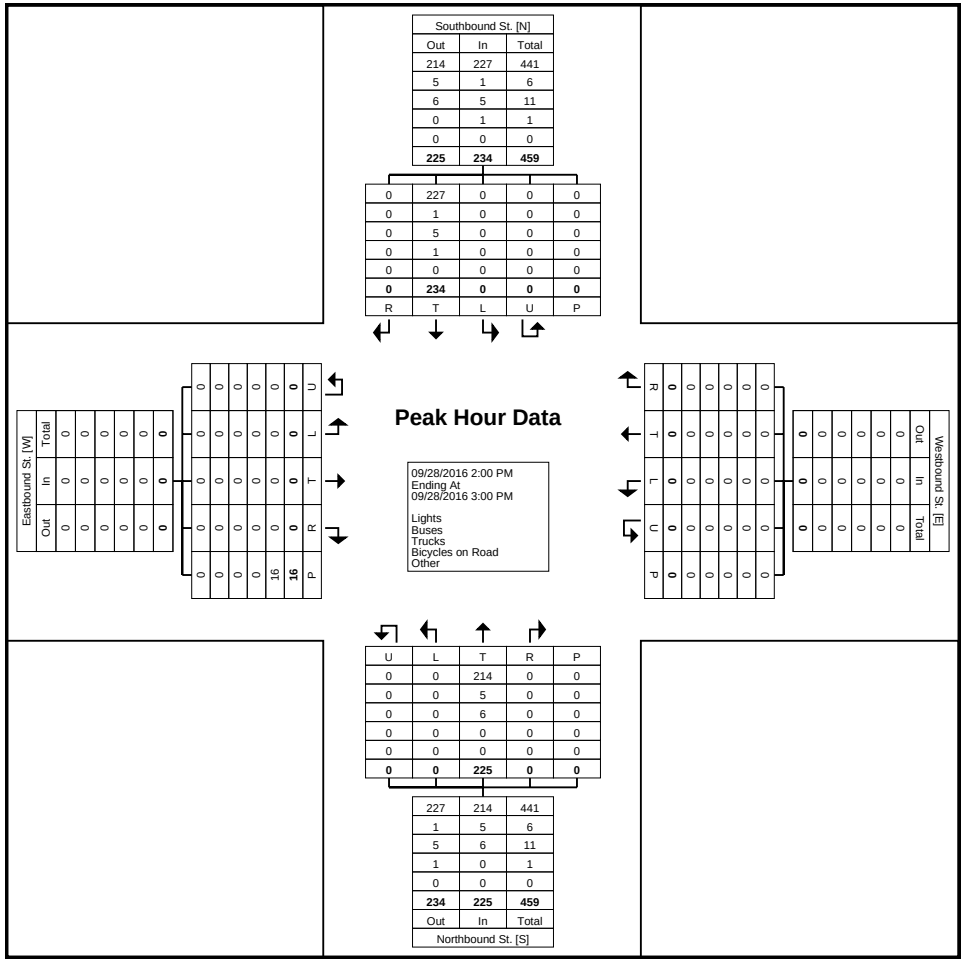

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Turning Movement Peak Hour Data (4:15 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
4:15 PM	0	59	0	0	0	59	0	0	0	0	0	0	0	78	0	0	0	78	0	0	0	0	7	0	137
4:30 PM	0	39	0	0	0	39	0	0	0	0	0	0	0	86	0	0	0	86	0	0	0	0	1	0	125
4:45 PM	0	62	0	0	0	62	0	0	0	0	0	0	0	70	0	0	0	70	0	0	0	0	1	0	132
5:00 PM	0	51	0	0	0	51	0	0	0	0	0	0	0	97	0	0	0	97	0	0	0	0	5	0	148
Total	0	211	0	0	0	211	0	0	0	0	0	0	0	331	0	0	0	331	0	0	0	0	14	0	542
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	38.9	0.0	0.0	-	38.9	0.0	0.0	0.0	0.0	-	0.0	0.0	61.1	0.0	0.0	-	61.1	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.851	0.000	0.000	-	0.851	0.000	0.000	0.000	0.000	-	0.000	0.000	0.853	0.000	0.000	-	0.853	0.000	0.000	0.000	0.000	-	0.000	0.916
Lights	0	207	0	0	-	207	0	0	0	0	-	0	0	329	0	0	-	329	0	0	0	0	-	0	536
% Lights	-	98.1	-	-	-	98.1	-	-	-	-	-	-	-	99.4	-	-	-	99.4	-	-	-	-	-	-	98.9
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	1
% Buses	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.3	-	-	-	0.3	-	-	-	-	-	-	0.2
Trucks	0	3	0	0	-	3	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	4
% Trucks	-	1.4	-	-	-	1.4	-	-	-	-	-	-	-	0.3	-	-	-	0.3	-	-	-	-	-	-	0.7
Bicycles on Road	0	1	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1
% Bicycles on Road	-	0.5	-	-	-	0.5	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.2
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	14	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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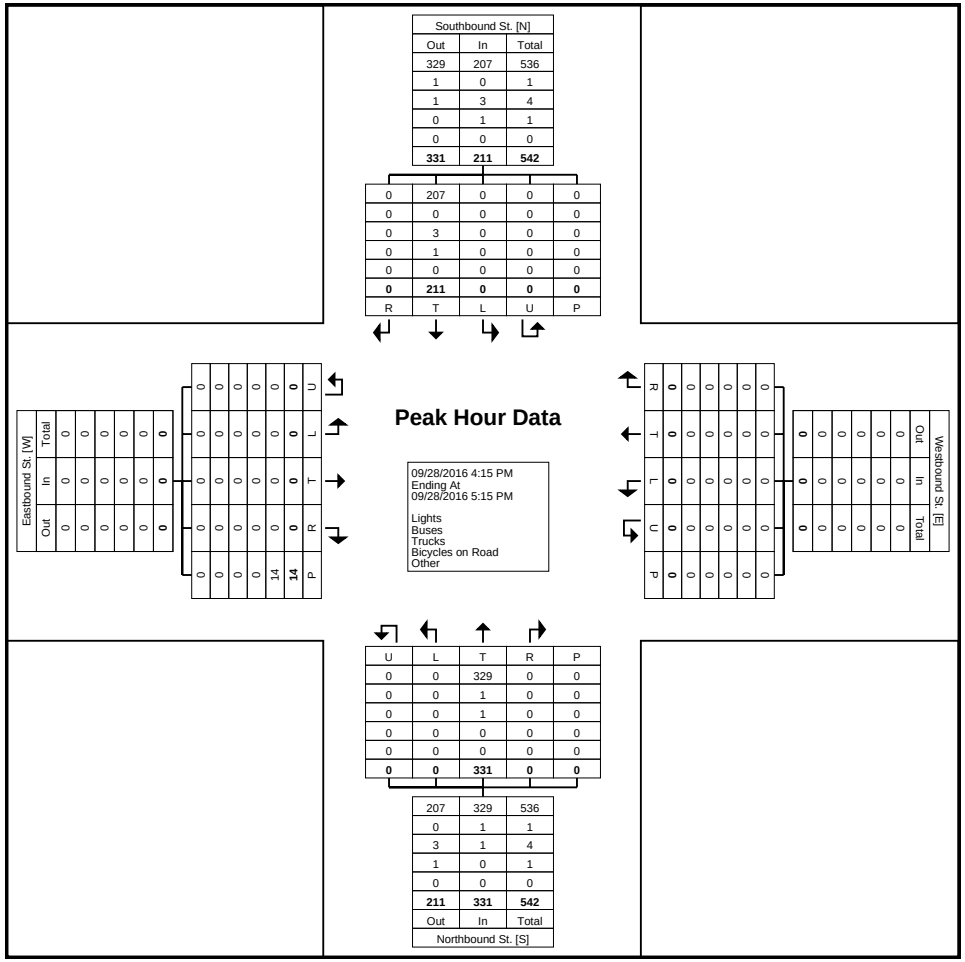
Southbound St. [N]
Out In Total
329 207 536
1 0 1
1 3 4
0 1 1
0 0 0
331 211 542
0 207 0 0 0
0 0 0 0 0
0 3 0 0 0
0 1 0 0 0
0 0 0 0 0
0 211 0 0 0
R T L U P
Peak Hour Data
09/28/2016 4:15 PM
Ending At
09/28/2016 5:15 PM
Lights
Buses
Trucks
Bicycles on Road
Other
Eastbound St. [W]
Total In Out
U L T R P
0 0 0 0

Whitman, Requardt, and Associates, LLP
2009 MacKenzie Way
Suite 240
Cranberry Twp, Pennsylvania, United States 16066
724-779-7940 lweimer@wrallp.com
People Focused - Project Driven

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Cranberry Twp, Pennsylvania, United States 16066
724-779-7940 lweimer@wrallp.com
People Focused - Project Driven

Count Name: TMC - Main St @ E College St
Site Code: 120
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound					Westbound St. Westbound					Northbound St. Northbound					
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	Int. Total
7:00 AM	30	1	0	0	31	2	0	0	2	2	2	31	0	0	33	66
7:15 AM	43	4	0	0	47	6	2	0	2	8	1	23	0	2	24	79
7:30 AM	54	4	0	2	58	2	2	0	3	4	6	36	0	3	42	104
7:45 AM	62	7	0	4	69	0	7	0	7	7	8	51	0	5	59	135
Hourly Total	189	16	0	6	205	10	11	0	14	21	17	141	0	10	158	384
8:00 AM	50	5	0	1	55	1	1	0	1	2	7	35	0	4	42	99
8:15 AM	55	4	0	0	59	8	0	0	0	8	3	50	0	9	53	120
8:30 AM	55	1	0	1	56	3	0	0	5	3	1	45	0	10	46	105
8:45 AM	47	4	0	7	51	2	1	0	26	3	4	35	0	33	39	93
Hourly Total	207	14	0	9	221	14	2	0	32	16	15	165	0	56	180	417
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
1:00 PM	42	1	0	8	43	2	4	0	8	6	4	48	0	21	52	101
1:15 PM	37	1	0	10	38	1	1	0	20	2	5	50	0	61	55	95
1:30 PM	36	1	0	3	37	3	2	0	7	5	2	52	0	13	54	96
1:45 PM	29	4	0	0	33	2	7	0	2	9	2	51	0	10	53	95
Hourly Total	144	7	0	21	151	8	14	0	37	22	13	201	0	105	214	387
2:00 PM	54	1	0	0	55	1	0	0	8	1	4	42	0	10	46	102
2:15 PM	40	0	0	6	40	4	3	0	27	7	0	58	0	48	58	105
2:30 PM	70	1	0	3	71	1	8	0	6	9	4	53	0	16	57	137
2:45 PM	58	3	0	1	61	4	3	0	12	7	0	64	0	17	64	132
Hourly Total	222	5	0	10	227	10	14	0	53	24	8	217	0	91	225	476
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	41	2	0	0	43	10	5	0	3	15	2	67	0	24	69	127
3:45 PM	65	3	0	2	68	6	4	0	3	10	1	62	0	10	63	141
Hourly Total	106	5	0	2	111	16	9	0	6	25	3	129	0	34	132	268
4:00 PM	66	6	0	0	72	4	3	0	5	7	3	73	0	8	76	155
4:15 PM	56	0	0	4	56	2	5	0	5	7	3	75	0	14	78	141
4:30 PM	35	10	0	2	45	4	2	0	4	6	4	84	0	17	88	139
4:45 PM	54	3	0	4	57	9	5	0	8	14	3	68	0	17	71	142
Hourly Total	211	19	0	10	230	19	15	0	22	34	13	300	0	56	313	577
5:00 PM	46	4	0	4	50	7	8	0	2	15	4	93	0	25	97	162
5:15 PM	38	2	0	0	40	3	4	0	3	7	4	70	0	8	74	121
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
Grand Total	1163	72	0	62	1235	87	77	0	169	164	77	1317	0	387	1394	2793

Approach %	94.2	5.8	0.0	-	-	53.0	47.0	0.0	-	-	5.5	94.5	0.0	-	-	-
Total %	41.6	2.6	0.0	-	44.2	3.1	2.8	0.0	-	5.9	2.8	47.2	0.0	-	49.9	-
Lights	1134	69	0	-	1203	87	76	0	-	163	72	1276	0	-	1348	2714
% Lights	97.5	95.8	-	-	97.4	100.0	98.7	-	-	99.4	93.5	96.9	-	-	96.7	97.2
Buses	3	2	0	-	5	0	0	0	-	0	0	18	0	-	18	23
% Buses	0.3	2.8	-	-	0.4	0.0	0.0	-	-	0.0	0.0	1.4	-	-	1.3	0.8
Trucks	25	0	0	-	25	0	1	0	-	1	5	22	0	-	27	53
% Trucks	2.1	0.0	-	-	2.0	0.0	1.3	-	-	0.6	6.5	1.7	-	-	1.9	1.9
Bicycles on Road	1	1	0	-	2	0	0	0	-	0	0	1	0	-	1	3
% Bicycles on Road	0.1	1.4	-	-	0.2	0.0	0.0	-	-	0.0	0.0	0.1	-	-	0.1	0.1
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	1	-	-	-	-	3	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.6	-	-	-	-	0.8	-	-
Pedestrians	-	-	-	62	-	-	-	-	168	-	-	-	-	384	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	99.4	-	-	-	-	99.2	-	-

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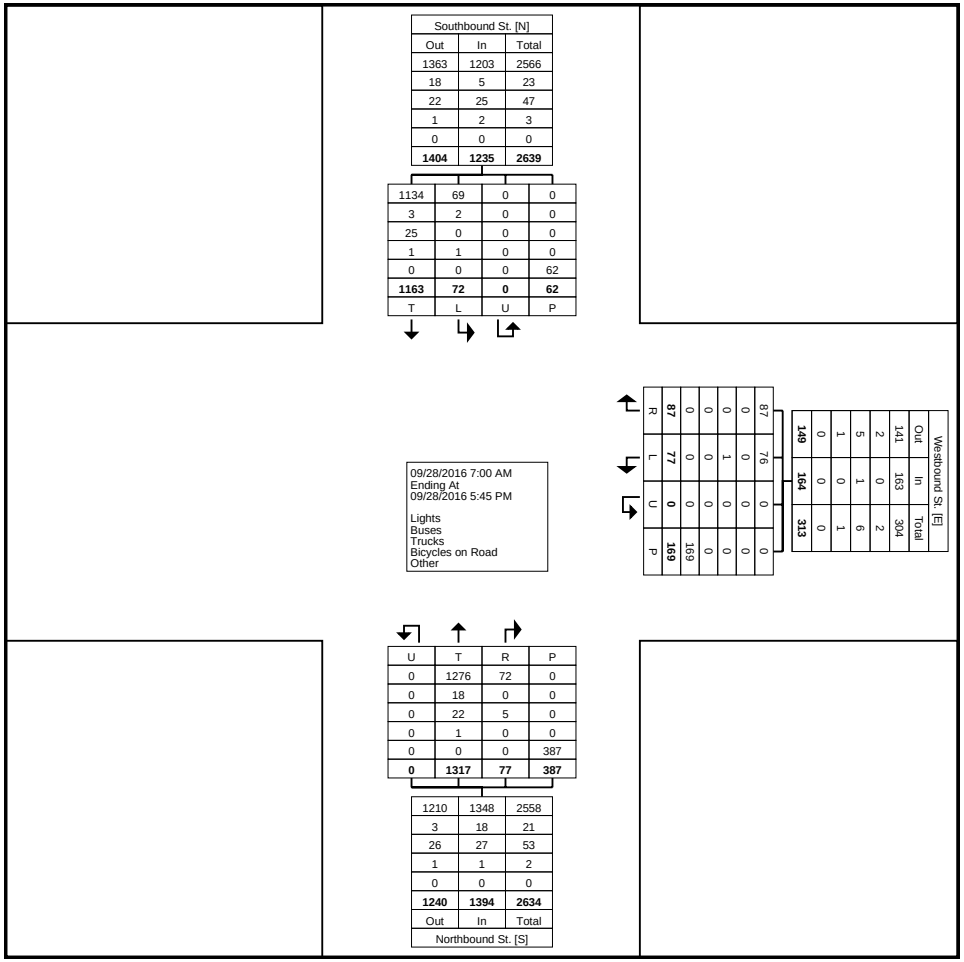
Count Name: TMC - Main St @ E College St
Site Code: 120
Start Date: 09/28/2016



Turning Movement Data Plot

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Count Name: TMC - Main St @ E College St
Site Code: 120
Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound					Westbound St. Westbound					Northbound St. Northbound					
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	Int. Total
7:45 AM	62	7	0	4	69	0	7	0	7	7	8	51	0	5	59	135
8:00 AM	50	5	0	1	55	1	1	0	1	2	7	35	0	4	42	99
8:15 AM	55	4	0	0	59	8	0	0	0	8	3	50	0	9	53	120
8:30 AM	55	1	0	1	56	3	0	0	5	3	1	45	0	10	46	105
Total	222	17	0	6	239	12	8	0	13	20	19	181	0	28	200	459
Approach %	92.9	7.1	0.0	-	-	60.0	40.0	0.0	-	-	9.5	90.5	0.0	-	-	-
Total %	48.4	3.7	0.0	-	52.1	2.6	1.7	0.0	-	4.4	4.1	39.4	0.0	-	43.6	-
PHF	0.895	0.607	0.000	-	0.866	0.375	0.286	0.000	-	0.625	0.594	0.887	0.000	-	0.847	0.850
Lights	215	17	0	-	232	12	8	0	-	20	18	172	0	-	190	442
% Lights	96.8	100.0	-	-	97.1	100.0	100.0	-	-	100.0	94.7	95.0	-	-	95.0	96.3
Buses	0	0	0	-	0	0	0	0	-	0	0	5	0	-	5	5
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	2.8	-	-	2.5	1.1
Trucks	7	0	0	-	7	0	0	0	-	0	1	4	0	-	5	12
% Trucks	3.2	0.0	-	-	2.9	0.0	0.0	-	-	0.0	5.3	2.2	-	-	2.5	2.6
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	6	-	-	-	-	13	-	-	-	-	28	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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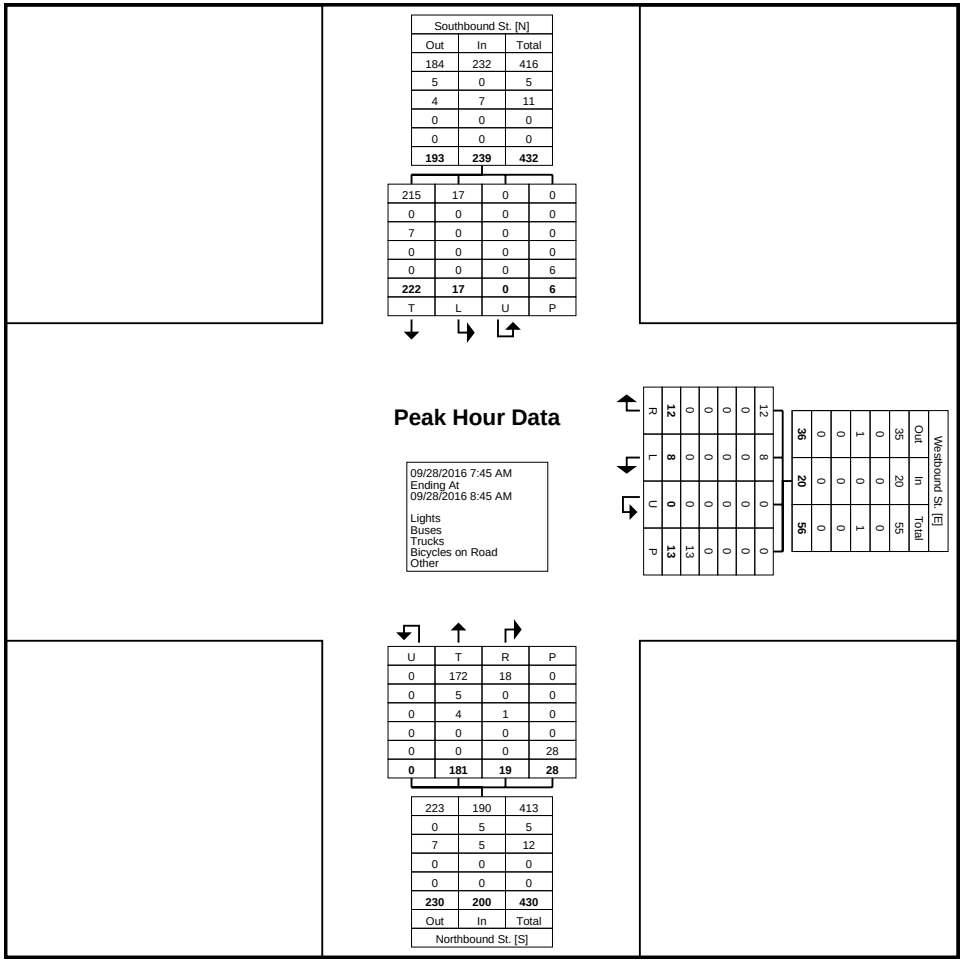

Turning Movement Peak Hour Data Plot (7:45 AM)

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Count Name: TMC - Main St @ E College St
Site Code: 120
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound					Westbound St. Westbound					Northbound St. Northbound					
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	Int. Total
2:00 PM	54	1	0	0	55	1	0	0	8	1	4	42	0	10	46	102
2:15 PM	40	0	0	6	40	4	3	0	27	7	0	58	0	48	58	105
2:30 PM	70	1	0	3	71	1	8	0	6	9	4	53	0	16	57	137
2:45 PM	58	3	0	1	61	4	3	0	12	7	0	64	0	17	64	132
Total	222	5	0	10	227	10	14	0	53	24	8	217	0	91	225	476
Approach %	97.8	2.2	0.0	-	-	41.7	58.3	0.0	-	-	3.6	96.4	0.0	-	-	-
Total %	46.6	1.1	0.0	-	47.7	2.1	2.9	0.0	-	5.0	1.7	45.6	0.0	-	47.3	-
PHF	0.793	0.417	0.000	-	0.799	0.625	0.438	0.000	-	0.667	0.500	0.848	0.000	-	0.879	0.869
Lights	216	5	0	-	221	10	13	0	-	23	7	206	0	-	213	457
% Lights	97.3	100.0	-	-	97.4	100.0	92.9	-	-	95.8	87.5	94.9	-	-	94.7	96.0
Buses	0	0	0	-	0	0	0	0	-	0	0	5	0	-	5	5
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	2.3	-	-	2.2	1.1
Trucks	6	0	0	-	6	0	1	0	-	1	1	6	0	-	7	14
% Trucks	2.7	0.0	-	-	2.6	0.0	7.1	-	-	4.2	12.5	2.8	-	-	3.1	2.9
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	1.9	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	10	-	-	-	-	52	-	-	-	-	91	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	98.1	-	-	-	-	100.0	-	-

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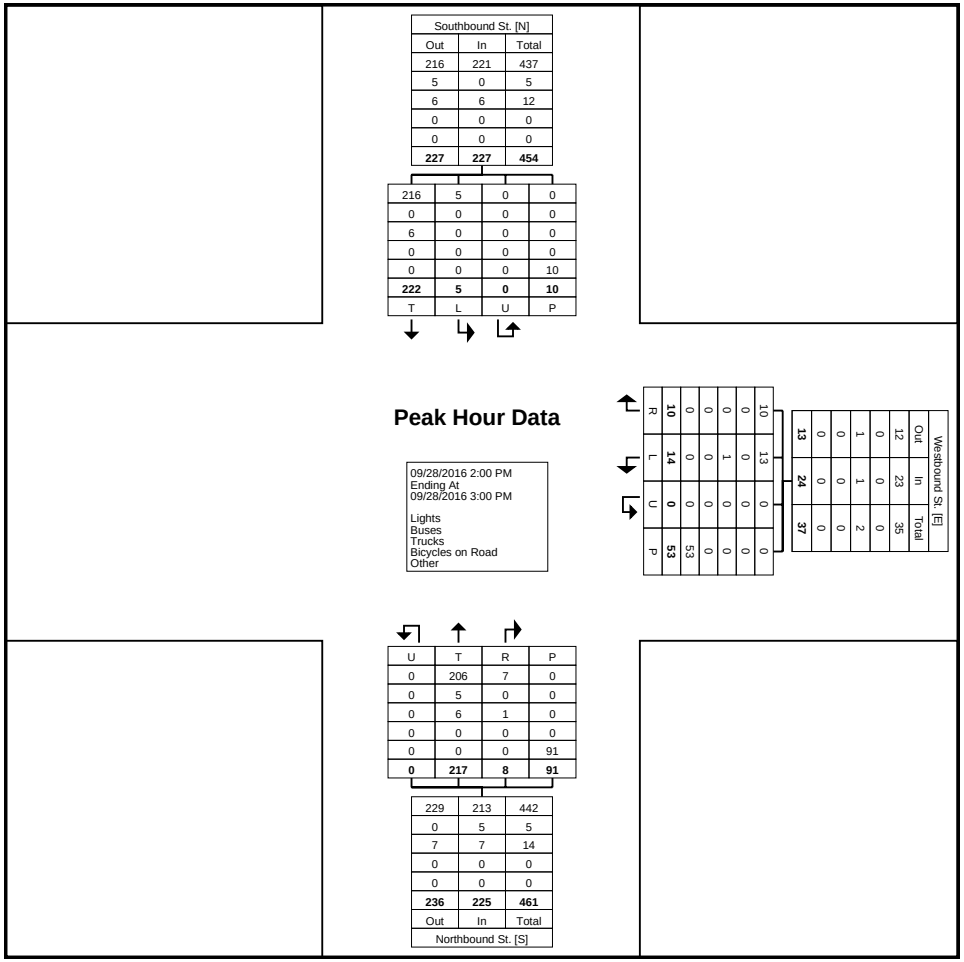

Turning Movement Peak Hour Data Plot (2:00 PM)

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Count Name: TMC - Main St @ E College St
Site Code: 120
Start Date: 09/28/2016

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Southbound St. Southbound					Westbound St. Westbound					Northbound St. Northbound					
	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Right	Thru	U-Turn	Peds	App. Total	Int. Total
4:15 PM	56	0	0	4	56	2	5	0	5	7	3	75	0	14	78	141
4:30 PM	35	10	0	2	45	4	2	0	4	6	4	84	0	17	88	139
4:45 PM	54	3	0	4	57	9	5	0	8	14	3	68	0	17	71	142
5:00 PM	46	4	0	4	50	7	8	0	2	15	4	93	0	25	97	162
Total	191	17	0	14	208	22	20	0	19	42	14	320	0	73	334	584
Approach %	91.8	8.2	0.0	-	-	52.4	47.6	0.0	-	-	4.2	95.8	0.0	-	-	-
Total %	32.7	2.9	0.0	-	35.6	3.8	3.4	0.0	-	7.2	2.4	54.8	0.0	-	57.2	-
PHF	0.853	0.425	0.000	-	0.912	0.611	0.625	0.000	-	0.700	0.875	0.860	0.000	-	0.861	0.901
Lights	188	15	0	-	203	22	20	0	-	42	14	318	0	-	332	577
% Lights	98.4	88.2	-	-	97.6	100.0	100.0	-	-	100.0	100.0	99.4	-	-	99.4	98.8
Buses	0	1	0	-	1	0	0	0	-	0	0	1	0	-	1	2
% Buses	0.0	5.9	-	-	0.5	0.0	0.0	-	-	0.0	0.0	0.3	-	-	0.3	0.3
Trucks	2	0	0	-	2	0	0	0	-	0	0	1	0	-	1	3
% Trucks	1.0	0.0	-	-	1.0	0.0	0.0	-	-	0.0	0.0	0.3	-	-	0.3	0.5
Bicycles on Road	1	1	0	-	2	0	0	0	-	0	0	0	0	-	0	2
% Bicycles on Road	0.5	5.9	-	-	1.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.3
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	14	-	-	-	-	19	-	-	-	-	73	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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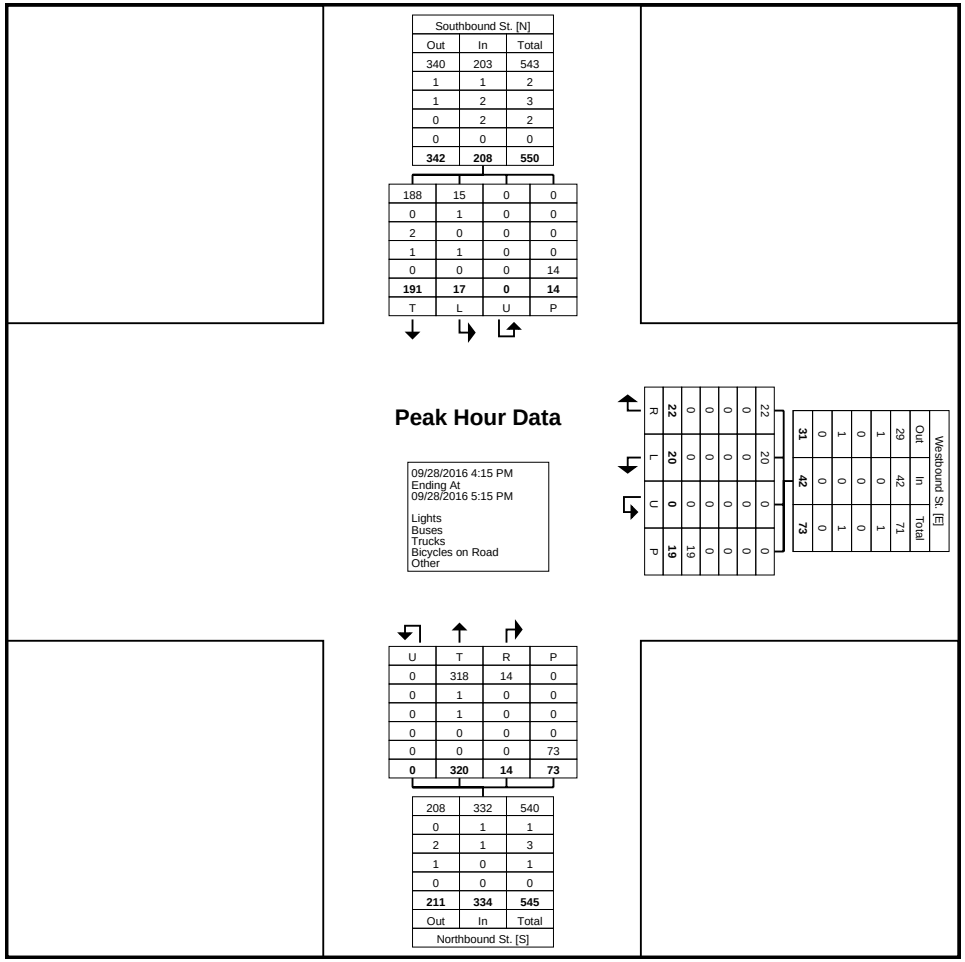

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Count Name: Main St @ MB 10
Site Code: 125
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:00 AM	0	32	0	0	0	32	0	0	0	0	0	0	0	36	0	0	0	36	0	0	0	0	0	0	68
7:15 AM	0	45	0	0	0	45	0	0	0	0	0	0	0	30	0	0	0	30	0	0	0	0	1	0	75
7:30 AM	0	58	0	0	0	58	0	0	0	0	0	0	0	36	0	0	0	36	0	0	0	0	3	0	94
7:45 AM	0	68	0	0	1	68	0	0	0	0	0	0	0	50	0	0	0	50	0	0	0	0	8	0	118
Hourly Total	0	203	0	0	1	203	0	0	0	0	0	0	0	152	0	0	0	152	0	0	0	0	12	0	355
8:00 AM	0	54	0	0	1	54	0	0	0	0	0	0	0	36	0	0	0	36	0	0	0	0	3	0	90
8:15 AM	0	64	0	0	0	64	0	0	0	0	0	0	0	59	0	0	0	59	0	0	0	0	1	0	123
8:30 AM	0	56	0	0	0	56	0	0	0	0	0	0	0	50	0	0	0	50	0	0	0	0	7	0	106
8:45 AM	0	52	0	0	0	52	0	0	0	0	0	0	0	37	0	0	0	37	0	0	0	0	40	0	89
Hourly Total	0	226	0	0	1	226	0	0	0	0	0	0	0	182	0	0	0	182	0	0	0	0	51	0	408
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	42	0	0	0	42	0	0	0	0	0	0	0	53	0	0	0	53	0	0	0	0	10	0	95
1:15 PM	0	37	0	0	0	37	0	0	0	0	0	0	0	50	0	0	1	50	0	0	0	0	61	0	87
1:30 PM	0	38	0	0	0	38	0	0	0	0	0	0	0	52	0	0	0	52	0	0	0	0	12	0	90
1:45 PM	0	34	0	0	0	34	0	0	0	0	0	0	0	55	0	0	0	55	0	0	0	0	3	0	89
Hourly Total	0	151	0	0	0	151	0	0	0	0	0	0	0	210	0	0	1	210	0	0	0	0	86	0	361
2:00 PM	0	54	0	0	0	54	0	0	0	0	0	0	0	41	0	0	0	41	0	0	0	0	6	0	95
2:15 PM	0	40	0	0	0	40	0	0	0	0	0	0	0	63	0	0	0	63	0	0	0	0	78	0	103
2:30 PM	0	71	0	0	0	71	0	0	0	0	0	0	0	54	0	0	0	54	0	0	0	0	19	0	125
2:45 PM	0	59	0	0	0	59	0	0	0	0	0	0	0	70	0	0	0	70	0	0	0	0	17	0	129
Hourly Total	0	224	0	0	0	224	0	0	0	0	0	0	0	228	0	0	0	228	0	0	0	0	120	0	452
3:00 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	0	43	0	0	1	43	0	0	0	0	0	0	0	74	0	0	0	74	0	0	0	0	13	0	117
3:45 PM	0	66	0	0	0	66	0	0	0	0	0	0	0	70	0	0	0	70	0	0	0	0	14	0	136
Hourly Total	0	110	0	0	1	110	0	0	0	0	0	0	0	144	0	0	0	144	0	0	0	0	27	0	254
4:00 PM	0	72	0	0	0	72	0	0	0	0	0	0	0	76	0	0	0	76	0	0	0	0	9	0	148
4:15 PM	0	56	0	0	0	56	0	0	0	0	0	0	0	79	0	0	0	79	0	0	0	0	16	0	135
4:30 PM	0	47	0	0	0	47	0	0	0	0	0	0	0	84	0	0	0	84	0	0	0	0	9	0	131
4:45 PM	0	58	0	0	0	58	0	0	0	0	0	0	0	75	0	0	0	75	0	0	0	0	11	0	133
Hourly Total	0	233	0	0	0	233	0	0	0	0	0	0	0	314	0	0	0	314	0	0	0	0	45	0	547
5:00 PM	0	47	0	0	0	47	0	0	0	0	0	0	0	102	0	0	0	102	0	0	0	0	12	0	149
5:15 PM	0	41	0	0	0	41	0	0	0	0	0	0	0	79	0	0	0	79	0	0	0	0	5	0	120
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Grand Total	0	1235	0	0	3	1235	0	0	0	0	0	0	0	1411	0	0	1	1411	0	0	0	0	358	0	2646
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	46.7	0.0	0.0	-	46.7	0.0	0.0	0.0	0.0	-	0.0	0.0	53.3	0.0	0.0	-	53.3	0.0	0.0	0.0	0.0	-	0.0	-
Lights	0	1207	0	0	-	1207	0	0	0	0	-	0	0	1370	0	0	-	1370	0	0	0	0	-	0	2577
% Lights	-	97.7	-	-	-	97.7	-	-	-	-	-	-	-	97.1	-	-	-	97.1	-	-	-	-	-	-	97.4
Buses	0	7	0	0	-	7	0	0	0	0	-	0	0	19	0	0	-	19	0	0	0	0	-	0	26
% Buses	-	0.6	-	-	-	0.6	-	-	-	-	-	-	-	1.3	-	-	-	1.3	-	-	-	-	-	-	1.0
Trucks	0	19	0	0	-	19	0	0	0	0	-	0	0	22	0	0	-	22	0	0	0	0	-	0	41
% Trucks	-	1.5	-	-	-	1.5	-	-	-	-	-	-	-	1.6	-	-	-	1.6	-	-	-	-	-	-	1.5
Bicycles on Road	0	2	0	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	2
% Bicycles on Road	-	0.2	-	-	-	0.2	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	358	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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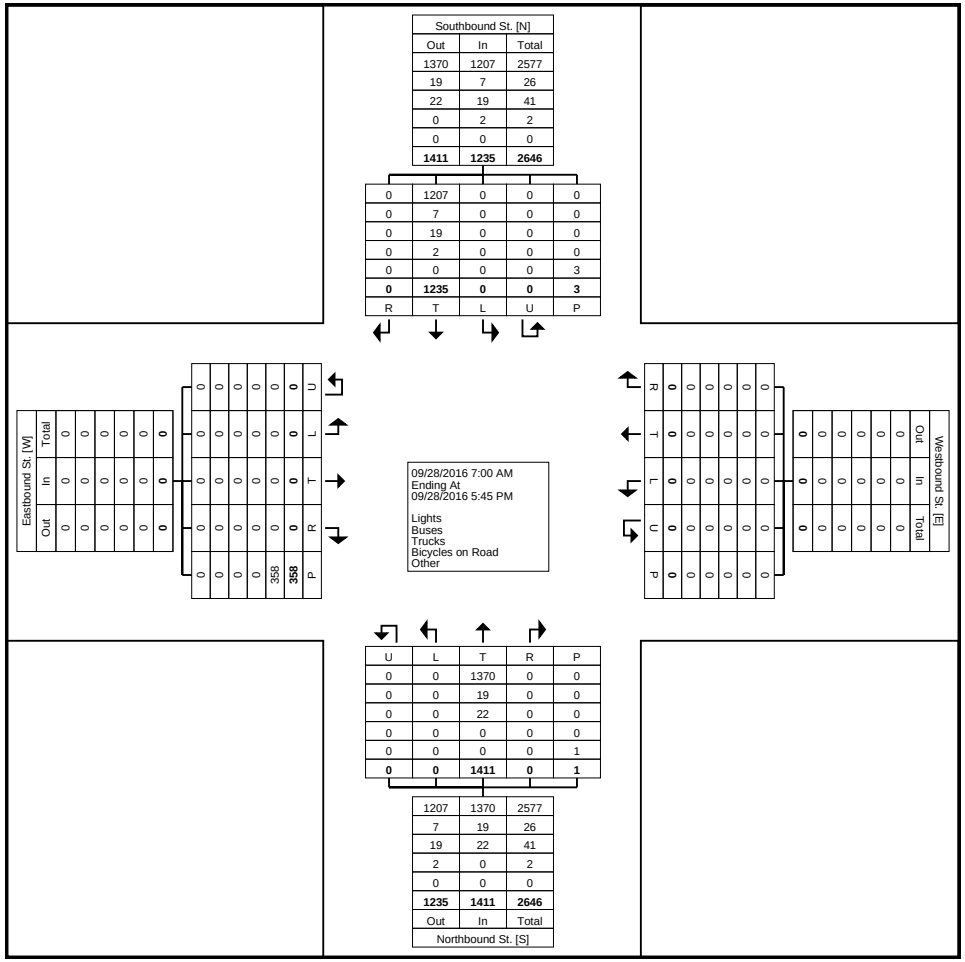
People Focused - Project Driven

Count Name: Main St @ MB 10
Site Code: 125
Start Date: 09/28/2016



Turning Movement Data Plot

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Count Name: Main St @ MB 10
Site Code: 125
Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
7:45 AM	0	68	0	0	1	68	0	0	0	0	0	0	0	50	0	0	0	50	0	0	0	0	8	0	118
8:00 AM	0	54	0	0	1	54	0	0	0	0	0	0	0	36	0	0	0	36	0	0	0	0	3	0	90
8:15 AM	0	64	0	0	0	64	0	0	0	0	0	0	0	59	0	0	0	59	0	0	0	0	1	0	123
8:30 AM	0	56	0	0	0	56	0	0	0	0	0	0	0	50	0	0	0	50	0	0	0	0	7	0	106
Total	0	242	0	0	2	242	0	0	0	0	0	0	0	195	0	0	0	195	0	0	0	0	19	0	437
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	55.4	0.0	0.0	-	55.4	0.0	0.0	0.0	0.0	-	0.0	0.0	44.6	0.0	0.0	-	44.6	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.890	0.000	0.000	-	0.890	0.000	0.000	0.000	0.000	-	0.000	0.000	0.826	0.000	0.000	-	0.826	0.000	0.000	0.000	0.000	-	0.000	0.888
Lights	0	237	0	0	-	237	0	0	0	0	-	0	0	186	0	0	-	186	0	0	0	0	-	0	423
% Lights	-	97.9	-	-	-	97.9	-	-	-	-	-	-	-	95.4	-	-	-	95.4	-	-	-	-	-	-	96.8
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	5
% Buses	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	2.6	-	-	-	2.6	-	-	-	-	-	-	1.1
Trucks	0	5	0	0	-	5	0	0	0	0	-	0	0	4	0	0	-	4	0	0	0	0	-	0	9
% Trucks	-	2.1	-	-	-	2.1	-	-	-	-	-	-	-	2.1	-	-	-	2.1	-	-	-	-	-	-	2.1
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	19	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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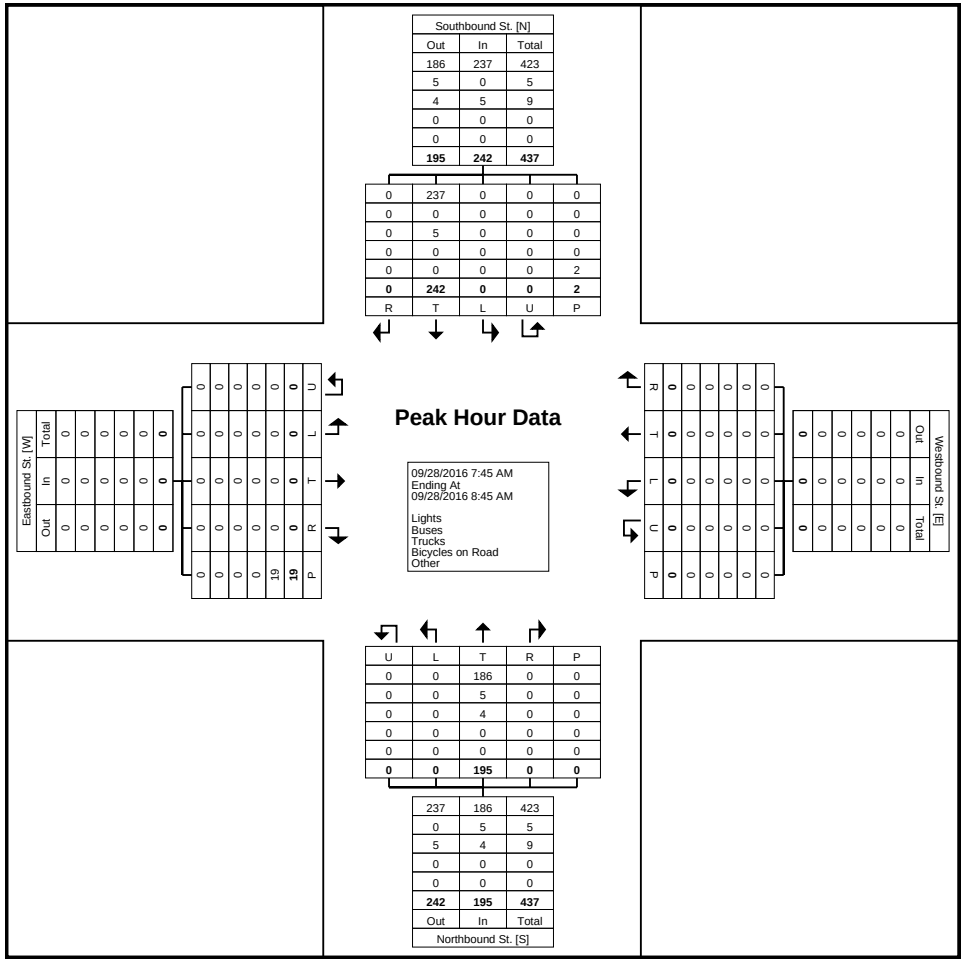
Count Name: Main St @ MB 10
Site Code: 125
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (7:45 AM)

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Count Name: Main St @ MB 10
Site Code: 125
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
2:00 PM	0	54	0	0	0	54	0	0	0	0	0	0	0	41	0	0	0	41	0	0	0	0	6	0	95
2:15 PM	0	40	0	0	0	40	0	0	0	0	0	0	0	63	0	0	0	63	0	0	0	0	78	0	103
2:30 PM	0	71	0	0	0	71	0	0	0	0	0	0	0	54	0	0	0	54	0	0	0	0	19	0	125
2:45 PM	0	59	0	0	0	59	0	0	0	0	0	0	0	70	0	0	0	70	0	0	0	0	17	0	129
Total	0	224	0	0	0	224	0	0	0	0	0	0	0	228	0	0	0	228	0	0	0	0	120	0	452
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	49.6	0.0	0.0	-	49.6	0.0	0.0	0.0	0.0	-	0.0	0.0	50.4	0.0	0.0	-	50.4	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.789	0.000	0.000	-	0.789	0.000	0.000	0.000	0.000	-	0.000	0.000	0.814	0.000	0.000	-	0.814	0.000	0.000	0.000	0.000	-	0.000	0.876
Lights	0	218	0	0	-	218	0	0	0	0	-	0	0	217	0	0	-	217	0	0	0	0	-	0	435
% Lights	-	97.3	-	-	-	97.3	-	-	-	-	-	-	-	95.2	-	-	-	95.2	-	-	-	-	-	-	96.2
Buses	0	2	0	0	-	2	0	0	0	0	-	0	0	4	0	0	-	4	0	0	0	0	-	0	6
% Buses	-	0.9	-	-	-	0.9	-	-	-	-	-	-	-	1.8	-	-	-	1.8	-	-	-	-	-	-	1.3
Trucks	0	4	0	0	-	4	0	0	0	0	-	0	0	7	0	0	-	7	0	0	0	0	-	0	11
% Trucks	-	1.8	-	-	-	1.8	-	-	-	-	-	-	-	3.1	-	-	-	3.1	-	-	-	-	-	-	2.4
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	120	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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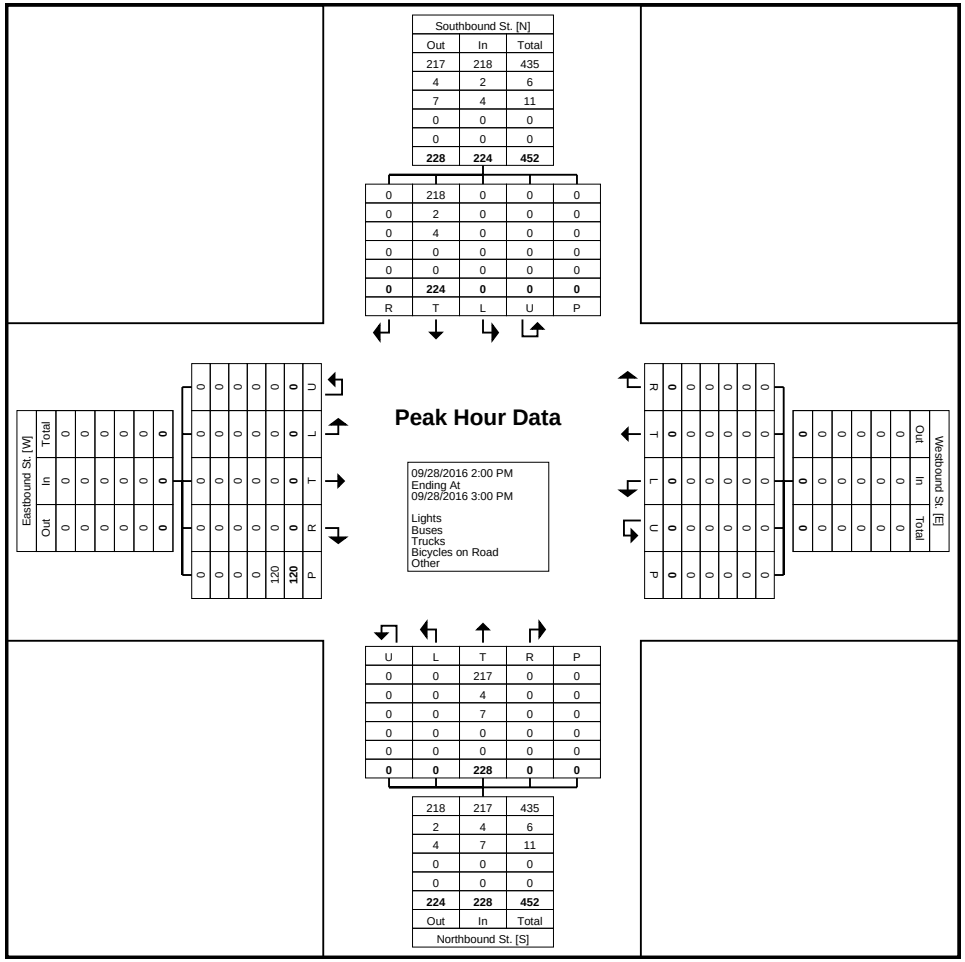
Count Name: Main St @ MB 10
Site Code: 125
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (2:00 PM)

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Count Name: Main St @ MB 10
Site Code: 125
Start Date: 09/28/2016

Turning Movement Peak Hour Data (3:45 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
3:45 PM	0	66	0	0	0	66	0	0	0	0	0	0	0	70	0	0	0	70	0	0	0	0	14	0	136
4:00 PM	0	72	0	0	0	72	0	0	0	0	0	0	0	76	0	0	0	76	0	0	0	0	9	0	148
4:15 PM	0	56	0	0	0	56	0	0	0	0	0	0	0	79	0	0	0	79	0	0	0	0	16	0	135
4:30 PM	0	47	0	0	0	47	0	0	0	0	0	0	0	84	0	0	0	84	0	0	0	0	9	0	131
Total	0	241	0	0	0	241	0	0	0	0	0	0	0	309	0	0	0	309	0	0	0	0	48	0	550
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	43.8	0.0	0.0	-	43.8	0.0	0.0	0.0	0.0	-	0.0	0.0	56.2	0.0	0.0	-	56.2	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.837	0.000	0.000	-	0.837	0.000	0.000	0.000	0.000	-	0.000	0.000	0.920	0.000	0.000	-	0.920	0.000	0.000	0.000	0.000	-	0.000	0.929
Lights	0	238	0	0	-	238	0	0	0	0	-	0	0	305	0	0	-	305	0	0	0	0	-	0	543
% Lights	-	98.8	-	-	-	98.8	-	-	-	-	-	-	-	98.7	-	-	-	98.7	-	-	-	-	-	-	98.7
Buses	0	2	0	0	-	2	0	0	0	0	-	0	0	3	0	0	-	3	0	0	0	0	-	0	5
% Buses	-	0.8	-	-	-	0.8	-	-	-	-	-	-	-	1.0	-	-	-	1.0	-	-	-	-	-	-	0.9
Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	1
% Trucks	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.3	-	-	-	0.3	-	-	-	-	-	-	0.2
Bicycles on Road	0	1	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1
% Bicycles on Road	-	0.4	-	-	-	0.4	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.2
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	48	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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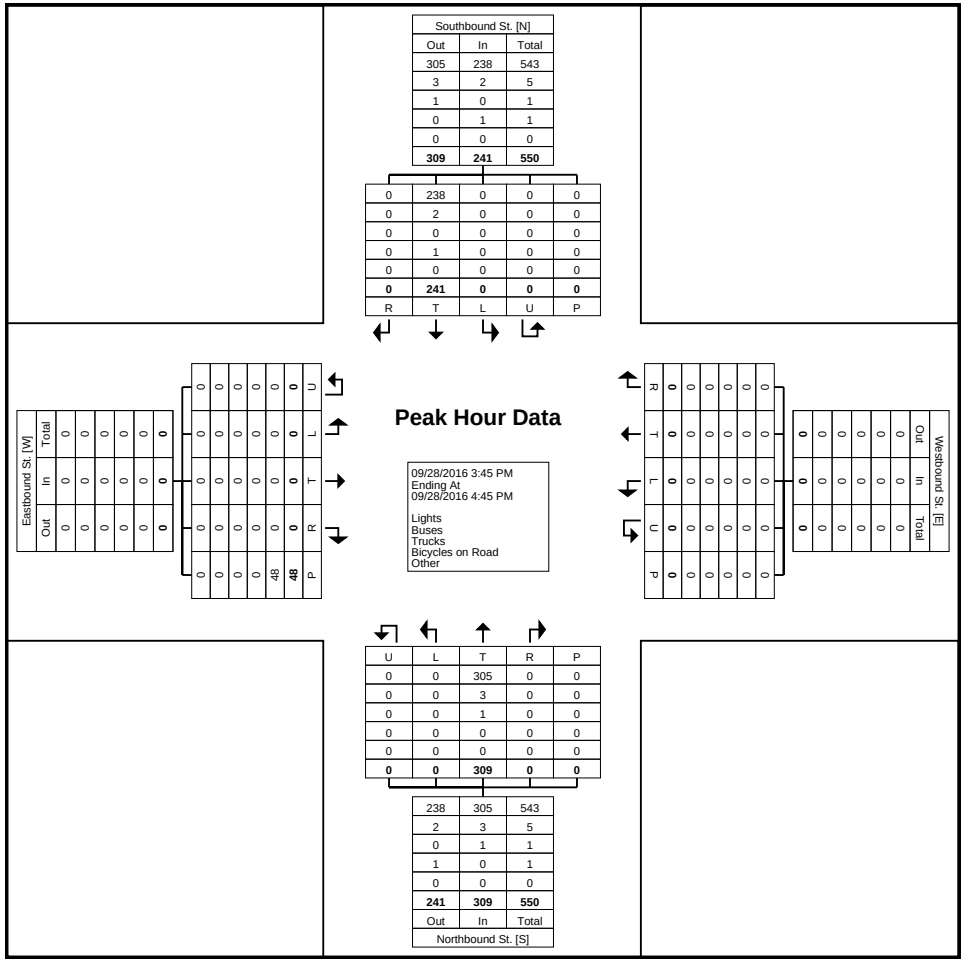

Turning Movement Peak Hour Data Plot (3:45 PM)

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People Focused - Project Driven

Count Name: TMC - Main @ Post Office
Site Code: 130
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound				Northbound St. Northbound				
	Thru	U-Turn	Peds	App. Total	Thru	U-Turn	Peds	App. Total	Int. Total
7:00 AM	31	0	0	31	33	0	7	33	64
7:15 AM	49	0	0	49	29	0	2	29	78
7:30 AM	59	0	0	59	36	0	12	36	95
7:45 AM	68	0	0	68	48	0	28	48	116
Hourly Total	207	0	0	207	146	0	49	146	353
8:00 AM	54	0	0	54	37	0	12	37	91
8:15 AM	58	0	0	58	58	0	8	58	116
8:30 AM	54	0	2	54	48	0	7	48	102
8:45 AM	52	0	0	52	36	0	38	36	88
Hourly Total	218	0	2	218	179	0	65	179	397
9:00 AM	1	0	0	1	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-
Hourly Total	1	0	0	1	0	0	0	0	1
1:00 PM	43	0	0	43	50	0	19	50	93
1:15 PM	38	0	1	38	50	0	53	50	88
1:30 PM	37	0	2	37	56	0	15	56	93
1:45 PM	33	0	0	33	53	0	10	53	86
Hourly Total	151	0	3	151	209	0	97	209	360
2:00 PM	55	0	0	55	42	0	5	42	97
2:15 PM	40	0	2	40	62	0	36	62	102
2:30 PM	71	0	0	71	55	0	12	55	126
2:45 PM	61	0	2	61	68	0	13	68	129
Hourly Total	227	0	4	227	227	0	66	227	454
3:00 PM	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-
3:30 PM	44	0	1	44	75	0	18	75	119
3:45 PM	67	0	0	67	70	0	12	70	137
Hourly Total	111	0	1	111	145	0	30	145	256
4:00 PM	71	0	0	71	77	0	13	77	148
4:15 PM	59	0	0	59	76	0	7	76	135
4:30 PM	41	0	0	41	86	0	10	86	127
4:45 PM	58	0	0	58	76	0	12	76	134
Hourly Total	229	0	0	229	315	0	42	315	544
5:00 PM	48	0	0	48	103	0	13	103	151
5:15 PM	41	0	1	41	73	0	15	73	114
5:30 PM	1	0	0	1	0	0	0	0	1
Grand Total	1234	0	11	1234	1397	0	377	1397	2631

Approach %	100.0	0.0	-	-	100.0	0.0	-	-	-
Total %	46.9	0.0	-	46.9	53.1	0.0	-	53.1	-
Lights	1207	0	-	1207	1356	0	-	1356	2563
% Lights	97.8	-	-	97.8	97.1	-	-	97.1	97.4
Buses	7	0	-	7	20	0	-	20	27
% Buses	0.6	-	-	0.6	1.4	-	-	1.4	1.0
Trucks	19	0	-	19	20	0	-	20	39
% Trucks	1.5	-	-	1.5	1.4	-	-	1.4	1.5
Bicycles on Road	1	0	-	1	1	0	-	1	2
% Bicycles on Road	0.1	-	-	0.1	0.1	-	-	0.1	0.1
Bicycles on Crosswalk	-	-	0	-	-	-	2	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	0.5	-	-
Pedestrians	-	-	11	-	-	-	375	-	-
% Pedestrians	-	-	100.0	-	-	-	99.5	-	-

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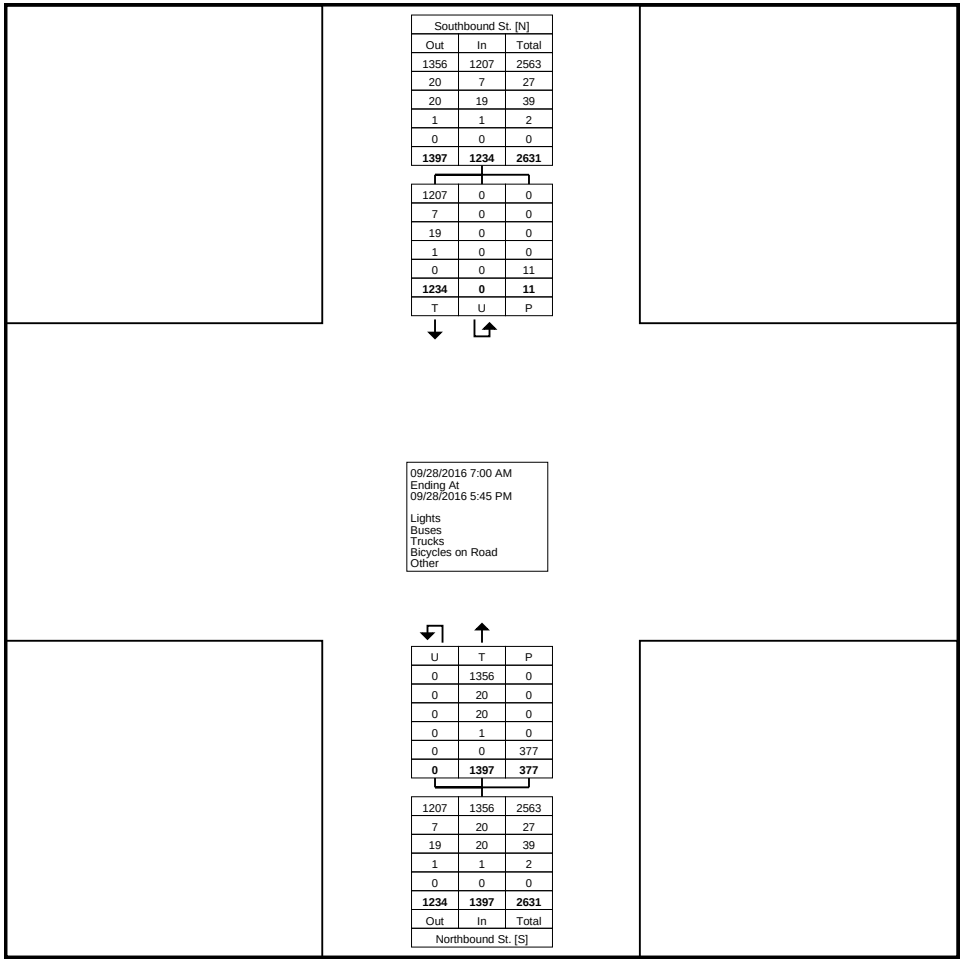
Count Name: TMC - Main @ Post Office
Site Code: 130
Start Date: 09/28/2016



Turning Movement Data Plot

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Count Name: TMC - Main @ Post Office
Site Code: 130
Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound				Northbound St. Northbound				
	Thru	U-Turn	Peds	App. Total	Thru	U-Turn	Peds	App. Total	Int. Total
7:45 AM	68	0	0	68	48	0	28	48	116
8:00 AM	54	0	0	54	37	0	12	37	91
8:15 AM	58	0	0	58	58	0	8	58	116
8:30 AM	54	0	2	54	48	0	7	48	102
Total	234	0	2	234	191	0	55	191	425
Approach %	100.0	0.0	-	-	100.0	0.0	-	-	-
Total %	55.1	0.0	-	55.1	44.9	0.0	-	44.9	-
PHF	0.860	0.000	-	0.860	0.823	0.000	-	0.823	0.916
Lights	229	0	-	229	183	0	-	183	412
% Lights	97.9	-	-	97.9	95.8	-	-	95.8	96.9
Buses	0	0	-	0	5	0	-	5	5
% Buses	0.0	-	-	0.0	2.6	-	-	2.6	1.2
Trucks	5	0	-	5	3	0	-	3	8
% Trucks	2.1	-	-	2.1	1.6	-	-	1.6	1.9
Bicycles on Road	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	-	-	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	0.0	-	-
Pedestrians	-	-	2	-	-	-	55	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-

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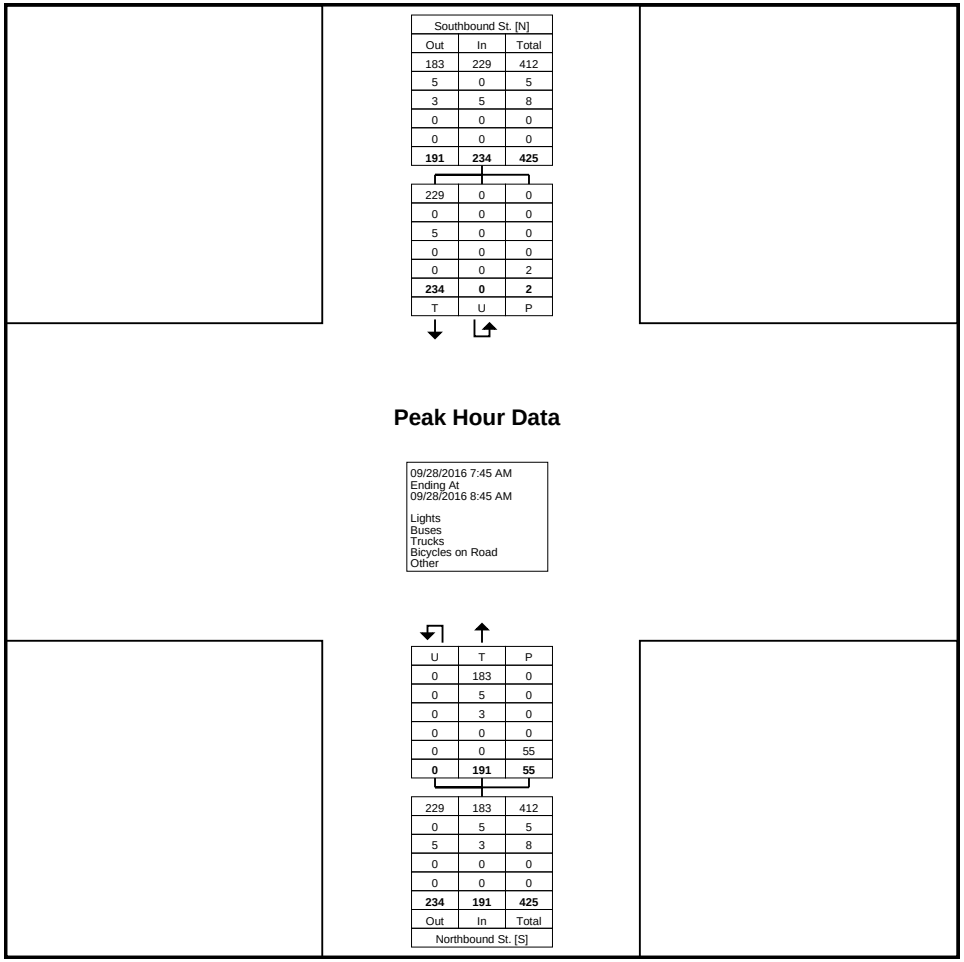
Count Name: TMC - Main @ Post Office
Site Code: 130
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (7:45 AM)

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Count Name: TMC - Main @ Post Office
Site Code: 130
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound				Northbound St. Northbound				
	Thru	U-Turn	Peds	App. Total	Thru	U-Turn	Peds	App. Total	Int. Total
2:00 PM	55	0	0	55	42	0	5	42	97
2:15 PM	40	0	2	40	62	0	36	62	102
2:30 PM	71	0	0	71	55	0	12	55	126
2:45 PM	61	0	2	61	68	0	13	68	129
Total	227	0	4	227	227	0	66	227	454
Approach %	100.0	0.0	-	-	100.0	0.0	-	-	-
Total %	50.0	0.0	-	50.0	50.0	0.0	-	50.0	-
PHF	0.799	0.000	-	0.799	0.835	0.000	-	0.835	0.880
Lights	222	0	-	222	216	0	-	216	438
% Lights	97.8	-	-	97.8	95.2	-	-	95.2	96.5
Buses	2	0	-	2	5	0	-	5	7
% Buses	0.9	-	-	0.9	2.2	-	-	2.2	1.5
Trucks	3	0	-	3	6	0	-	6	9
% Trucks	1.3	-	-	1.3	2.6	-	-	2.6	2.0
Bicycles on Road	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	-	-	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	0.0	-	-
Pedestrians	-	-	4	-	-	-	66	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-

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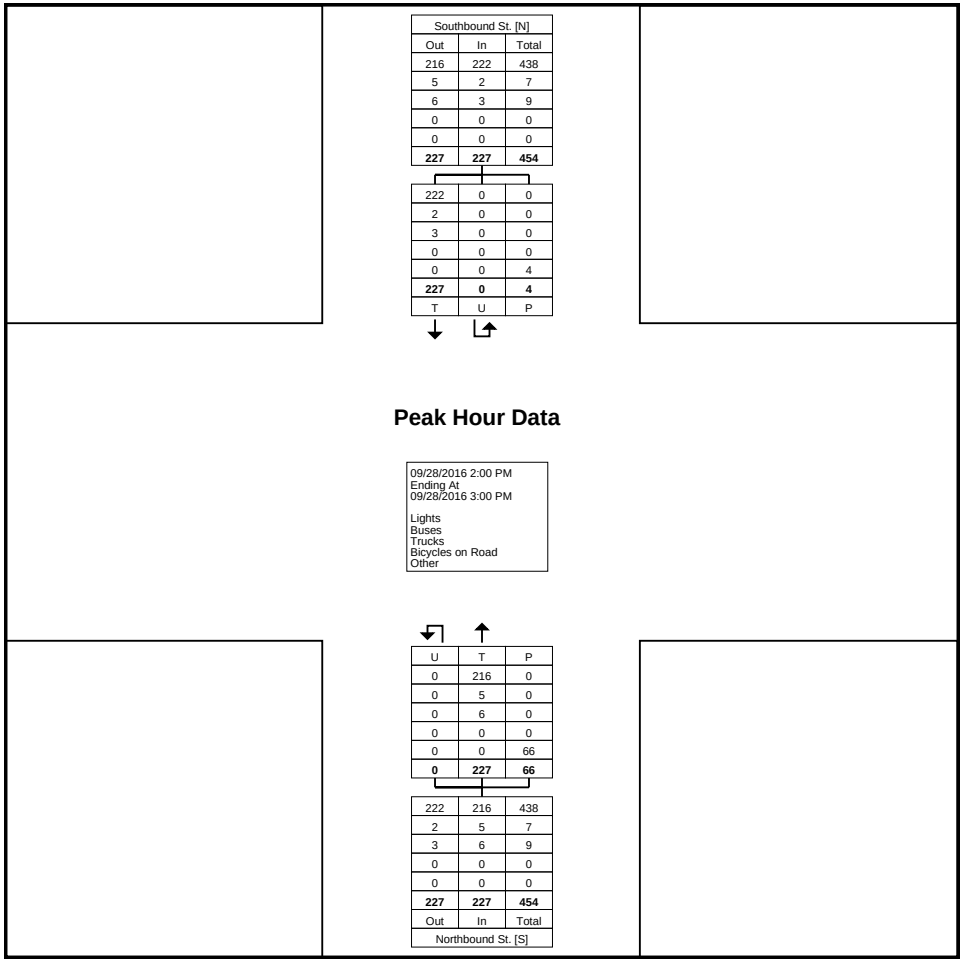

Turning Movement Peak Hour Data Plot (2:00 PM)

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Count Name: TMC - Main @ Post Office
Site Code: 130
Start Date: 09/28/2016

Turning Movement Peak Hour Data (3:45 PM)

Start Time	Southbound St. Southbound				Northbound St. Northbound				
	Thru	U-Turn	Peds	App. Total	Thru	U-Turn	Peds	App. Total	Int. Total
3:45 PM	67	0	0	67	70	0	12	70	137
4:00 PM	71	0	0	71	77	0	13	77	148
4:15 PM	59	0	0	59	76	0	7	76	135
4:30 PM	41	0	0	41	86	0	10	86	127
Total	238	0	0	238	309	0	42	309	547
Approach %	100.0	0.0	-	-	100.0	0.0	-	-	-
Total %	43.5	0.0	-	43.5	56.5	0.0	-	56.5	-
PHF	0.838	0.000	-	0.838	0.898	0.000	-	0.898	0.924
Lights	236	0	-	236	305	0	-	305	541
% Lights	99.2	-	-	99.2	98.7	-	-	98.7	98.9
Buses	2	0	-	2	3	0	-	3	5
% Buses	0.8	-	-	0.8	1.0	-	-	1.0	0.9
Trucks	0	0	-	0	1	0	-	1	1
% Trucks	0.0	-	-	0.0	0.3	-	-	0.3	0.2
Bicycles on Road	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	-	-	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	0	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	2.4	-	-
Pedestrians	-	-	0	-	-	-	41	-	-
% Pedestrians	-	-	-	-	-	-	97.6	-	-

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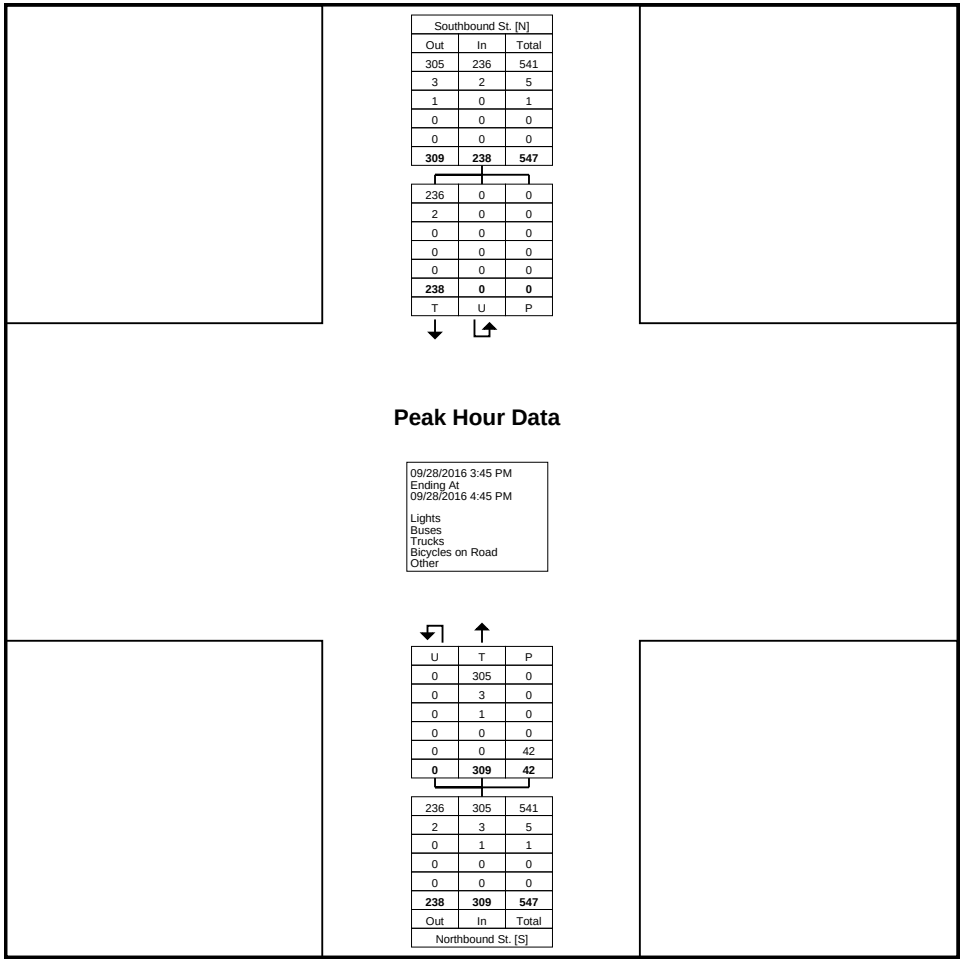
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (3:45 PM)

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Count Name: Main St @ MB 11
Site Code: 135
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:00 AM	0	35	0	0	0	35	0	0	0	0	2	0	0	36	0	0	0	36	0	0	0	0	0	0	71
7:15 AM	0	44	0	0	0	44	0	0	0	0	0	0	0	27	0	0	0	27	0	0	0	0	0	0	71
7:30 AM	0	59	0	0	0	59	0	0	0	0	0	0	0	39	0	0	0	39	0	0	0	0	0	0	98
7:45 AM	0	61	0	0	0	61	0	0	0	0	15	0	0	53	0	0	0	53	0	0	0	0	0	0	114
Hourly Total	0	199	0	0	0	199	0	0	0	0	17	0	0	155	0	0	0	155	0	0	0	0	0	0	354
8:00 AM	0	53	0	0	0	53	0	0	0	0	0	0	0	36	0	0	0	36	0	0	0	0	1	0	89
8:15 AM	0	59	0	0	0	59	0	0	0	0	0	0	0	59	0	0	0	59	0	0	0	0	2	0	118
8:30 AM	0	58	0	0	0	58	0	0	0	0	7	0	0	42	0	0	0	42	0	0	0	0	1	0	100
8:45 AM	0	51	0	0	0	51	0	0	0	0	31	0	0	40	0	0	0	40	0	0	0	0	19	0	91
Hourly Total	0	221	0	0	0	221	0	0	0	0	38	0	0	177	0	0	0	177	0	0	0	0	23	0	398
9:00 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1:00 PM	0	45	0	0	0	45	0	0	0	0	8	0	0	49	0	0	0	49	0	0	0	0	0	0	94
1:15 PM	0	45	0	0	0	45	0	0	0	0	37	0	0	48	0	0	1	48	0	0	0	0	0	0	93
1:30 PM	0	28	0	0	1	28	0	0	0	0	9	0	0	56	0	0	2	56	0	0	0	0	1	0	84
1:45 PM	0	32	0	0	0	32	0	0	0	0	1	0	0	55	0	0	0	55	0	0	0	0	0	0	87
Hourly Total	0	150	0	0	1	150	0	0	0	0	55	0	0	208	0	0	3	208	0	0	0	0	1	0	358
2:00 PM	0	56	0	0	0	56	0	0	0	0	5	0	0	45	0	0	0	45	0	0	0	0	0	0	101
2:15 PM	0	45	0	0	0	45	0	0	0	0	41	0	0	56	0	0	0	56	0	0	0	0	0	0	101
2:30 PM	0	68	0	0	0	68	0	0	0	0	8	0	0	58	0	0	0	58	0	0	0	0	0	0	126
2:45 PM	0	58	0	0	0	58	0	0	0	0	11	0	0	68	0	0	1	68	0	0	0	0	0	0	126
Hourly Total	0	227	0	0	0	227	0	0	0	0	65	0	0	227	0	0	1	227	0	0	0	0	0	0	454
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	0	48	0	0	0	48	0	0	0	0	5	0	0	77	0	0	0	77	0	0	0	0	0	0	125
3:45 PM	0	62	0	0	0	62	0	0	0	0	5	0	0	69	0	0	0	69	0	0	0	0	0	0	131
Hourly Total	0	110	0	0	0	110	0	0	0	0	10	0	0	146	0	0	0	146	0	0	0	0	0	0	256
4:00 PM	0	73	0	0	0	73	0	0	0	0	6	0	0	76	0	0	0	76	0	0	0	0	0	0	149
4:15 PM	0	59	0	0	0	59	0	0	0	0	11	0	0	75	0	0	0	75	0	0	0	0	0	0	134
4:30 PM	0	41	0	0	0	41	0	0	0	0	7	0	0	93	0	0	0	93	0	0	0	0	2	0	134
4:45 PM	0	56	0	0	0	56	0	0	0	0	4	0	0	73	0	0	0	73	0	0	0	0	0	0	129
Hourly Total	0	229	0	0	0	229	0	0	0	0	28	0	0	317	0	0	0	317	0	0	0	0	2	0	546
5:00 PM	0	51	0	0	0	51	0	0	0	0	1	0	0	100	0	0	0	100	0	0	0	0	4	0	151
5:15 PM	0	45	0	0	0	45	0	0	0	0	1	0	0	72	0	0	0	72	0	0	0	0	3	0	117
5:30 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Grand Total	0	1234	0	0	1	1234	0	0	0	0	215	0	0	1402	0	0	4	1402	0	0	0	0	33	0	2636
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	46.8	0.0	0.0	-	46.8	0.0	0.0	0.0	0.0	-	0.0	0.0	53.2	0.0	0.0	-	53.2	0.0	0.0	0.0	0.0	-	0.0	-
Lights	0	1206	0	0	-	1206	0	0	0	0	-	0	0	1361	0	0	-	1361	0	0	0	0	-	0	2567
% Lights	-	97.7	-	-	-	97.7	-	-	-	-	-	-	-	97.1	-	-	-	97.1	-	-	-	-	-	-	97.4
Buses	0	6	0	0	-	6	0	0	0	0	-	0	0	21	0	0	-	21	0	0	0	0	-	0	27
% Buses	-	0.5	-	-	-	0.5	-	-	-	-	-	-	-	1.5	-	-	-	1.5	-	-	-	-	-	-	1.0
Trucks	0	21	0	0	-	21	0	0	0	0	-	0	0	19	0	0	-	19	0	0	0	0	-	0	40
% Trucks	-	1.7	-	-	-	1.7	-	-	-	-	-	-	-	1.4	-	-	-	1.4	-	-	-	-	-	-	1.5
Bicycles on Road	0	1	0	0	-	1	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	2
% Bicycles on Road	-	0.1	-	-	-	0.1	-	-	-	-	-	-	-	0.1	-	-	-	0.1	-	-	-	-	-	-	0.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	1.4	-	-	-	-	-	0.0	-	-	-	-	-	3.0	-	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	212	-	-	-	-	-	4	-	-	-	-	-	32	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	98.6	-	-	-	-	-	100.0	-	-	-	-	-	97.0	-	-

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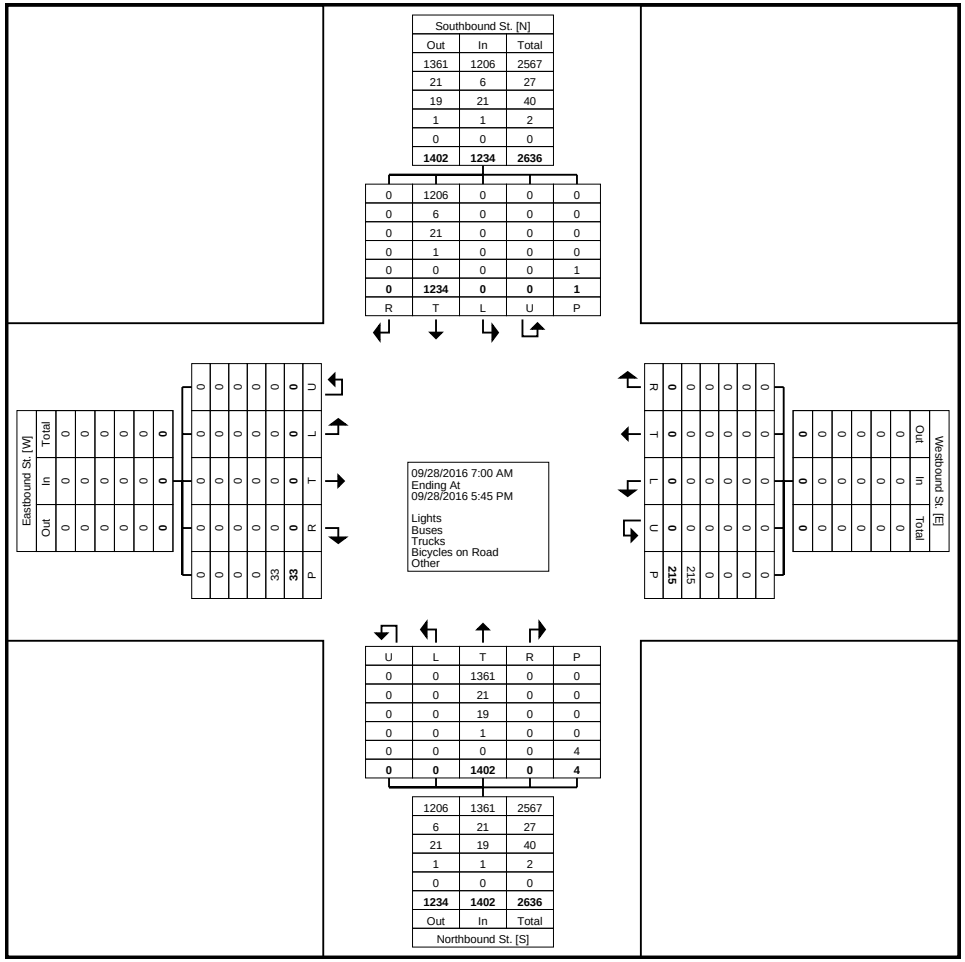
Count Name: Main St @ MB 11
Site Code: 135
Start Date: 09/28/2016


Southbound St. [N]
Out In Total
1361 1206 2567
21 6 27
19 21 40
1 1 2
0 0 0
1402 1234 2636
0 1206 0 0 0
0 6 0 0 0
0 21 0 0 0
0 1 0 0 0
0 0 0 0 1
0 1234 0 0 1
R T L U P
Eastbound St. [W]
Total In Out
U L T R P
0 0 0 0

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Count Name: Main St @ MB 11
Site Code: 135
Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
7:45 AM	0	61	0	0	0	61	0	0	0	0	15	0	0	53	0	0	0	53	0	0	0	0	0	0	114
8:00 AM	0	53	0	0	0	53	0	0	0	0	0	0	0	36	0	0	0	36	0	0	0	0	1	0	89
8:15 AM	0	59	0	0	0	59	0	0	0	0	0	0	0	59	0	0	0	59	0	0	0	0	2	0	118
8:30 AM	0	58	0	0	0	58	0	0	0	0	7	0	0	42	0	0	0	42	0	0	0	0	1	0	100
Total	0	231	0	0	0	231	0	0	0	0	22	0	0	190	0	0	0	190	0	0	0	0	4	0	421
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	54.9	0.0	0.0	-	54.9	0.0	0.0	0.0	0.0	-	0.0	0.0	45.1	0.0	0.0	-	45.1	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.947	0.000	0.000	-	0.947	0.000	0.000	0.000	0.000	-	0.000	0.000	0.805	0.000	0.000	-	0.805	0.000	0.000	0.000	0.000	-	0.000	0.892
Lights	0	226	0	0	-	226	0	0	0	0	-	0	0	182	0	0	-	182	0	0	0	0	-	0	408
% Lights	-	97.8	-	-	-	97.8	-	-	-	-	-	-	-	95.8	-	-	-	95.8	-	-	-	-	-	-	96.9
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	5
% Buses	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	2.6	-	-	-	2.6	-	-	-	-	-	-	1.2
Trucks	0	5	0	0	-	5	0	0	0	0	-	0	0	3	0	0	-	3	0	0	0	0	-	0	8
% Trucks	-	2.2	-	-	-	2.2	-	-	-	-	-	-	-	1.6	-	-	-	1.6	-	-	-	-	-	-	1.9
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	4.5	-	-	-	-	-	-	-	-	-	-	-	25.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	21	-	-	-	-	-	0	-	-	-	-	-	3	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	95.5	-	-	-	-	-	-	-	-	-	-	-	75.0	-	-

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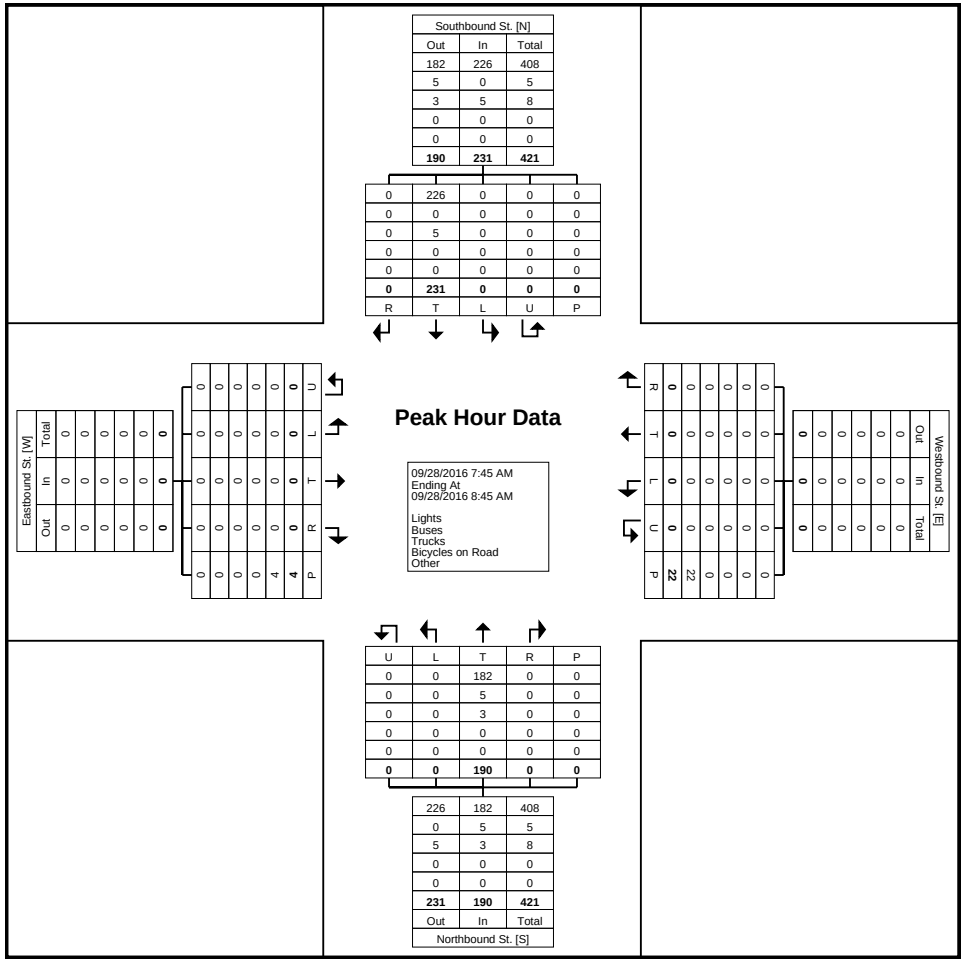
People Focused - Project Driven

Count Name: Main St @ MB 11
Site Code: 135
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (7:45 AM)

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Count Name: Main St @ MB 11
Site Code: 135
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
2:00 PM	0	56	0	0	0	56	0	0	0	0	5	0	0	45	0	0	0	45	0	0	0	0	0	0	101
2:15 PM	0	45	0	0	0	45	0	0	0	0	41	0	0	56	0	0	0	56	0	0	0	0	0	0	101
2:30 PM	0	68	0	0	0	68	0	0	0	0	8	0	0	58	0	0	0	58	0	0	0	0	0	0	126
2:45 PM	0	58	0	0	0	58	0	0	0	0	11	0	0	68	0	0	1	68	0	0	0	0	0	0	126
Total	0	227	0	0	0	227	0	0	0	0	65	0	0	227	0	0	1	227	0	0	0	0	0	0	454
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	50.0	0.0	0.0	-	50.0	0.0	0.0	0.0	0.0	-	0.0	0.0	50.0	0.0	0.0	-	50.0	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.835	0.000	0.000	-	0.835	0.000	0.000	0.000	0.000	-	0.000	0.000	0.835	0.000	0.000	-	0.835	0.000	0.000	0.000	0.000	-	0.000	0.901
Lights	0	222	0	0	-	222	0	0	0	0	-	0	0	215	0	0	-	215	0	0	0	0	-	0	437
% Lights	-	97.8	-	-	-	97.8	-	-	-	-	-	-	-	94.7	-	-	-	94.7	-	-	-	-	-	-	96.3
Buses	0	1	0	0	-	1	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	6
% Buses	-	0.4	-	-	-	0.4	-	-	-	-	-	-	-	2.2	-	-	-	2.2	-	-	-	-	-	-	1.3
Trucks	0	4	0	0	-	4	0	0	0	0	-	0	0	7	0	0	-	7	0	0	0	0	-	0	11
% Trucks	-	1.8	-	-	-	1.8	-	-	-	-	-	-	-	3.1	-	-	-	3.1	-	-	-	-	-	-	2.4
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	64	-	-	-	-	-	1	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	98.5	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-

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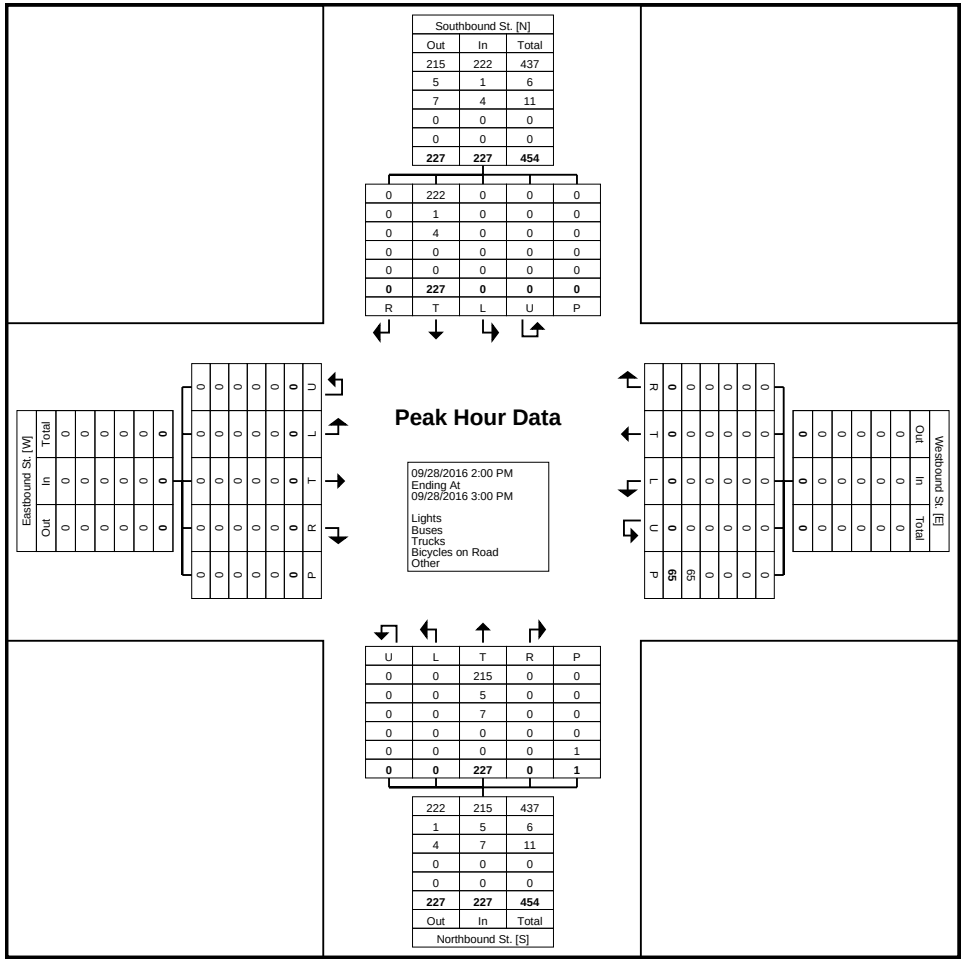

Turning Movement Peak Hour Data Plot (2:00 PM)

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Start Date: 09/28/2016

Turning Movement Peak Hour Data (3:45 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
3:45 PM	0	62	0	0	0	62	0	0	0	0	5	0	0	69	0	0	0	69	0	0	0	0	0	0	131
4:00 PM	0	73	0	0	0	73	0	0	0	0	6	0	0	76	0	0	0	76	0	0	0	0	0	0	149
4:15 PM	0	59	0	0	0	59	0	0	0	0	11	0	0	75	0	0	0	75	0	0	0	0	0	0	134
4:30 PM	0	41	0	0	0	41	0	0	0	0	7	0	0	93	0	0	0	93	0	0	0	0	2	0	134
Total	0	235	0	0	0	235	0	0	0	0	29	0	0	313	0	0	0	313	0	0	0	0	2	0	548
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	42.9	0.0	0.0	-	42.9	0.0	0.0	0.0	0.0	-	0.0	0.0	57.1	0.0	0.0	-	57.1	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.805	0.000	0.000	-	0.805	0.000	0.000	0.000	0.000	-	0.000	0.000	0.841	0.000	0.000	-	0.841	0.000	0.000	0.000	0.000	-	0.000	0.919
Lights	0	233	0	0	-	233	0	0	0	0	-	0	0	310	0	0	-	310	0	0	0	0	-	0	543
% Lights	-	99.1	-	-	-	99.1	-	-	-	-	-	-	-	99.0	-	-	-	99.0	-	-	-	-	-	-	99.1
Buses	0	2	0	0	-	2	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	4
% Buses	-	0.9	-	-	-	0.9	-	-	-	-	-	-	-	0.6	-	-	-	0.6	-	-	-	-	-	-	0.7
Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	1
% Trucks	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.3	-	-	-	0.3	-	-	-	-	-	-	0.2
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	29	-	-	-	-	-	0	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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Count Name: Main St @ MB 11
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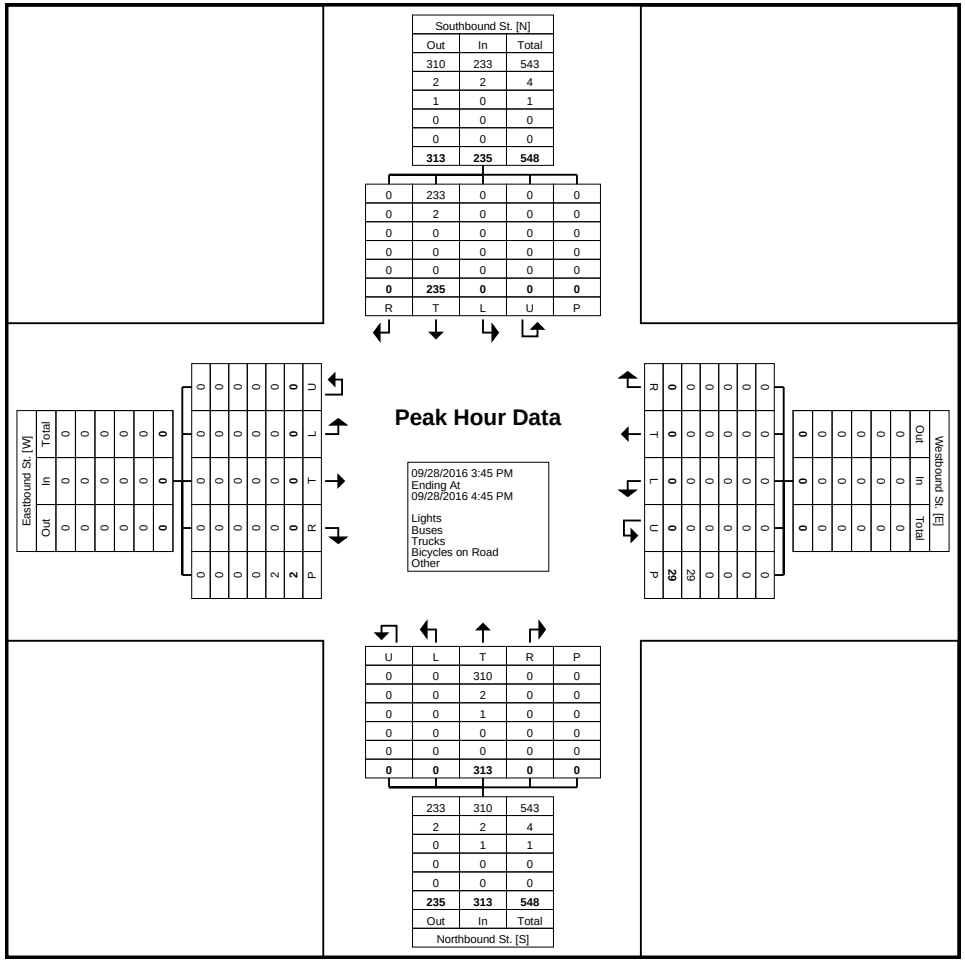
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (3:45 PM)

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Count Name: TMC - Main St @ Baldwin Hall
Site Code: 140
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound					Northbound St. Northbound					Eastbound St. Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
7:00 AM	0	34	0	0	34	34	0	0	8	34	1	0	0	4	1	69
7:15 AM	0	44	0	0	44	26	0	0	6	26	1	1	0	2	2	72
7:30 AM	1	64	0	0	65	39	1	0	14	40	0	0	0	2	0	105
7:45 AM	0	62	0	0	62	51	1	0	63	52	1	0	0	7	1	115
Hourly Total	1	204	0	0	205	150	2	0	91	152	3	1	0	15	4	361
8:00 AM	0	53	0	0	53	36	0	0	11	36	0	0	0	2	0	89
8:15 AM	1	56	0	0	57	57	1	0	18	58	2	0	0	0	2	117
8:30 AM	0	58	0	0	58	42	0	0	32	42	0	0	0	5	0	100
8:45 AM	0	50	0	0	50	38	1	0	184	39	1	0	0	34	1	90
Hourly Total	1	217	0	0	218	173	2	0	245	175	3	0	0	41	3	396
9:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
1:00 PM	0	46	0	0	46	49	0	0	121	49	0	0	0	21	0	95
1:15 PM	0	43	0	0	43	47	1	0	205	48	0	1	0	46	1	92
1:30 PM	1	28	0	0	29	57	1	0	49	58	0	1	0	17	1	88
1:45 PM	0	32	0	0	32	54	0	0	25	54	0	1	0	6	1	87
Hourly Total	1	149	0	0	150	207	2	0	400	209	0	3	0	90	3	362
2:00 PM	0	57	0	0	57	44	1	0	45	45	0	1	0	6	1	103
2:15 PM	1	43	0	1	44	56	1	0	148	57	0	0	0	54	0	101
2:30 PM	1	65	0	0	66	58	0	0	69	58	2	0	0	12	2	126
2:45 PM	0	56	0	1	56	67	1	0	35	68	1	0	0	14	1	125
Hourly Total	2	221	0	2	223	225	3	0	297	228	3	1	0	86	4	455
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	1	47	0	0	48	75	1	0	61	76	0	1	0	16	1	125
3:45 PM	2	60	0	0	62	68	1	0	49	69	2	2	0	10	4	135
Hourly Total	3	107	0	0	110	143	2	0	110	145	2	3	0	26	5	260
4:00 PM	0	73	0	0	73	74	1	0	56	75	0	1	0	9	1	149
4:15 PM	2	60	0	0	62	75	2	0	74	77	0	1	0	22	1	140
4:30 PM	1	39	0	0	40	90	2	0	54	92	1	1	0	5	2	134
4:45 PM	1	56	0	0	57	72	2	0	27	74	1	1	0	5	2	133
Hourly Total	4	228	0	0	232	311	7	0	211	318	2	4	0	41	6	556
5:00 PM	0	48	0	0	48	98	1	0	45	99	4	0	0	8	4	151
5:15 PM	0	43	0	0	43	73	0	0	49	73	1	1	0	9	2	118
5:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Grand Total	12	1219	0	2	1231	1380	19	0	1448	1399	18	13	0	316	31	2661

Approach %	1.0	99.0	0.0	-	-	98.6	1.4	0.0	-	-	58.1	41.9	0.0	-	-	-
Total %	0.5	45.8	0.0	-	46.3	51.9	0.7	0.0	-	52.6	0.7	0.5	0.0	-	1.2	-
Lights	11	1187	0	-	1198	1341	19	0	-	1360	18	12	0	-	30	2588
% Lights	91.7	97.4	-	-	97.3	97.2	100.0	-	-	97.2	100.0	92.3	-	-	96.8	97.3
Buses	0	7	0	-	7	20	0	0	-	20	0	0	0	-	0	27
% Buses	0.0	0.6	-	-	0.6	1.4	0.0	-	-	1.4	0.0	0.0	-	-	0.0	1.0
Trucks	1	24	0	-	25	18	0	0	-	18	0	1	0	-	1	44
% Trucks	8.3	2.0	-	-	2.0	1.3	0.0	-	-	1.3	0.0	7.7	-	-	3.2	1.7
Bicycles on Road	0	1	0	-	1	1	0	0	-	1	0	0	0	-	0	2
% Bicycles on Road	0.0	0.1	-	-	0.1	0.1	0.0	-	-	0.1	0.0	0.0	-	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	5	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.3	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	2	-	-	-	-	1443	-	-	-	-	316	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	99.7	-	-	-	-	100.0	-	-

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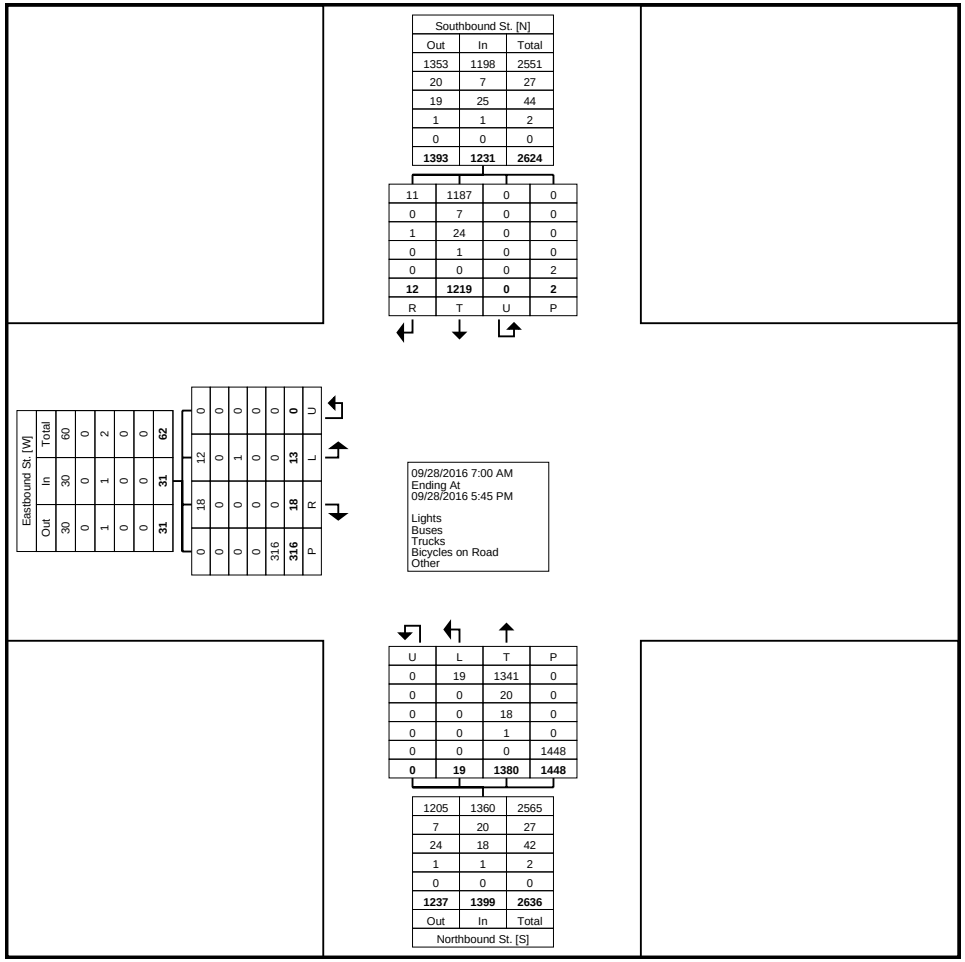

Turning Movement Data Plot

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Turning Movement Peak Hour Data (7:30 AM)

Start Time	Southbound St. Southbound					Northbound St. Northbound					Eastbound St. Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
7:30 AM	1	64	0	0	65	39	1	0	14	40	0	0	0	2	0	105
7:45 AM	0	62	0	0	62	51	1	0	63	52	1	0	0	7	1	115
8:00 AM	0	53	0	0	53	36	0	0	11	36	0	0	0	2	0	89
8:15 AM	1	56	0	0	57	57	1	0	18	58	2	0	0	0	2	117
Total	2	235	0	0	237	183	3	0	106	186	3	0	0	11	3	426
Approach %	0.8	99.2	0.0	-	-	98.4	1.6	0.0	-	-	100.0	0.0	0.0	-	-	-
Total %	0.5	55.2	0.0	-	55.6	43.0	0.7	0.0	-	43.7	0.7	0.0	0.0	-	0.7	-
PHF	0.500	0.918	0.000	-	0.912	0.803	0.750	0.000	-	0.802	0.375	0.000	0.000	-	0.375	0.910
Lights	2	228	0	-	230	177	3	0	-	180	3	0	0	-	3	413
% Lights	100.0	97.0	-	-	97.0	96.7	100.0	-	-	96.8	100.0	-	-	-	100.0	96.9
Buses	0	1	0	-	1	5	0	0	-	5	0	0	0	-	0	6
% Buses	0.0	0.4	-	-	0.4	2.7	0.0	-	-	2.7	0.0	-	-	-	0.0	1.4
Trucks	0	6	0	-	6	1	0	0	-	1	0	0	0	-	0	7
% Trucks	0.0	2.6	-	-	2.5	0.5	0.0	-	-	0.5	0.0	-	-	-	0.0	1.6
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	-	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	106	-	-	-	-	11	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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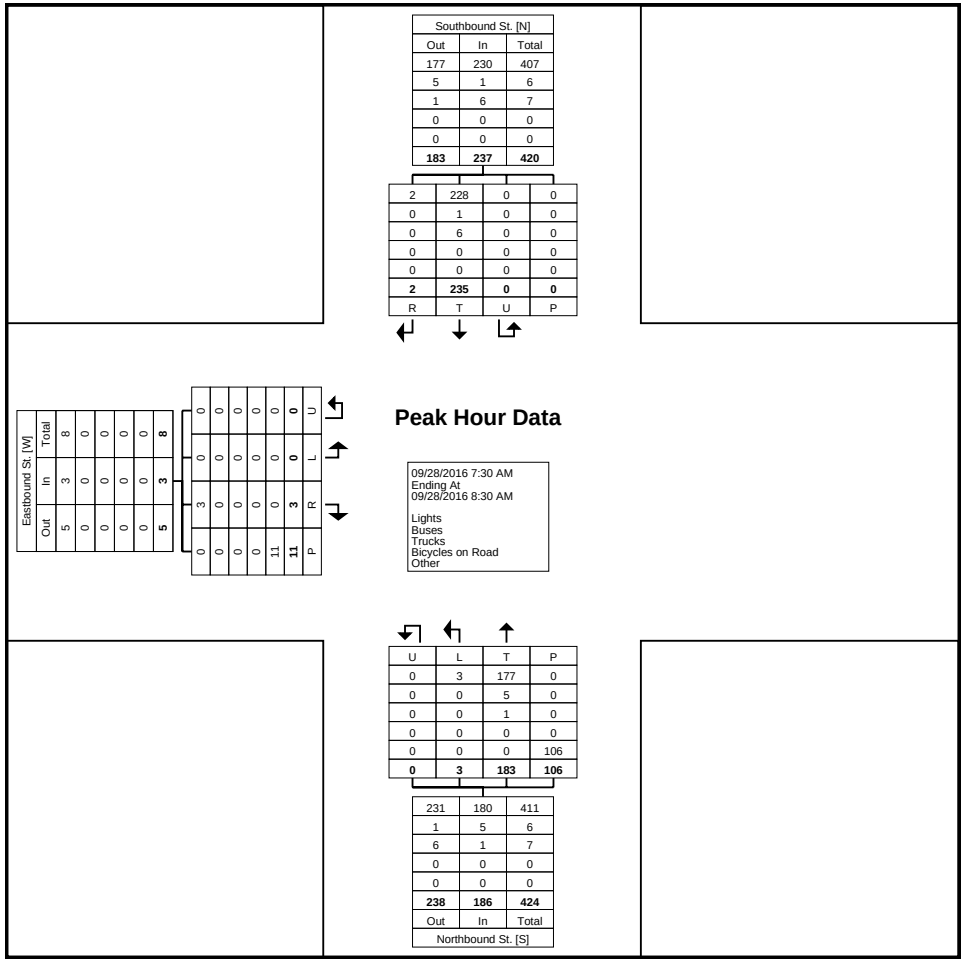
People Focused - Project Driven

Count Name: TMC - Main St @ Baldwin Hall
Site Code: 140
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (7:30 AM)

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People Focused - Project Driven

Count Name: TMC - Main St @ Baldwin Hall
Site Code: 140
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound					Northbound St. Northbound					Eastbound St. Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
2:00 PM	0	57	0	0	57	44	1	0	45	45	0	1	0	6	1	103
2:15 PM	1	43	0	1	44	56	1	0	148	57	0	0	0	54	0	101
2:30 PM	1	65	0	0	66	58	0	0	69	58	2	0	0	12	2	126
2:45 PM	0	56	0	1	56	67	1	0	35	68	1	0	0	14	1	125
Total	2	221	0	2	223	225	3	0	297	228	3	1	0	86	4	455
Approach %	0.9	99.1	0.0	-	-	98.7	1.3	0.0	-	-	75.0	25.0	0.0	-	-	-
Total %	0.4	48.6	0.0	-	49.0	49.5	0.7	0.0	-	50.1	0.7	0.2	0.0	-	0.9	-
PHF	0.500	0.850	0.000	-	0.845	0.840	0.750	0.000	-	0.838	0.375	0.250	0.000	-	0.500	0.903
Lights	2	215	0	-	217	215	3	0	-	218	3	1	0	-	4	439
% Lights	100.0	97.3	-	-	97.3	95.6	100.0	-	-	95.6	100.0	100.0	-	-	100.0	96.5
Buses	0	2	0	-	2	5	0	0	-	5	0	0	0	-	0	7
% Buses	0.0	0.9	-	-	0.9	2.2	0.0	-	-	2.2	0.0	0.0	-	-	0.0	1.5
Trucks	0	4	0	-	4	5	0	0	-	5	0	0	0	-	0	9
% Trucks	0.0	1.8	-	-	1.8	2.2	0.0	-	-	2.2	0.0	0.0	-	-	0.0	2.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	3	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	1.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	2	-	-	-	-	294	-	-	-	-	86	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	99.0	-	-	-	-	100.0	-	-

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Count Name: TMC - Main St @ Baldwin Hall
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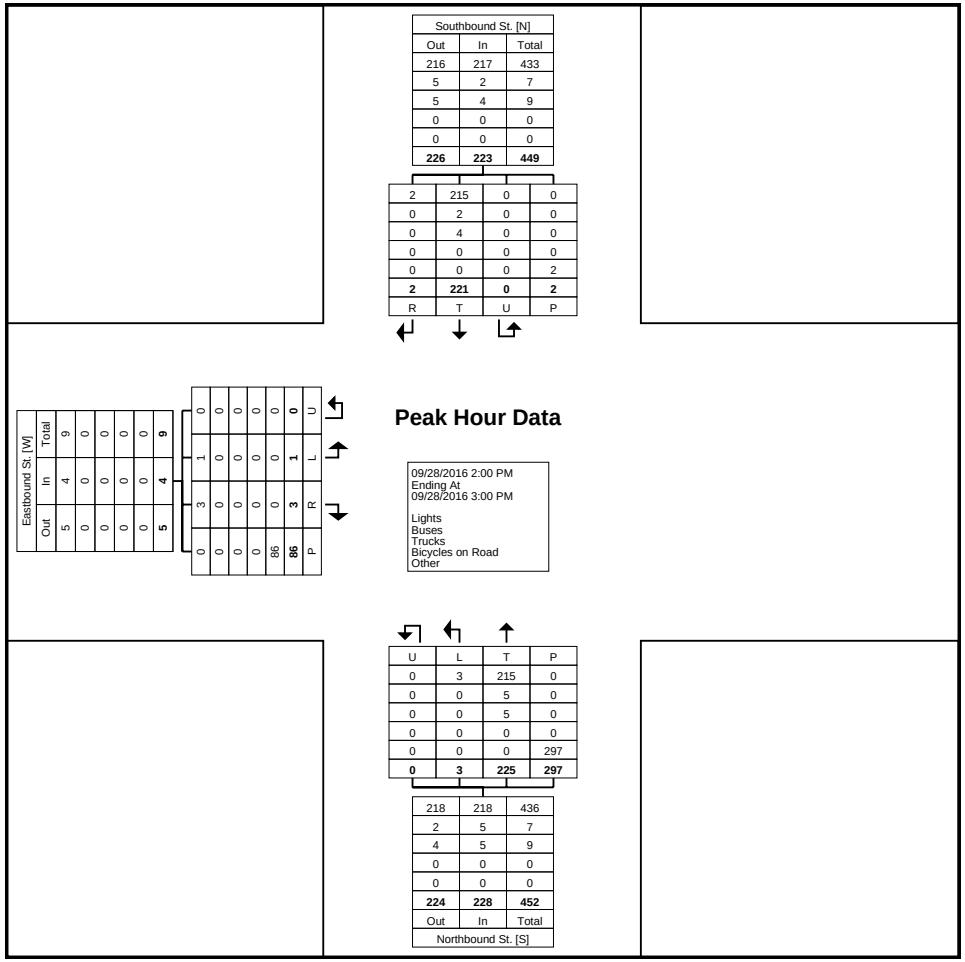

Turning Movement Peak Hour Data Plot (2:00 PM)

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Count Name: TMC - Main St @ Baldwin Hall
Site Code: 140
Start Date: 09/28/2016

Turning Movement Peak Hour Data (3:45 PM)

Start Time	Southbound St. Southbound					Northbound St. Northbound					Eastbound St. Eastbound					
	Right	Thru	U-Turn	Peds	App. Total	Thru	Left	U-Turn	Peds	App. Total	Right	Left	U-Turn	Peds	App. Total	Int. Total
3:45 PM	2	60	0	0	62	68	1	0	49	69	2	2	0	10	4	135
4:00 PM	0	73	0	0	73	74	1	0	56	75	0	1	0	9	1	149
4:15 PM	2	60	0	0	62	75	2	0	74	77	0	1	0	22	1	140
4:30 PM	1	39	0	0	40	90	2	0	54	92	1	1	0	5	2	134
Total	5	232	0	0	237	307	6	0	233	313	3	5	0	46	8	558
Approach %	2.1	97.9	0.0	-	-	98.1	1.9	0.0	-	-	37.5	62.5	0.0	-	-	-
Total %	0.9	41.6	0.0	-	42.5	55.0	1.1	0.0	-	56.1	0.5	0.9	0.0	-	1.4	-
PHF	0.625	0.795	0.000	-	0.812	0.853	0.750	0.000	-	0.851	0.375	0.625	0.000	-	0.500	0.936
Lights	5	229	0	-	234	304	6	0	-	310	3	5	0	-	8	552
% Lights	100.0	98.7	-	-	98.7	99.0	100.0	-	-	99.0	100.0	100.0	-	-	100.0	98.9
Buses	0	2	0	-	2	2	0	0	-	2	0	0	0	-	0	4
% Buses	0.0	0.9	-	-	0.8	0.7	0.0	-	-	0.6	0.0	0.0	-	-	0.0	0.7
Trucks	0	1	0	-	1	1	0	0	-	1	0	0	0	-	0	2
% Trucks	0.0	0.4	-	-	0.4	0.3	0.0	-	-	0.3	0.0	0.0	-	-	0.0	0.4
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	233	-	-	-	-	46	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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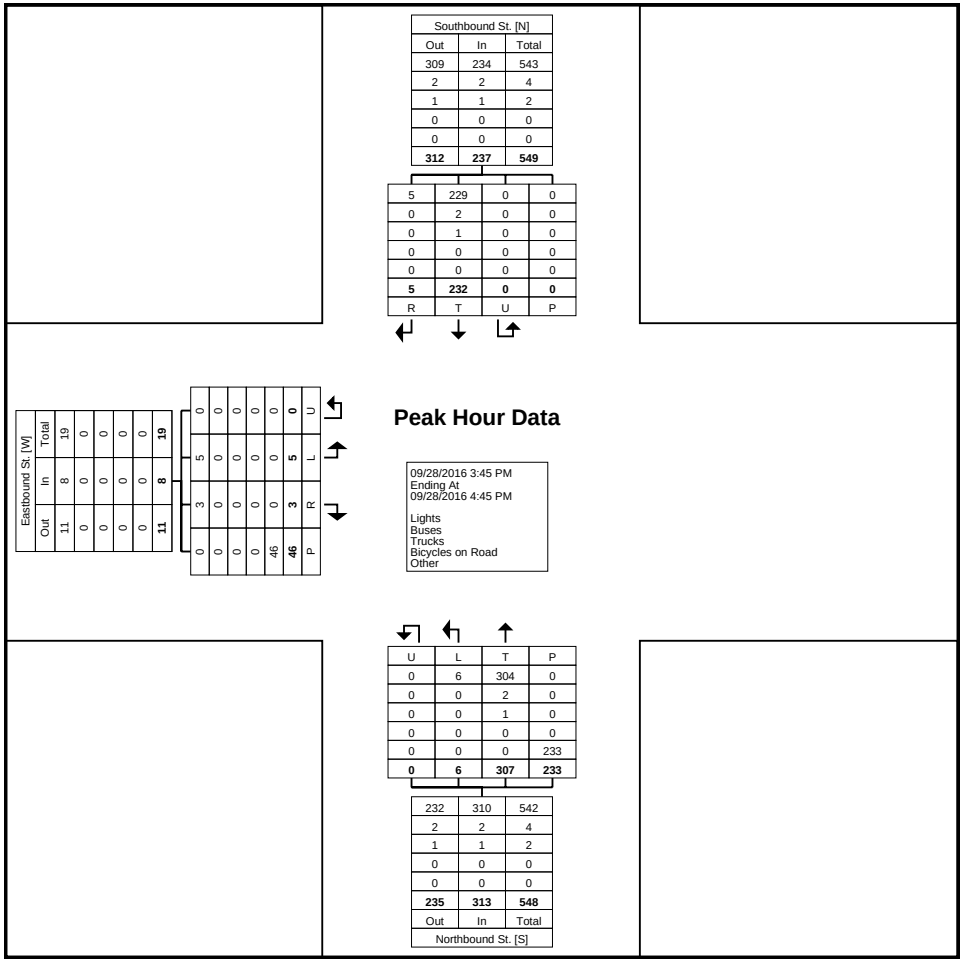

Turning Movement Peak Hour Data Plot (3:45 PM)

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Count Name: Main St @ MB 12
Site Code: 145
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:00 AM	0	28	0	0	0	28	0	0	0	0	0	0	0	33	0	0	0	33	0	0	0	0	0	0	61
7:15 AM	0	45	0	0	0	45	0	0	0	0	1	0	0	28	0	0	0	28	0	0	0	0	0	0	73
7:30 AM	0	61	0	0	0	61	0	0	0	0	1	0	0	39	0	0	0	39	0	0	0	0	0	0	100
7:45 AM	0	66	0	0	3	66	0	0	0	0	10	0	0	46	0	0	0	46	0	0	0	0	0	0	112
Hourly Total	0	200	0	0	3	200	0	0	0	0	12	0	0	146	0	0	0	146	0	0	0	0	0	0	346
8:00 AM	0	53	0	0	0	53	0	0	0	0	1	0	0	37	0	0	0	37	0	0	0	0	0	0	90
8:15 AM	0	58	0	0	0	58	0	0	0	0	1	0	0	56	0	0	0	56	0	0	0	0	0	0	114
8:30 AM	0	60	0	0	0	60	0	0	0	0	3	0	0	48	0	0	0	48	0	0	0	0	0	0	108
8:45 AM	0	49	0	0	8	49	0	0	0	0	20	0	0	34	0	0	2	34	0	0	0	0	0	0	83
Hourly Total	0	220	0	0	8	220	0	0	0	0	25	0	0	175	0	0	2	175	0	0	0	0	0	0	395
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	42	0	0	5	42	0	0	0	0	13	0	0	54	0	0	0	54	0	0	0	0	0	0	96
1:15 PM	0	47	0	0	8	47	0	0	0	0	16	0	0	49	0	0	2	49	0	0	0	0	0	0	96
1:30 PM	0	27	0	0	3	27	0	0	0	0	2	0	0	59	0	0	0	59	0	0	0	0	0	0	86
1:45 PM	0	31	0	0	1	31	0	0	0	0	2	0	0	54	0	0	0	54	0	0	0	0	0	0	85
Hourly Total	0	147	0	0	17	147	0	0	0	0	33	0	0	216	0	0	2	216	0	0	0	0	0	0	363
2:00 PM	0	56	0	0	1	56	0	0	0	0	0	0	0	41	0	0	0	41	0	0	0	0	0	0	97
2:15 PM	0	43	0	0	8	43	0	0	0	0	15	0	0	57	0	0	5	57	0	0	0	0	0	0	100
2:30 PM	0	76	0	0	2	76	0	0	0	0	2	0	0	59	0	0	0	59	0	0	0	0	0	0	135
2:45 PM	0	57	0	0	2	57	0	0	0	0	10	0	0	67	0	0	0	67	0	0	0	0	0	0	124
Hourly Total	0	232	0	0	13	232	0	0	0	0	27	0	0	224	0	0	5	224	0	0	0	0	0	0	456
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	0	47	0	0	4	47	0	0	0	0	0	0	0	75	0	0	4	75	0	0	0	0	0	0	122
3:45 PM	0	61	0	0	5	61	0	0	0	0	4	0	0	72	0	0	4	72	0	0	0	0	0	0	133
Hourly Total	0	108	0	0	9	108	0	0	0	0	4	0	0	147	0	0	8	147	0	0	0	0	0	0	255
4:00 PM	0	70	0	0	0	70	0	0	0	0	2	0	0	77	0	0	0	77	0	0	0	0	0	0	147
4:15 PM	0	59	0	0	3	59	0	0	0	0	4	0	0	75	0	0	0	75	0	0	0	0	0	0	134
4:30 PM	0	41	0	0	2	41	0	0	0	0	8	0	0	87	0	0	0	87	0	0	0	0	1	0	128
4:45 PM	0	58	0	0	2	58	0	0	0	0	1	0	0	76	0	0	0	76	0	0	0	0	2	0	134
Hourly Total	0	228	0	0	7	228	0	0	0	0	15	0	0	315	0	0	0	315	0	0	0	0	3	0	543
5:00 PM	0	48	0	0	0	48	0	0	1	0	3	1	0	97	0	0	0	97	0	0	0	0	1	0	146
5:15 PM	0	41	0	0	3	41	0	0	0	0	4	0	0	78	0	0	0	78	0	0	0	0	2	0	119
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Grand Total	0	1224	0	0	60	1224	0	0	1	0	123	1	0	1398	0	0	17	1398	0	0	0	0	6	0	2623
Approach %	0.0	100.0	0.0	0.0	-	-	0.0	0.0	100.0	0.0	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	46.7	0.0	0.0	-	46.7	0.0	0.0	0.0	0.0	-	0.0	0.0	53.3	0.0	0.0	-	53.3	0.0	0.0	0.0	0.0	-	0.0	-
Lights	0	1192	0	0	-	1192	0	0	0	0	-	0	0	1357	0	0	-	1357	0	0	0	0	-	0	2549
% Lights	-	97.4	-	-	-	97.4	-	-	0.0	-	-	0.0	-	97.1	-	-	-	97.1	-	-	-	-	-	-	97.2
Buses	0	7	0	0	-	7	0	0	0	0	-	0	0	19	0	0	-	19	0	0	0	0	-	0	26
% Buses	-	0.6	-	-	-	0.6	-	-	0.0	-	-	0.0	-	1.4	-	-	-	1.4	-	-	-	-	-	-	1.0
Trucks	0	25	0	0	-	25	0	0	0	0	-	0	0	21	0	0	-	21	0	0	0	0	-	0	46
% Trucks	-	2.0	-	-	-	2.0	-	-	0.0	-	-	0.0	-	1.5	-	-	-	1.5	-	-	-	-	-	-	1.8
Bicycles on Road	0	0	0	0	-	0	0	0	1	0	-	1	0	1	0	0	-	1	0	0	0	0	-	0	2
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	100.0	-	-	100.0	-	0.1	-	-	-	0.1	-	-	-	-	-	-	0.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	60	-	-	-	-	-	123	-	-	-	-	-	17	-	-	-	-	-	6	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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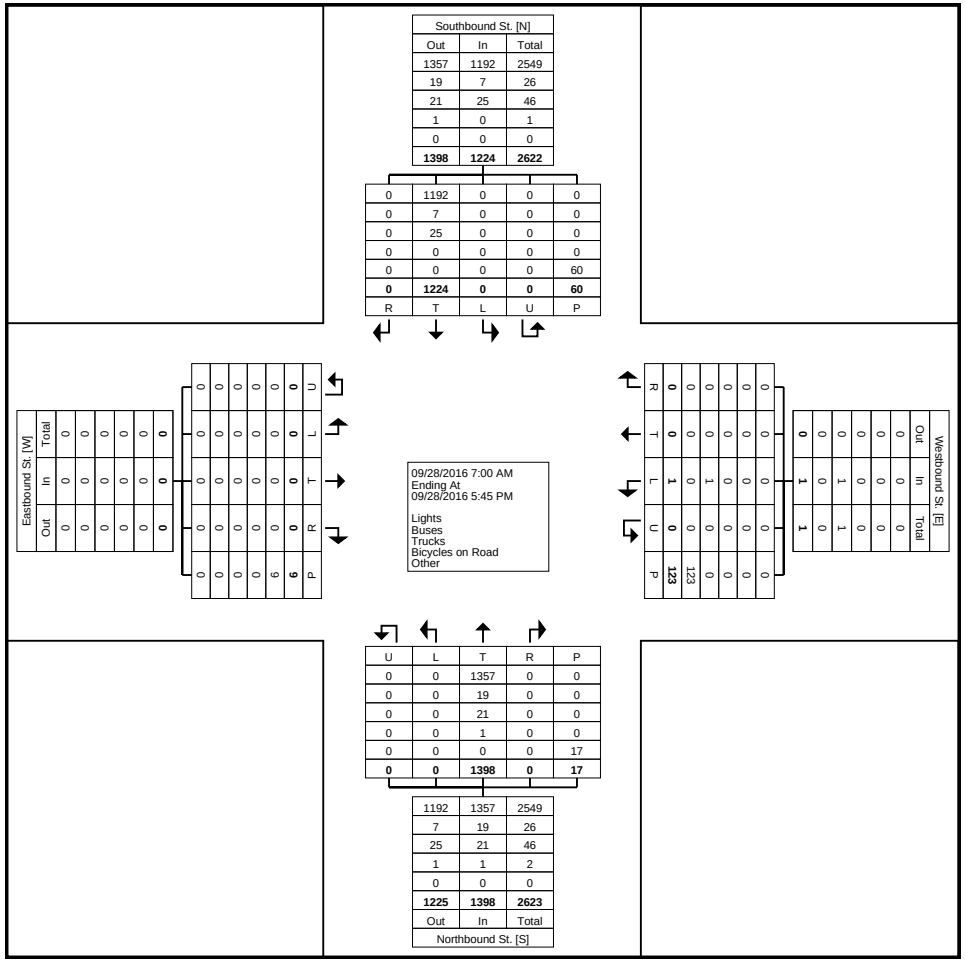
Count Name: Main St @ MB 12
Site Code: 145
Start Date: 09/28/2016



Turning Movement Data Plot

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Site Code: 145
Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
7:45 AM	0	66	0	0	3	66	0	0	0	0	10	0	0	46	0	0	0	46	0	0	0	0	0	0	112
8:00 AM	0	53	0	0	0	53	0	0	0	0	1	0	0	37	0	0	0	37	0	0	0	0	0	0	90
8:15 AM	0	58	0	0	0	58	0	0	0	0	1	0	0	56	0	0	0	56	0	0	0	0	0	0	114
8:30 AM	0	60	0	0	0	60	0	0	0	0	3	0	0	48	0	0	0	48	0	0	0	0	0	0	108
Total	0	237	0	0	3	237	0	0	0	0	15	0	0	187	0	0	0	187	0	0	0	0	0	0	424
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	55.9	0.0	0.0	-	55.9	0.0	0.0	0.0	0.0	-	0.0	0.0	44.1	0.0	0.0	-	44.1	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.898	0.000	0.000	-	0.898	0.000	0.000	0.000	0.000	-	0.000	0.000	0.835	0.000	0.000	-	0.835	0.000	0.000	0.000	0.000	-	0.000	0.930
Lights	0	231	0	0	-	231	0	0	0	0	-	0	0	179	0	0	-	179	0	0	0	0	-	0	410
% Lights	-	97.5	-	-	-	97.5	-	-	-	-	-	-	-	95.7	-	-	-	95.7	-	-	-	-	-	-	96.7
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	4	0	0	-	4	0	0	0	0	-	0	4
% Buses	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	2.1	-	-	-	2.1	-	-	-	-	-	-	0.9
Trucks	0	6	0	0	-	6	0	0	0	0	-	0	0	4	0	0	-	4	0	0	0	0	-	0	10
% Trucks	-	2.5	-	-	-	2.5	-	-	-	-	-	-	-	2.1	-	-	-	2.1	-	-	-	-	-	-	2.4
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	3	-	-	-	-	-	15	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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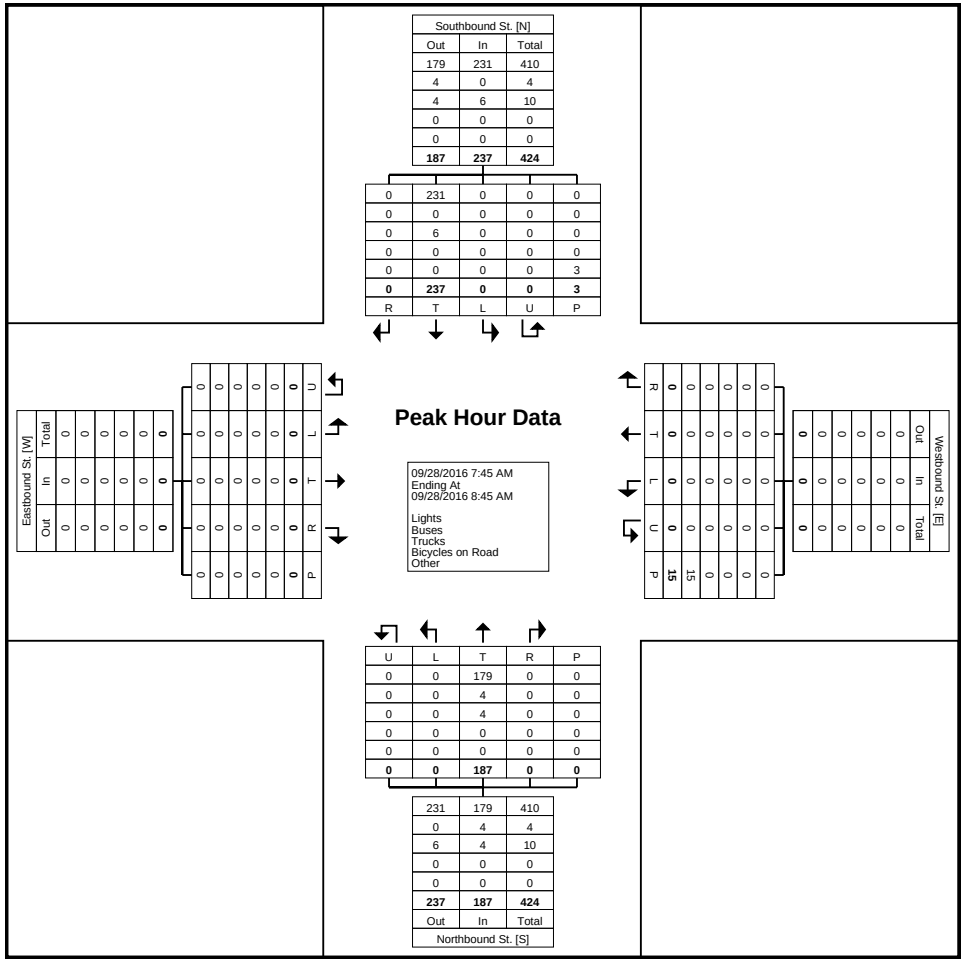
Site Code: 145
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (7:45 AM)

Whitman, Requardt, and Associates, LLP
2009 MacKenzie Way
Suite 240
Cranberry Twp, Pennsylvania, United States 16066
724-779-7940 lweimer@wrallp.com
People Focused - Project Driven

Count Name: Main St @ MB 12
Site Code: 145
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
2:00 PM	0	56	0	0	1	56	0	0	0	0	0	0	0	41	0	0	0	41	0	0	0	0	0	0	97
2:15 PM	0	43	0	0	8	43	0	0	0	0	15	0	0	57	0	0	5	57	0	0	0	0	0	0	100
2:30 PM	0	76	0	0	2	76	0	0	0	0	2	0	0	59	0	0	0	59	0	0	0	0	0	0	135
2:45 PM	0	57	0	0	2	57	0	0	0	0	10	0	0	67	0	0	0	67	0	0	0	0	0	0	124
Total	0	232	0	0	13	232	0	0	0	0	27	0	0	224	0	0	5	224	0	0	0	0	0	0	456
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	50.9	0.0	0.0	-	50.9	0.0	0.0	0.0	0.0	-	0.0	0.0	49.1	0.0	0.0	-	49.1	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.763	0.000	0.000	-	0.763	0.000	0.000	0.000	0.000	-	0.000	0.000	0.836	0.000	0.000	-	0.836	0.000	0.000	0.000	0.000	-	0.000	0.844
Lights	0	226	0	0	-	226	0	0	0	0	-	0	0	215	0	0	-	215	0	0	0	0	-	0	441
% Lights	-	97.4	-	-	-	97.4	-	-	-	-	-	-	-	96.0	-	-	-	96.0	-	-	-	-	-	-	96.7
Buses	0	2	0	0	-	2	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	7
% Buses	-	0.9	-	-	-	0.9	-	-	-	-	-	-	-	2.2	-	-	-	2.2	-	-	-	-	-	-	1.5
Trucks	0	4	0	0	-	4	0	0	0	0	-	0	0	4	0	0	-	4	0	0	0	0	-	0	8
% Trucks	-	1.7	-	-	-	1.7	-	-	-	-	-	-	-	1.8	-	-	-	1.8	-	-	-	-	-	-	1.8
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	13	-	-	-	-	-	27	-	-	-	-	-	5	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-

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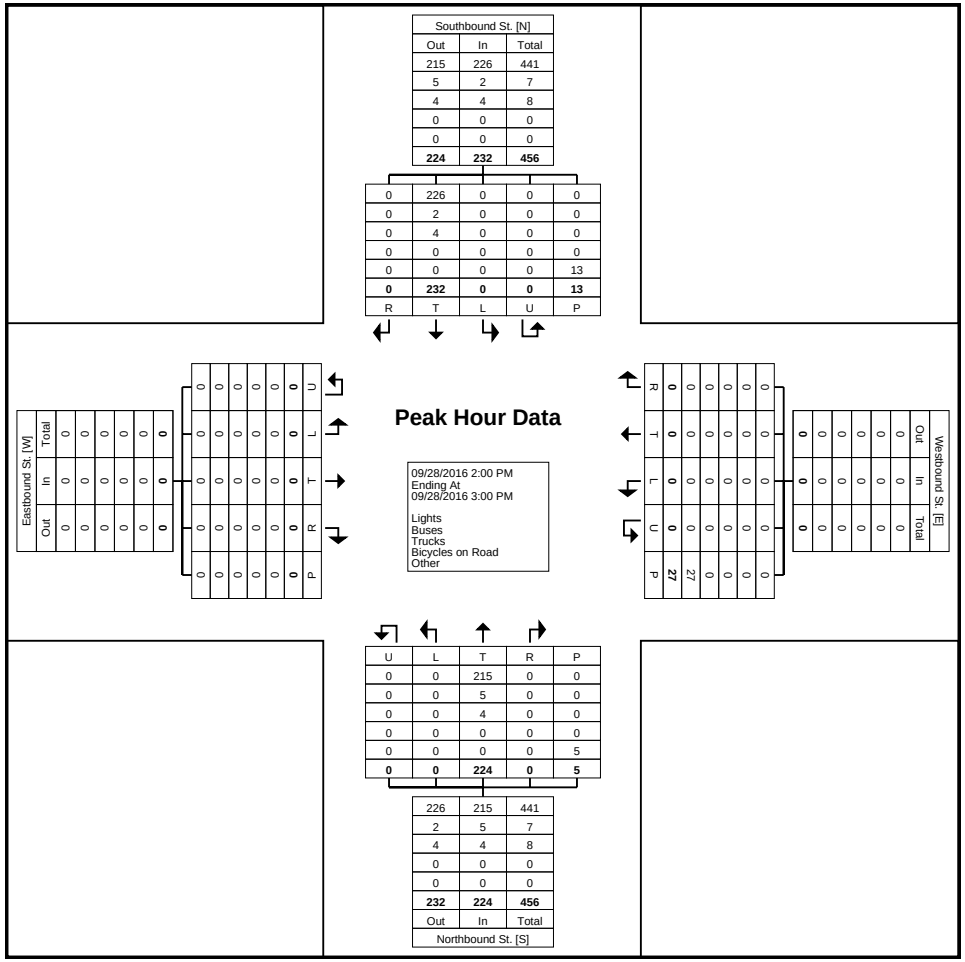

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Site Code: 145
Start Date: 09/28/2016

Turning Movement Peak Hour Data (4:00 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
4:00 PM	0	70	0	0	0	70	0	0	0	0	2	0	0	77	0	0	0	77	0	0	0	0	0	0	147
4:15 PM	0	59	0	0	3	59	0	0	0	0	4	0	0	75	0	0	0	75	0	0	0	0	0	0	134
4:30 PM	0	41	0	0	2	41	0	0	0	0	8	0	0	87	0	0	0	87	0	0	0	0	1	0	128
4:45 PM	0	58	0	0	2	58	0	0	0	0	1	0	0	76	0	0	0	76	0	0	0	0	2	0	134
Total	0	228	0	0	7	228	0	0	0	0	15	0	0	315	0	0	0	315	0	0	0	0	3	0	543
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	42.0	0.0	0.0	-	42.0	0.0	0.0	0.0	0.0	-	0.0	0.0	58.0	0.0	0.0	-	58.0	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.814	0.000	0.000	-	0.814	0.000	0.000	0.000	0.000	-	0.000	0.000	0.905	0.000	0.000	-	0.905	0.000	0.000	0.000	0.000	-	0.000	0.923
Lights	0	226	0	0	-	226	0	0	0	0	-	0	0	312	0	0	-	312	0	0	0	0	-	0	538
% Lights	-	99.1	-	-	-	99.1	-	-	-	-	-	-	-	99.0	-	-	-	99.0	-	-	-	-	-	-	99.1
Buses	0	1	0	0	-	1	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	3
% Buses	-	0.4	-	-	-	0.4	-	-	-	-	-	-	-	0.6	-	-	-	0.6	-	-	-	-	-	-	0.6
Trucks	0	1	0	0	-	1	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	2
% Trucks	-	0.4	-	-	-	0.4	-	-	-	-	-	-	-	0.3	-	-	-	0.3	-	-	-	-	-	-	0.4
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	7	-	-	-	-	-	15	-	-	-	-	-	0	-	-	-	-	-	3	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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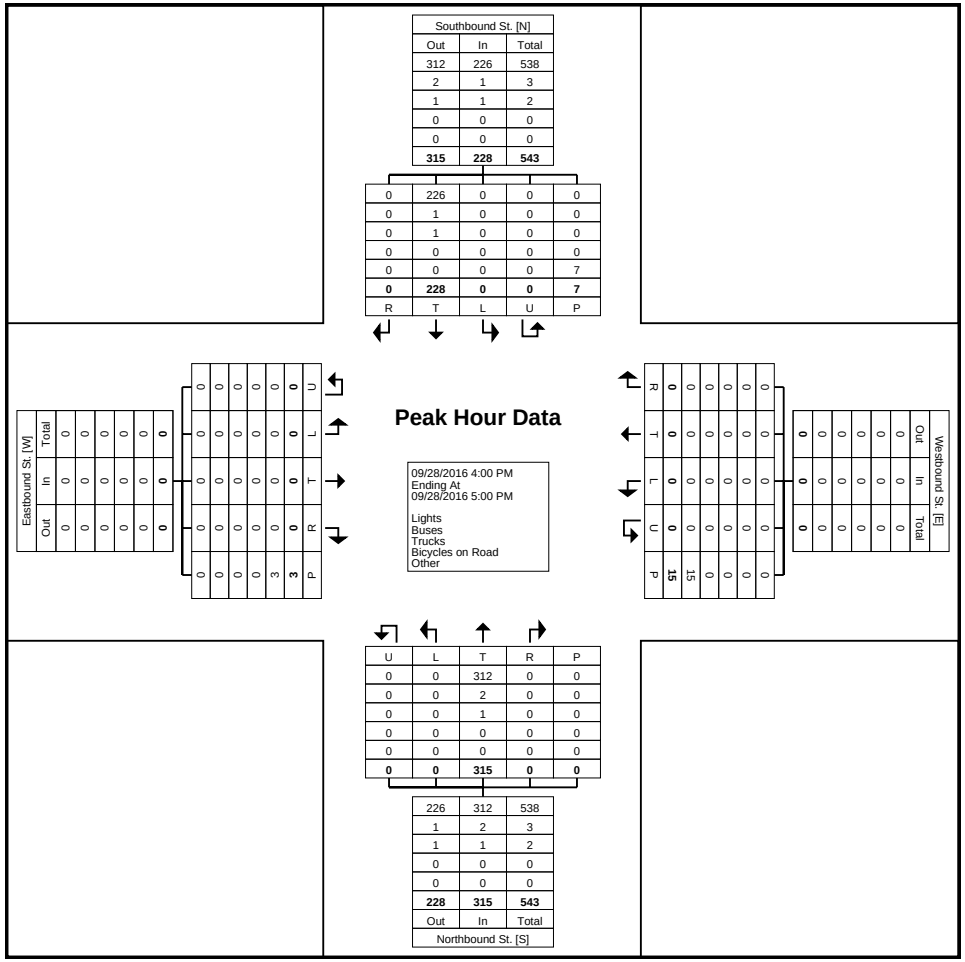

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Count Name: TMC - Main St @ E Jogn St
Site Code: 150
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
7:00 AM	0	35	3	0	3	38	1	1	0	0	1	2	0	31	2	0	0	33	0	0	1	0	0	1	74
7:15 AM	0	45	2	0	1	47	1	1	0	0	0	2	3	24	0	0	1	27	0	1	2	0	1	3	79
7:30 AM	0	59	1	0	1	60	1	3	3	0	1	7	4	32	2	0	3	38	1	0	0	0	1	1	106
7:45 AM	4	60	2	0	23	66	0	0	0	0	5	0	0	49	3	0	3	52	2	0	0	0	9	2	120
Hourly Total	4	199	8	0	28	211	3	5	3	0	7	11	7	136	7	0	7	150	3	1	3	0	11	7	379
8:00 AM	1	52	3	0	5	56	0	0	1	0	1	1	2	29	5	0	1	36	0	0	0	0	1	0	93
8:15 AM	1	57	3	0	4	61	1	1	0	0	1	2	2	46	8	0	1	56	3	0	0	0	0	3	122
8:30 AM	0	51	4	0	7	55	2	1	1	0	3	4	6	33	4	0	5	43	4	1	0	0	4	5	107
8:45 AM	0	48	3	0	73	51	3	1	0	0	14	4	3	32	3	0	21	38	2	0	0	0	32	2	95
Hourly Total	2	208	13	0	89	223	6	3	2	0	19	11	13	140	20	0	28	173	9	1	0	0	37	10	417
9:00 AM	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00 PM	0	42	3	0	10	45	3	1	2	0	4	6	8	41	0	0	6	49	1	1	1	0	10	3	103
1:15 PM	1	41	1	0	69	43	0	0	3	0	11	3	2	44	2	0	12	48	1	0	0	0	32	1	95
1:30 PM	0	26	4	0	6	30	6	1	1	0	0	8	5	52	1	0	1	58	2	0	0	0	4	2	98
1:45 PM	1	29	3	0	2	33	0	0	2	0	1	2	1	55	0	0	2	56	4	0	1	0	0	5	96
Hourly Total	2	138	11	0	87	151	9	2	8	0	16	19	16	192	3	0	21	211	8	1	2	0	46	11	392
2:00 PM	1	47	1	0	8	49	4	0	5	0	0	9	2	40	2	0	1	44	2	1	0	0	3	3	105
2:15 PM	0	45	3	0	25	48	4	0	4	0	8	8	3	52	1	0	22	56	1	2	0	0	41	3	115
2:30 PM	0	58	0	0	10	58	4	1	5	0	1	10	2	56	1	0	2	59	1	2	2	0	7	5	132
2:45 PM	0	55	2	0	19	57	3	0	2	0	3	5	6	58	1	0	17	65	2	0	0	0	10	2	129
Hourly Total	1	205	6	0	62	212	15	1	16	0	12	32	13	206	5	0	42	224	6	5	2	0	61	13	481
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	0	43	3	0	8	46	10	0	6	0	1	16	2	74	1	0	4	77	1	0	0	0	10	1	140
3:45 PM	0	51	2	0	9	53	4	0	8	0	3	12	4	66	0	0	4	70	3	0	1	0	6	4	139
Hourly Total	0	94	5	0	17	99	14	0	14	0	4	28	6	140	1	0	8	147	4	0	1	0	16	5	279
4:00 PM	0	64	1	0	11	65	8	1	6	0	0	15	3	70	2	0	4	75	3	0	0	0	3	3	158
4:15 PM	0	53	2	0	15	55	8	1	4	0	3	13	3	72	0	0	2	75	2	2	0	0	14	4	147
4:30 PM	1	36	1	0	5	38	10	0	4	0	3	14	3	89	0	0	5	92	3	0	1	0	1	4	148
4:45 PM	1	49	5	0	9	55	4	0	3	0	1	7	1	70	0	0	4	71	2	1	0	0	2	3	136
Hourly Total	2	202	9	0	40	213	30	2	17	0	7	49	10	301	2	0	15	313	10	3	1	0	20	14	589
5:00 PM	0	40	0	0	9	40	5	0	6	0	3	11	1	97	1	0	7	99	3	0	5	0	2	8	158
5:15 PM	1	38	0	0	9	39	4	0	1	0	4	5	1	72	1	0	2	74	4	0	1	0	1	5	123
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Grand Total	12	1124	52	0	342	1188	86	13	67	0	72	166	67	1284	40	0	130	1391	47	11	15	0	194	73	2818
Approach %	1.0	94.6	4.4	0.0	-	-	51.8	7.8	40.4	0.0	-	-	4.8	92.3	2.9	0.0	-	-	64.4	15.1	20.5	0.0	-	-	-
Total %	0.4	39.9	1.8	0.0	-	42.2	3.1	0.5	2.4	0.0	-	5.9	2.4	45.6	1.4	0.0	-	49.4	1.7	0.4	0.5	0.0	-	2.6	-
Lights	11	1093	51	0	-	1155	84	13	64	0	-	161	66	1243	39	0	-	1348	45	11	15	0	-	71	2735
% Lights	91.7	97.2	98.1	-	-	97.2	97.7	100.0	95.5	-	-	97.0	98.5	96.8	97.5	-	-	96.9	95.7	100.0	100.0	-	-	97.3	97.1
Buses	0	6	0	0	-	6	0	0	2	0	-	2	0	20	0	0	-	20	0	0	0	0	-	0	28
% Buses	0.0	0.5	0.0	-	-	0.5	0.0	0.0	3.0	-	-	1.2	0.0	1.6	0.0	-	-	1.4	0.0	0.0	0.0	-	-	0.0	1.0
Trucks	1	25	1	0	-	27	2	0	1	0	-	3	1	21	1	0	-	23	2	0	0	0	-	2	55
% Trucks	8.3	2.2	1.9	-	-	2.3	2.3	0.0	1.5	-	-	1.8	1.5	1.6	2.5	-	-	1.7	4.3	0.0	0.0	-	-	2.7	2.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	1.4	-	-	-	-	-	0.8	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	342	-	-	-	-	-	71	-	-	-	-	-	129	-	-	-	-	-	194	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	98.6	-	-	-	-	-	99.2	-	-	-	-	-	100.0	-	-

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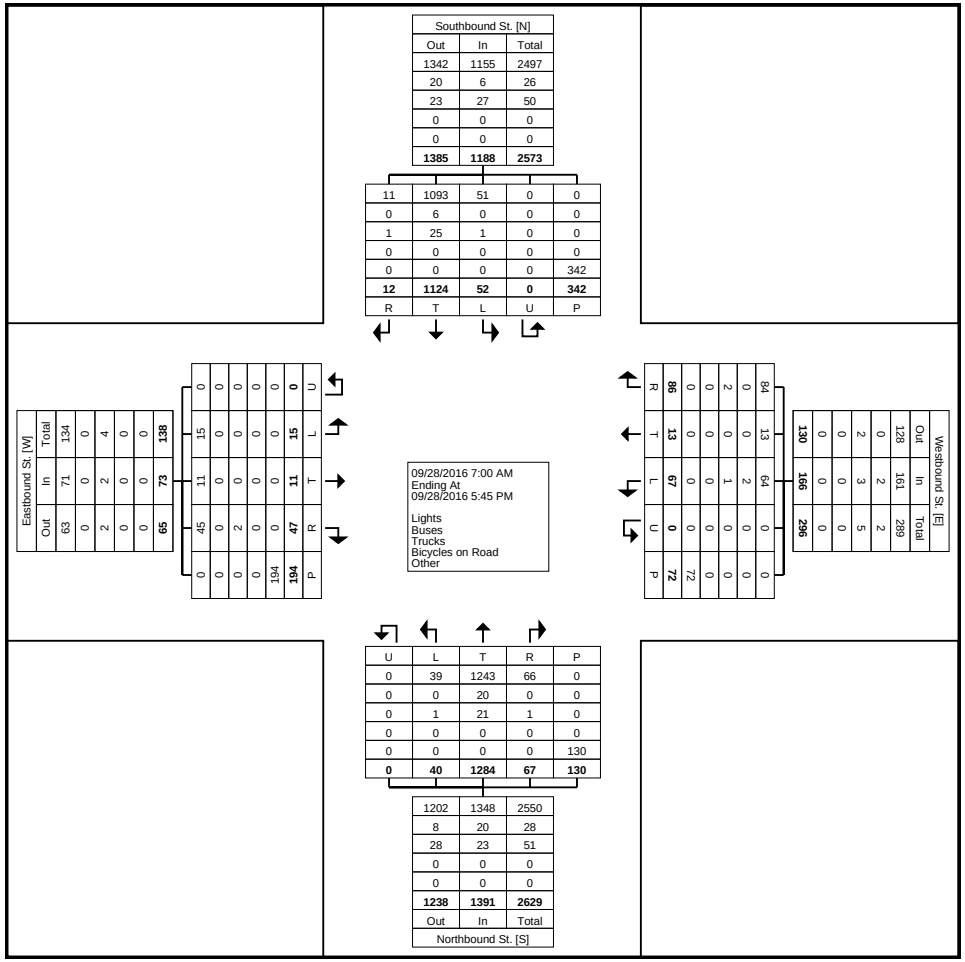

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Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:45 AM	4	60	2	0	23	66	0	0	0	0	5	0	0	49	3	0	3	52	2	0	0	0	9	2	120
8:00 AM	1	52	3	0	5	56	0	0	1	0	1	1	2	29	5	0	1	36	0	0	0	0	1	0	93
8:15 AM	1	57	3	0	4	61	1	1	0	0	1	2	2	46	8	0	1	56	3	0	0	0	0	3	122
8:30 AM	0	51	4	0	7	55	2	1	1	0	3	4	6	33	4	0	5	43	4	1	0	0	4	5	107
Total	6	220	12	0	39	238	3	2	2	0	10	7	10	157	20	0	10	187	9	1	0	0	14	10	442
Approach %	2.5	92.4	5.0	0.0	-	-	42.9	28.6	28.6	0.0	-	-	5.3	84.0	10.7	0.0	-	-	90.0	10.0	0.0	0.0	-	-	-
Total %	1.4	49.8	2.7	0.0	-	53.8	0.7	0.5	0.5	0.0	-	1.6	2.3	35.5	4.5	0.0	-	42.3	2.0	0.2	0.0	0.0	-	2.3	-
PHF	0.375	0.917	0.750	0.000	-	0.902	0.375	0.500	0.500	0.000	-	0.438	0.417	0.801	0.625	0.000	-	0.835	0.563	0.250	0.000	0.000	-	0.500	0.906
Lights	6	213	12	0	-	231	2	2	1	0	-	5	10	148	20	0	-	178	9	1	0	0	-	10	424
% Lights	100.0	96.8	100.0	-	-	97.1	66.7	100.0	50.0	-	-	71.4	100.0	94.3	100.0	-	-	95.2	100.0	100.0	-	-	-	100.0	95.9
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	5
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	3.2	0.0	-	-	2.7	0.0	0.0	-	-	-	0.0	1.1
Trucks	0	7	0	0	-	7	1	0	1	0	-	2	0	4	0	0	-	4	0	0	0	0	-	0	13
% Trucks	0.0	3.2	0.0	-	-	2.9	33.3	0.0	50.0	-	-	28.6	0.0	2.5	0.0	-	-	2.1	0.0	0.0	-	-	-	0.0	2.9
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	10.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	39	-	-	-	-	-	9	-	-	-	-	-	10	-	-	-	-	-	14	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	90.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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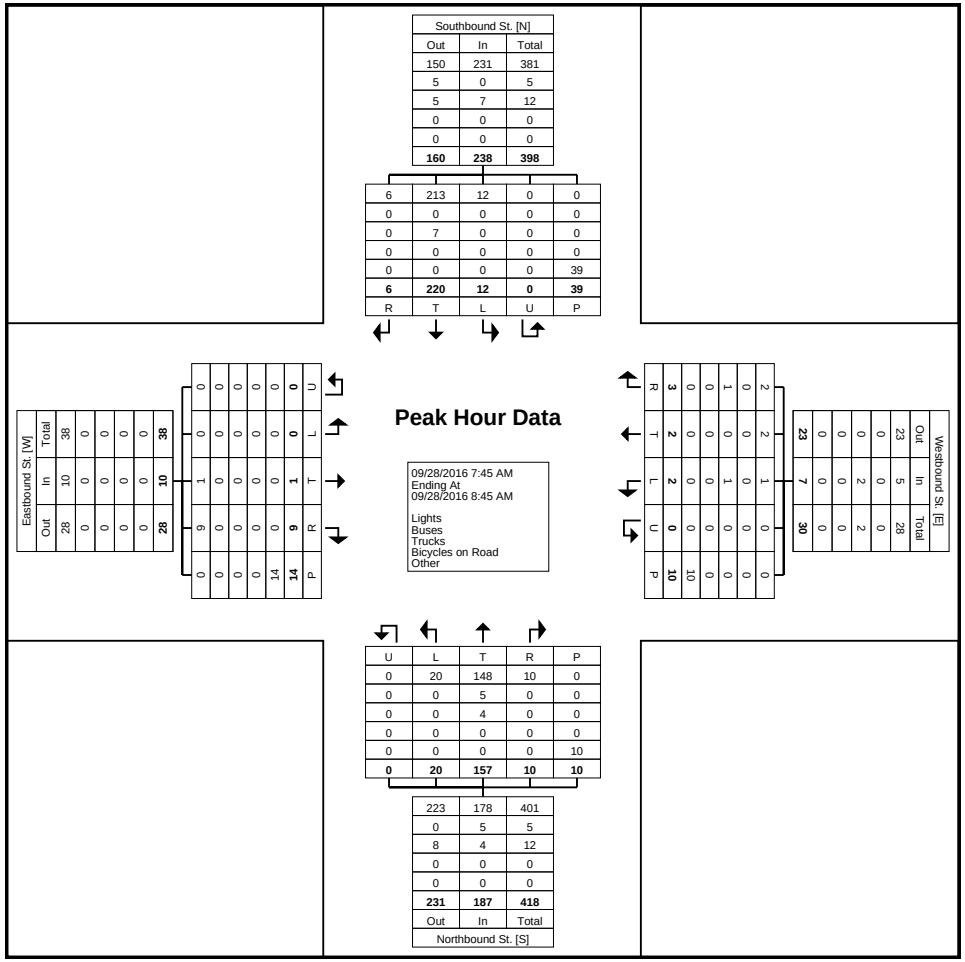
Count Name: TMC - Main St @ E Jogn St
Site Code: 150
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (7:45 AM)

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Count Name: TMC - Main St @ E Jogn St
Site Code: 150
Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
2:00 PM	1	47	1	0	8	49	4	0	5	0	0	9	2	40	2	0	1	44	2	1	0	0	3	3	105
2:15 PM	0	45	3	0	25	48	4	0	4	0	8	8	3	52	1	0	22	56	1	2	0	0	41	3	115
2:30 PM	0	58	0	0	10	58	4	1	5	0	1	10	2	56	1	0	2	59	1	2	2	0	7	5	132
2:45 PM	0	55	2	0	19	57	3	0	2	0	3	5	6	58	1	0	17	65	2	0	0	0	10	2	129
Total	1	205	6	0	62	212	15	1	16	0	12	32	13	206	5	0	42	224	6	5	2	0	61	13	481
Approach %	0.5	96.7	2.8	0.0	-	-	46.9	3.1	50.0	0.0	-	-	5.8	92.0	2.2	0.0	-	-	46.2	38.5	15.4	0.0	-	-	-
Total %	0.2	42.6	1.2	0.0	-	44.1	3.1	0.2	3.3	0.0	-	6.7	2.7	42.8	1.0	0.0	-	46.6	1.2	1.0	0.4	0.0	-	2.7	-
PHF	0.250	0.884	0.500	0.000	-	0.914	0.938	0.250	0.800	0.000	-	0.800	0.542	0.888	0.625	0.000	-	0.862	0.750	0.625	0.250	0.000	-	0.650	0.911
Lights	1	198	5	0	-	204	15	1	16	0	-	32	13	195	5	0	-	213	6	5	2	0	-	13	462
% Lights	100.0	96.6	83.3	-	-	96.2	100.0	100.0	100.0	-	-	100.0	100.0	94.7	100.0	-	-	95.1	100.0	100.0	100.0	-	-	100.0	96.0
Buses	0	3	0	0	-	3	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	8
% Buses	0.0	1.5	0.0	-	-	1.4	0.0	0.0	0.0	-	-	0.0	0.0	2.4	0.0	-	-	2.2	0.0	0.0	0.0	-	-	0.0	1.7
Trucks	0	4	1	0	-	5	0	0	0	0	-	0	0	6	0	0	-	6	0	0	0	0	-	0	11
% Trucks	0.0	2.0	16.7	-	-	2.4	0.0	0.0	0.0	-	-	0.0	0.0	2.9	0.0	-	-	2.7	0.0	0.0	0.0	-	-	0.0	2.3
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	62	-	-	-	-	-	12	-	-	-	-	-	42	-	-	-	-	-	61	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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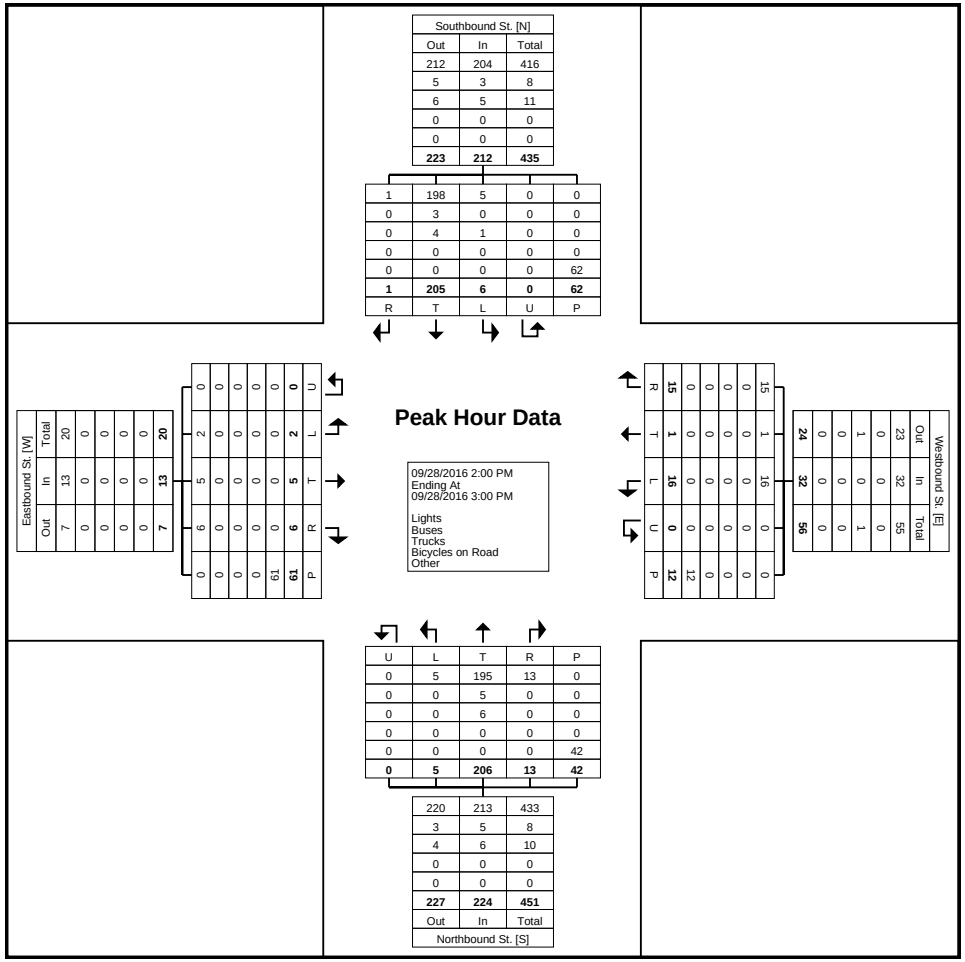
Start Date: 09/28/2016



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Count Name: TMC - Main St @ E Jogn St
Site Code: 150
Start Date: 09/28/2016

Turning Movement Peak Hour Data (3:45 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
3:45 PM	0	51	2	0	9	53	4	0	8	0	3	12	4	66	0	0	4	70	3	0	1	0	6	4	139
4:00 PM	0	64	1	0	11	65	8	1	6	0	0	15	3	70	2	0	4	75	3	0	0	0	3	3	158
4:15 PM	0	53	2	0	15	55	8	1	4	0	3	13	3	72	0	0	2	75	2	2	0	0	14	4	147
4:30 PM	1	36	1	0	5	38	10	0	4	0	3	14	3	89	0	0	5	92	3	0	1	0	1	4	148
Total	1	204	6	0	40	211	30	2	22	0	9	54	13	297	2	0	15	312	11	2	2	0	24	15	592
Approach %	0.5	96.7	2.8	0.0	-	-	55.6	3.7	40.7	0.0	-	-	4.2	95.2	0.6	0.0	-	-	73.3	13.3	13.3	0.0	-	-	-
Total %	0.2	34.5	1.0	0.0	-	35.6	5.1	0.3	3.7	0.0	-	9.1	2.2	50.2	0.3	0.0	-	52.7	1.9	0.3	0.3	0.0	-	2.5	-
PHF	0.250	0.797	0.750	0.000	-	0.812	0.750	0.500	0.688	0.000	-	0.900	0.813	0.834	0.250	0.000	-	0.848	0.917	0.250	0.500	0.000	-	0.938	0.937
Lights	1	202	6	0	-	209	30	2	21	0	-	53	13	293	2	0	-	308	11	2	2	0	-	15	585
% Lights	100.0	99.0	100.0	-	-	99.1	100.0	100.0	95.5	-	-	98.1	100.0	98.7	100.0	-	-	98.7	100.0	100.0	100.0	-	-	100.0	98.8
Buses	0	1	0	0	-	1	0	0	1	0	-	1	0	2	0	0	-	2	0	0	0	0	-	0	4
% Buses	0.0	0.5	0.0	-	-	0.5	0.0	0.0	4.5	-	-	1.9	0.0	0.7	0.0	-	-	0.6	0.0	0.0	0.0	-	-	0.0	0.7
Trucks	0	1	0	0	-	1	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	3
% Trucks	0.0	0.5	0.0	-	-	0.5	0.0	0.0	0.0	-	-	0.0	0.0	0.7	0.0	-	-	0.6	0.0	0.0	0.0	-	-	0.0	0.5
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	40	-	-	-	-	-	9	-	-	-	-	-	15	-	-	-	-	-	24	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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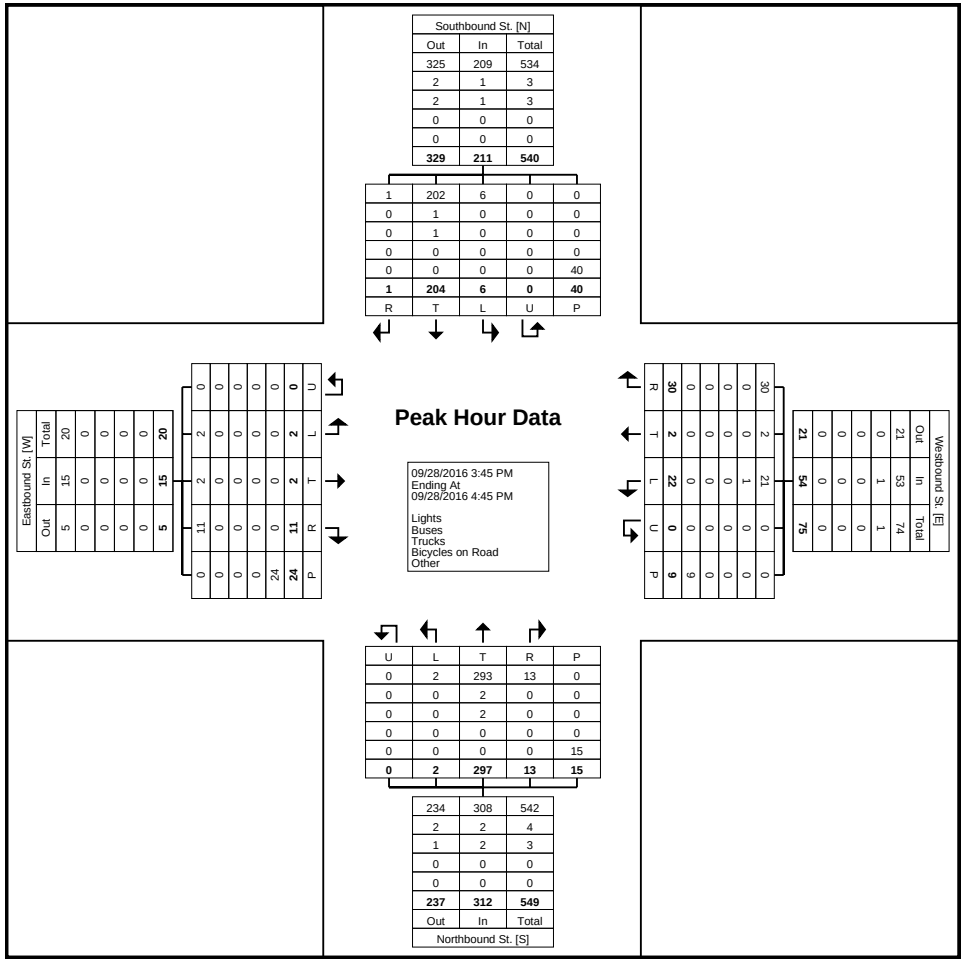
Count Name: TMC - Main St @ E Jogn St
Site Code: 150
Start Date: 09/28/2016



Turning Movement Peak Hour Data Plot (3:45 PM)

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Count Name: Main St @ MB 13
Site Code: 155
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:00 AM	0	33	0	0	0	33	0	0	0	0	0	0	0	33	0	0	0	33	0	0	0	0	0	0	66
7:15 AM	0	43	0	0	0	43	0	0	0	0	0	0	0	32	0	0	0	32	0	0	0	0	0	0	75
7:30 AM	0	55	0	0	0	55	0	0	0	0	0	0	0	34	0	0	0	34	0	0	0	0	0	0	89
7:45 AM	0	57	0	0	0	57	0	0	0	0	0	0	0	49	0	0	0	49	0	0	0	0	0	0	106
Hourly Total	0	188	0	0	0	188	0	0	0	0	0	0	0	148	0	0	0	148	0	0	0	0	0	0	336
8:00 AM	0	50	0	0	0	50	0	0	0	0	0	0	0	29	0	0	0	29	0	0	0	0	0	0	79
8:15 AM	0	51	0	0	0	51	0	0	0	0	0	0	0	45	0	0	1	45	0	0	0	0	4	0	96
8:30 AM	0	50	0	0	0	50	0	0	0	0	0	0	0	36	0	0	0	36	0	0	0	0	1	0	86
8:45 AM	0	45	0	0	0	45	0	0	0	0	0	0	0	36	0	0	4	36	0	0	0	0	2	0	81
Hourly Total	0	196	0	0	0	196	0	0	0	0	0	0	0	146	0	0	5	146	0	0	0	0	7	0	342
9:00 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
1:00 PM	0	43	0	0	0	43	0	0	0	0	0	0	0	47	0	0	0	47	0	0	0	0	2	0	90
1:15 PM	0	45	0	0	0	45	0	0	0	0	0	0	0	47	0	0	0	47	0	0	0	0	0	0	92
1:30 PM	0	29	0	0	0	29	0	0	0	0	0	0	0	57	0	0	0	57	0	0	0	0	1	0	86
1:45 PM	0	29	0	0	0	29	0	0	0	0	0	0	0	53	0	0	0	53	0	0	0	0	0	0	82
Hourly Total	0	146	0	0	0	146	0	0	0	0	0	0	0	204	0	0	0	204	0	0	0	0	3	0	350
2:00 PM	0	51	0	0	0	51	0	0	0	0	0	0	0	41	0	0	0	41	0	0	0	0	0	0	92
2:15 PM	0	36	0	0	0	36	0	0	0	0	0	0	0	65	0	0	0	65	0	0	0	0	1	0	101
2:30 PM	0	61	0	0	0	61	0	0	0	0	0	0	0	61	0	0	0	61	0	0	0	0	0	0	122
2:45 PM	0	50	0	0	0	50	0	0	0	0	0	0	0	65	0	0	0	65	0	0	0	0	0	0	115
Hourly Total	0	198	0	0	0	198	0	0	0	0	0	0	0	232	0	0	0	232	0	0	0	0	1	0	430
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	0	43	0	0	0	43	0	0	0	0	0	0	0	82	0	0	0	82	0	0	0	0	1	0	125
3:45 PM	0	53	0	0	0	53	0	0	0	0	0	0	0	73	0	0	0	73	0	0	0	0	0	0	126
Hourly Total	0	96	0	0	0	96	0	0	0	0	0	0	0	155	0	0	0	155	0	0	0	0	1	0	251
4:00 PM	0	59	0	0	0	59	0	0	0	0	0	0	0	79	0	0	0	79	0	0	0	0	2	0	138
4:15 PM	0	51	0	0	0	51	0	0	0	0	0	0	0	81	0	0	0	81	0	0	0	0	3	0	132
4:30 PM	0	35	0	0	0	35	0	0	0	0	0	0	0	95	0	0	0	95	0	0	0	0	1	0	130
4:45 PM	0	47	0	0	0	47	0	0	0	0	0	0	0	81	0	0	0	81	0	0	0	0	2	0	128
Hourly Total	0	192	0	0	0	192	0	0	0	0	0	0	0	336	0	0	0	336	0	0	0	0	8	0	528
5:00 PM	0	33	0	0	0	33	0	0	0	0	0	0	0	109	0	0	2	109	0	0	0	0	3	0	142
5:15 PM	0	36	0	0	0	36	0	0	0	0	0	0	0	82	0	0	1	82	0	0	0	0	1	0	118
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Grand Total	0	1086	0	0	0	1086	0	0	0	0	0	0	0	1412	0	0	8	1412	0	0	0	0	25	0	2498
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	43.5	0.0	0.0	-	43.5	0.0	0.0	0.0	0.0	-	0.0	0.0	56.5	0.0	0.0	-	56.5	0.0	0.0	0.0	0.0	-	0.0	-
Lights	0	1058	0	0	-	1058	0	0	0	0	-	0	0	1374	0	0	-	1374	0	0	0	0	-	0	2432
% Lights	-	97.4	-	-	-	97.4	-	-	-	-	-	-	-	97.3	-	-	-	97.3	-	-	-	-	-	-	97.4
Buses	0	4	0	0	-	4	0	0	0	0	-	0	0	20	0	0	-	20	0	0	0	0	-	0	24
% Buses	-	0.4	-	-	-	0.4	-	-	-	-	-	-	-	1.4	-	-	-	1.4	-	-	-	-	-	-	1.0
Trucks	0	24	0	0	-	24	0	0	0	0	-	0	0	18	0	0	-	18	0	0	0	0	-	0	42
% Trucks	-	2.2	-	-	-	2.2	-	-	-	-	-	-	-	1.3	-	-	-	1.3	-	-	-	-	-	-	1.7
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	8	-	-	-	-	-	25	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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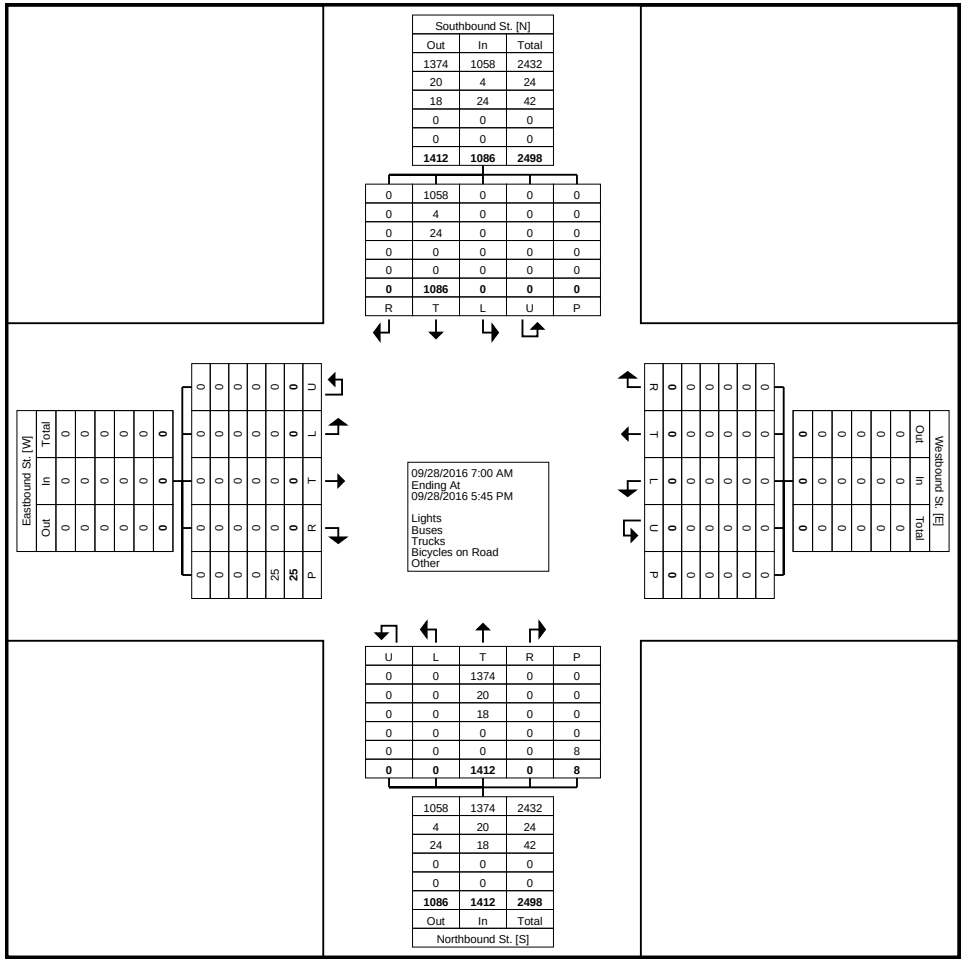
Start Date: 09/28/2016



Turning Movement Data Plot

Whitman, Requardt, and Associates, LLP
2009 MacKenzie Way
Suite 240
Cranberry Twp, Pennsylvania, United States 16066
724-779-7940 lweimer@wrallp.com
People Focused - Project Driven

Count Name: Main St @ MB 13
Site Code: 155
Start Date: 09/28/2016

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
7:30 AM	0	55	0	0	0	55	0	0	0	0	0	0	0	34	0	0	0	34	0	0	0	0	0	0	89
7:45 AM	0	57	0	0	0	57	0	0	0	0	0	0	0	49	0	0	0	49	0	0	0	0	0	0	106
8:00 AM	0	50	0	0	0	50	0	0	0	0	0	0	0	29	0	0	0	29	0	0	0	0	0	0	79
8:15 AM	0	51	0	0	0	51	0	0	0	0	0	0	0	45	0	0	1	45	0	0	0	0	4	0	96
Total	0	213	0	0	0	213	0	0	0	0	0	0	0	157	0	0	1	157	0	0	0	0	4	0	370
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	57.6	0.0	0.0	-	57.6	0.0	0.0	0.0	0.0	-	0.0	0.0	42.4	0.0	0.0	-	42.4	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.934	0.000	0.000	-	0.934	0.000	0.000	0.000	0.000	-	0.000	0.000	0.801	0.000	0.000	-	0.801	0.000	0.000	0.000	0.000	-	0.000	0.873
Lights	0	208	0	0	-	208	0	0	0	0	-	0	0	149	0	0	-	149	0	0	0	0	-	0	357
% Lights	-	97.7	-	-	-	97.7	-	-	-	-	-	-	-	94.9	-	-	-	94.9	-	-	-	-	-	-	96.5
Buses	0	1	0	0	-	1	0	0	0	0	-	0	0	6	0	0	-	6	0	0	0	0	-	0	7
% Buses	-	0.5	-	-	-	0.5	-	-	-	-	-	-	-	3.8	-	-	-	3.8	-	-	-	-	-	-	1.9
Trucks	0	4	0	0	-	4	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	6
% Trucks	-	1.9	-	-	-	1.9	-	-	-	-	-	-	-	1.3	-	-	-	1.3	-	-	-	-	-	-	1.6
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	4	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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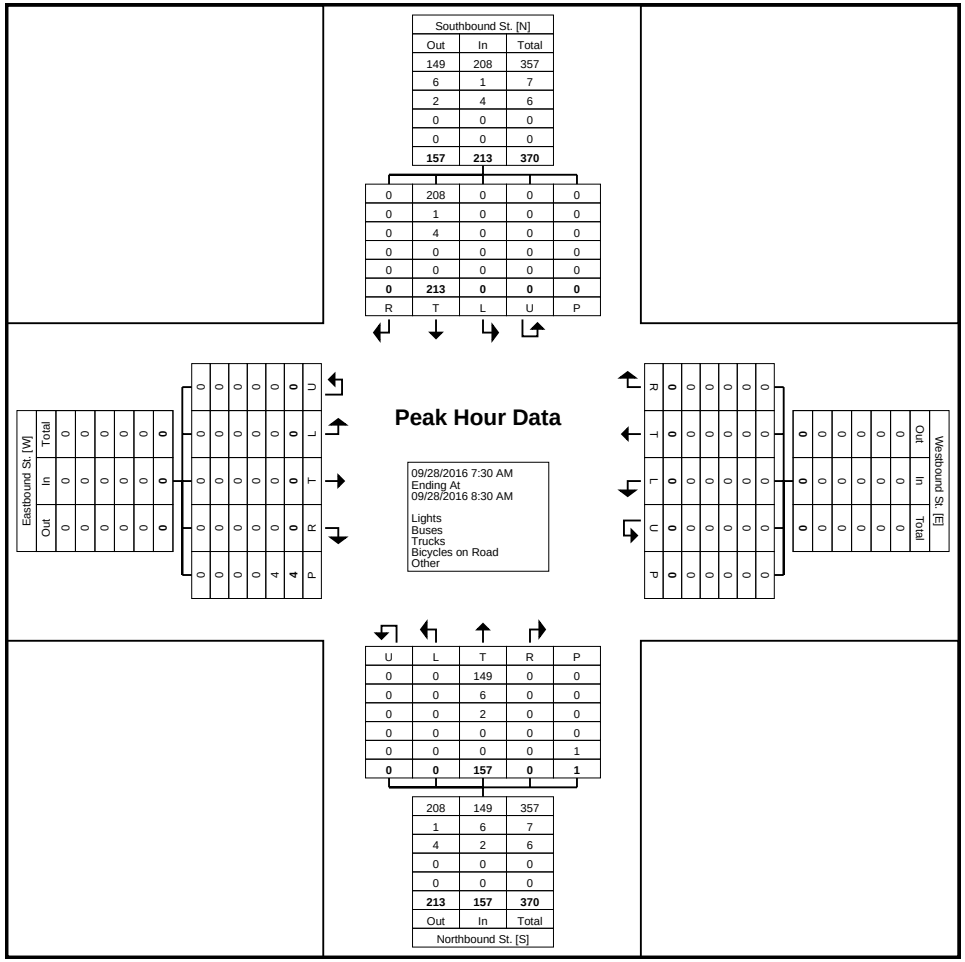

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Start Date: 09/28/2016

Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
2:00 PM	0	51	0	0	0	51	0	0	0	0	0	0	0	41	0	0	0	41	0	0	0	0	0	0	92
2:15 PM	0	36	0	0	0	36	0	0	0	0	0	0	0	65	0	0	0	65	0	0	0	0	1	0	101
2:30 PM	0	61	0	0	0	61	0	0	0	0	0	0	0	61	0	0	0	61	0	0	0	0	0	0	122
2:45 PM	0	50	0	0	0	50	0	0	0	0	0	0	0	65	0	0	0	65	0	0	0	0	0	0	115
Total	0	198	0	0	0	198	0	0	0	0	0	0	0	232	0	0	0	232	0	0	0	0	1	0	430
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	46.0	0.0	0.0	-	46.0	0.0	0.0	0.0	0.0	-	0.0	0.0	54.0	0.0	0.0	-	54.0	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.811	0.000	0.000	-	0.811	0.000	0.000	0.000	0.000	-	0.000	0.000	0.892	0.000	0.000	-	0.892	0.000	0.000	0.000	0.000	-	0.000	0.881
Lights	0	192	0	0	-	192	0	0	0	0	-	0	0	223	0	0	-	223	0	0	0	0	-	0	415
% Lights	-	97.0	-	-	-	97.0	-	-	-	-	-	-	-	96.1	-	-	-	96.1	-	-	-	-	-	-	96.5
Buses	0	1	0	0	-	1	0	0	0	0	-	0	0	5	0	0	-	5	0	0	0	0	-	0	6
% Buses	-	0.5	-	-	-	0.5	-	-	-	-	-	-	-	2.2	-	-	-	2.2	-	-	-	-	-	-	1.4
Trucks	0	5	0	0	-	5	0	0	0	0	-	0	0	4	0	0	-	4	0	0	0	0	-	0	9
% Trucks	-	2.5	-	-	-	2.5	-	-	-	-	-	-	-	1.7	-	-	-	1.7	-	-	-	-	-	-	2.1
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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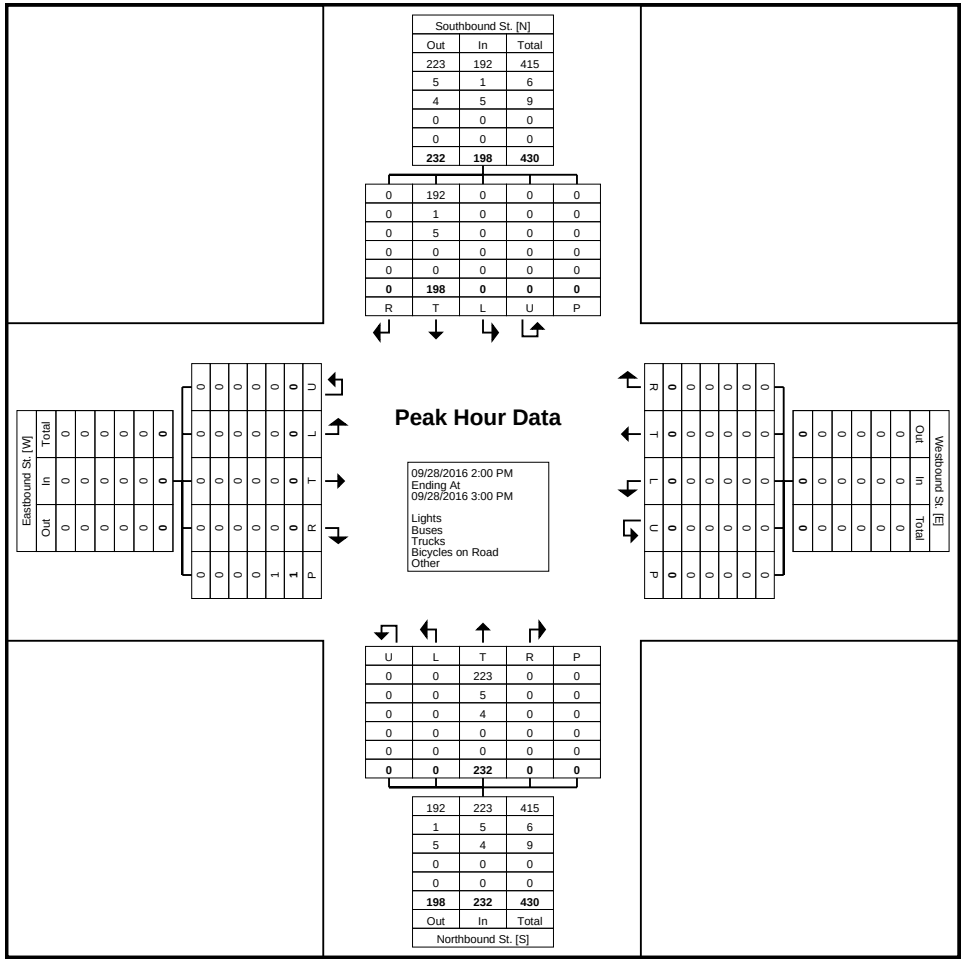

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Count Name: Main St @ MB 13
Site Code: 155
Start Date: 09/28/2016

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
4:15 PM	0	51	0	0	0	51	0	0	0	0	0	0	0	81	0	0	0	81	0	0	0	0	3	0	132
4:30 PM	0	35	0	0	0	35	0	0	0	0	0	0	0	95	0	0	0	95	0	0	0	0	1	0	130
4:45 PM	0	47	0	0	0	47	0	0	0	0	0	0	0	81	0	0	0	81	0	0	0	0	2	0	128
5:00 PM	0	33	0	0	0	33	0	0	0	0	0	0	0	109	0	0	2	109	0	0	0	0	3	0	142
Total	0	166	0	0	0	166	0	0	0	0	0	0	0	366	0	0	2	366	0	0	0	0	9	0	532
Approach %	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	0.0	100.0	0.0	0.0	-	-	NaN	NaN	NaN	NaN	-	-	-
Total %	0.0	31.2	0.0	0.0	-	31.2	0.0	0.0	0.0	0.0	-	0.0	0.0	68.8	0.0	0.0	-	68.8	0.0	0.0	0.0	0.0	-	0.0	-
PHF	0.000	0.814	0.000	0.000	-	0.814	0.000	0.000	0.000	0.000	-	0.000	0.000	0.839	0.000	0.000	-	0.839	0.000	0.000	0.000	0.000	-	0.000	0.937
Lights	0	162	0	0	-	162	0	0	0	0	-	0	0	363	0	0	-	363	0	0	0	0	-	0	525
% Lights	-	97.6	-	-	-	97.6	-	-	-	-	-	-	-	99.2	-	-	-	99.2	-	-	-	-	-	-	98.7
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	1
% Buses	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.3	-	-	-	0.3	-	-	-	-	-	-	0.2
Trucks	0	4	0	0	-	4	0	0	0	0	-	0	0	2	0	0	-	2	0	0	0	0	-	0	6
% Trucks	-	2.4	-	-	-	2.4	-	-	-	-	-	-	-	0.5	-	-	-	0.5	-	-	-	-	-	-	1.1
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-	-	-	-	-	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	9	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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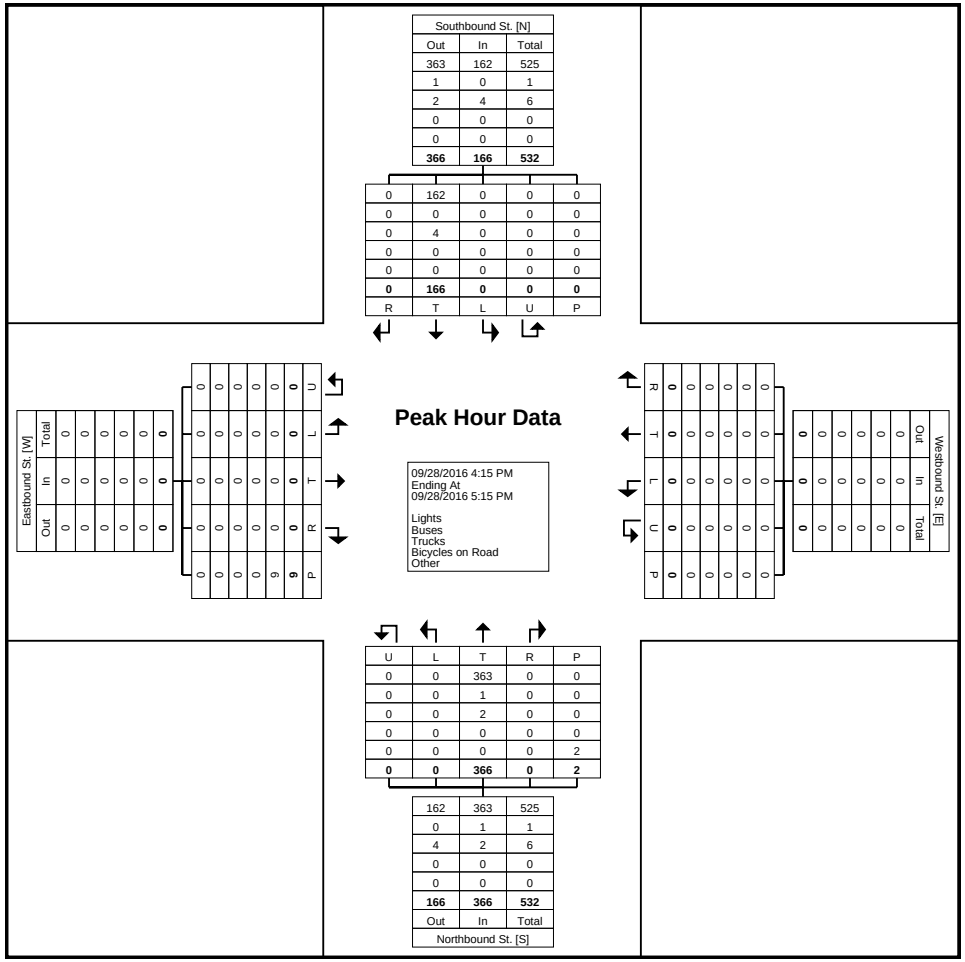

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Count Name: TMC - Main St @ Allegheny St_Limber Rd
Site Code: 160
Start Date: 09/28/2016

Turning Movement Data

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:00 AM	7	22	1	0	0	30	2	25	5	0	0	32	3	25	3	0	0	31	7	6	4	0	0	17	110
7:15 AM	6	40	2	0	0	48	1	20	6	0	0	27	3	20	10	0	0	33	5	11	7	0	0	23	131
7:30 AM	14	39	2	0	0	55	0	20	5	0	0	25	4	20	3	0	0	27	10	7	3	0	0	20	127
7:45 AM	22	49	2	0	0	73	0	33	5	0	0	38	1	28	9	0	1	38	9	13	3	0	0	25	174
Hourly Total	49	150	7	0	0	206	3	98	21	0	0	122	11	93	25	0	1	129	31	37	17	0	0	85	542
8:00 AM	13	42	0	0	0	55	0	16	6	0	0	22	2	29	2	0	0	33	8	19	7	0	0	34	144
8:15 AM	17	48	1	0	0	66	0	23	6	0	2	29	7	27	11	0	2	45	7	4	6	0	2	17	157
8:30 AM	11	42	3	0	0	56	0	18	5	0	0	23	8	29	3	0	1	40	11	10	12	0	3	33	152
8:45 AM	10	39	1	0	0	50	3	21	5	0	3	29	6	18	6	0	5	30	8	12	2	0	0	22	131
Hourly Total	51	171	5	0	0	227	3	78	22	0	5	103	23	103	22	0	8	148	34	45	27	0	5	106	584
9:00 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1:00 PM	8	33	2	0	0	43	0	7	4	0	0	11	9	36	7	0	0	52	2	17	11	0	2	30	136
1:15 PM	14	36	3	0	0	53	0	21	6	0	0	27	8	30	4	0	0	42	3	13	10	0	2	26	148
1:30 PM	12	22	2	0	0	36	0	12	4	0	0	16	5	41	9	0	0	55	4	12	4	0	1	20	127
1:45 PM	8	23	0	0	0	31	1	13	4	0	0	18	4	45	6	0	0	55	5	12	10	0	0	27	131
Hourly Total	42	114	7	0	0	163	1	53	18	0	0	72	26	152	26	0	0	204	14	54	35	0	5	103	542
2:00 PM	9	43	2	0	0	54	1	14	4	0	0	19	3	34	4	0	0	41	4	15	4	0	0	23	137
2:15 PM	15	32	1	0	0	48	1	12	5	0	0	18	11	37	8	0	0	56	7	17	10	0	3	34	156
2:30 PM	10	49	1	0	0	60	2	13	5	0	0	20	9	42	7	0	1	58	6	22	7	0	0	35	173
2:45 PM	13	45	1	0	0	59	1	15	3	0	4	19	8	45	5	0	4	58	7	14	8	0	0	29	165
Hourly Total	47	169	5	0	0	221	5	54	17	0	4	76	31	158	24	0	5	213	24	68	29	0	3	121	631
3:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:30 PM	11	30	2	0	0	43	2	12	7	0	0	21	10	53	13	0	0	76	1	29	4	0	1	34	174
3:45 PM	11	47	1	0	0	59	3	21	2	0	4	26	14	47	14	0	2	75	12	23	5	0	4	40	200
Hourly Total	22	77	3	0	0	102	5	33	9	0	4	47	24	100	27	0	2	151	13	52	9	0	5	74	374
4:00 PM	10	53	2	0	0	65	6	25	2	0	4	33	13	49	15	0	3	77	6	20	11	0	1	37	212
4:15 PM	13	39	1	0	0	53	3	21	5	0	2	29	11	58	9	0	0	78	11	21	10	0	2	42	202
4:30 PM	11	26	4	0	0	41	0	14	3	0	0	17	12	58	15	0	2	85	9	25	5	0	3	39	182
4:45 PM	9	38	3	0	0	50	1	19	5	0	2	25	11	54	16	0	0	81	13	24	11	0	2	48	204
Hourly Total	43	156	10	0	0	209	10	79	15	0	8	104	47	219	55	0	5	321	39	90	37	0	8	166	800
5:00 PM	8	27	0	0	0	35	2	14	2	0	0	18	12	82	11	0	2	105	6	19	8	0	4	33	191
5:15 PM	7	25	1	0	0	33	1	21	5	0	4	27	18	59	7	0	0	84	9	33	8	0	1	50	194
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Grand Total	269	890	38	0	0	1197	30	430	109	0	25	569	192	966	197	0	23	1355	170	398	170	0	31	738	3859
Approach %	22.5	74.4	3.2	0.0	-	-	5.3	75.6	19.2	0.0	-	-	14.2	71.3	14.5	0.0	-	-	23.0	53.9	23.0	0.0	-	-	-
Total %	7.0	23.1	1.0	0.0	-	31.0	0.8	11.1	2.8	0.0	-	14.7	5.0	25.0	5.1	0.0	-	35.1	4.4	10.3	4.4	0.0	-	19.1	-
Lights	260	872	37	0	-	1169	30	422	107	0	-	559	189	930	193	0	-	1312	164	390	161	0	-	715	3755
% Lights	96.7	98.0	97.4	-	-	97.7	100.0	98.1	98.2	-	-	98.2	98.4	96.3	98.0	-	-	96.8	96.5	98.0	94.7	-	-	96.9	97.3
Buses	5	4	1	0	-	10	0	1	0	0	-	1	0	18	0	0	-	18	1	3	8	0	-	12	41
% Buses	1.9	0.4	2.6	-	-	0.8	0.0	0.2	0.0	-	-	0.2	0.0	1.9	0.0	-	-	1.3	0.6	0.8	4.7	-	-	1.6	1.1
Trucks	4	14	0	0	-	18	0	6	2	0	-	8	3	17	4	0	-	24	5	5	1	0	-	11	61
% Trucks	1.5	1.6	0.0	-	-	1.5	0.0	1.4	1.8	-	-	1.4	1.6	1.8	2.0	-	-	1.8	2.9	1.3	0.6	-	-	1.5	1.6
Bicycles on Road	0	0	0	0	-	0	0	1	0	0	-	1	0	1	0	0	-	1	0	0	0	0	-	0	2
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.2	0.0	-	-	0.2	0.0	0.1	0.0	-	-	0.1	0.0	0.0	0.0	-	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	25	-	-	-	-	-	23	-	-	-	-	-	31	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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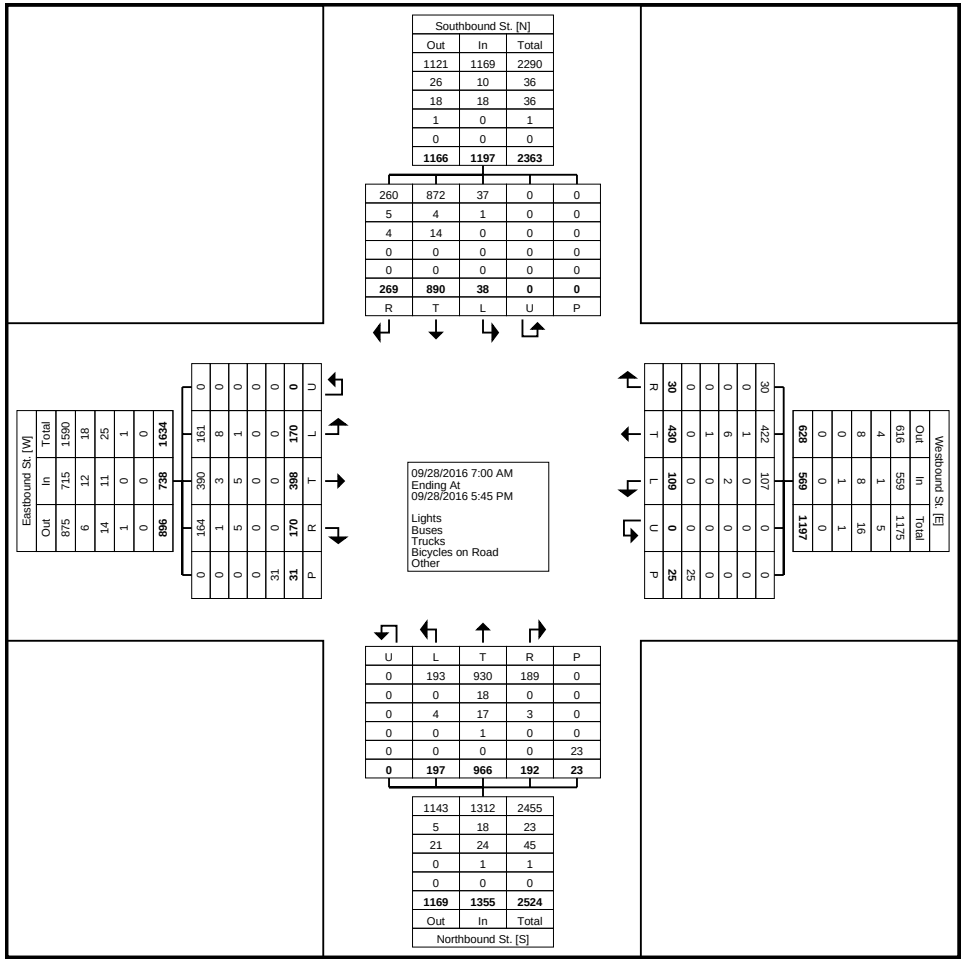
Count Name: TMC - Main St @ Allegheny St_Limber Rd
Site Code: 160
Start Date: 09/28/2016



Turning Movement Data Plot

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Turning Movement Peak Hour Data (7:45 AM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
7:45 AM	22	49	2	0	0	73	0	33	5	0	0	38	1	28	9	0	1	38	9	13	3	0	0	25	174
8:00 AM	13	42	0	0	0	55	0	16	6	0	0	22	2	29	2	0	0	33	8	19	7	0	0	34	144
8:15 AM	17	48	1	0	0	66	0	23	6	0	2	29	7	27	11	0	2	45	7	4	6	0	2	17	157
8:30 AM	11	42	3	0	0	56	0	18	5	0	0	23	8	29	3	0	1	40	11	10	12	0	3	33	152
Total	63	181	6	0	0	250	0	90	22	0	2	112	18	113	25	0	4	156	35	46	28	0	5	109	627
Approach %	25.2	72.4	2.4	0.0	-	-	0.0	80.4	19.6	0.0	-	-	11.5	72.4	16.0	0.0	-	-	32.1	42.2	25.7	0.0	-	-	-
Total %	10.0	28.9	1.0	0.0	-	39.9	0.0	14.4	3.5	0.0	-	17.9	2.9	18.0	4.0	0.0	-	24.9	5.6	7.3	4.5	0.0	-	17.4	-
PHF	0.716	0.923	0.500	0.000	-	0.856	0.000	0.682	0.917	0.000	-	0.737	0.563	0.974	0.568	0.000	-	0.867	0.795	0.605	0.583	0.000	-	0.801	0.901
Lights	61	177	6	0	-	244	0	89	21	0	-	110	17	106	24	0	-	147	34	44	25	0	-	103	604
% Lights	96.8	97.8	100.0	-	-	97.6	-	98.9	95.5	-	-	98.2	94.4	93.8	96.0	-	-	94.2	97.1	95.7	89.3	-	-	94.5	96.3
Buses	2	0	0	0	-	2	0	0	0	0	-	0	0	5	0	0	-	5	0	0	3	0	-	3	10
% Buses	3.2	0.0	0.0	-	-	0.8	-	0.0	0.0	-	-	0.0	0.0	4.4	0.0	-	-	3.2	0.0	0.0	10.7	-	-	2.8	1.6
Trucks	0	4	0	0	-	4	0	1	1	0	-	2	1	2	1	0	-	4	1	2	0	0	-	3	13
% Trucks	0.0	2.2	0.0	-	-	1.6	-	1.1	4.5	-	-	1.8	5.6	1.8	4.0	-	-	2.6	2.9	4.3	0.0	-	-	2.8	2.1
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	4	-	-	-	-	-	5	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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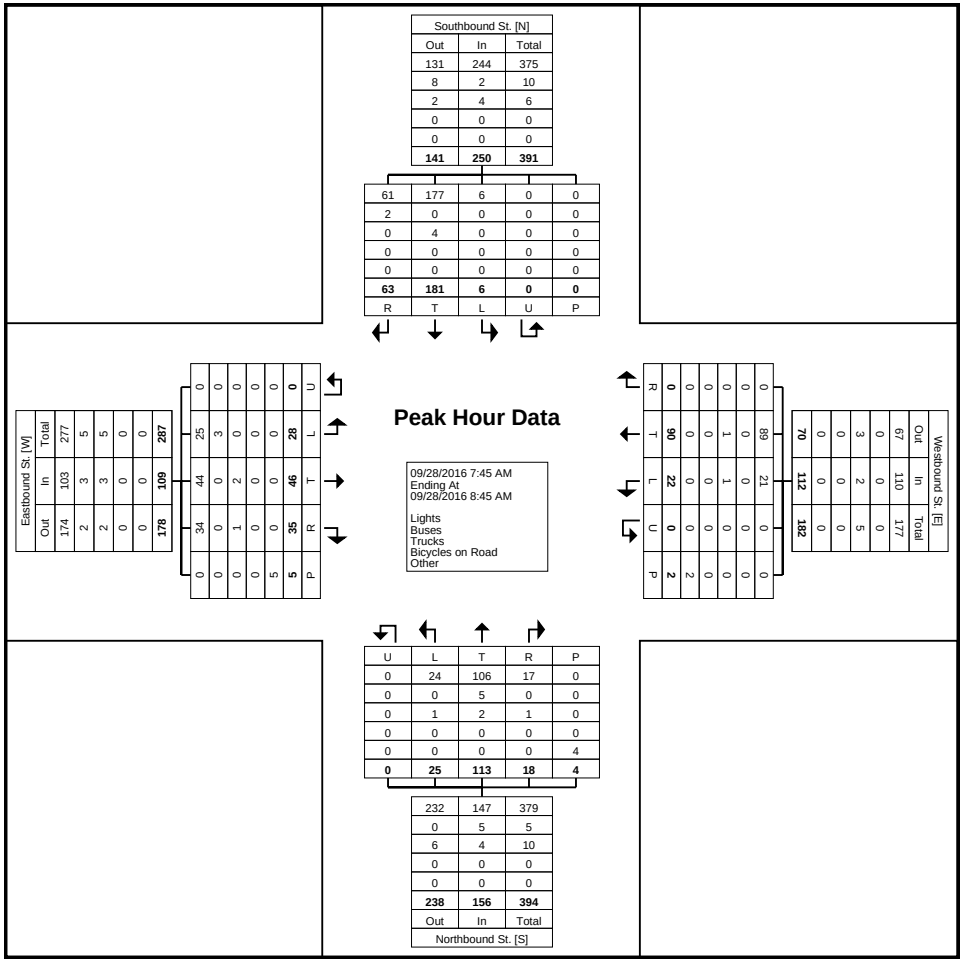

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Turning Movement Peak Hour Data (2:00 PM)

Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
2:00 PM	9	43	2	0	0	54	1	14	4	0	0	19	3	34	4	0	0	41	4	15	4	0	0	23	137
2:15 PM	15	32	1	0	0	48	1	12	5	0	0	18	11	37	8	0	0	56	7	17	10	0	3	34	156
2:30 PM	10	49	1	0	0	60	2	13	5	0	0	20	9	42	7	0	1	58	6	22	7	0	0	35	173
2:45 PM	13	45	1	0	0	59	1	15	3	0	4	19	8	45	5	0	4	58	7	14	8	0	0	29	165
Total	47	169	5	0	0	221	5	54	17	0	4	76	31	158	24	0	5	213	24	68	29	0	3	121	631
Approach %	21.3	76.5	2.3	0.0	-	-	6.6	71.1	22.4	0.0	-	-	14.6	74.2	11.3	0.0	-	-	19.8	56.2	24.0	0.0	-	-	-
Total %	7.4	26.8	0.8	0.0	-	35.0	0.8	8.6	2.7	0.0	-	12.0	4.9	25.0	3.8	0.0	-	33.8	3.8	10.8	4.6	0.0	-	19.2	-
PHF	0.783	0.862	0.625	0.000	-	0.921	0.625	0.900	0.850	0.000	-	0.950	0.705	0.878	0.750	0.000	-	0.918	0.857	0.773	0.725	0.000	-	0.864	0.912
Lights	46	166	5	0	-	217	5	52	17	0	-	74	29	150	23	0	-	202	22	67	26	0	-	115	608
% Lights	97.9	98.2	100.0	-	-	98.2	100.0	96.3	100.0	-	-	97.4	93.5	94.9	95.8	-	-	94.8	91.7	98.5	89.7	-	-	95.0	96.4
Buses	0	1	0	0	-	1	0	0	0	0	-	0	0	4	0	0	-	4	0	0	3	0	-	3	8
% Buses	0.0	0.6	0.0	-	-	0.5	0.0	0.0	0.0	-	-	0.0	0.0	2.5	0.0	-	-	1.9	0.0	0.0	10.3	-	-	2.5	1.3
Trucks	1	2	0	0	-	3	0	2	0	0	-	2	2	4	1	0	-	7	2	1	0	0	-	3	15
% Trucks	2.1	1.2	0.0	-	-	1.4	0.0	3.7	0.0	-	-	2.6	6.5	2.5	4.2	-	-	3.3	8.3	1.5	0.0	-	-	2.5	2.4
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	4	-	-	-	-	-	5	-	-	-	-	-	3	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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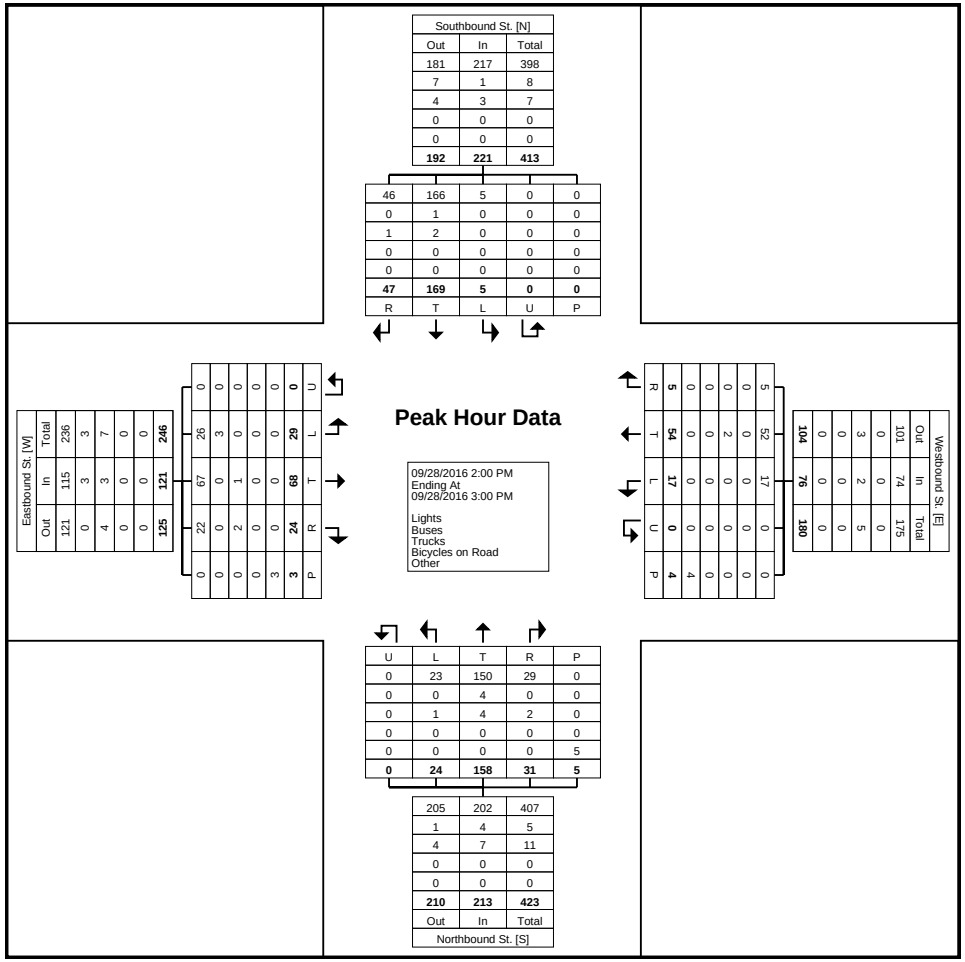

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Start Time	Southbound St. Southbound						Westbound St. Westbound						Northbound St. Northbound						Eastbound St. Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
4:00 PM	10	53	2	0	0	65	6	25	2	0	4	33	13	49	15	0	3	77	6	20	11	0	1	37	212
4:15 PM	13	39	1	0	0	53	3	21	5	0	2	29	11	58	9	0	0	78	11	21	10	0	2	42	202
4:30 PM	11	26	4	0	0	41	0	14	3	0	0	17	12	58	15	0	2	85	9	25	5	0	3	39	182
4:45 PM	9	38	3	0	0	50	1	19	5	0	2	25	11	54	16	0	0	81	13	24	11	0	2	48	204
Total	43	156	10	0	0	209	10	79	15	0	8	104	47	219	55	0	5	321	39	90	37	0	8	166	800
Approach %	20.6	74.6	4.8	0.0	-	-	9.6	76.0	14.4	0.0	-	-	14.6	68.2	17.1	0.0	-	-	23.5	54.2	22.3	0.0	-	-	-
Total %	5.4	19.5	1.3	0.0	-	26.1	1.3	9.9	1.9	0.0	-	13.0	5.9	27.4	6.9	0.0	-	40.1	4.9	11.3	4.6	0.0	-	20.8	-
PHF	0.827	0.736	0.625	0.000	-	0.804	0.417	0.790	0.750	0.000	-	0.788	0.904	0.944	0.859	0.000	-	0.944	0.750	0.900	0.841	0.000	-	0.865	0.943
Lights	41	156	10	0	-	207	10	77	15	0	-	102	47	216	54	0	-	317	37	89	37	0	-	163	789
% Lights	95.3	100.0	100.0	-	-	99.0	100.0	97.5	100.0	-	-	98.1	100.0	98.6	98.2	-	-	98.8	94.9	98.9	100.0	-	-	98.2	98.6
Buses	1	0	0	0	-	1	0	1	0	0	-	1	0	1	0	0	-	1	0	1	0	0	-	1	4
% Buses	2.3	0.0	0.0	-	-	0.5	0.0	1.3	0.0	-	-	1.0	0.0	0.5	0.0	-	-	0.3	0.0	1.1	0.0	-	-	0.6	0.5
Trucks	1	0	0	0	-	1	0	1	0	0	-	1	0	2	1	0	-	3	2	0	0	0	-	2	7
% Trucks	2.3	0.0	0.0	-	-	0.5	0.0	1.3	0.0	-	-	1.0	0.0	0.9	1.8	-	-	0.9	5.1	0.0	0.0	-	-	1.2	0.9
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	8	-	-	-	-	-	5	-	-	-	-	-	8	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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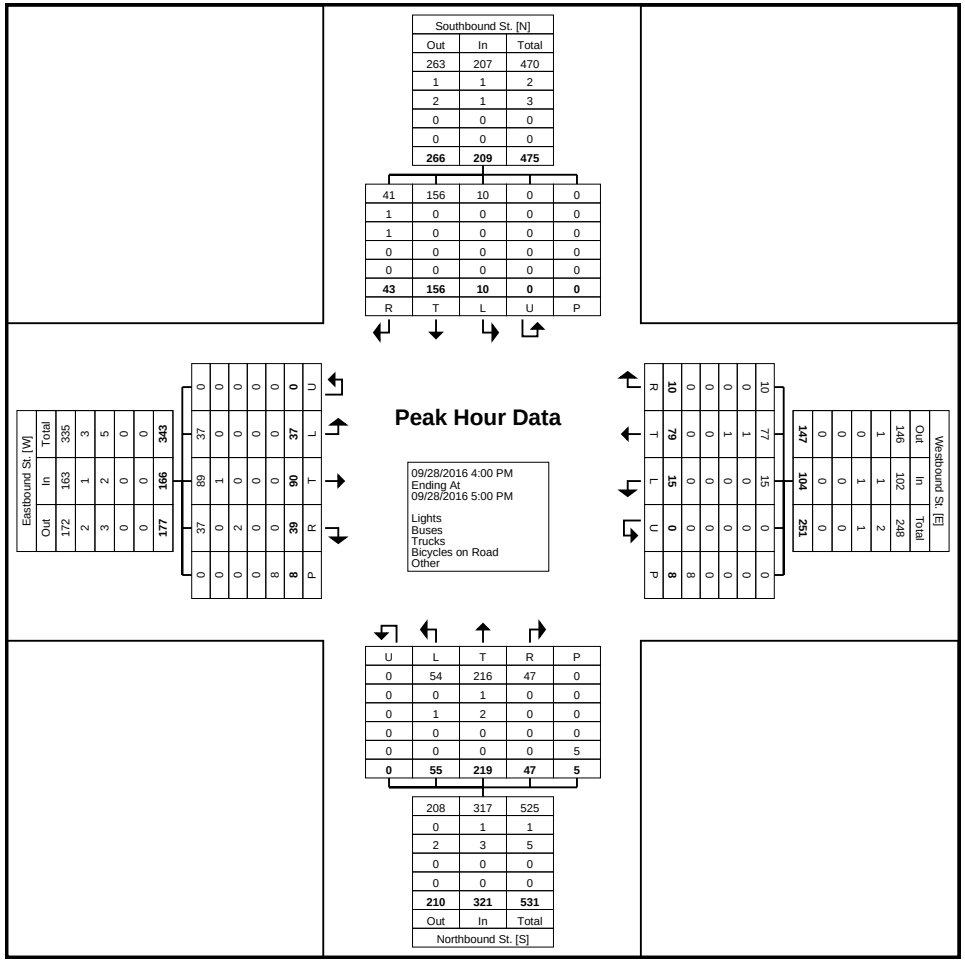

Turning Movement Peak Hour Data Plot (4:00 PM)

Appendix B: October 20th Public Meeting Summary

Allegheny College 1st Public Meeting Summary

Location: Schultz Hall, Allegheny College

Date: 10/20/2016

Public Official Meeting Time: 5:00-6:00 PM

Public Meeting Time: 6:00-8:00 PM

The meeting summary below combines discussion and proposed improvements from both the Public Officials and General Public meetings. Sign-in sheets from both meetings are attached as well as all submitted comment forms.

Presentation Summary:

- Brian Smith of PennDOT kicked off the meeting by providing opening remarks explaining the purpose and importance of both the project and the public meeting
- Ross Buchan of WRA then informed the public regarding project scope, schedule, effort to date, and instructions for each of the work stations
- After the conclusion of the presentation, PennDOT and WRA addressed questions from the public and then hosted the public at work stations; comments gathered are summarized below

Discussion (Public Officials & General Public):

Observations/Safety Concerns:

- Lighting is poor/lacking along the corridor
  - Visibility is of particular concern during inclement weather
  - Headlight glare creates shadows and hides pedestrians
  - Intersection of East College was called out specifically for having insufficient lighting
  - Pedestrian scale lighting is needed
  - Important that lighting is focused on roadway and does not create light pollution
- Speeding is a major concern with community and campus members; many noted that the 35 MPH speed limit is too high and should be reduced to 25 MPH
- "Distracted walking" is a major problem along the corridor
  - Pedestrians aren't paying attention and walk right out into the roadway
- Jaywalking is an issue along the corridor but the following blocks are of particular concern
  - Baldwin Hall pedestrian walkway to East John Street
    - Curb cuts are actually provided in the sidewalk from Caflisch Hall to SR 86 encouraging pedestrians to cross
  - East John Street to Allegheny/Limber Road
    - Fatality occurred just north of East John Street
- In addition to distracted- and jay- walking, crossing pedestrians appear to walk slower than normal which creates additional driver frustration
- Some motorists avoid North Main Street altogether and use Park Avenue instead to avoid the frequent pedestrian crossing along North Main Street
  - Pedestrian-vehicles crashes have been reported on both North Main Street and Park Avenue

    - Explore potential to completely close North Main Street through campus and direct all traffic to Park Avenue
- Town Fair along Limber Road can bring a lot of out-of-town traffic who may not be expecting the high number of pedestrian crossings along North Main Street through Allegheny College
- Some feel that signage along the corridor is not effective in reducing speeds and improving pedestrian crossing safety
- Snow removal impacts need to be considered when developing alternatives
- Park Avenue – Delivery trucks frequently park in the middle of the travel lane blocking traffic in the morning (approximately 3 days a week)

Potential Improvements:

- Close Main Street to normal traffic from Loomis Street to Allegheny/Limber Road
    - Create a community street to encourage pedestrian and bicycle usage with roundabouts at both ends to divert normal traffic
    - Emergency and delivery vehicles could still utilize Main Street if needed
- Convert Main Street to one way north and Park Avenue one way south
- Curb extensions/bulb-outs should be considered at all major crossings/intersections
- Chicanes or diverters should be considered at primary crossings to grab drivers attention
- Consider a bus stop along the corridor where students could be transported into and out of town concentrating pedestrian traffic to one location
- Crossing guard or traffic signal should be considered at the heaviest pedestrian crossings
- Additional education and outreach is needed for campus students on how to safely cross the street
    - District 1-0 has some innovative posters that can be shared with Allegheny College students to educate regarding pedestrian safety
- Roadway should be narrowed to reduce speeds and pedestrian crossing lengths
    - Stripe bike lanes on roadway to narrow
- At one time a pedestrian barrier was considered along the east side of North Main Street; with the recent pedestrian-vehicle crashes a barrier should be considered again
- Center median was considered along the corridor but delivery trucks frequently stop along Main Street which would block the travel lane
    - If median treatment is considered, pull-offs need to be provided for delivery vehicles

Workstation Summaries (Public Officials & General Public):

Corridor wide:

- Consider center median with landscaping that is capable of obscuring headlights and inhibiting jaywalking throughout the corridor
- Overhead gateway signing on the north and south boundaries to campus
    - North end is the higher priority due to speeds and road character north of Meadville

Allegheny/Limber Road:

- On-street parking along Allegheny Street significantly narrows the roadway forcing vehicles to yield to one another and limiting sight distance at the intersection with SR 86

- Allegheny/Limber Road - Congestion and delay is experienced during peak periods along the side streets
- The skew at Limber Road limits motorist sight distance and complicates turning movements
- Consider changing traffic control to an All-Way Stop or constructing a roundabout to alleviate congestion and improve operations while slowing individuals on SR 86
- Needs additional lighting due to heavy pedestrian traffic at night with the fraternity in the northwest corner of the intersection
- Sight distance is limited due obstructions in the northwest corner of the intersection

East John Street:

- East John Street has a textured crosswalk on the northern end since it's more heavily used but the southern painted crosswalk has an in-road pedestrian crossing sign
    - Would like to see in-road pedestrian crossing sign at northern crosswalk or move existing south crosswalk sign to the north crosswalk

Center of Campus:

- Raised intersections should be considered to reduce speeds along North Main Street
    - Suggested around the center of campus, no specific locations noted

East College Street:

- Utility pole in the southeastern corner of the pedestrian crosswalk adjacent Montgomery Hall obscures sight distance of/for pedestrians, especially at night
- During snow events, difficult to gain traction along Main Street near the campus library
- Utility pole in the southeastern corner of East College Street obscures sight distance of/for pedestrians, especially at night
- Consider burying utilities from Montgomery Hall Pedestrian Crossing to Sherman Street to improve visibility of pedestrians

Loomis Street:

- Loomis Street – Pedestrian congestion is present in the evenings outside the data collection periods
- Loomis Street – Any alternatives at Loomis need to consider that buses travel southbound and make a right turn onto Loomis
- Loomis Street – A roundabout should be considered here to calm traffic and create a gateway into campus

The above is a memorandum of understanding between the parties regarding the topics discussed and the decisions reached. Any participants desiring to add to, or otherwise amend the minutes, are requested to put their comments in writing to Ross Buchan at rbuchan@wrallp.com within seven (7) days; otherwise, the minutes will stand as written.

pennsylvania DEPARTMENT OF TRANSPORTATION

ALLEGHENY COLLEGE

SIGN-IN SHEET

Date: October 20, 2016

Time: 5:00 – 6:00 PM

Project: **NORTH MAIN STREET (SR 86) SAFETY STUDY**

Location: **Allegheny College**
Schultz Banquet Hall
520 North Main Street,

Meeting: Public Officials Briefing

☑	Name	Organization	Phone	Email
	John Amato	Crawford County	814-333-7400	jamato@co.crawford.pa.us
✓	**John Battaglia**	City of Meadville	814-724-6000	jbattaglia@cityofmeadville.org
✓	**Sen. Michele Brooks** DIANE HELBIG	Pennsylvania Senate	814-337-8132	mbrooks@pasen.gov
✓	**Ross Buchan**	Whitman, Requardt & Associates, LLP	717-741-5057	rbuchan@wrallp.com
	Sen. Robert Casey	U.S. Senate	814-874-5080	
✓	**Marcus Cramer**	PennDOT Engineering District 1-0	814-678-7146	marccramer@pa.gov
	Lyndsie DeVito	PennDOT Engineering District 1-0	814-678-7174	ldevito@pa.gov
✓	**Sean Donahue**	City of Meadville	814-724-6000	sean.donahue@cityofmeadville.org
	Joe Gigler	City of Meadville	814-724-6054	jgigler@cityofmeadville.org
	Pam Higham	Allegheny College	814-332-3576	phigham@allegheny.edu
	Rep. Mike Kelly	U.S. House of Representatives	814-454-8190	
	Patricia Kidd	Allegheny College	814-332-3782	pkidd@allegheny.edu
✓	**Robert Langley**	City of Meadville	814-724-6000	blangley@cityofmeadville.org
	Nancy Mangilo-Bittner	City of Meadville	814-724-6000	nmb@cityofmeadville.org
	James Mullen, Jr.	Allegheny College	814-332-3576	jmullen@allegheny.edu

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ALLEGHENY COLLEGE

PUBLIC OFFICIALS BRIEFING SIGN-IN SHEET

NORTH MAIN STREET SAFETY STUDY

October 20, 2016

☑	Name	Organization	Phone	Email
	William Petit	PennDOT Engineering District 1-0	814-678-7015	wpetit@pa.gov
✓	**Eileen Petula**	Allegheny College	814-332-3787	epetula@allegheny.edu
✓	**L. Ashley Porter**	City of Meadville	814-337-4447	aporter@pceengineers.com
✓	**Rep. Brad Roae**	Pennsylvania House of Representatives	814-336-1136	broae@pahousegop.com
✓	**Brian Smith**	PennDOT Engineering District 1-0	814-678-7181	briansmit@pa.gov
	Rob Smith	Acutec Precision Aerospace	814-336-22214	rsmith@acutecprecision.com
✓	**John Christopher Soff**	Crawford County	814-333-7400	csoff@co.crawford.pa.us
	LeRoy Stearns	City of Meadville	814-724-6000	lstearns@cityofmeadville.org
✓	**Scott Thompson-Graves**	Whitman, Requardt & Associates, LLP	724-779-7940	sthompson-graves@wrallp.com
	Sen. Pat Toomey	U.S. Senate	814-453-3010	
✓	**Andy Walker**	City of Meadville	814-333-3310	~~citymanager2~~@cityofmeadville.org awalker
	Francis Weiderspahn, Jr.	Crawford County	814-333-7400	fweiderspahn@co.crawford.pa.us
✓	**Linda Wetsell**	Allegheny College	814-332-4790	lwetsell@allegheny.edu
	Brian Williams	Rep. Brad Roae	814-336-1136	~~bwilliams@pahousegop.com~~ bswilli@pahousegop.com
X	**Cliff Willis**	Allegheny College	814-332-2865	cwillis@allegheny.edu
X	**Brian Yedinak**	PennDOT Engineering District 1-0	814-678-7130	byedinak@pa.gov

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pennsylvania DEPARTMENT OF TRANSPORTATION

ALLEGHENY COLLEGE

PUBLIC OFFICIALS BRIEFING SIGN-IN SHEET

NORTH MAIN STREET SAFETY STUDY

October 20, 2016

Name	Organization	Phone	Email
Gary Johnson	City of Meadville	333-3351	gjohnson@cityofmeadville.org
Mike Adamczyk	Allegheny College	814-428-1691	madamczyk@allegheny.edu
Jim Carroll	Penn DOT	814 678 7095	JAMECARROLL@PA.GOV
Eric Young	City of Meadville	333-3306	eyoung@cityofmeadville.org
Christopher Soff	Crawford Co.	333.7403	
Lisa Zucco	WRA	724-779-7440	lzucco@wrallp.com

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pennsylvania
DEPARTMENT OF TRANSPORTATION

ALLEGHENY COLLEGE

SIGN-IN SHEET

Date: October 20, 2016

Time: 6:00 – 8:00 PM

Project: **NORTH MAIN STREET (SR 86) SAFETY STUDY**

Location: **Allegheny College**
Schultz Banquet Hall
520 North Main Street, Meadville, PA 16335

Meeting: Public Meeting

Name	Organization/Address	Phone	Email
Tony Pollock	Parkhurst	814-969-4597	APollock@allegheny.edu
DAVID WETZEL		814-763-2027	WETZEL@WINDSTREAM.NET
Murray Braden	SE College	7246990540	mmbraden@zoominternet.net
Kent Gushard	Meadville Tribune	814 724-6390 Ext 269	kgushard@meadvilletrib.com
Peter Oven	French Creek Recreation Trails Inc.	01 509 228 8258	poven@uw.edu
Wendy Kedzierski	1005 Leslie Rd Allegheny College	814-332-3357	WKedzier@allegheny.edu
Robert Wright	Allegheny College	814 332-3357	rwright@allegheny.edu
Jim Mencher	allegheny	814 337 8555	jkencher@allegheny.edu
Jonathan Miller	JONATHAN MILLER DESIGN	814-333-8138	jemiller@windstream.net

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ALLEGHENY COLLEGE

MEADVILLE PA

PUBLIC MEETING SIGN-IN SHEET

NORTH MAIN STREET (SR 86) SAFETY STUDY

October 20, 2016

Name	Organization/Address	Phone	Email
Lisa Whitenack	Allegheny	814 332 2888	lwhitena@allegheny.edu
Kimberly M. Ferguson	Allegheny	814-332-4358	KFerguson@Allegheny.edu
Peter Pless	Meadville	814-333-7731	ppless@zoominternet.net
Kylie Buehler	Allegheny		editor@alleghenycampus.com
Andrew Nunn	Allegheny		nunna@allegheny.edu

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North Main Street (SR 86) Safety Study Public Meeting

Thursday, October 20, 2016

Schultz Banquet Hall, Allegheny College

TELL US ABOUT YOURSELF (*optional*)

Your contact information will not be shared with anyone outside the project team.

Name:	Murray Braden
Email:	mmbraden@zoominternet.net
Organization:	resident
Address:	551 E College
Phone:	724 6990540

TELL US ABOUT TONIGHT'S PUBLIC MEETING

1. How did you hear about the meeting?

☑ Newspaper article ☒ Mailed invitation ☐ Roadside signage
☐ Email ☐ From a friend ☐ Other: _____

2. How would you rate the meeting?

Meeting Location.....	☑ Excellent	☐ Good	☐ Fair	☐ Poor
Time of Day.....	☑ Excellent	☐ Good	☐ Fair	☐ Poor
Presentation.....	☐ Excellent	☐ Good	☐ Fair	☐ Poor
Displays.....	☐ Excellent	☐ Good	☐ Fair	☐ Poor
Interaction with Project Team.....	☑ Excellent	☐ Good	☐ Fair	☐ Poor

Other (please explain): _____

PLEASE PROVIDE YOUR INPUT ABOUT THE PROJECT

The project team welcomes your input about multimodal safety needs along the North Main Street corridor through the Allegheny College campus.

Great to give thoughts before things are decided

If more space is needed, use back of sheet.

Drop completed form in comment box at meeting, or email to:
Brian Smith, P.E., PennDOT Project Manager at briansmit@pa.gov

North Main Street (SR 86) Safety Study Public Meeting

Thursday, October 20, 2016

Schultz Banquet Hall, Allegheny College

TELL US ABOUT YOURSELF (*optional*)

Your contact information will not be shared with anyone outside the project team.

Name:	
Email:	
Organization:	
Address:	
Phone:	

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Other (please explain): _____

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North Main Street (SR 86) Safety Study Public Meeting

Thursday, October 20, 2016

Schultz Banquet Hall, Allegheny College

TELL US ABOUT YOURSELF (*optional*)

Your contact information will not be shared with anyone outside the project team.

Name:	Wendy Kedzierski
Email:	WKedzier@allegheny.edu
Organization:	Allegheny & Citizen
Address:	1005 Leslie Rd, Meadville
Phone:	814.332.5551

TELL US ABOUT TONIGHT'S PUBLIC MEETING

1. **How did you hear about the meeting?**

☒ Newspaper article ☒ Mailed invitation ☐ Roadside signage
☐ Email ☐ From a friend ☐ Other: _____

Where were the signs along main st. would have made it a lot easier

2. **How would you rate the meeting?**

Meeting Location.....	☐ Excellent	☒ Good	☐ Fair	☐ Poor
Time of Day.....	☐ Excellent	☒ Good	☐ Fair	☐ Poor
Presentation.....	☐ Excellent	☐ Good	☒ Fair	☐ Poor
Displays.....	☒ Excellent	☐ Good	☐ Fair	☐ Poor
Interaction with Project Team.....	☒ Excellent	☐ Good	☐ Fair	☐ Poor

Other (please explain): _____

PLEASE PROVIDE YOUR INPUT ABOUT THE PROJECT

The project team welcomes your input about multimodal safety needs along the North Main Street corridor through the Allegheny College campus.

lower speed limit to 25 mph

Center median

if not center median then bumpouts at all main crosswalks and top of hill and bottom of hill

If more space is needed, use back of sheet.

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Brian Smith, P.E., PennDOT Project Manager at briansmit@pa.gov

North Main Street (SR 86) Safety Study Public Meeting

Thursday, October 20, 2016

Schultz Banquet Hall, Allegheny College

TELL US ABOUT YOURSELF (*optional*)

Your contact information will not be shared with anyone outside the project team.

Name:	
Email:	
Organization:	
Address:	
Phone:	

TELL US ABOUT TONIGHT'S PUBLIC MEETING

1. **How did you hear about the meeting?**

☐ Newspaper article ☒ Mailed invitation ☐ Roadside signage
☐ Email ☐ From a friend ☑ Other: Allegheny College

2. **How would you rate the meeting?**

Meeting Location.....	☐ Excellent	☑ Good	☐ Fair	☐ Poor
Time of Day.....	☐ Excellent	☑ Good	☐ Fair	☐ Poor
Presentation.....	☐ Excellent	☑ Good	☐ Fair	☐ Poor
Displays.....	☑ Excellent	☐ Good	☐ Fair	☐ Poor
Interaction with Project Team.....	☐ Excellent	☑ Good	☐ Fair	☐ Poor

Other (please explain): _____

PLEASE PROVIDE YOUR INPUT ABOUT THE PROJECT

The project team welcomes your input about multimodal safety needs along the North Main Street corridor through the Allegheny College campus.

Physical Change!

Curb outs or shorten the width of road!

If more space is needed, use back of sheet.

Drop completed form in comment box at meeting, or email to:
Brian Smith, P.E., PennDOT Project Manager at briansmit@pa.gov

North Main Street (SR 86) Safety Study Public Meeting

Thursday, October 20, 2016

Schultz Banquet Hall, Allegheny College

TELL US ABOUT YOURSELF (*optional*)

Your contact information will not be shared with anyone outside the project team.

Name:	Lisa Whitenack
Email:	lwhitena@allegheny.edu
Organization:	Allegheny College
Address:	1285 Ridgemont Dr. Meadville
Phone:	813 924 4612

TELL US ABOUT TONIGHT'S PUBLIC MEETING

1. **How did you hear about the meeting?**

☐ Newspaper article ☒ Mailed invitation ☐ Roadside signage
☐ Email ☐ From a friend ☐ Other: _____

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Interaction with Project Team.....	☐ Excellent	☒ Good	☐ Fair	☐ Poor

Other (please explain): _____

PLEASE PROVIDE YOUR INPUT ABOUT THE PROJECT

The project team welcomes your input about multimodal safety needs along the North Main Street corridor through the Allegheny College campus.

Roundabouts at each end would be great!

If more space is needed, use back of sheet.

WRA

Drop completed form in comment box at meeting, or email to:
Brian Smith, P.E., PennDOT Project Manager at briansmit@pa.gov

North Main Street (SR 86) Safety Study Public Meeting

Thursday, October 20, 2016

Schultz Banquet Hall, Allegheny College

TELL US ABOUT YOURSELF (*optional*)

Your contact information will not be shared with anyone outside the project team.

Name:	Peter Oven
Email:	poven@gw.edu
Organization:	French Creek Recreational Trails Inc
Address:	329 Terrace St Ext, Meadville PA 16335
Phone:	509 228 8258

TELL US ABOUT TONIGHT'S PUBLIC MEETING

1. **How did you hear about the meeting?**

☒ Newspaper article ☒ Mailed invitation ☐ Roadside signage
☐ Email ☐ From a friend ☐ Other: _____

2. **How would you rate the meeting?**

Meeting Location.....	☒ Excellent	☐ Good	☐ Fair	☐ Poor
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Interaction with Project Team.....	☒ Excellent	☐ Good	☐ Fair	☐ Poor

Other (please explain): _____

PLEASE PROVIDE YOUR INPUT ABOUT THE PROJECT

The project team welcomes your input about multimodal safety needs along the North Main Street corridor through the Allegheny College campus.

Long term solution is to close the road and divert to Baldwin / Park / Allegheny. This will unify the campus and add value to the college, which will ultimately benefit the community.

Other option would be to complete the French Creek Parkway / to 86 which was never completed in the 1970's. This will route the traffic away from N. Main.

If more space is needed, use back of sheet.

Drop completed form in comment box at meeting, or email to:
Brian Smith, P.E., PennDOT Project Manager at briansmit@pa.gov

North Main Street (SR 86) Safety Study Public Meeting

Thursday, October 20, 2016

Schultz Banquet Hall, Allegheny College

TELL US ABOUT YOURSELF (*optional*)

Your contact information will not be shared with anyone outside the project team.

Name:	Robert Wright
Email:	twright@Allegheny.edu
Organization:	Allegheny College Public Safety
Address:	520 N. Main St Meadville PA 16335
Phone:	814 332-3357

TELL US ABOUT TONIGHT'S PUBLIC MEETING

1. How did you hear about the meeting?

☐ Newspaper article ☒ Mailed invitation ☐ Roadside signage
☐ Email ☐ From a friend ☒ Other: College Email

2. How would you rate the meeting?

Meeting Location.....	☐ Excellent	☒ Good	☐ Fair	☐ Poor
Time of Day.....	☐ Excellent	☒ Good	☐ Fair	☐ Poor
Presentation.....	☒ Excellent	☐ Good	☐ Fair	☐ Poor
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Interaction with Project Team.....	☒ Excellent	☐ Good	☐ Fair	☐ Poor

Other (please explain): _____

PLEASE PROVIDE YOUR INPUT ABOUT THE PROJECT

The project team welcomes your input about multimodal safety needs along the North Main Street corridor through the Allegheny College campus.

AREA NEEDS LIGHTING SO IT LOOKS LIKE DAYLIGHT
BARRIERS TO FUNNEL STUDENTS TO CROSSWALKS
CONSTRUCTION TO SLOW TRAFFIC DOWN
EDUCATE STUDENTS HOW TO CROSS STREET AT CROSSWALKS AND PUT UP PHONES
SIGN AGE TO ALERT DRIVERS NOT FROM AREA.

LIGHTING ON PARK AVE IS AS BAD OR WORSE AND THE NEXT FATAL ACCIDENT AREA IN THE NEAR FUTURE.

OVER

If more space is needed, use back of sheet.

Drop completed form in comment box at meeting, or email to:
Brian Smith, P.E., PennDOT Project Manager at briansmit@pa.gov

Possibility of making North Main one way Down (Southbound)
and Park Ave one way North bound from Allegheny
St. to Baldwin St. narrowing both streets
and blocking ability to cross except at crosswalks

Appendix C:
Alternatives Presented to Steering committee

North Main Street Safety Study

PennDOT District 1-0 in conjunction with
Allegheny College & City of Meadville



Alternatives Selection Meeting

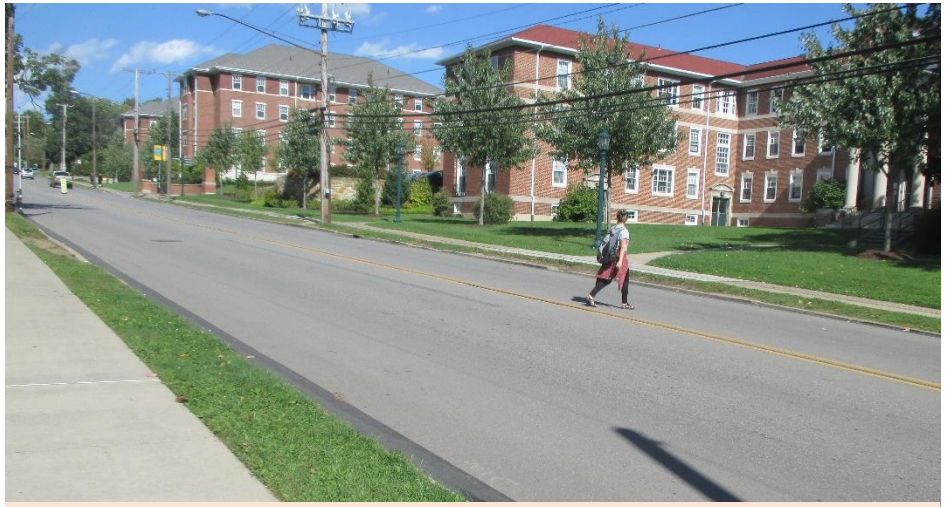
December 6th, 2016

Study Corridor Concerns

- Poor visibility at night
  - 2 of 3 ped crashes during dark conditions
  - No pedestrian scale lighting
  - Headlight glare from opposing vehicles
- Vehicle speeds
  - Posted 35 MPH but some feel too high
- Road character changes significantly
  - Roadway widens south of Allegheny/Limber Road
- High number of pedestrian crossings
  - Safety concern for pedestrians
  - Delay/driver frustration for vehicles
- Jaywalking
  - Blocks north & south of East John Street
- Distracted walking



Traffic queues due to high pedestrian crossing volumes



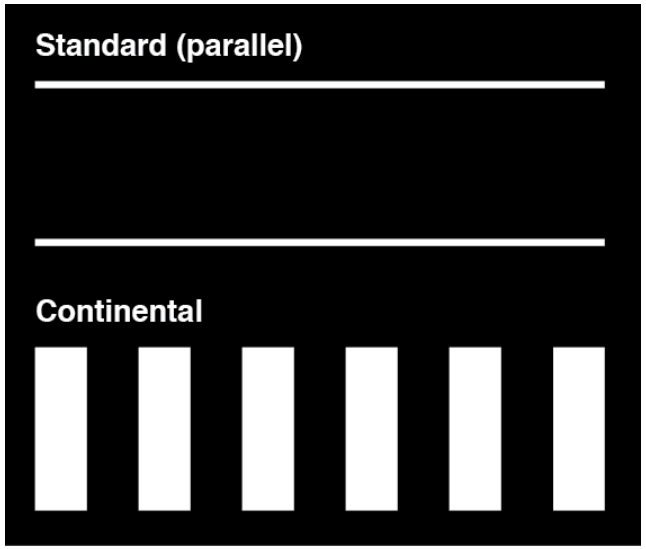
Jaywalker south of East John Street

Immediate Improvements

- Restripe faded crosswalk markings
- Switch from standard transverse crosswalk markings to continental style
- Install PEDESTRIAN CROSSING NEXT ½ MILE signs (W11-2 and W7-3aP)
  - Bracket on northern and southern campus boundaries
- Upgrade drainage grates to bicycle friendly grates



Sherman Street









Immediate Improvements

- Relocate in-roadway pedestrian crossing signs to centerline of roadway and on the far boundary of the high-visibility crosswalk if only 1 in-roadway pedestrian sign is present
- Consider an additional in-roadway pedestrian crossing signs for each crosswalk
  - If provided, install on centerline at far boundary of crosswalk (book-ending the crossing area)





Alternative 1: Short-term Improvement Examples

1) Overhead gateway signs
2) Two-way cycle track
3) Raised crossing area
4) High-visibility crosswalk









Alternative 1: Long-term Improvement Examples

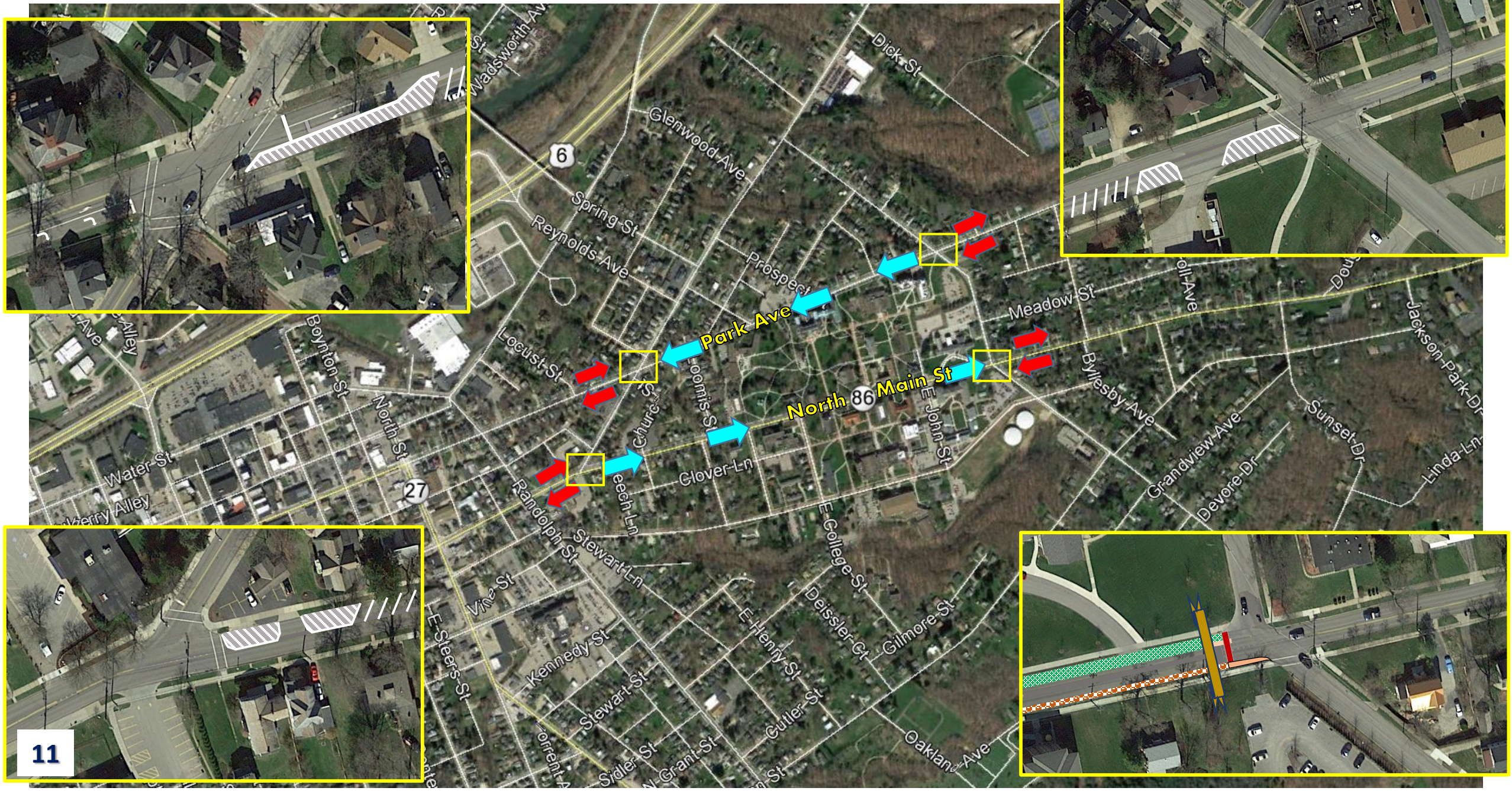
1) Shared Used Path
2) Single Lane Roundabout





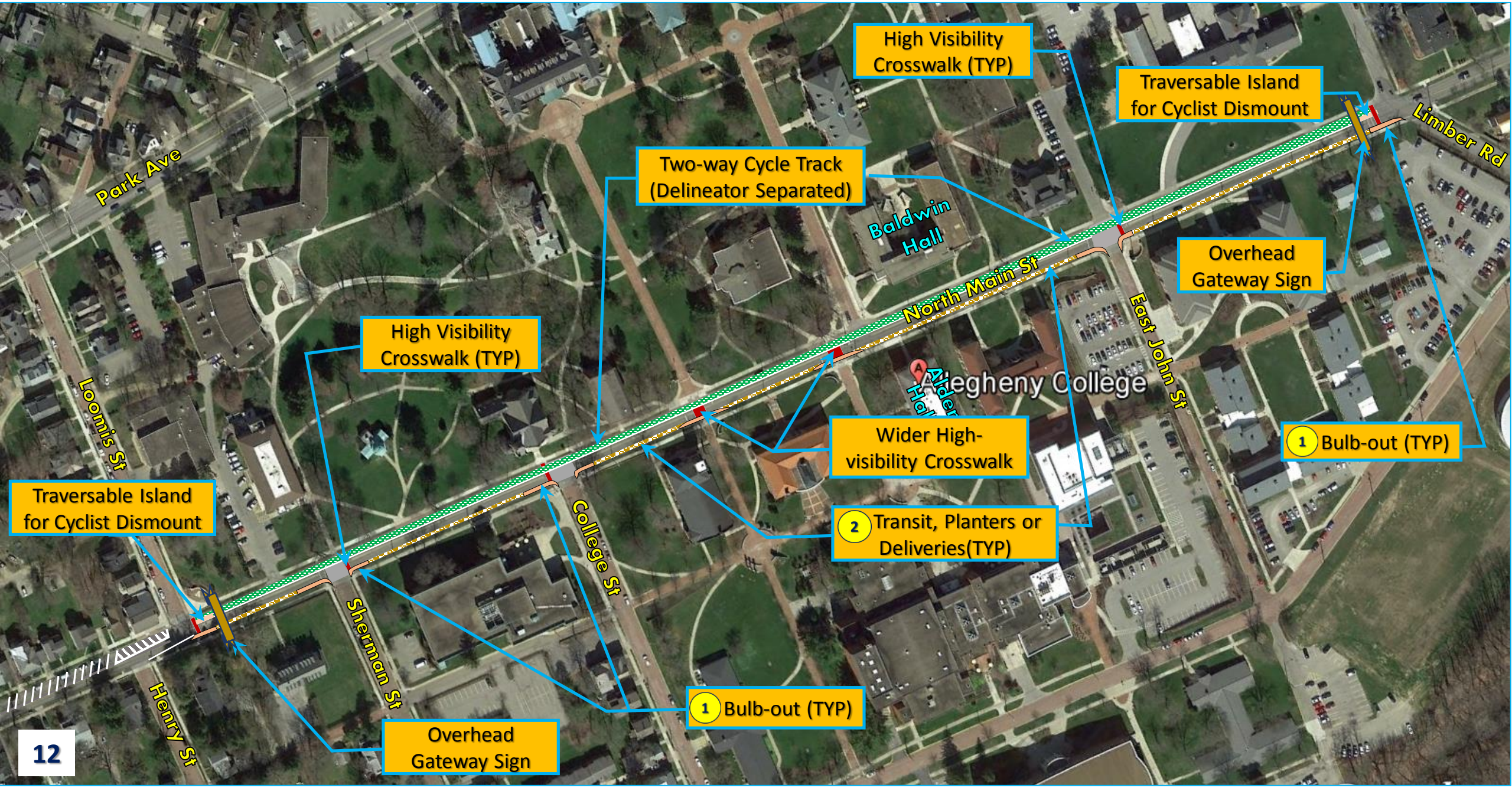
LONG-TERM

Alternative 2 – One Way Pair with North Main St & Park Ave



LONG-TERM

Alternative 2 – One Way Pair with North Main St & Park Ave



Alternative 2: Long-term Improvement Examples

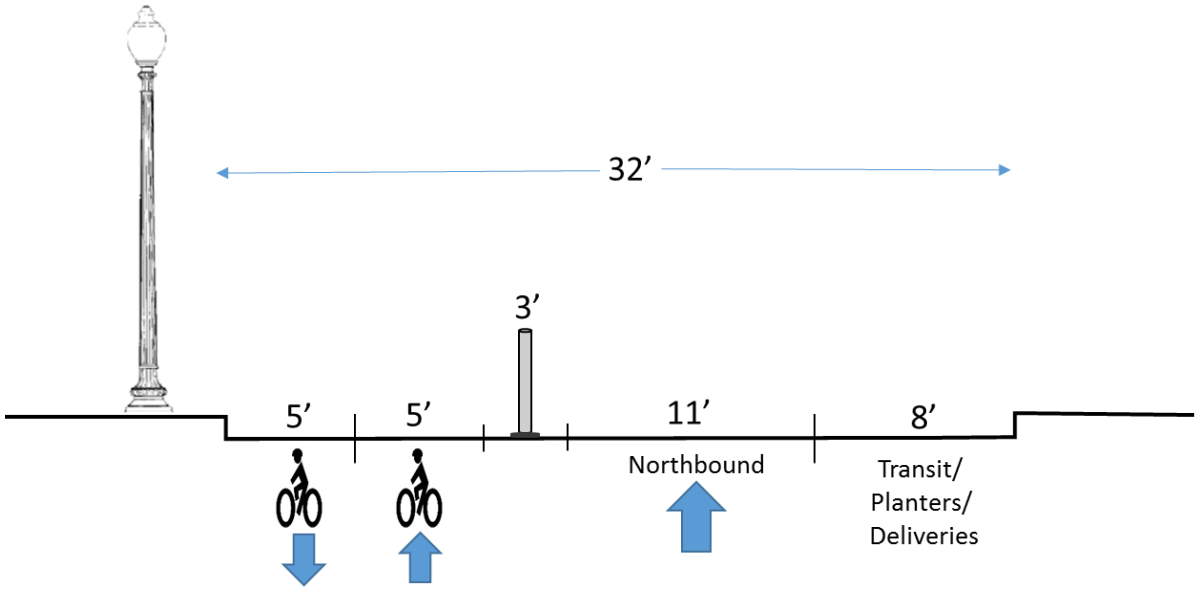
1) Bulb-outs
2) Planters



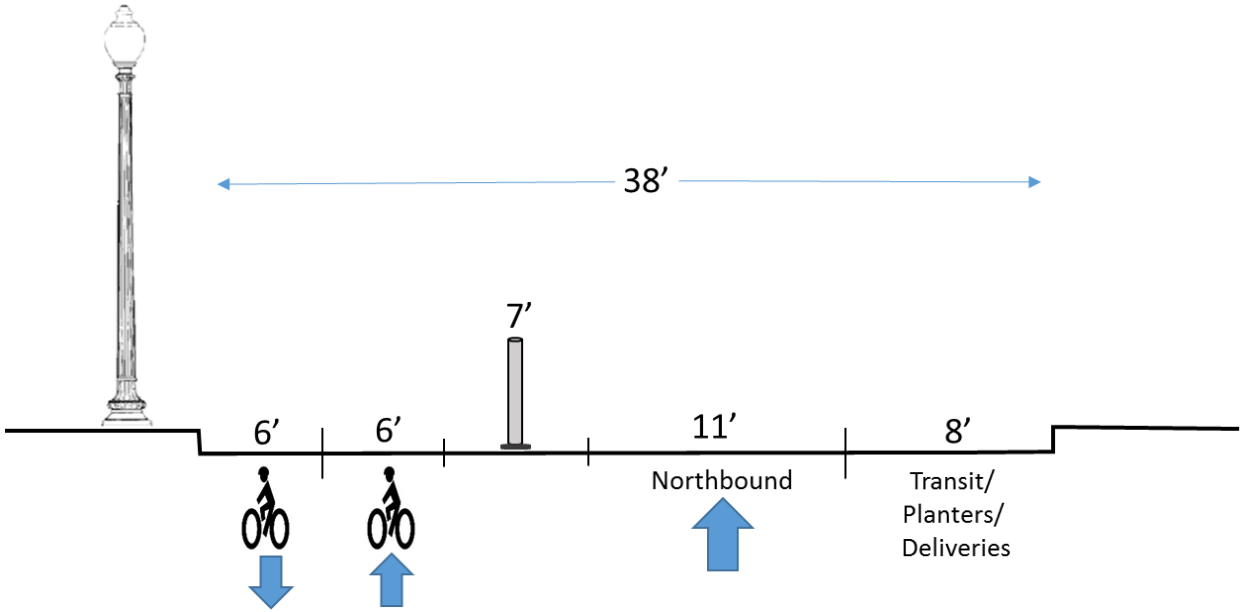


Alternative 2: Long-term Cross Sections

Southern Typical Cross Section
Loomis Street – Baldwin/Alden Halls

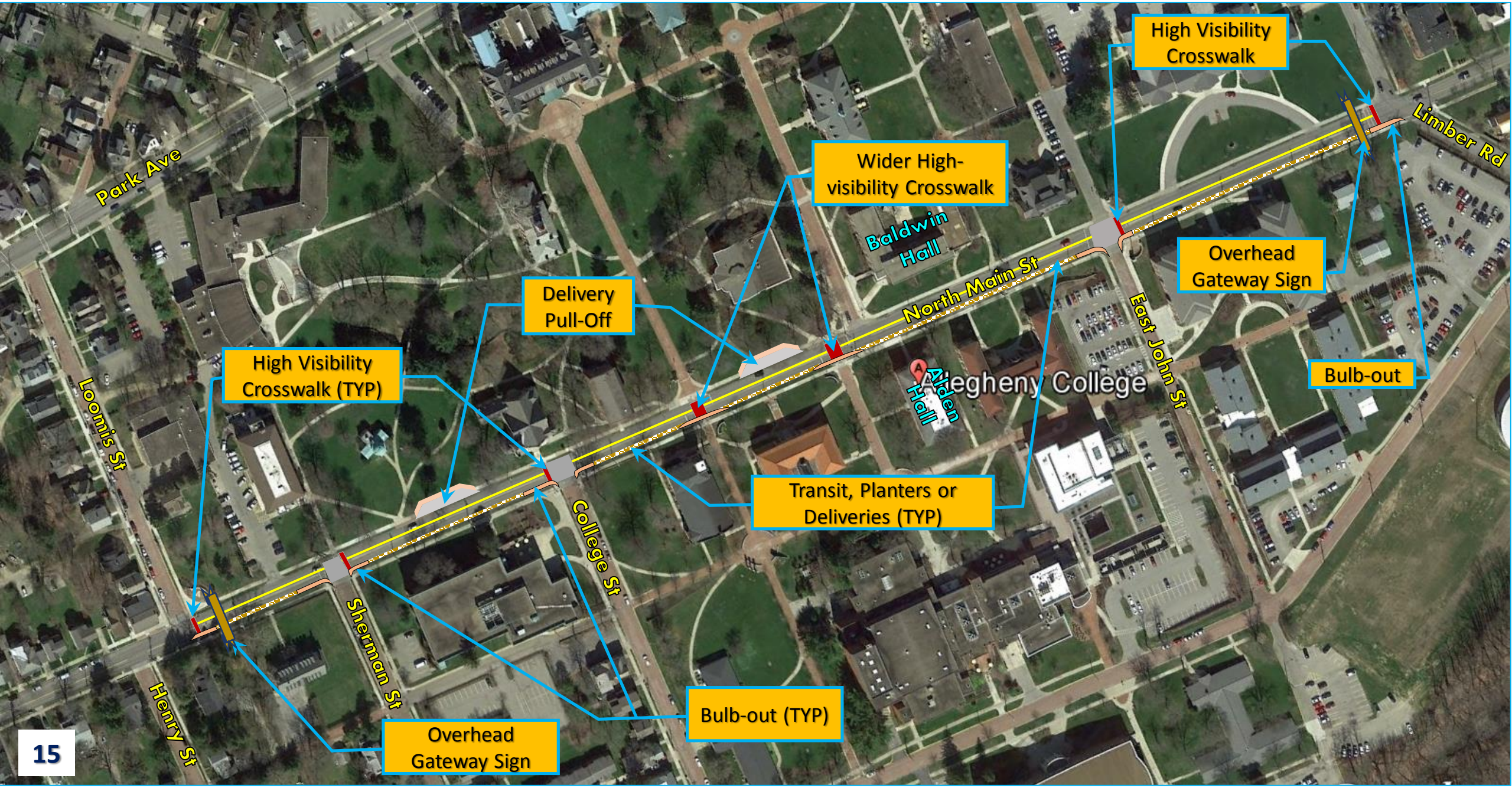


Northern Typical Cross Section
Baldwin/Alden Halls – Limber Road



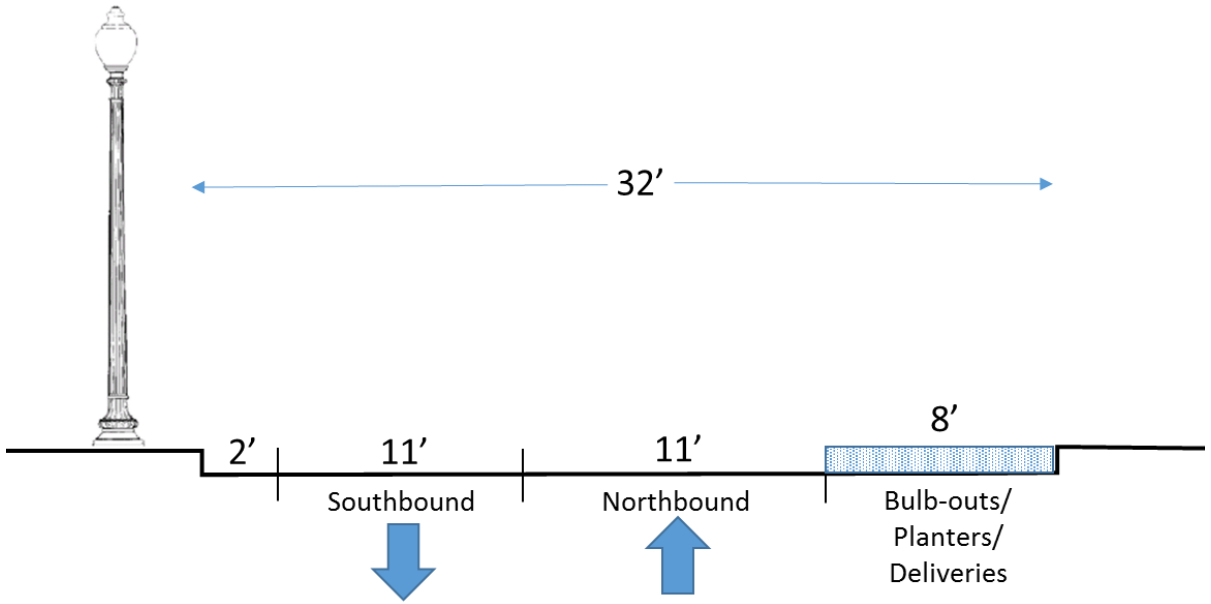
SHORT-TERM

Alternative 3 – Bulb-outs and Transit/Planters

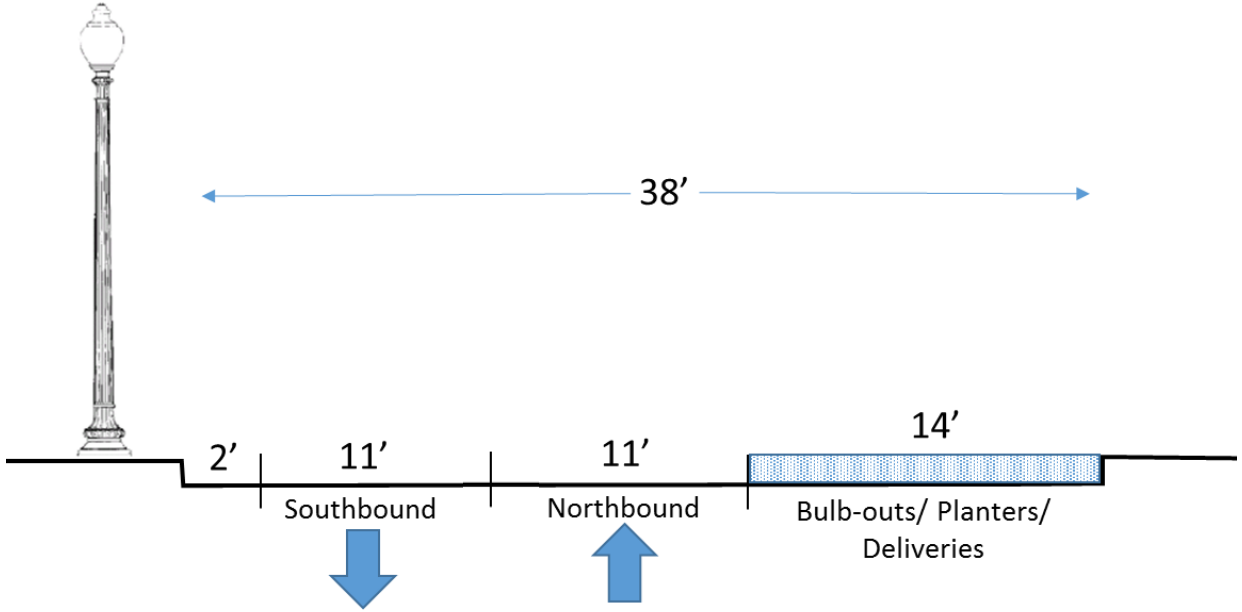


Alternative 3: Short-term Cross Sections

Southern Typical Cross Section
Loomis Street – Baldwin/Alden Halls

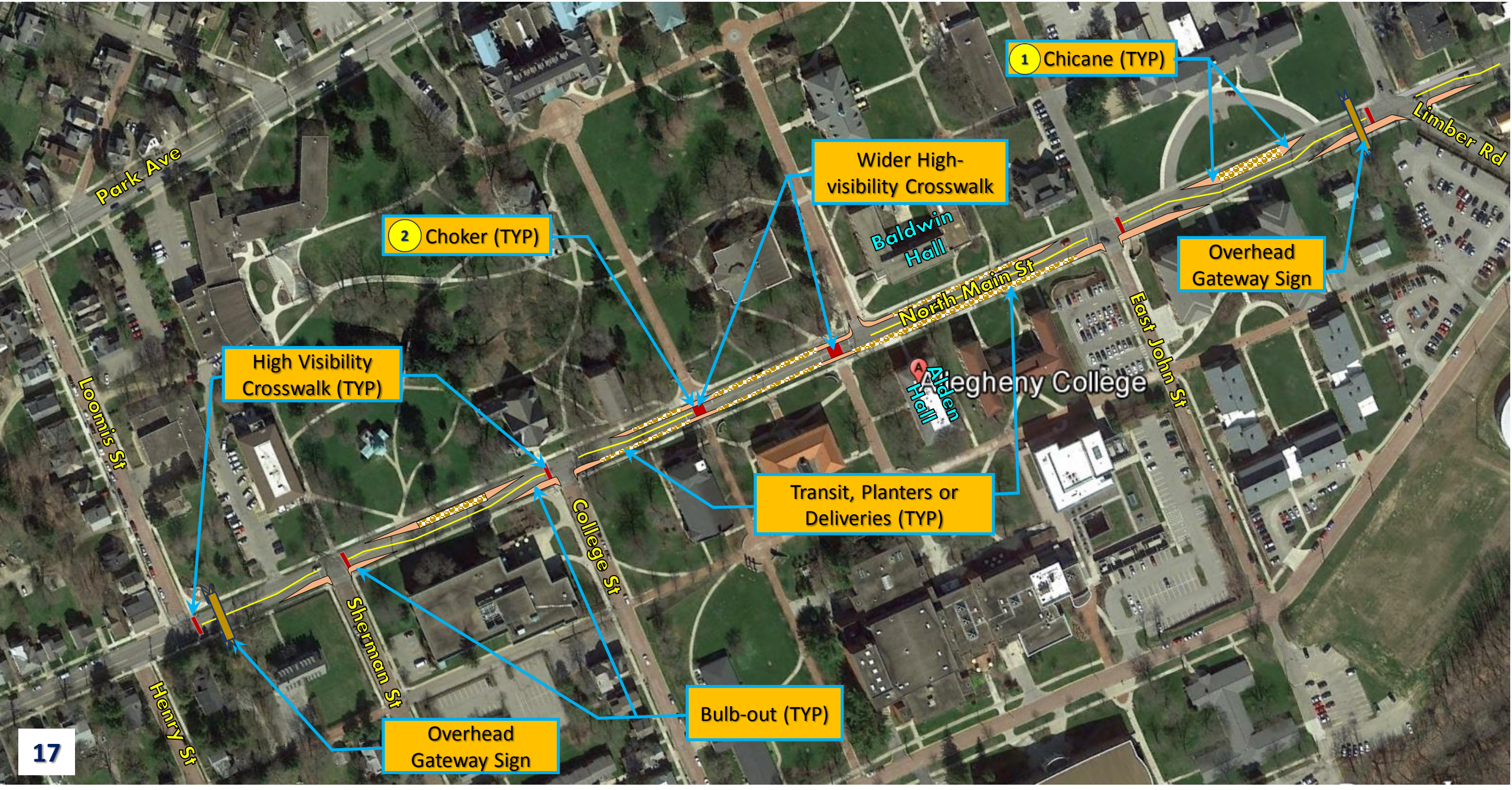


Northern Typical Cross Section
Baldwin/Alden Halls – Limber Road



SHORT-TERM

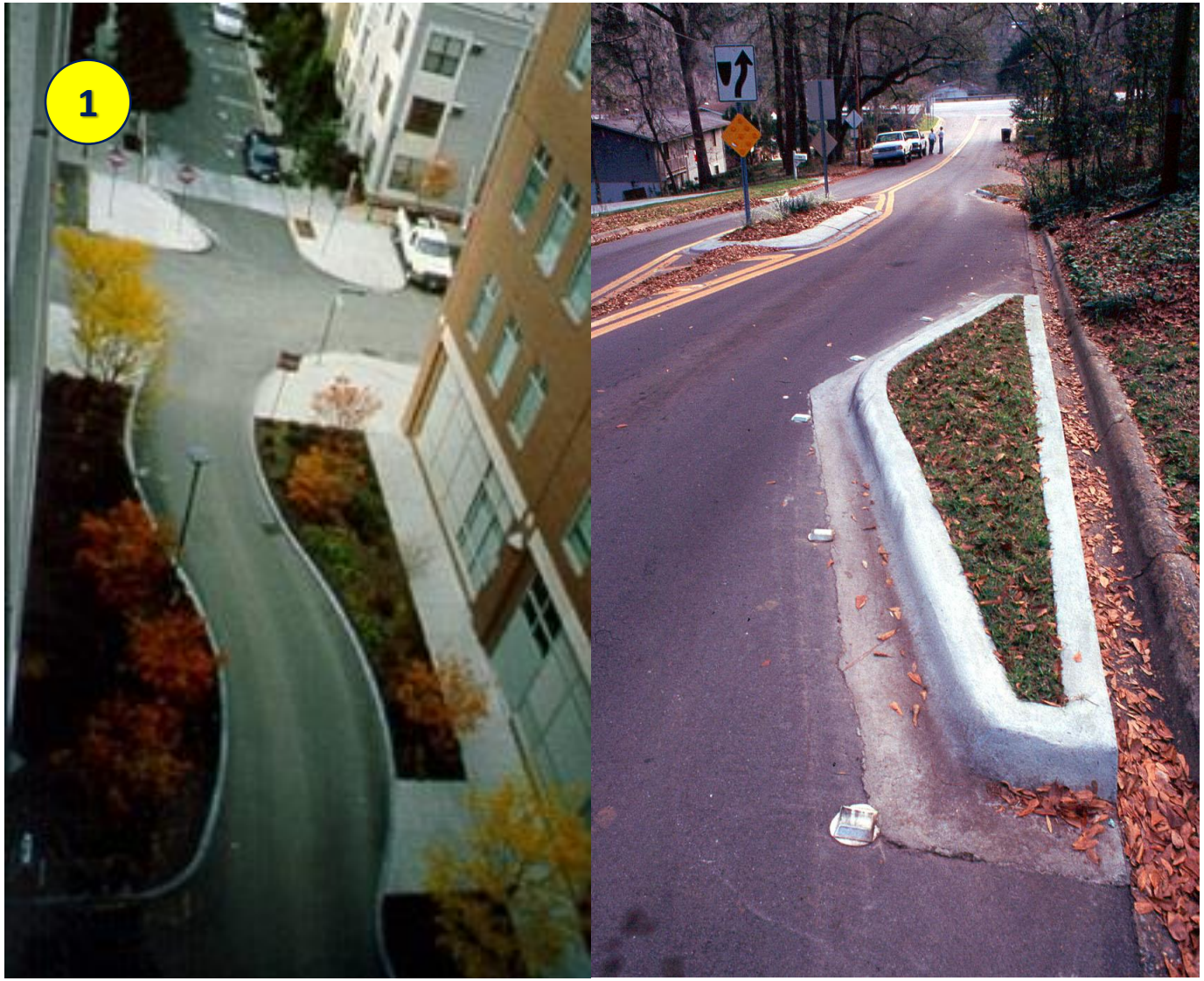
Alternative 4 – Chicanes, Chokers and Planters/Deliveries



Alternative 4: Short-term Improvement Examples

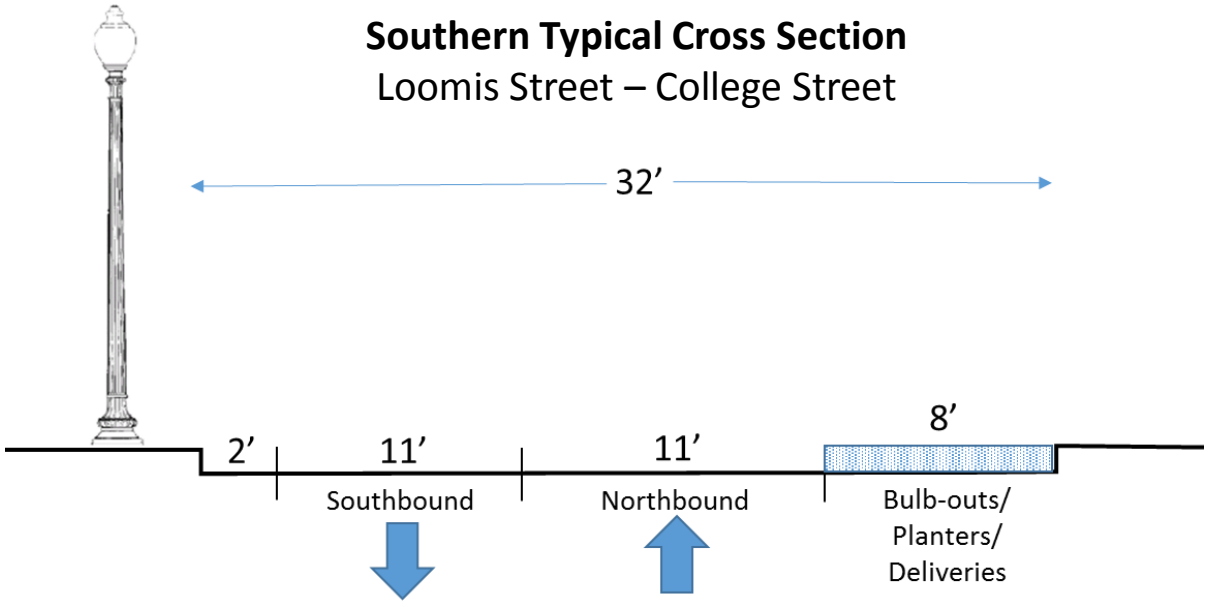
1) Chicane
2) Choker



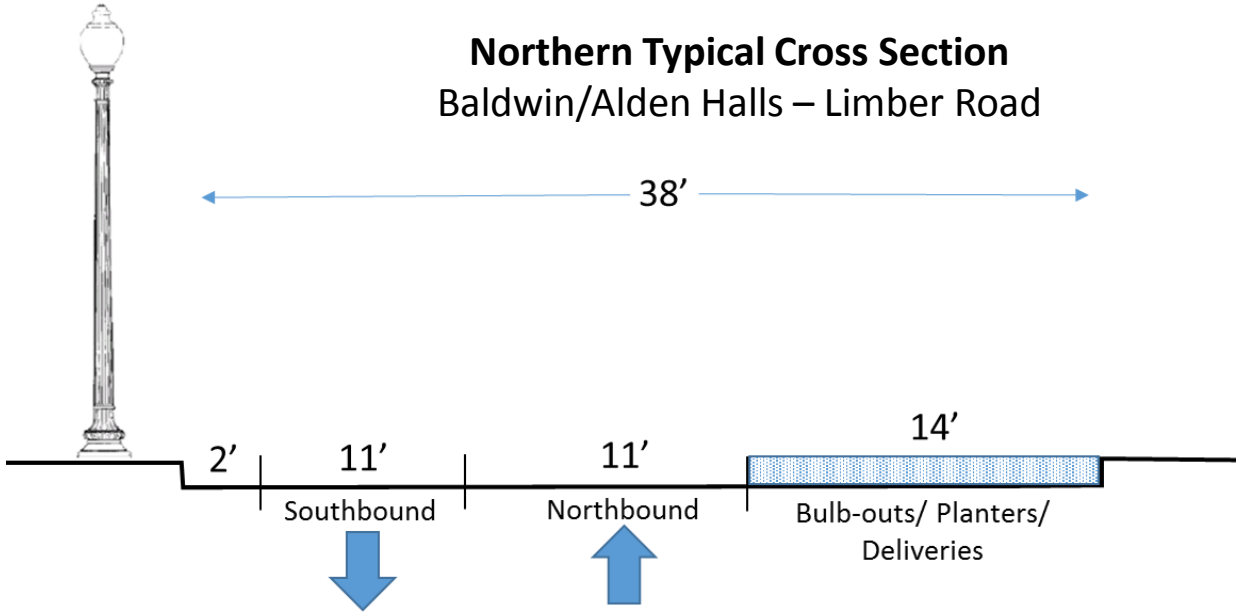


Alternative 4: Short-term Cross Sections

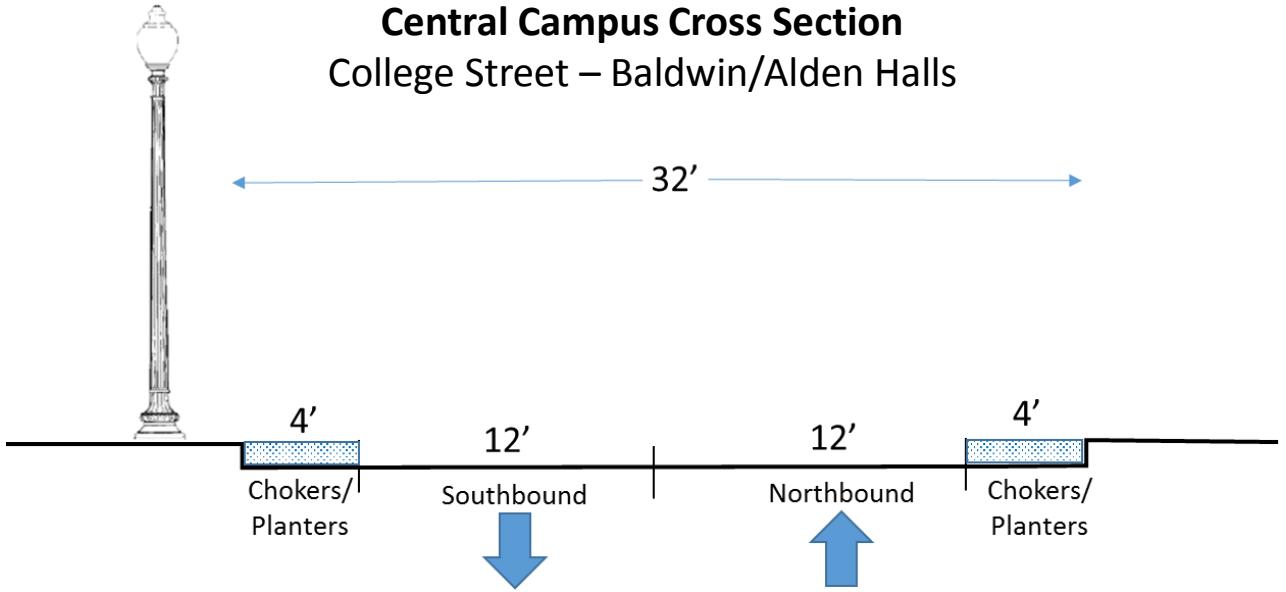
Southern Typical Cross Section
Loomis Street – College Street



Northern Typical Cross Section
Baldwin/Alden Halls – Limber Road

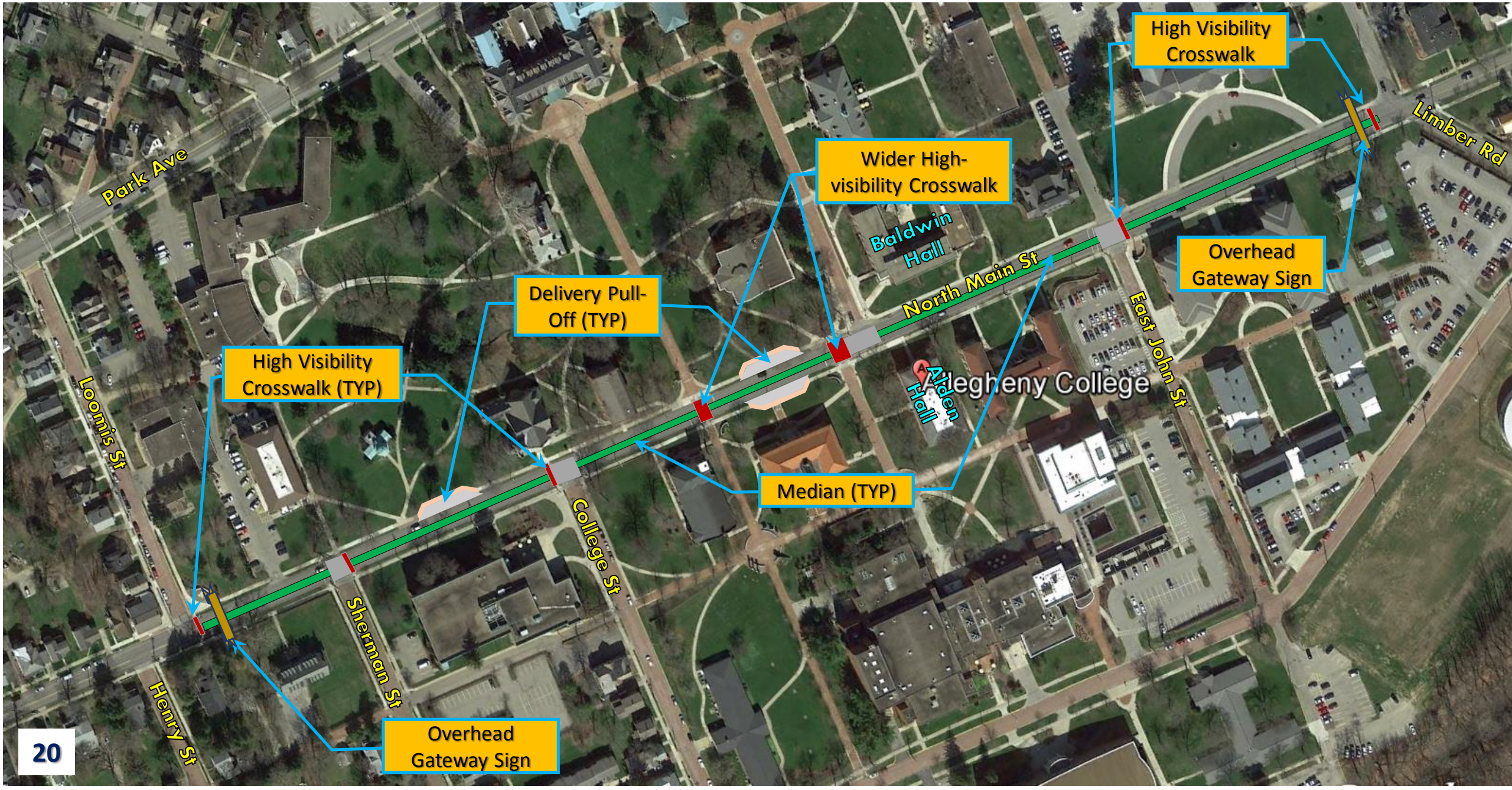


Central Campus Cross Section
College Street – Baldwin/Alden Halls



LONG-TERM

Alternative 5 – Median



Alternative 5: Long-term Improvement Examples

1) Pedestrian refuge areas

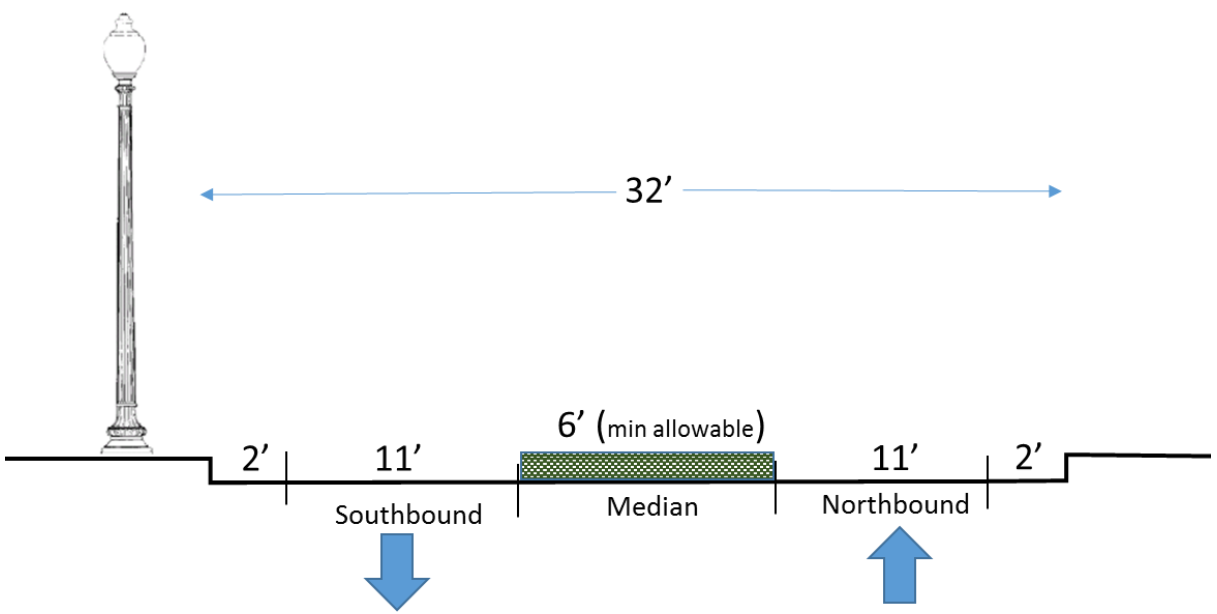




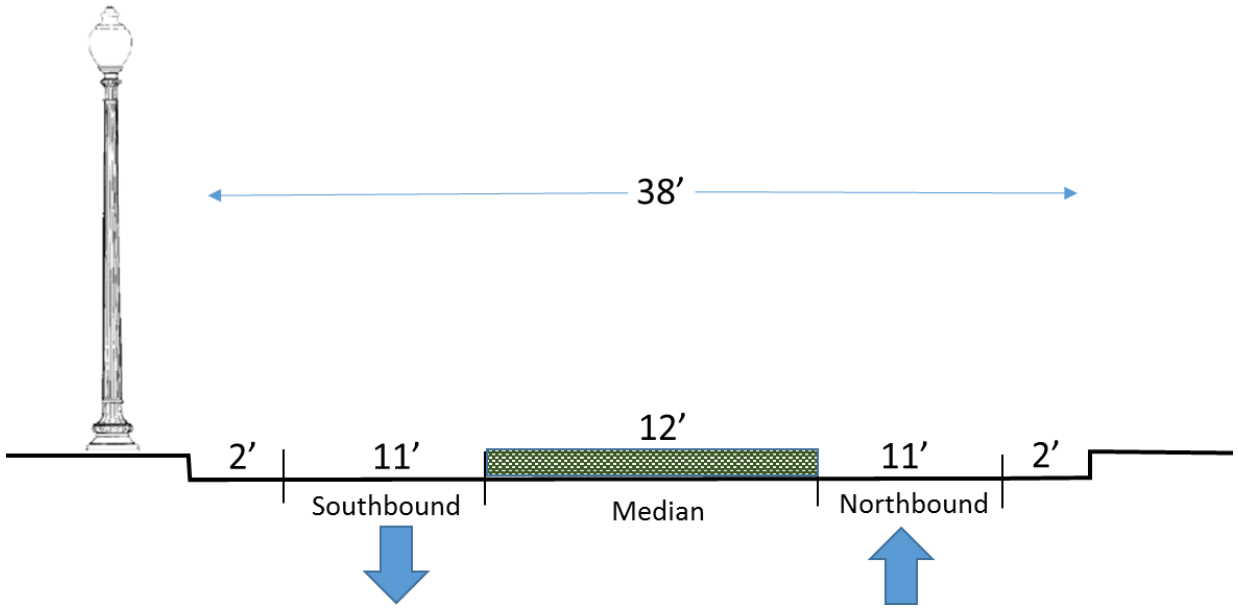


Alternative 5: Median Cross Sections

Southern Typical Cross Section
Loomis Street – Baldwin/Alden Halls



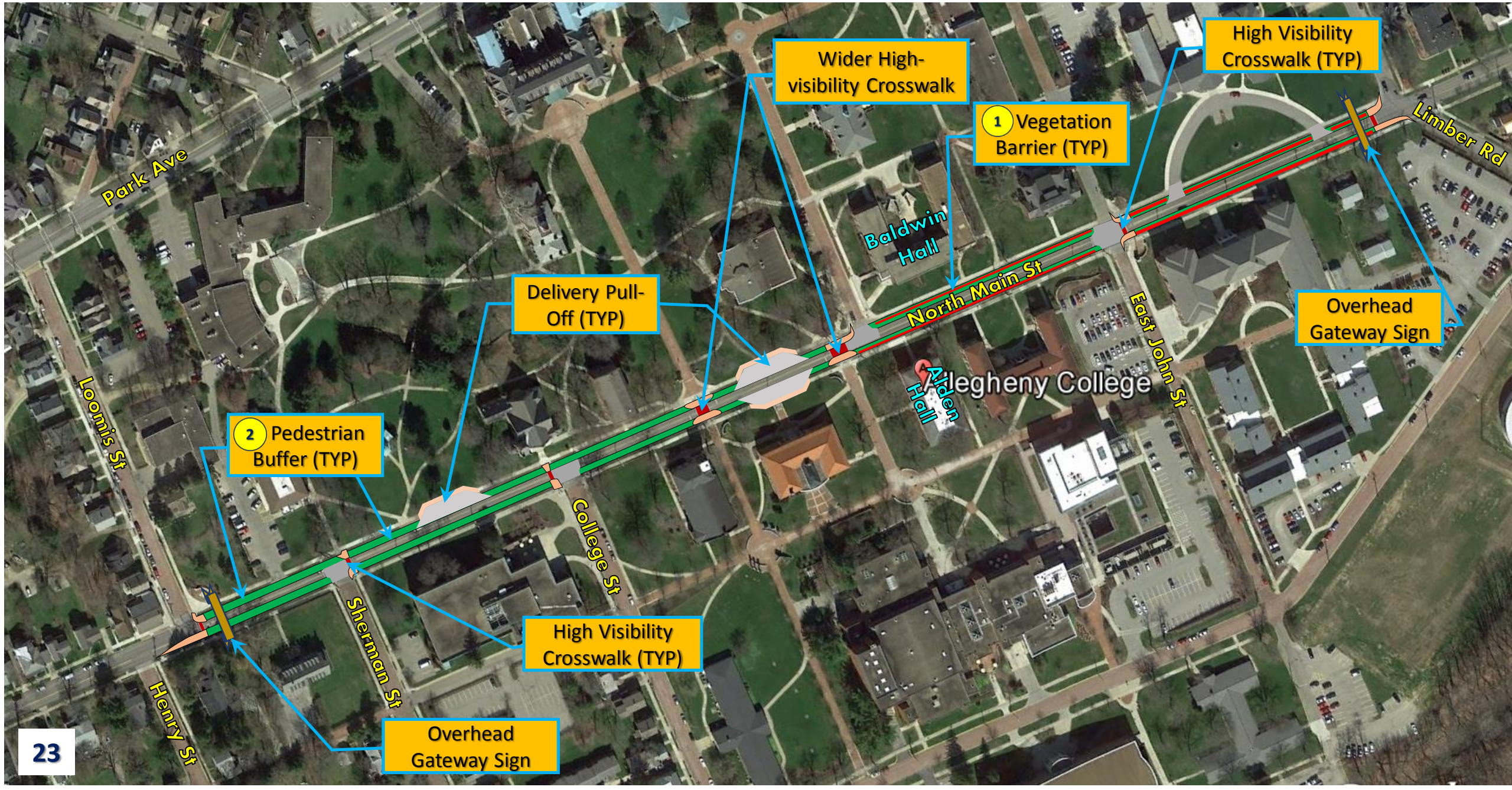
Northern Typical Cross Section
Baldwin/Alden Halls – Limber Road



NOTE: Minimum protected width for a pedestrian refuge island is 6 feet per National Association of City Transportation Officials, 8 feet is preferred.

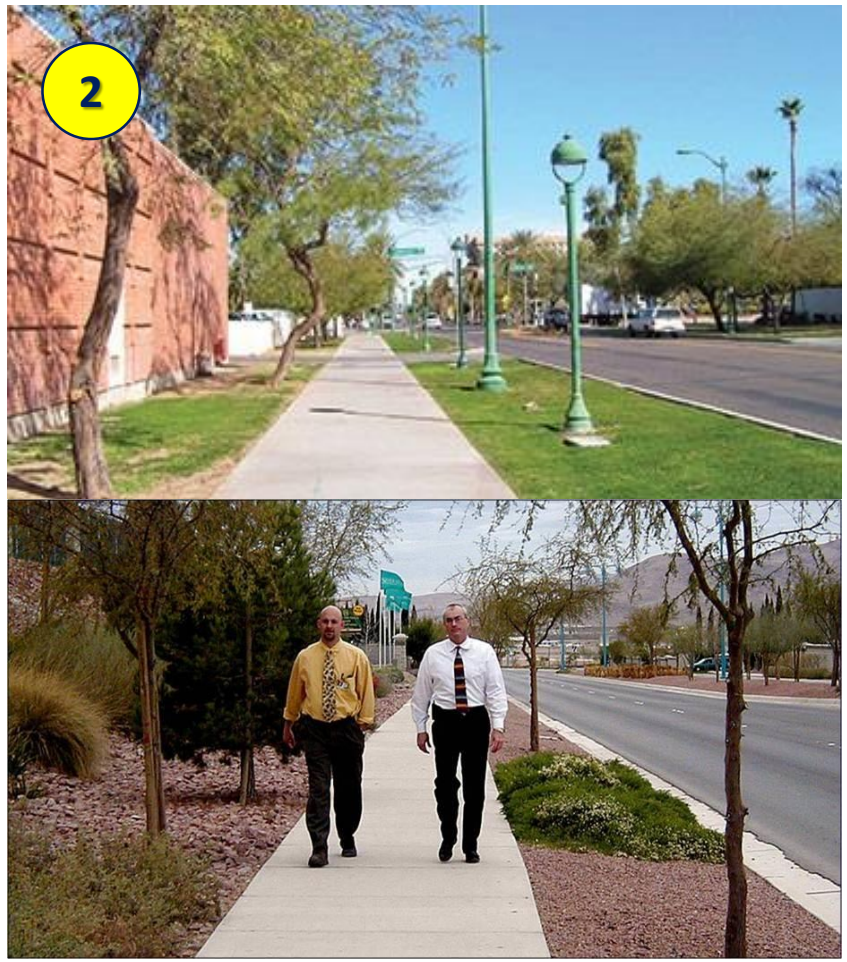
LONG-TERM

Alternative 6 – Roadway Narrowing & Pedestrian Barriers/Diverters



Alternative 6: Long-term Improvement Examples

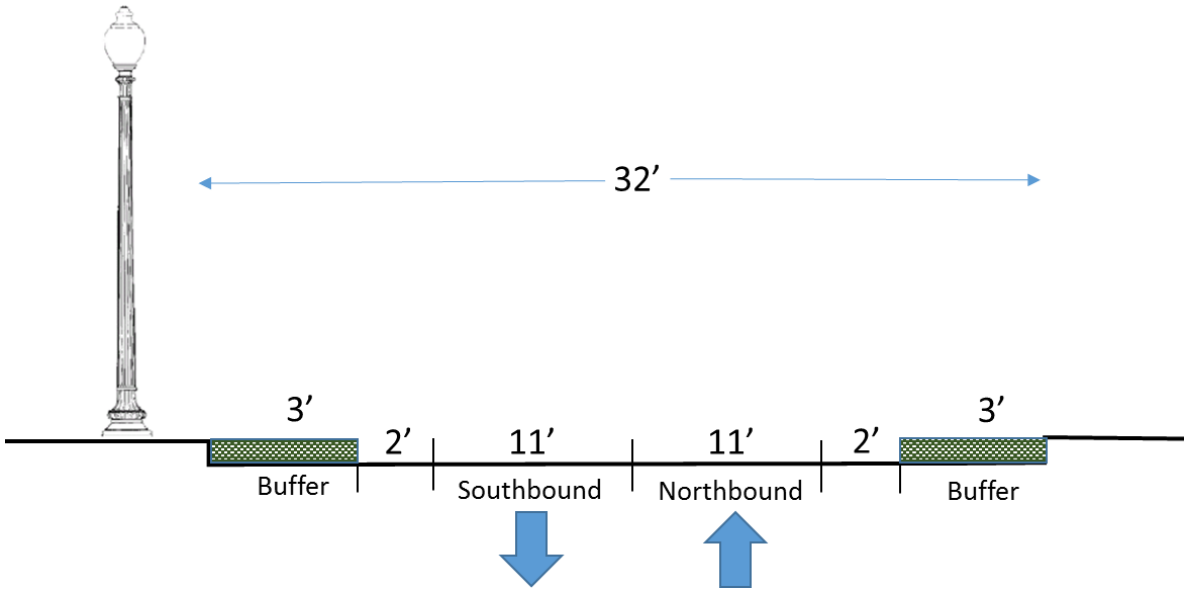
1) Vegetation barrier
2) Pedestrian buffer



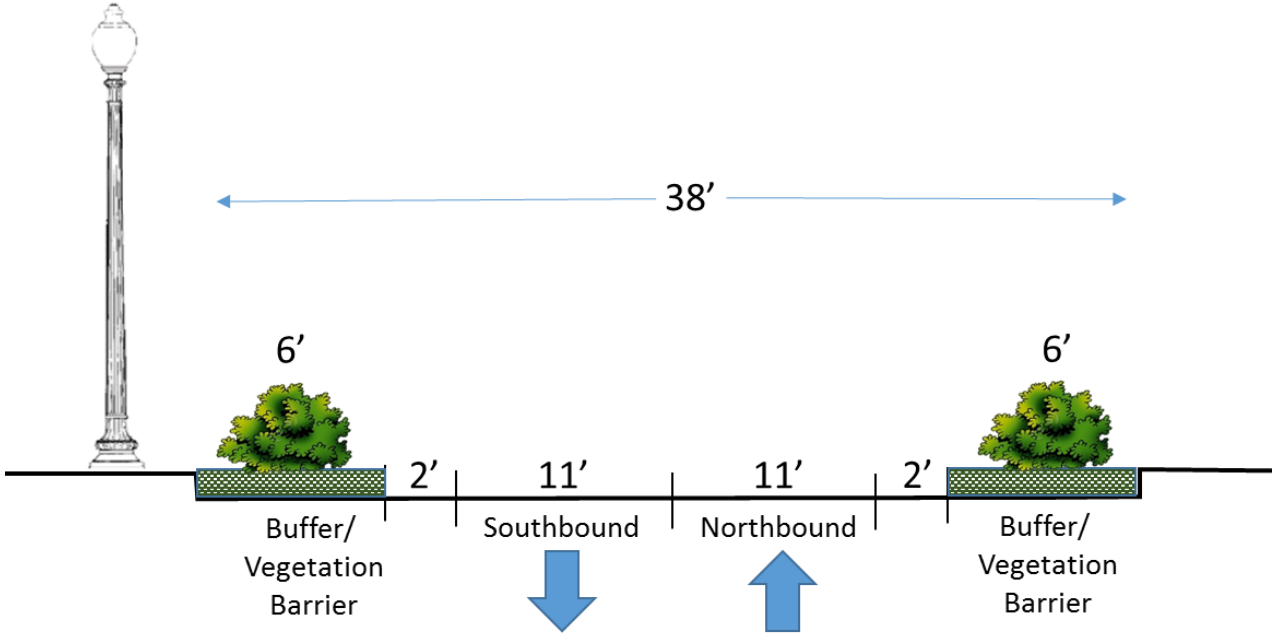


Alternative 6: Long-term Cross Sections

Southern Typical Cross Section
Loomis Street – Baldwin/Alden Halls

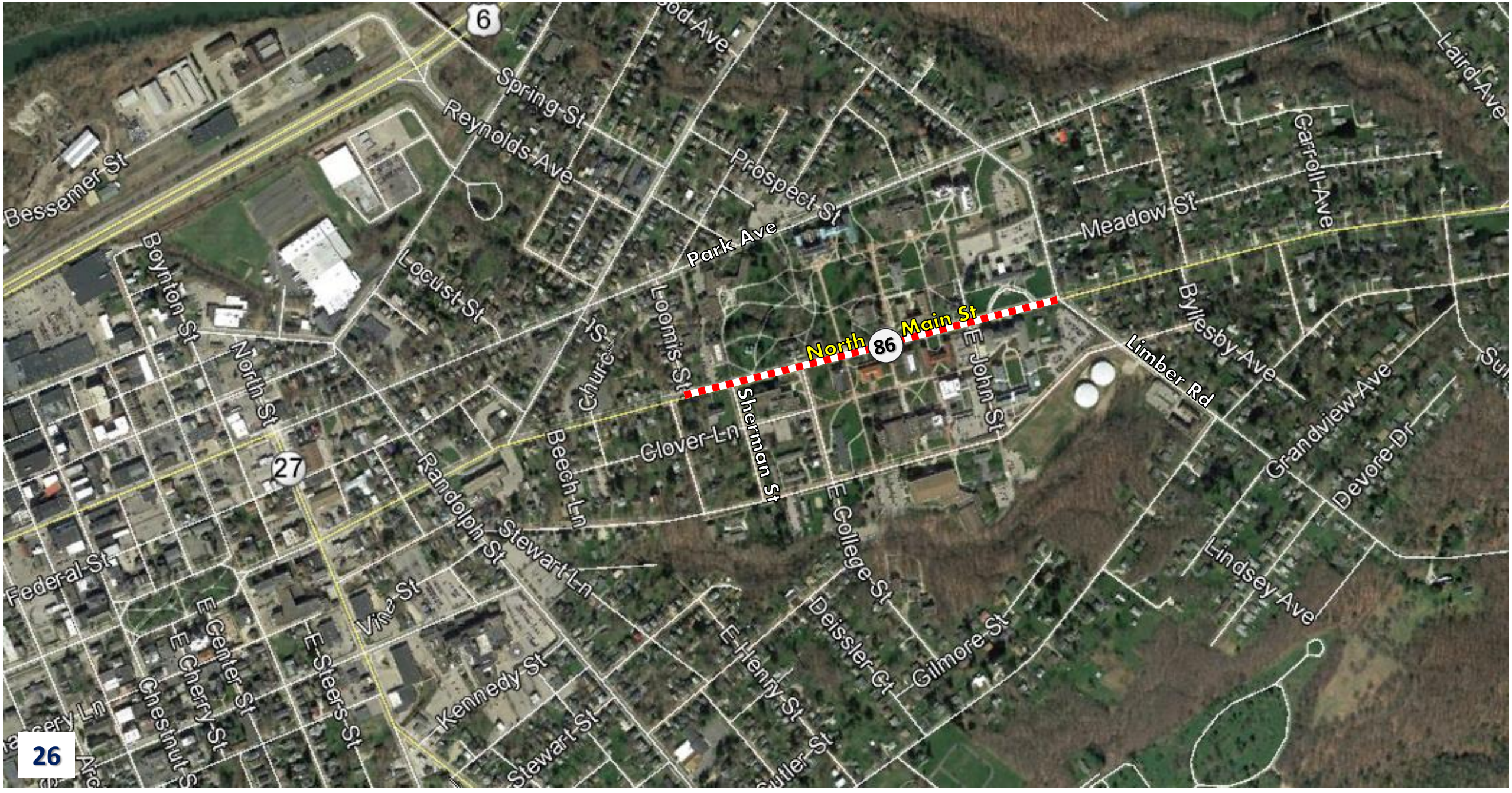


Northern Typical Cross Section
Baldwin/Alden Halls – Limber Road



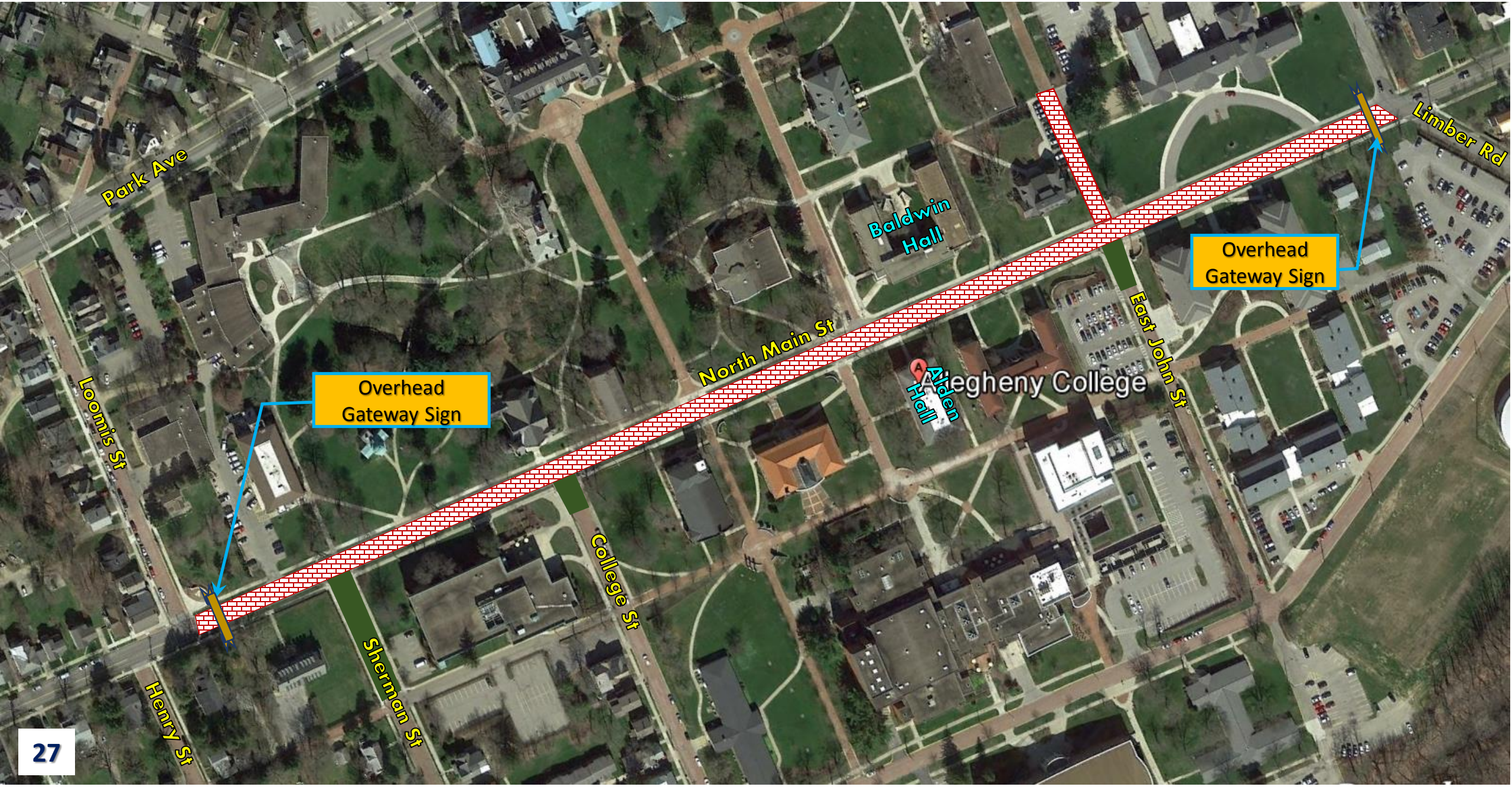
LONG-TERM

Alternative 7 – Community Street (No Thru Traffic)



LONG-TERM

Alternative 7 – Community Street (No Thru Traffic)



Alternative 7: Community Street Examples











Level of Impact Comparison

Areas of Interest		Alt 1		Alt 2 (One-way Pair)	Alt 3 (Bulb-outs/ Planters)	Alt 4 (Chokers/ Chicanes)	Alt 5 (Median)	Alt 6 (Narrow Rd/Ped Barriers)	Alt 7 (Community Street)
		In-road Cycle Track	Raised Cycle Track						
Enhanced Ped Visibility		Med	High	Med	Med	High	Low	High	N/A
Speed Reduction		Med	Med	Med	Med	High	Med	Med	High
Improve Mobility	Pedestrian	Low	High	Low	Med	Med	Med	Med	High
	Bicycle	High	High	High	Low	Low	Low	Low	High
	Vehicle	None	None	Reduced	None	None	None	None	Reduced
Reduce Jaywalking		Med	Med	Low	Low	Low	Low	High	High
Improve Distracted Walking		Low	Low	Low	Low	Low	Med	Med	High
Maintenance	PennDOT	Med	Low	Med	Low	Med	Low	Low	None
	College/City	Low	High	Med	High	High	High	High	High
Construction Cost*		Low	High	Med	Med	Med	Med	High	High

*Low < $100k Med = $100k to $1M High > $1M

Appendix D:
Existing & Future Traffic Volumes

Whitman, Requardt & Associates, LLP
Engineers · Architects · Environmental Planners Est. 1915
300 Seven Fields Boulevard, Suite 130, Seven Fields, Pennsylvania 16048

Volume Balancing Calculations

Project: Allegheny College Project
Location: Meadville, PA
Date: 10/17/2016

Time Period: AM Peak
Compiled By: XW
Reviewed By: REB

Color Coding Legend

- Decreased Volume
- Changed +5 to 10 Vehicles
- Changed +15 to 20 Vehicles
- Changed + >20 Vehicles
- Allowed Imbalance

Base Information:

Existing Year =	2016
Future Year =	2036
# of Years =	20
Growth Rate =	0.50%
Growth Rate + 1 =	1.0050

Definitions:

EV = Existing Volumes
FV = Future Volumes
Y = # of years
GR = Growth Rate

Linear Growth Equation:

FV = (((EV x GR) - EV) x Y) + EV)

Raw Original Volumes

Enter raw peak hour volumes from traffic count data

				250				141						
				⇩	63	181	6	⇧						
			178	⇦ Out/In	N Main St		Out/In ⇦	112						
				28	Allegheny St/ Limber Rd		0							
100				46	TEV:627		90							
				35	9/28/2016		22							
			109	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	70						
				⇩	25	113	18	⇧						
				238				156						
				0	⇩		⇧	-4						
				238				160						
				⇩	6	220	12	⇧						
			28	⇦ Out/In	N Main St		Out/In ⇦	7						
				0	E John ST		3							
105				1	TEV:442		2							
				9	9/28/2016		2							
			10	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	23						
				⇩	20	157	10	⇧						
				231				187						
				6	⇩		⇧	4						
				237				183						
				⇩	2	235		⇧						
			5	⇦ Out/In	N Main St		Out/In ⇦	0						
				0	Baldwin Hall									
110					TEV:426									
				3	9/28/2016									
			3	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	0						
				⇩	3	183		⇧						
				238				186						
				-4	⇩		⇧	-5						
				234				191						
				⇩	234			⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	0						
					US Post Office									
115					TEV:425									
					9/28/2016									
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	0						
				⇩	191			⇧						
				234				191						
				5	⇩		⇧	-2						
				239				193						
				⇩	222	17		⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	20						
					E College St		12							
120					TEV:459									
					9/28/2016		8							
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	36						
				⇩	181	19		⇧						
				230				200						
				-2	⇩		⇧	-2						
				228				202						
				⇩	225	3		⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	5						
					Sherman St		3							
125					TEV:449									
					9/28/2016		2							
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	20						
				⇩	199	17		⇧						
				227				216						
				-6	⇩		⇧	3						
				221				213						
				⇩	12	209		⇧						
			23	⇦ Out/In	N Main St		Out/In ⇦	0						
				13	Loomis St									
130					TEV:458									
				13	9/28/2016									
			26	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	0						
				⇩	11	200		⇧						
				222				211						
				1	⇩		⇧	3						
				223				208						
				⇩	216	7		⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	4						
					Henry St		3							
135					TEV:439									
					9/28/2016		1							
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	14						
				⇩	205	7		⇧						
				217				212						

Modified / Balanced Volumes

Rounded peak hour volumes, highlighted / color-coded to show data overrides during balancing

				255				160						
				⇩	65	185	5	⇧						
			185	⇦ Out/In	N Main St		Out/In ⇦	115						
				30	Allegheny St/ Limber Rd		5							
100				45	TEV:655		90							
				35	9/28/2016		20							
			110	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	70						
				⇩	30	125	20	⇧						
				240				175						
				OK	0	⇩	⇧	0	OK					
				240				175						
				⇩	5	225	10	⇧						
			30	⇦ Out/In	N Main St		Out/In ⇦	15						
				5	E John ST		5							
105				5	TEV:470		5							
				10	9/28/2016		5							
			20	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	25						
				⇩	20	165	10	⇧						
				240				195						
				OK	0	⇩	⇧	0	OK					
				240				195						
				⇩	5	235		⇧						
			10	⇦ Out/In	N Main St		Out/In ⇦	0						
				5	Baldwin Hall									
110					TEV:445									
				5	9/28/2016									
			10	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	0						
				⇩	5	190		⇧						
				240				195						
				OK	0	⇩	⇧	0	OK					
				240				195						
				⇩	240			⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	0						
					US Post Office									
115					TEV:435									
					9/28/2016									
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	0						
				⇩	195			⇧						
				240				195						
				OK	0	⇩	⇧	0	OK					
				240				195						
				⇩	225	15		⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	20						
					E College St		10							
120					TEV:465									
					9/28/2016		10							
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	35						
				⇩	185	20		⇧						
				235				205						
				OK	0	⇩	⇧	0	OK					
				235				205						
				⇩	230	5		⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	10						
					Sherman St		5							
125					TEV:460									
					9/28/2016		5							
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	20						
				⇩	200	15		⇧						
				235				215						
				NG	-10	⇩	⇧	0	OK					
				225				215						
				⇩	10	215		⇧						
			20	⇦ Out/In	N Main St		Out/In ⇦	0						
				15	Loomis St									
130					TEV:465									
				15	9/28/2016									
			30	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	0						
				⇩	10	200		⇧						
				230				210						
				OK	0	⇩	⇧	0	OK					
				230				210						
				⇩	220	10		⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	10						
					Henry St		5							
135					TEV:450									
					9/28/2016		5							
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	15						
				⇩	205	5		⇧						
				225				210						

Future Year 2036 Volumes

Increased by the growth rate determined from the SPC Cycle 10 travel demand model

				280				176						
				⇩	71	204	5	⇧						
			204	⇦ Out/In	N Main St		Out/In ⇦	127						
				33	Allegheny St/ Limber Rd		5							
100				49	TEV:720		99							
				38	9/28/2016		22							
			121	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	77						
				⇩	33	138	22	⇧						
				264				193						
				0	⇩		⇧	0						
				264				193						
				⇩	5	247	11	⇧						
			33	⇦ Out/In	N Main St		Out/In ⇦	17						
				5	E John ST		5							
105				5	TEV:517		5							
				11	9/28/2016		5							
			22	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	27						
				⇩	22	182	11	⇧						
				264				215						
				0	⇩		⇧	0						
				264				215						
				⇩	5	259		⇧						
			11	⇦ Out/In	N Main St		Out/In ⇦	0						
				5	Baldwin Hall									
110					TEV:489									
				5	9/28/2016									
			11	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	0						
				⇩	5	209		⇧						
				264				215						
				0	⇩		⇧	0						
				264				214						
				⇩	264			⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	0						
					US Post Office									
115					TEV:478									
					9/28/2016									
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	0						
				⇩	214			⇧						
				264				214						
				0	⇩		⇧	0						
				264				215						
				⇩	247	17		⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	22						
					E College St		11							
120					TEV:511									
					9/28/2016		11							
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	38						
				⇩	204	22		⇧						
				258				226						
				0	⇩		⇧	0						
				259				225						
				⇩	253	5		⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	11						
					Sherman St		5							
125					TEV:506									
					9/28/2016		5							
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	22						
				⇩	220	17		⇧						
				259				236						
				-11	⇩		⇧	0						
				248				236						
				⇩	11	237		⇧						
			22	⇦ Out/In	N Main St		Out/In ⇦	0						
				17	Loomis St									
130					TEV:511									
				17	9/28/2016									
			33	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	0						
				⇩	11	220		⇧						
				253				231						
				0	⇩		⇧	0						
				253				231						
				⇩	242	11		⇧						
			0	⇦ Out/In	N Main St		Out/In ⇦	11						
					Henry St		5							
135					TEV:495									
					9/28/2016		5							
			0	⇨ Out/In	7:45 am to 8:45 am		Out/In ⇨	17						
				⇩	226	5		⇧						
				247				231						

Whitman, Requardt & Associates, LLP
Engineers · Architects · Environmental Planners Est. 1915
300 Seven Fields Boulevard, Suite 130, Seven Fields, Pennsylvania 16046

Volume Balancing Calculations

Project: Allegheny College Project
Location: Meadville, PA
Date: 10/17/2016

Time Period: MD Peak
Compiled By: XW
Reviewed By: REB

Color Coding Legend

- Decreased Volume
- Changed +5 to 10 Vehicles
- Changed +15 to 20 Vehicles
- Changed + >20 Vehicles
- Allowed Imbalance

Base Information:

Existing Year =	2016
Future Year =	2036
# of Years =	20
Growth Rate =	0.50%
Growth Rate + 1 =	1.0050

Definitions:

EV = Existing Volumes
FV = Future Volumes
Y = # of years
GR = Growth Rate

Linear Growth Equation:

FV = (((EV x GR) - EV) x Y) + EV)

Raw Original Volumes

Enter raw peak hour volumes from traffic count data

| | | |

Whitman, Requardt & Associates, LLP
Engineers · Architects · Environmental Planners Est. 1915
300 Seven Fields Boulevard, Suite 130, Seven Fields, Pennsylvania 16046

Volume Balancing Calculations

Project: Allegheny College Project
Location: Meadville, PA
Date: 10/17/2016

Time Period: PM Peak
Compiled By: XW
Reviewed By: REB

Color Coding Legend

- Decreased Volume
- Changed +5 to 10 Vehicles
- Changed +15 to 20 Vehicles
- Changed + >20 Vehicles
- Allowed Imbalance

Base Information:

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Future Year =	2036
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Growth Rate =	0.50%
Growth Rate + 1 =	1.0050

Definitions:

EV = Existing Volumes
FV = Future Volumes
Y = # of years
GR = Growth Rate

Linear Growth Equation:

FV = (((EV x GR) - EV) x Y) + EV)

Raw Original Volumes

Enter raw peak hour volumes from traffic count data

				209				266				
				⇩	43	156	10	⇧				
		177	⇦ Out/In	N Main St			Out/In ⇦	104				
100			37	Allegheny St/ Limber Rd			10					
			90	TEV:800			79					
			39	9/28/2016			15					
		166	⇨ Out/In	4:00 pm to 5:00 pm			Out/In ⇨	147				
			⇩	55	219	47	⇧					
				210				321				
				1	⇩			⇧	-8			
				211				329				
				⇩	1	204	6	⇧				
		5	⇦ Out/In	N Main St			Out/In ⇦	54				
105			2	E John ST			30					
			2	TEV:592			2					
			11	9/28/2016			22					
		15	⇨ Out/In	3:45 pm to 4:45 pm			Out/In ⇨	21				
			⇩	2	297	13	⇧					
				237				312				
				0	⇩			⇧	0			
				237				312				
				⇩	5	232		⇧				
		11	⇦ Out/In	N Main St			Out/In ⇦	0				
110			5	Baldwin Hall								
				TEV:558								
			3	9/28/2016								
		8	⇨ Out/In	3:45 pm to 4:45 pm			Out/In ⇨	0				
			⇩	6	307		⇧					
				235				313				
				3	⇩			⇧	4			
				238				309				
				⇩	238			⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	0				
115				US Post Office								
				TEV:547								
				9/28/2016								
		0	⇨ Out/In	3:45 pm to 4:45 pm			Out/In ⇨	0				
			⇩		309		⇧					
				238				309				
				-30	⇩			⇧	-33			
				208				342				
				⇩	191	17		⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	42				
120				E College St			22					
				TEV:584								
				9/28/2016			20					
		0	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	31				
			⇩		320	14	⇧					
				211				334				
				-1	⇩			⇧	1			
				210				333				
				⇩	209	1		⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	25				
125				Sherman St			7					
				TEV:564								
				9/28/2016			18					
		0	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	4				
			⇩		326	3	⇧					
				227				329				
				1	⇩			⇧	3			
				228				326				
				⇩	18	210		⇧				
		26	⇦ Out/In	N Main St			Out/In ⇦	0				
130			13	Loomis St								
				TEV:573								
			11	9/28/2016								
		24	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	0				
			⇩	8	313		⇧					
				221				321				
				-3	⇩			⇧	-3			
				218				324				
				⇩	211	7		⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	5				
135				Henry St			2					
				TEV:547								
				9/28/2016			3					
		0	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	9				
			⇩		322	2	⇧					
				214				324				

Modified / Balanced Volumes

Rounded peak hour volumes, highlighted / color-coded to show data overrides during balancing

				215				285				
				⇩	45	160	10	⇧				
		185	⇦ Out/In	N Main St			Out/In ⇦	105				
100			35	Allegheny St/ Limber Rd			10					
			90	TEV:835			80					
			40	9/28/2016			15					
		165	⇨ Out/In	4:00 pm to 5:00 pm			Out/In ⇨	150				
			⇩	60	240	50	⇧					
				215				350				
				OK	0	⇩		⇧	0	OK		
				215				350				
				⇩	5	205	5	⇧				
		15	⇦ Out/In	N Main St			Out/In ⇦	55				
105			5	E John ST			30					
			5	TEV:625			5					
			10	9/28/2016			20					
		20	⇨ Out/In	3:45 pm to 4:45 pm			Out/In ⇨	25				
			⇩	5	315	15	⇧					
				235				335				
				OK	0	⇩		⇧	0	OK		
				235				335				
				⇩	5	230		⇧				
		15	⇦ Out/In	N Main St			Out/In ⇦	0				
110			5	Baldwin Hall								
				TEV:585								
			5	9/28/2016								
		10	⇨ Out/In	3:45 pm to 4:45 pm			Out/In ⇨	0				
			⇩	10	330		⇧					
				235				340				
				OK	0	⇩		⇧	0	OK		
				235				340				
				⇩	235			⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	0				
115				US Post Office								
				TEV:575								
				9/28/2016								
		0	⇨ Out/In	3:45 pm to 4:45 pm			Out/In ⇨	0				
			⇩		340		⇧					
				235				340				
				OK	0	⇩		⇧	0	OK		
				235				340				
				⇩	210	25		⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	40				
120				E College St			20					
				TEV:610								
				9/28/2016			20					
		0	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	40				
			⇩		320	15	⇧					
				230				335				
				OK	0	⇩		⇧	0	OK		
				230				335				
				⇩	225	5		⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	30				
125				Sherman St			10					
				TEV:590								
				9/28/2016			20					
		0	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	10				
			⇩		325	5	⇧					
				245				330				
				OK	0	⇩		⇧	0	OK		
				245				330				
				⇩	20	225		⇧				
		30	⇦ Out/In	N Main St			Out/In ⇦	0				
130			15	Loomis St								
				TEV:595								
			10	9/28/2016								
		25	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	0				
			⇩	10	315		⇧					
				235				325				
				OK	0	⇩		⇧	0	OK		
				235				325				
				⇩	225	10		⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	10				
135				Henry St			5					
				TEV:570								
				9/28/2016			5					
		0	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	15				
			⇩		320	5	⇧					
				230				325				

Future Year 2036 Volumes

Increased by the growth rate determined from the SPC Cycle 10 travel demand model

				237				314				
				⇩	49	176	11	⇧				
		204	⇦ Out/In	N Main St			Out/In ⇦	116				
100			38	Allegheny St/ Limber Rd			11					
			99	TEV:918			88					
			44	9/28/2016			17					
		182	⇨ Out/In	4:00 pm to 5:00 pm			Out/In ⇨	165				
			⇩	66	264	55	⇧					
				237				385				
				0	⇩			⇧	0			
				237				385				
				⇩	5	226	5	⇧				
		17	⇦ Out/In	N Main St			Out/In ⇦	60				
105			5	E John ST			33					
			5	TEV:687			5					
			11	9/28/2016			22					
		22	⇨ Out/In	3:45 pm to 4:45 pm			Out/In ⇨	28				
			⇩	5	347	17	⇧					
				258				369				
				0	⇩			⇧	0			
				259				369				
				⇩	5	253		⇧				
		17	⇦ Out/In	N Main St			Out/In ⇦	0				
110			5	Baldwin Hall								
				TEV:643								
			5	9/28/2016								
		11	⇨ Out/In	3:45 pm to 4:45 pm			Out/In ⇨	0				
			⇩	11	363		⇧					
				259				374				
				0	⇩			⇧	0			
				259				374				
				⇩	259			⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	0				
115				US Post Office								
				TEV:632								
				9/28/2016								
		0	⇨ Out/In	3:45 pm to 4:45 pm			Out/In ⇨	0				
			⇩		374		⇧					
				259				374				
				0	⇩			⇧	0			
				259				374				
				⇩	231	27		⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	44				
120				E College St			22					
				TEV:671								
				9/28/2016			22					
		0	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	44				
			⇩		352	17	⇧					
				253				368				
				0	⇩			⇧	0			
				253				368				
				⇩	247	5		⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	33				
125				Sherman St			11					
				TEV:649								
				9/28/2016			22					
		0	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	11				
			⇩		357	5	⇧					
				269				363				
				0	⇩			⇧	0			
				269				363				
				⇩	22	247		⇧				
		33	⇦ Out/In	N Main St			Out/In ⇦	0				
130			17	Loomis St								
				TEV:654								
			11	9/28/2016								
		28	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	0				
			⇩	11	347		⇧					
				258				358				
				0	⇩			⇧	0			
				258				357				
				⇩	247	11		⇧				
		0	⇦ Out/In	N Main St			Out/In ⇦	11				
135				Henry St			5					
				TEV:627								
				9/28/2016			5					
		0	⇨ Out/In	4:15 pm to 5:15 pm			Out/In ⇨	17				
			⇩		352	5	⇧					
				253				357				

Appendix E:
Traffic Analysis (HCM & SIDRA)

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	AM Peak
Intersection:	SR 86 @ Baldwin Hall
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Baldwin Hall
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	190			235	5
Peak-Hour Factor, PHF	0.75	0.80			0.92	0.50
Hourly Flow Rate, HFR	6	237			255	10
Percent Heavy Vehicles	1	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				5		5
Peak Hour Factor, PHF				1.00		0.38
Hourly Flow Rate, HFR				5		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	6						18	
C(m) (vph)	1305						669	
v/c	0.00						0.03	
95% queue length	0.01						0.08	
Control Delay	7.8						10.5	
LOS	A						B	
Approach Delay							10.5	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Baldwin Hall
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Baldwin Hall
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	190		235	5	
Peak-Hour Factor, PHF	0.75	0.80		0.92	0.50	
Peak-15 Minute Volume	2	59		64	2	
Hourly Flow Rate, HFR	6	237		255	10	
Percent Heavy Vehicles	1	--	--	--	--	
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1		1	0	
Configuration	LT				TR	
Upstream Signal?		No		No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				5		5
Peak Hour Factor, PHF				1.00		0.38
Peak-15 Minute Volume				1		3
Hourly Flow Rate, HFR				5		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	237	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	1					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	1					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	265					509		260
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		260
Potential Capacity		772
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		772
Probability of Queue free St.	1.00	0.98
Step 2: LT from Major St.	4	1
Conflicting Flows		265
Potential Capacity		1305
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1305
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		0.99
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		509
Potential Capacity		499
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.98	1.00
Movement Capacity		497

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		509
Potential Capacity		499
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.98	1.00
Movement Capacity		497
Results for Two-stage process:		
a		
y		
C t		497

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				5		13
Movement Capacity (vph)				497		772
Shared Lane Capacity (vph)					669	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				497		772
Volume				5		13
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					669	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	6						18	
C(m) (vph)	1305						669	
v/c	0.00						0.03	
95% queue length	0.01						0.08	
Control Delay	7.8						10.5	
LOS	A						B	
Approach Delay							10.5	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	237	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.8	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.0	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	AM Peak
Intersection:	SR 86 @ E College
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	East College
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		185	20	15	225	
Peak-Hour Factor, PHF		0.89	0.60	0.61	0.90	
Hourly Flow Rate, HFR		207	33	24	250	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10		10			
Peak Hour Factor, PHF	0.29		0.38			
Hourly Flow Rate, HFR	34		26			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		24		60				
C(m) (vph)		1321		663				
v/c		0.02		0.09				
95% queue length		0.06		0.30				
Control Delay		7.8		11.0				
LOS		A		B				
Approach Delay				11.0				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		185	20	15	225	
Peak-Hour Factor, PHF		0.89	0.60	0.61	0.90	
Peak-15 Minute Volume		52	8	6	62	
Hourly Flow Rate, HFR		207	33	24	250	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	10		10			
Peak Hour Factor, PHF	0.29		0.38			
Peak-15 Minute Volume	9		7			
Hourly Flow Rate, HFR	34		26			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		250
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		3	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.6		5.8			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		3	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		240	522		224			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			224			
Potential Capacity			841			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			841			
Probability of Queue free St.			0.97		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			240			
Potential Capacity			1321			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1321			
Probability of Queue free St.			0.98		1.00	
Maj L-Shared Prob Q free St.			0.98			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.98	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			522			
Potential Capacity			582			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.98	
Maj. L, Min T Adj. Imp Factor.					0.98	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.95	
Movement Capacity			571			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	522	
Potential Capacity	582	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.95
Movement Capacity	571	

Results for Two-stage process:	
a	
y	
C t	571

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	34		26			
Movement Capacity (vph)	571		841			
Shared Lane Capacity (vph)		663				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	571		841			
Volume	34		26			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		663				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		24		60				
C(m) (vph)		1321		663				
v/c		0.02		0.09				
95% queue length		0.06		0.30				
Control Delay		7.8		11.0				
LOS		A		B				
Approach Delay				11.0				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		250
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.2

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	AM Peak
Intersection:	SR 86 @ E John
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	East John
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	20	165	10	10	225	5
Peak-Hour Factor, PHF	0.63	0.80	0.42	0.75	0.92	0.38
Hourly Flow Rate, HFR	31	206	23	13	244	13
Percent Heavy Vehicles	3	--	--	3	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	5	5	5	10
Peak Hour Factor, PHF	0.50	0.50	0.38	1.00	0.25	0.56
Hourly Flow Rate, HFR	10	10	13	5	20	17
Percent Heavy Vehicles	50	0	33	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	31	13		33			42	
C(m) (vph)	1302	1333		540			504	
v/c	0.02	0.01		0.06			0.08	
95% queue length	0.07	0.03		0.20			0.27	
Control Delay	7.8	7.7		12.1			12.8	
LOS	A	A		B			B	
Approach Delay				12.1			12.8	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	20	165	10	10	225	5
Peak-Hour Factor, PHF	0.63	0.80	0.42	0.75	0.92	0.38
Peak-15 Minute Volume	8	52	6	3	61	3
Hourly Flow Rate, HFR	31	206	23	13	244	13
Percent Heavy Vehicles	3	--	--	3	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5	5	5	5	5	10
Peak Hour Factor, PHF	0.50	0.50	0.38	1.00	0.25	0.56
Peak-15 Minute Volume	2	2	3	1	5	4
Hourly Flow Rate, HFR	10	10	13	5	20	17
Percent Heavy Vehicles	50	0	33	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	206	244
Shared ln volume, major rt vehicles:	23	13
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	3	3	50	0	33	0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	1.00	1.00	1.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	6.4	5.3	5.9	7.3	6.7	6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	3	3	50	0	33	0	0	0
t(f)	2.2	2.2	4.0	4.0	3.6	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	257	229	575	563	218	567	567	250
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	218	250
Potential Capacity	778	788
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	778	788
Probability of Queue free St.	0.98	0.98
Step 2: LT from Major St.	4	1
Conflicting Flows	229	257
Potential Capacity	1333	1302
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1333	1302
Probability of Queue free St.	0.99	0.98
Maj L-Shared Prob Q free St.	0.99	0.97
Step 3: TH from Minor St.	8	11
Conflicting Flows	563	567
Potential Capacity	529	422
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	509	406
Probability of Queue free St.	0.98	0.95
Step 4: LT from Minor St.	7	10
Conflicting Flows	575	567
Potential Capacity	442	424
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.91	0.94
Maj. L, Min T Adj. Imp Factor.	0.93	0.96
Cap. Adj. factor due to Impeding mvmnt	0.91	0.94
Movement Capacity	404	399

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	563	567
Potential Capacity	529	422
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	509	406
Result for 2 stage process:		
a		
y		
C t	509	406
Probability of Queue free St.	0.98	0.95
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	575	567
Potential Capacity	442	424
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.91	0.94
Maj. L, Min T Adj. Imp Factor.	0.93	0.96
Cap. Adj. factor due to Impeding mvmnt	0.91	0.94
Movement Capacity	404	399
Results for Two-stage process:		
a		
y		
C t	404	399

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	10	10	13	5	20	17
Movement Capacity (vph)	404	509	778	399	406	788
Shared Lane Capacity (vph)		540			504	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	404	509	778	399	406	788
Volume	10	10	13	5	20	17
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		540			504	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	31	13		33			42	
C(m) (vph)	1302	1333		540			504	
v/c	0.02	0.01		0.06			0.08	
95% queue length	0.07	0.03		0.20			0.27	
Control Delay	7.8	7.7		12.1			12.8	
LOS	A	A		B			B	
Approach Delay				12.1			12.8	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	0.99
v(il), Volume for stream 2 or 5	206	244
v(i2), Volume for stream 3 or 6	23	13
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.97	0.99
d(M,LT), Delay for stream 1 or 4	7.8	7.7
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.2	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	AM Peak
Intersection:	SR 86 @ Henry
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Henry
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		205	5	10	220	
Peak-Hour Factor, PHF		0.81	0.58	0.44	0.89	
Hourly Flow Rate, HFR		253	8	22	247	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.25		0.38			
Hourly Flow Rate, HFR	20		13			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage		No	/			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		22		33				
C(m) (vph)		1315		664				
v/c		0.02		0.05				
95% queue length		0.05		0.16				
Control Delay		7.8		10.7				
LOS		A		B				
Approach Delay				10.7				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Henry
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Henry
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		205	5	10	220	
Peak-Hour Factor, PHF		0.81	0.58	0.44	0.89	
Peak-15 Minute Volume		63	2	6	62	
Hourly Flow Rate, HFR		253	8	22	247	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.25		0.38			
Peak-15 Minute Volume	5		3			
Hourly Flow Rate, HFR	20		13			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn						
	Through						
S5	Left-Turn						
	Through						

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		247
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.2		5.6			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		261	548		257			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			257			
Potential Capacity			821			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			821			
Probability of Queue free St.			0.98		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			261			
Potential Capacity			1315			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1315			
Probability of Queue free St.			0.98		1.00	
Maj L-Shared Prob Q free St.			0.98			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.98	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			548			
Potential Capacity			601			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.98	
Maj. L, Min T Adj. Imp Factor.					0.99	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.97	
Movement Capacity			591			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	548	
Potential Capacity	601	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.98	0.97
Movement Capacity	591	

Results for Two-stage process:	
a	
y	
C t	591

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	20		13			
Movement Capacity (vph)	591		821			
Shared Lane Capacity (vph)		664				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	591		821			
Volume	20		13			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		664				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		22		33				
C(m) (vph)		1315		664				
v/c		0.02		0.05				
95% queue length		0.05		0.16				
Control Delay		7.8		10.7				
LOS		A		B				
Approach Delay				10.7				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		247
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.2

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TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	30	125	20	5	185	65
Peak-Hour Factor, PHF	0.57	0.98	0.56	0.50	0.92	0.72
Hourly Flow Rate, HFR	52	127	35	10	201	90
Percent Heavy Vehicles	5	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	20	90	5	30	45	35
Peak Hour Factor, PHF	0.92	0.68	1.00	0.58	0.61	0.80
Hourly Flow Rate, HFR	21	132	5	51	73	43
Percent Heavy Vehicles	5	1	0	0	4	3
Percent Grade (%)		0			3	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	52	10		158			167	
C(m) (vph)	1254	1417		408			392	
v/c	0.04	0.01		0.39			0.43	
95% queue length	0.13	0.02		1.87			2.18	
Control Delay	8.0	7.6		19.4			21.0	
LOS	A	A		C			C	
Approach Delay				19.4			21.0	
Approach LOS				C			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	30	125	20	5	185	65
Peak-Hour Factor, PHF	0.57	0.98	0.56	0.50	0.92	0.72
Peak-15 Minute Volume	13	32	9	2	50	23
Hourly Flow Rate, HFR	52	127	35	10	201	90
Percent Heavy Vehicles	5	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?	No			No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	20	90	5	30	45	35
Peak Hour Factor, PHF	0.92	0.68	1.00	0.58	0.61	0.80
Peak-15 Minute Volume	5	33	1	13	18	11
Hourly Flow Rate, HFR	21	132	5	51	73	43
Percent Heavy Vehicles	5	1	0	0	4	3
Percent Grade (%)		0			3	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	127	201
Shared ln volume, major rt vehicles:	35	90
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	5	2	5	1	0	0	4	3
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	3.00	3.00	3.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.2	4.1	7.2	6.5	6.2	7.7	7.1	6.5
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	5	2	5	1	0	0	4	3
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	291	162	572	559	144	583	532	246
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	144	246
Potential Capacity	909	774
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	909	774
Probability of Queue free St.	0.99	0.94
Step 2: LT from Major St.	4	1
Conflicting Flows	162	291
Potential Capacity	1417	1254
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1417	1254
Probability of Queue free St.	0.99	0.96
Maj L-Shared Prob Q free St.	0.99	0.95
Step 3: TH from Minor St.	8	11
Conflicting Flows	559	532
Potential Capacity	439	412
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity	415	390
Probability of Queue free St.	0.68	0.81
Step 4: LT from Minor St.	7	10
Conflicting Flows	572	583
Potential Capacity	426	387
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.77	0.65
Maj. L, Min T Adj. Imp Factor.	0.82	0.72
Cap. Adj. factor due to Impeding mvmnt	0.78	0.72
Movement Capacity	331	279

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	559	532
Potential Capacity	439	412
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.95	0.95
Movement Capacity	415	390
Result for 2 stage process:		
a		
y		
C t	415	390
Probability of Queue free St.	0.68	0.81
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	572	583
Potential Capacity	426	387
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.77	0.65
Maj. L, Min T Adj. Imp Factor.	0.82	0.72
Cap. Adj. factor due to Impeding mvmnt	0.78	0.72
Movement Capacity	331	279
Results for Two-stage process:		
a		
y		
C t	331	279

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	21	132	5	51	73	43
Movement Capacity (vph)	331	415	909	279	390	774
Shared Lane Capacity (vph)		408			392	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	331	415	909	279	390	774
Volume	21	132	5	51	73	43
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		408			392	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	52	10		158			167	
C(m) (vph)	1254	1417		408			392	
v/c	0.04	0.01		0.39			0.43	
95% queue length	0.13	0.02		1.87			2.18	
Control Delay	8.0	7.6		19.4			21.0	
LOS	A	A		C			C	
Approach Delay				19.4			21.0	
Approach LOS				C			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.96	0.99
v(il), Volume for stream 2 or 5	127	201
v(i2), Volume for stream 3 or 6	35	90
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.95	0.99
d(M,LT), Delay for stream 1 or 4	8.0	7.6
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.4	0.1

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TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	AM Peak
Intersection:	SR 86 @ Loomis
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Loomis
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	200			215	10
Peak-Hour Factor, PHF	0.34	0.91			0.86	0.60
Hourly Flow Rate, HFR	29	219			249	16
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				15		15
Peak Hour Factor, PHF				0.65		0.46
Hourly Flow Rate, HFR				23		32
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	29						55	
C(m) (vph)	1299						610	
v/c	0.02						0.09	
95% queue length	0.07						0.30	
Control Delay	7.8						11.5	
LOS	A						B	
Approach Delay							11.5	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Loomis
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Loomis
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	10	200			215	10
Peak-Hour Factor, PHF	0.34	0.91			0.86	0.60
Peak-15 Minute Volume	7	55			62	4
Hourly Flow Rate, HFR	29	219			249	16
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				15		15
Peak Hour Factor, PHF				0.65		0.46
Peak-15 Minute Volume				6		8
Hourly Flow Rate, HFR				23		32
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	219	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	2					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	2					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	265					534		257
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		257
Potential Capacity		775
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		775
Probability of Queue free St.	1.00	0.96
Step 2: LT from Major St.	4	1
Conflicting Flows		265
Potential Capacity		1299
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1299
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.97
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		534
Potential Capacity		481
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.94	0.98
Movement Capacity		470

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		534
Potential Capacity		481
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.94	0.98
Movement Capacity		470

Results for Two-stage process:	
a	
y	
C t	470

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				23		32
Movement Capacity (vph)				470		775
Shared Lane Capacity (vph)					610	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				470		775
Volume				23		32
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					610	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	29						55	
C(m) (vph)	1299						610	
v/c	0.02						0.09	
95% queue length	0.07						0.30	
Control Delay	7.8						11.5	
LOS	A						B	
Approach Delay							11.5	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	219	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	7.8	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Post Office
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Post Office
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		195			240	
Peak-Hour Factor, PHF		0.83			0.86	
Hourly Flow Rate, HFR		234			279	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume						
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			/			/
Lanes						
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	AM Peak
Intersection:	SR 86 @ Post Office
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Post Office
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		195			240	
Peak-Hour Factor, PHF		0.83			0.86	
Peak-15 Minute Volume		59			70	
Hourly Flow Rate, HFR		234			279	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume						
Peak Hour Factor, PHF						
Peak-15 Minute Volume						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						
Lanes						
Configuration						

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)								
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)								
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)								
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage								
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)								
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)								
t(f)								

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x								
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Result for 2 stage process:				
a				
y				
C t				
Probability of Queue free St.		1.00		1.00
Step 4: LT from Minor St.		7		10
Part 1 - First Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Maj. L, Min T Impedance factor				
Maj. L, Min T Adj. Imp Factor.				
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Results for Two-stage process:				
a				
y				
C t				

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)						
Movement Capacity (vph)						
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	AM Peak
Intersection:	SR 86 @ Sherman
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Sherman
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		200	15	5	0	
Peak-Hour Factor, PHF		0.84	0.71	0.75	0.94	
Hourly Flow Rate, HFR		238	21	6	0	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.50		0.75			
Hourly Flow Rate, HFR	10		6			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		6		16				
C(m) (vph)		1300		817				
v/c		0.00		0.02				
95% queue length		0.01		0.06				
Control Delay		7.8		9.5				
LOS		A		A				
Approach Delay				9.5				
Approach LOS				A				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Sherman
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Sherman
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		200	15	5	0	
Peak-Hour Factor, PHF		0.84	0.71	0.75	0.94	
Peak-15 Minute Volume		60	5	2	0	
Hourly Flow Rate, HFR		238	21	6	0	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.50		0.75			
Peak-15 Minute Volume	2		2			
Hourly Flow Rate, HFR	10		6			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		0
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		3	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.0		5.5			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		3	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		259	260		248			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.		9		12
Conflicting Flows		248		
Potential Capacity		835		
Pedestrian Impedance Factor		1.00		1.00
Movement Capacity		835		
Probability of Queue free St.		0.99		1.00
Step 2: LT from Major St.		4		1
Conflicting Flows		259		
Potential Capacity		1300		
Pedestrian Impedance Factor		1.00		1.00
Movement Capacity		1300		
Probability of Queue free St.		1.00		1.00
Maj L-Shared Prob Q free St.		1.00		
Step 3: TH from Minor St.		8		11
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Probability of Queue free St.		1.00		1.00
Step 4: LT from Minor St.		7		10
Conflicting Flows		260		
Potential Capacity		811		
Pedestrian Impedance Factor		1.00		1.00
Maj. L, Min T Impedance factor				1.00
Maj. L, Min T Adj. Imp Factor.				1.00
Cap. Adj. factor due to Impeding mvmnt		1.00		0.99
Movement Capacity		807		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.		8		11
Part 1 - First Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Probability of Queue free St.				

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	260	
Potential Capacity	811	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		1.00
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	807	
Results for Two-stage process:		
a		
y		
C t	807	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	10		6			
Movement Capacity (vph)	807		835			
Shared Lane Capacity (vph)		817				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	807		835			
Volume	10		6			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		817				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		6		16				
C(m) (vph)		1300		817				
v/c		0.00		0.02				
95% queue length		0.01		0.06				
Control Delay		7.8		9.5				
LOS		A		A				
Approach Delay				9.5				
Approach LOS				A				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		0
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		1.00
d(M,LT), Delay for stream 1 or 4		7.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ Baldwin Hall
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Baldwin Hall
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	225			220	5
Peak-Hour Factor, PHF	0.75	0.84			0.85	0.50
Hourly Flow Rate, HFR	6	267			258	10
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				5		5
Peak Hour Factor, PHF				0.25		0.38
Hourly Flow Rate, HFR				20		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	6						33	
C(m) (vph)	1296						558	
v/c	0.00						0.06	
95% queue length	0.01						0.19	
Control Delay	7.8						11.9	
LOS	A						B	
Approach Delay							11.9	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Baldwin Hall
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Baldwin Hall
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	225			220	5
Peak-Hour Factor, PHF	0.75	0.84			0.85	0.50
Peak-15 Minute Volume	2	67			65	2
Hourly Flow Rate, HFR	6	267			258	10
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				5		5
Peak Hour Factor, PHF				0.25		0.38
Peak-15 Minute Volume				5		3
Hourly Flow Rate, HFR				20		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	267	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	2					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	2					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	268					542		263
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							263	
Potential Capacity							769	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							769	
Probability of Queue free St.					1.00		0.98	
Step 2: LT from Major St.					4		1	
Conflicting Flows							268	
Potential Capacity							1296	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1296	
Probability of Queue free St.					1.00		1.00	
Maj L-Shared Prob Q free St.							0.99	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.99		0.99	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							542	
Potential Capacity							475	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.99			
Maj. L, Min T Adj. Imp Factor.					1.00			
Cap. Adj. factor due to Impeding mvmnt					0.98		1.00	
Movement Capacity							473	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		542	
Potential Capacity		475	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.99		
Maj. L, Min T Adj. Imp Factor.	1.00		
Cap. Adj. factor due to Impeding mvmnt	0.98	1.00	
Movement Capacity		473	
Results for Two-stage process:			
a			
y			
C t		473	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				20		13
Movement Capacity (vph)				473		769
Shared Lane Capacity (vph)					558	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				473		769
Volume				20		13
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					558	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	6						33	
C(m) (vph)	1296						558	
v/c	0.00						0.06	
95% queue length	0.01						0.19	
Control Delay	7.8						11.9	
LOS	A						B	
Approach Delay							11.9	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	267	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.8	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.0	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		220	10	5	220	
Peak-Hour Factor, PHF		0.85	0.50	0.42	0.42	
Hourly Flow Rate, HFR		258	20	11	523	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15		10			
Peak Hour Factor, PHF	0.44		0.63			
Hourly Flow Rate, HFR	34		15			
Percent Heavy Vehicles	7		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		11		49				
C(m) (vph)		1285		477				
v/c		0.01		0.10				
95% queue length		0.03		0.34				
Control Delay		7.8		13.4				
LOS		A		B				
Approach Delay				13.4				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		220	10	5	220	
Peak-Hour Factor, PHF		0.85	0.50	0.42	0.42	
Peak-15 Minute Volume		65	5	3	131	
Hourly Flow Rate, HFR		258	20	11	523	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	15		10			
Peak Hour Factor, PHF	0.44		0.63			
Peak-15 Minute Volume	9		4			
Hourly Flow Rate, HFR	34		15			
Percent Heavy Vehicles	7		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		523
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		2	7		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.7		5.8			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		2	7		0			
t(f)		2.2	3.6		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		278	813		268			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			268			
Potential Capacity			799			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			799			
Probability of Queue free St.			0.98		1.00	

Step 2: LT from Major St.			4		1	
Conflicting Flows			278			
Potential Capacity			1285			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1285			
Probability of Queue free St.			0.99		1.00	
Maj L-Shared Prob Q free St.			0.99			

Step 3: TH from Minor St.			8		11	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.99		0.99	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	

Step 4: LT from Minor St.			7		10	
Conflicting Flows			813			
Potential Capacity			409			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.99	
Maj. L, Min T Adj. Imp Factor.					0.99	
Cap. Adj. factor due to Impeding mvmnt			0.99		0.97	
Movement Capacity			405			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	813	
Potential Capacity	409	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.97
Movement Capacity	405	
Results for Two-stage process:		
a		
y		
C t	405	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	34		15			
Movement Capacity (vph)	405		799			
Shared Lane Capacity (vph)		477				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	405		799			
Volume	34		15			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		477				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		11		49				
C(m) (vph)		1285		477				
v/c		0.01		0.10				
95% queue length		0.03		0.34				
Control Delay		7.8		13.4				
LOS		A		B				
Approach Delay				13.4				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		523
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ E John
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	East John
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	210	15	5	205	5
Peak-Hour Factor, PHF	0.63	0.89	0.54	0.50	0.88	0.25
Hourly Flow Rate, HFR	7	235	27	10	232	20
Percent Heavy Vehicles	3	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	5	15	5	5	5
Peak Hour Factor, PHF	0.80	0.25	0.94	0.25	0.63	0.75
Hourly Flow Rate, HFR	18	20	15	20	7	6
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	7	10		53			33	
C(m) (vph)	1307	1302		595			459	
v/c	0.01	0.01		0.09			0.07	
95% queue length	0.02	0.02		0.29			0.23	
Control Delay	7.8	7.8		11.6			13.5	
LOS	A	A		B			B	
Approach Delay				11.6			13.5	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	210	15	5	205	5
Peak-Hour Factor, PHF	0.63	0.89	0.54	0.50	0.88	0.25
Peak-15 Minute Volume	2	59	7	2	58	5
Hourly Flow Rate, HFR	7	235	27	10	232	20
Percent Heavy Vehicles	3	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	15	5	15	5	5	5
Peak Hour Factor, PHF	0.80	0.25	0.94	0.25	0.63	0.75
Peak-15 Minute Volume	5	5	4	5	2	2
Hourly Flow Rate, HFR	18	20	15	20	7	6
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	235	232
Shared ln volume, major rt vehicles:	27	20
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	3	2	0	0	0	0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	1.00	1.00	1.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	5.9	5.3	5.6	7.3	6.7	6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	3	2	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	252	262	530	534	248	542	538	242
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	248	242
Potential Capacity	829	796
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	829	796
Probability of Queue free St.	0.98	0.99
Step 2: LT from Major St.	4	1
Conflicting Flows	262	252
Potential Capacity	1302	1307
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1302	1307
Probability of Queue free St.	0.99	0.99
Maj L-Shared Prob Q free St.	0.99	0.99
Step 3: TH from Minor St.	8	11
Conflicting Flows	534	538
Potential Capacity	544	439
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	536	432
Probability of Queue free St.	0.96	0.98
Step 4: LT from Minor St.	7	10
Conflicting Flows	530	542
Potential Capacity	552	441
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.95
Maj. L, Min T Adj. Imp Factor.	0.98	0.96
Cap. Adj. factor due to Impeding mvmnt	0.97	0.94
Movement Capacity	535	416

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	534	538
Potential Capacity	544	439
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	536	432
Result for 2 stage process:		
a		
y		
C t	536	432
Probability of Queue free St.	0.96	0.98
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	530	542
Potential Capacity	552	441
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.95
Maj. L, Min T Adj. Imp Factor.	0.98	0.96
Cap. Adj. factor due to Impeding mvmnt	0.97	0.94
Movement Capacity	535	416
Results for Two-stage process:		
a		
y		
C t	535	416

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	18	20	15	20	7	6
Movement Capacity (vph)	535	536	829	416	432	796
Shared Lane Capacity (vph)		595			459	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	535	536	829	416	432	796
Volume	18	20	15	20	7	6
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		595			459	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	7	10		53			33	
C(m) (vph)	1307	1302		595			459	
v/c	0.01	0.01		0.09			0.07	
95% queue length	0.02	0.02		0.29			0.23	
Control Delay	7.8	7.8		11.6			13.5	
LOS	A	A		B			B	
Approach Delay				11.6			13.5	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	0.99
v(il), Volume for stream 2 or 5	235	232
v(i2), Volume for stream 3 or 6	27	20
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.99	0.99
d(M,LT), Delay for stream 1 or 4	7.8	7.8
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.0	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ Henry
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Henry
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		225	5	5	220	
Peak-Hour Factor, PHF		0.81	0.50	0.42	0.75	
Hourly Flow Rate, HFR		277	10	11	293	
Percent Heavy Vehicles		--	--	40	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.50		0.63			
Hourly Flow Rate, HFR	10		7			
Percent Heavy Vehicles	25		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		11		17				
C(m) (vph)		1086		607				
v/c		0.01		0.03				
95% queue length		0.03		0.09				
Control Delay		8.3		11.1				
LOS		A		B				
Approach Delay				11.1				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ Henry
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Henry
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		225	5	5	220	
Peak-Hour Factor, PHF		0.81	0.50	0.42	0.75	
Peak-15 Minute Volume		69	2	3	73	
Hourly Flow Rate, HFR		277	10	11	293	
Percent Heavy Vehicles		--	--	40	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.50		0.63			
Peak-15 Minute Volume	2		2			
Hourly Flow Rate, HFR	10		7			
Percent Heavy Vehicles	25		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		293
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		40	25		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.5	5.4		5.6			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		40	25		0			
t(f)		2.6	3.7		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		287	597		282			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			282			
Potential Capacity			798			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			798			
Probability of Queue free St.			0.99		1.00	

Step 2: LT from Major St.			4		1	
Conflicting Flows			287			
Potential Capacity			1086			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1086			
Probability of Queue free St.			0.99		1.00	
Maj L-Shared Prob Q free St.			0.99			

Step 3: TH from Minor St.			8		11	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.99		0.99	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	

Step 4: LT from Minor St.			7		10	
Conflicting Flows			597			
Potential Capacity			525			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.99	
Maj. L, Min T Adj. Imp Factor.					0.99	
Cap. Adj. factor due to Impeding mvmnt			0.99		0.98	
Movement Capacity			520			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	597	
Potential Capacity	525	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.98
Movement Capacity	520	
Results for Two-stage process:		
a		
y		
C t	520	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	10		7			
Movement Capacity (vph)	520		798			
Shared Lane Capacity (vph)		607				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	520		798			
Volume	10		7			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		607				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		11		17				
C(m) (vph)		1086		607				
v/c		0.01		0.03				
95% queue length		0.03		0.09				
Control Delay		8.3		11.1				
LOS		A		B				
Approach Delay				11.1				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		293
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		8.3
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	25	170	35	5	170	45
Peak-Hour Factor, PHF	0.75	0.88	0.71	0.63	0.86	0.78
Hourly Flow Rate, HFR	33	193	49	7	197	57
Percent Heavy Vehicles	4	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	20	55	5	30	70	25
Peak Hour Factor, PHF	0.85	0.90	0.63	0.73	0.77	0.86
Hourly Flow Rate, HFR	23	61	7	41	90	29
Percent Heavy Vehicles	0	4	0	0	2	8
Percent Grade (%)		-7			3	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	33	7		91			160	
C(m) (vph)	1300	1324		506			418	
v/c	0.03	0.01		0.18			0.38	
95% queue length	0.08	0.02		0.66			1.83	
Control Delay	7.8	7.7		13.7			18.9	
LOS	A	A		B			C	
Approach Delay				13.7			18.9	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	25	170	35	5	170	45
Peak-Hour Factor, PHF	0.75	0.88	0.71	0.63	0.86	0.78
Peak-15 Minute Volume	8	48	12	2	49	14
Hourly Flow Rate, HFR	33	193	49	7	197	57
Percent Heavy Vehicles	4	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	20	55	5	30	70	25
Peak Hour Factor, PHF	0.85	0.90	0.63	0.73	0.77	0.86
Peak-15 Minute Volume	6	15	2	10	23	7
Hourly Flow Rate, HFR	23	61	7	41	90	29
Percent Heavy Vehicles	0	4	0	0	2	8
Percent Grade (%)		-7			3	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	193	197
Shared ln volume, major rt vehicles:	49	57
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	4	2	0	4	0	0	2	8
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	3.00	3.00	3.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	5.7	5.1	5.5	7.7	7.1	6.6
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	4	2	0	4	0	0	2	8
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	254	242	583	552	218	558	548	226
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	218	226
Potential Capacity	863	784
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	863	784
Probability of Queue free St.	0.99	0.96
Step 2: LT from Major St.	4	1
Conflicting Flows	242	254
Potential Capacity	1324	1300
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1324	1300
Probability of Queue free St.	0.99	0.97
Maj L-Shared Prob Q free St.	0.99	0.97
Step 3: TH from Minor St.	8	11
Conflicting Flows	552	548
Potential Capacity	544	405
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	525	391
Probability of Queue free St.	0.88	0.77
Step 4: LT from Minor St.	7	10
Conflicting Flows	583	558
Potential Capacity	535	404
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.74	0.85
Maj. L, Min T Adj. Imp Factor.	0.80	0.89
Cap. Adj. factor due to Impeding mvmnt	0.77	0.88
Movement Capacity	413	355

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	552	548
Potential Capacity	544	405
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	525	391
Result for 2 stage process:		
a		
y		
C t	525	391
Probability of Queue free St.	0.88	0.77
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	583	558
Potential Capacity	535	404
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.74	0.85
Maj. L, Min T Adj. Imp Factor.	0.80	0.89
Cap. Adj. factor due to Impeding mvmnt	0.77	0.88
Movement Capacity	413	355
Results for Two-stage process:		
a		
y		
C t	413	355

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	23	61	7	41	90	29
Movement Capacity (vph)	413	525	863	355	391	784
Shared Lane Capacity (vph)		506			418	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	413	525	863	355	391	784
Volume	23	61	7	41	90	29
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		506			418	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	33	7		91			160	
C(m) (vph)	1300	1324		506			418	
v/c	0.03	0.01		0.18			0.38	
95% queue length	0.08	0.02		0.66			1.83	
Control Delay	7.8	7.7		13.7			18.9	
LOS	A	A		B			C	
Approach Delay				13.7			18.9	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	0.99
v(il), Volume for stream 2 or 5	193	197
v(i2), Volume for stream 3 or 6	49	57
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.97	0.99
d(M,LT), Delay for stream 1 or 4	7.8	7.7
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.2	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/13/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ Loomis
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Loomis
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	220			215	10
Peak-Hour Factor, PHF	0.45	0.83			0.72	0.55
Hourly Flow Rate, HFR	22	265			298	18
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				15		10
Peak Hour Factor, PHF				0.54		1.00
Hourly Flow Rate, HFR				27		10
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	22						37	
C(m) (vph)	1256						474	
v/c	0.02						0.08	
95% queue length	0.05						0.25	
Control Delay	7.9						13.2	
LOS	A						B	
Approach Delay							13.2	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/13/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Loomis
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Loomis
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	10	220			215	10
Peak-Hour Factor, PHF	0.45	0.83			0.72	0.55
Peak-15 Minute Volume	6	66			75	5
Hourly Flow Rate, HFR	22	265			298	18
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				15		10
Peak Hour Factor, PHF				0.54		1.00
Peak-15 Minute Volume				7		2
Hourly Flow Rate, HFR				27		10
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	265	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	316					616		307
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		307
Potential Capacity		725
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		725
Probability of Queue free St.	1.00	0.99
Step 2: LT from Major St.	4	1
Conflicting Flows		316
Potential Capacity		1256
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1256
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		616
Potential Capacity		427
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.98
Movement Capacity		420

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		616
Potential Capacity		427
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.98
Movement Capacity		420
Results for Two-stage process:		
a		
y		
C t		420

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				27		10
Movement Capacity (vph)				420		725
Shared Lane Capacity (vph)					474	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				420		725
Volume				27		10
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					474	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	22						37	
C(m) (vph)	1256						474	
v/c	0.02						0.08	
95% queue length	0.05						0.25	
Control Delay	7.9						13.2	
LOS	A						B	
Approach Delay							13.2	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	265	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	7.9	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Post Office
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Post Office
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		230			225	
Peak-Hour Factor, PHF		0.83			0.80	
Hourly Flow Rate, HFR		277			281	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume						
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			/			/
Lanes						
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

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E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ Post Office
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Post Office
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		230			225	
Peak-Hour Factor, PHF		0.83			0.80	
Peak-15 Minute Volume		69			70	
Hourly Flow Rate, HFR		277			281	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume						
Peak Hour Factor, PHF						
Peak-15 Minute Volume						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						
Lanes						
Configuration						

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)								
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)								
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)								
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage								
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)								
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)								
t(f)								

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x								
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Result for 2 stage process:				
a				
y				
C t				
Probability of Queue free St.		1.00		1.00
Step 4: LT from Minor St.		7		10
Part 1 - First Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Maj. L, Min T Impedance factor				
Maj. L, Min T Adj. Imp Factor.				
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Results for Two-stage process:				
a				
y				
C t				

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)						
Movement Capacity (vph)						
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

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TWO-WAY STOP CONTROL SUMMARY

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Sherman
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Sherman
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		225	10	10	225	
Peak-Hour Factor, PHF		0.90	0.63	0.58	0.79	
Hourly Flow Rate, HFR		250	15	17	284	
Percent Heavy Vehicles		--	--	14	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10		5			
Peak Hour Factor, PHF	0.56		0.33			
Hourly Flow Rate, HFR	17		15			
Percent Heavy Vehicles	11		25			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		17		32				
C(m) (vph)		1233		649				
v/c		0.01		0.05				
95% queue length		0.04		0.16				
Control Delay		8.0		10.8				
LOS		A		B				
Approach Delay				10.8				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Sherman
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Sherman
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		225	10	10	225	
Peak-Hour Factor, PHF		0.90	0.63	0.58	0.79	
Peak-15 Minute Volume		62	4	4	71	
Hourly Flow Rate, HFR		250	15	17	284	
Percent Heavy Vehicles		--	--	14	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	10		5			
Peak Hour Factor, PHF	0.56		0.33			
Peak-15 Minute Volume	4		4			
Hourly Flow Rate, HFR	17		15			
Percent Heavy Vehicles	11		25			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		284
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		14	11		25			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.2	5.1		5.8			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		14	11		25			
t(f)		2.3	3.6		3.5			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		265	576		258			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12	
Conflicting Flows			258				
Potential Capacity			765				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			765				
Probability of Queue free St.			0.98			1.00	

Step 2: LT from Major St.			4			1	
Conflicting Flows			265				
Potential Capacity			1233				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			1233				
Probability of Queue free St.			0.99			1.00	
Maj L-Shared Prob Q free St.			0.98				

Step 3: TH from Minor St.			8			11	
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor			1.00			1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98			0.98	
Movement Capacity							
Probability of Queue free St.			1.00			1.00	

Step 4: LT from Minor St.			7			10	
Conflicting Flows			576				
Potential Capacity			581				
Pedestrian Impedance Factor			1.00			1.00	
Maj. L, Min T Impedance factor						0.98	
Maj. L, Min T Adj. Imp Factor.						0.99	
Cap. Adj. factor due to Impeding mvmnt			0.99			0.97	
Movement Capacity			573				

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8			11	
Part 1 - First Stage							
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor							
Cap. Adj. factor due to Impeding mvmnt							
Movement Capacity							
Probability of Queue free St.							

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	576	
Potential Capacity	581	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.97
Movement Capacity	573	
Results for Two-stage process:		
a		
y		
C t	573	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	17		15			
Movement Capacity (vph)	573		765			
Shared Lane Capacity (vph)		649				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	573		765			
Volume	17		15			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		649				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		17		32				
C(m) (vph)		1233		649				
v/c		0.01		0.05				
95% queue length		0.04		0.16				
Control Delay		8.0		10.8				
LOS		A		B				
Approach Delay				10.8				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		284
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		8.0
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

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TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Baldwin Hall
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Baldwin Hall
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	330			230	5
Peak-Hour Factor, PHF	0.75	0.85			0.80	0.63
Hourly Flow Rate, HFR	13	388			287	7
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				5		5
Peak Hour Factor, PHF				0.63		0.38
Hourly Flow Rate, HFR				7		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	13						20	
C(m) (vph)	1279						550	
v/c	0.01						0.04	
95% queue length	0.03						0.11	
Control Delay	7.8						11.8	
LOS	A						B	
Approach Delay							11.8	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Baldwin Hall
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Baldwin Hall
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	10	330		230	5	
Peak-Hour Factor, PHF	0.75	0.85		0.80	0.63	
Peak-15 Minute Volume	3	97		72	2	
Hourly Flow Rate, HFR	13	388		287	7	
Percent Heavy Vehicles	0	--	--	--	--	
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1		1	0	
Configuration	LT				TR	
Upstream Signal?		No		No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				5		5
Peak Hour Factor, PHF				0.63		0.38
Peak-15 Minute Volume				2		3
Hourly Flow Rate, HFR				7		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	388	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	294					704		290
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		290
Potential Capacity		742
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		742
Probability of Queue free St.	1.00	0.98
Step 2: LT from Major St.	4	1
Conflicting Flows		294
Potential Capacity		1279
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1279
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		704
Potential Capacity		376
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99
Movement Capacity		372

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		704	
Potential Capacity		376	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.99		
Maj. L, Min T Adj. Imp Factor.	0.99		
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99	
Movement Capacity		372	
Results for Two-stage process:			
a			
y			
C t		372	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				7		13
Movement Capacity (vph)				372		742
Shared Lane Capacity (vph)					550	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				372		742
Volume				7		13
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					550	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	13						20	
C(m) (vph)	1279						550	
v/c	0.01						0.04	
95% queue length	0.03						0.11	
Control Delay	7.8						11.8	
LOS	A						B	
Approach Delay							11.8	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(il), Volume for stream 2 or 5	388	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.8	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

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TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ E College
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	East College
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		320	15	25	210	
Peak-Hour Factor, PHF		0.86	0.88	0.43	0.85	
Hourly Flow Rate, HFR		372	17	58	247	
Percent Heavy Vehicles		--	--	1	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	20		20			
Peak Hour Factor, PHF	0.63		0.61			
Hourly Flow Rate, HFR	31		32			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		58		63				
C(m) (vph)		1175		537				
v/c		0.05		0.12				
95% queue length		0.16		0.40				
Control Delay		8.2		12.6				
LOS		A		B				
Approach Delay				12.6				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		320	15	25	210	
Peak-Hour Factor, PHF		0.86	0.88	0.43	0.85	
Peak-15 Minute Volume		93	4	15	62	
Hourly Flow Rate, HFR		372	17	58	247	
Percent Heavy Vehicles		--	--	1	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	20		20			
Peak Hour Factor, PHF	0.63		0.61			
Peak-15 Minute Volume	8		8			
Hourly Flow Rate, HFR	31		32			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn						
	Through						
S5	Left-Turn						
	Through						

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		247
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		1	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.6		5.8			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		1	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		389	743		380			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			380			
Potential Capacity			700			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			700			
Probability of Queue free St.			0.95		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			389			
Potential Capacity			1175			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1175			
Probability of Queue free St.			0.95		1.00	
Maj L-Shared Prob Q free St.			0.94			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.94		0.94	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			743			
Potential Capacity			455			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.94	
Maj. L, Min T Adj. Imp Factor.					0.96	
Cap. Adj. factor due to Impeding mvmnt			0.95		0.91	
Movement Capacity			433			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	743	
Potential Capacity	455	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.94
Maj. L, Min T Adj. Imp Factor.		0.96
Cap. Adj. factor due to Impeding mvmnt	0.95	0.91
Movement Capacity	433	

Results for Two-stage process:	
a	
y	
C t	433

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	31		32			
Movement Capacity (vph)	433		700			
Shared Lane Capacity (vph)		537				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	433		700			
Volume	31		32			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		537				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		58		63				
C(m) (vph)		1175		537				
v/c		0.05		0.12				
95% queue length		0.16		0.40				
Control Delay		8.2		12.6				
LOS		A		B				
Approach Delay				12.6				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.95
v(il), Volume for stream 2 or 5		247
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.94
d(M,LT), Delay for stream 1 or 4		8.2
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.5

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	315	15	5	205	5
Peak-Hour Factor, PHF	0.25	0.83	0.81	0.75	0.80	0.25
Hourly Flow Rate, HFR	20	379	18	6	256	20
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	20	5	30	5	5	10
Peak Hour Factor, PHF	0.69	0.50	0.75	0.50	0.25	0.92
Hourly Flow Rate, HFR	28	10	40	10	20	10
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	20	6		78			40	
C(m) (vph)	1299	1173		527			376	
v/c	0.02	0.01		0.15			0.11	
95% queue length	0.05	0.02		0.52			0.36	
Control Delay	7.8	8.1		13.0			15.7	
LOS	A	A		B			C	
Approach Delay				13.0			15.7	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	315	15	5	205	5
Peak-Hour Factor, PHF	0.25	0.83	0.81	0.75	0.80	0.25
Peak-15 Minute Volume	5	95	5	2	64	5
Hourly Flow Rate, HFR	20	379	18	6	256	20
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?	No			No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	20	5	30	5	5	10
Peak Hour Factor, PHF	0.69	0.50	0.75	0.50	0.25	0.92
Peak-15 Minute Volume	7	2	10	2	5	3
Hourly Flow Rate, HFR	28	10	40	10	20	10
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	379	256
Shared ln volume, major rt vehicles:	18	20
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0	0	0	0	0	0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	1.00	1.00	1.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	5.9	5.3	5.6	7.3	6.7	6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	276	397	721	716	388	731	715	266
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	388	266
Potential Capacity	709	772
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	709	772
Probability of Queue free St.	0.94	0.99
Step 2: LT from Major St.	4	1
Conflicting Flows	397	276
Potential Capacity	1173	1299
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1173	1299
Probability of Queue free St.	0.99	0.98
Maj L-Shared Prob Q free St.	0.99	0.98
Step 3: TH from Minor St.	8	11
Conflicting Flows	716	715
Potential Capacity	455	345
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity	443	336
Probability of Queue free St.	0.98	0.94
Step 4: LT from Minor St.	7	10
Conflicting Flows	721	731
Potential Capacity	439	326
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.92	0.95
Maj. L, Min T Adj. Imp Factor.	0.94	0.96
Cap. Adj. factor due to Impeding mvmnt	0.92	0.91
Movement Capacity	405	296

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	716	715
Potential Capacity	455	345
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity	443	336
Result for 2 stage process:		
a		
y		
C t	443	336
Probability of Queue free St.	0.98	0.94
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	721	731
Potential Capacity	439	326
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.92	0.95
Maj. L, Min T Adj. Imp Factor.	0.94	0.96
Cap. Adj. factor due to Impeding mvmnt	0.92	0.91
Movement Capacity	405	296
Results for Two-stage process:		
a		
y		
C t	405	296

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	28	10	40	10	20	10
Movement Capacity (vph)	405	443	709	296	336	772
Shared Lane Capacity (vph)		527			376	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	405	443	709	296	336	772
Volume	28	10	40	10	20	10
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		527			376	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	20	6		78			40	
C(m) (vph)	1299	1173		527			376	
v/c	0.02	0.01		0.15			0.11	
95% queue length	0.05	0.02		0.52			0.36	
Control Delay	7.8	8.1		13.0			15.7	
LOS	A	A		B			C	
Approach Delay				13.0			15.7	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	0.99
v(il), Volume for stream 2 or 5	379	256
v(i2), Volume for stream 3 or 6	18	20
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.98	0.99
d(M,LT), Delay for stream 1 or 4	7.8	8.1
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.2	0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Henry
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Henry
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		320	5	10	225	
Peak-Hour Factor, PHF		0.88	0.50	0.44	0.87	
Hourly Flow Rate, HFR		363	10	22	258	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.38		0.50			
Hourly Flow Rate, HFR	13		10			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		22		23				
C(m) (vph)		1197		594				
v/c		0.02		0.04				
95% queue length		0.06		0.12				
Control Delay		8.1		11.3				
LOS		A		B				
Approach Delay				11.3				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Henry
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Henry
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		320	5	10	225	
Peak-Hour Factor, PHF		0.88	0.50	0.44	0.87	
Peak-15 Minute Volume		91	2	6	65	
Hourly Flow Rate, HFR		363	10	22	258	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.38		0.50			
Peak-15 Minute Volume	3		2			
Hourly Flow Rate, HFR	13		10			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn						
	Through						
S5	Left-Turn						
	Through						

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		258
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.2		5.6			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		373	670		368			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12	
Conflicting Flows			368				
Potential Capacity			725				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			725				
Probability of Queue free St.			0.99			1.00	

Step 2: LT from Major St.			4			1	
Conflicting Flows			373				
Potential Capacity			1197				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			1197				
Probability of Queue free St.			0.98			1.00	
Maj L-Shared Prob Q free St.			0.98				

Step 3: TH from Minor St.			8			11	
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor			1.00			1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98			0.98	
Movement Capacity							
Probability of Queue free St.			1.00			1.00	

Step 4: LT from Minor St.			7			10	
Conflicting Flows			670				
Potential Capacity			532				
Pedestrian Impedance Factor			1.00			1.00	
Maj. L, Min T Impedance factor						0.98	
Maj. L, Min T Adj. Imp Factor.						0.98	
Cap. Adj. factor due to Impeding mvmnt			0.98			0.97	
Movement Capacity			522				

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8			11	
Part 1 - First Stage							
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor							
Cap. Adj. factor due to Impeding mvmnt							
Movement Capacity							
Probability of Queue free St.							

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	670	
Potential Capacity	532	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.97
Movement Capacity	522	
Results for Two-stage process:		
a		
y		
C t	522	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	13		10			
Movement Capacity (vph)	522		725			
Shared Lane Capacity (vph)		594				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	522		725			
Volume	13		10			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		594				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		22		23				
C(m) (vph)		1197		594				
v/c		0.02		0.04				
95% queue length		0.06		0.12				
Control Delay		8.1		11.3				
LOS		A		B				
Approach Delay				11.3				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		258
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		8.1
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.2

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	60	240	50	10	160	45
Peak-Hour Factor, PHF	0.86	0.95	0.90	0.63	0.74	0.83
Hourly Flow Rate, HFR	69	252	55	15	216	54
Percent Heavy Vehicles	1	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	80	10	35	90	40
Peak Hour Factor, PHF	0.75	0.79	0.42	0.84	0.90	0.75
Hourly Flow Rate, HFR	20	101	23	41	100	53
Percent Heavy Vehicles	0	1	0	5	0	0
Percent Grade (%)		-7			3	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	69	15		144			194	
C(m) (vph)	1299	1254		433			322	
v/c	0.05	0.01		0.33			0.60	
95% queue length	0.17	0.04		1.48			4.26	
Control Delay	7.9	7.9		17.4			32.7	
LOS	A	A		C			D	
Approach Delay				17.4			32.7	
Approach LOS				C			D	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	60	240	50	10	160	45
Peak-Hour Factor, PHF	0.86	0.95	0.90	0.63	0.74	0.83
Peak-15 Minute Volume	17	63	14	4	54	14
Hourly Flow Rate, HFR	69	252	55	15	216	54
Percent Heavy Vehicles	1	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?	No			No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	15	80	10	35	90	40
Peak Hour Factor, PHF	0.75	0.79	0.42	0.84	0.90	0.75
Peak-15 Minute Volume	5	25	6	10	25	13
Hourly Flow Rate, HFR	20	101	23	41	100	53
Percent Heavy Vehicles	0	1	0	5	0	0
Percent Grade (%)		-7			3	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	252	216
Shared ln volume, major rt vehicles:	55	54
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	1	2	0	1	0	5	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	3.00	3.00	3.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	5.7	5.1	5.5	7.8	7.1	6.5
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	1	2	0	1	0	5	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	270	307	768	718	280	753	718	243
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	280	243
Potential Capacity	806	785
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	806	785
Probability of Queue free St.	0.97	0.93
Step 2: LT from Major St.	4	1
Conflicting Flows	307	270
Potential Capacity	1254	1299
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1254	1299
Probability of Queue free St.	0.99	0.95
Maj L-Shared Prob Q free St.	0.99	0.94
Step 3: TH from Minor St.	8	11
Conflicting Flows	718	718
Potential Capacity	471	317
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity	434	292
Probability of Queue free St.	0.77	0.66
Step 4: LT from Minor St.	7	10
Conflicting Flows	768	753
Potential Capacity	433	284
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.61	0.71
Maj. L, Min T Adj. Imp Factor.	0.69	0.77
Cap. Adj. factor due to Impeding mvmnt	0.65	0.75
Movement Capacity	280	213

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	718	718
Potential Capacity	471	317
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.92	0.92
Movement Capacity	434	292
Result for 2 stage process:		
a		
y		
C t	434	292
Probability of Queue free St.	0.77	0.66
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	768	753
Potential Capacity	433	284
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.61	0.71
Maj. L, Min T Adj. Imp Factor.	0.69	0.77
Cap. Adj. factor due to Impeding mvmnt	0.65	0.75
Movement Capacity	280	213
Results for Two-stage process:		
a		
y		
C t	280	213

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	20	101	23	41	100	53
Movement Capacity (vph)	280	434	806	213	292	785
Shared Lane Capacity (vph)		433			322	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	280	434	806	213	292	785
Volume	20	101	23	41	100	53
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		433			322	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	69	15		144			194	
C(m) (vph)	1299	1254		433			322	
v/c	0.05	0.01		0.33			0.60	
95% queue length	0.17	0.04		1.48			4.26	
Control Delay	7.9	7.9		17.4			32.7	
LOS	A	A		C			D	
Approach Delay				17.4			32.7	
Approach LOS				C			D	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.95	0.99
v(il), Volume for stream 2 or 5	252	216
v(i2), Volume for stream 3 or 6	55	54
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.94	0.99
d(M,LT), Delay for stream 1 or 4	7.9	7.9
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.5	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Loomis
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Loomis
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	315			225	20
Peak-Hour Factor, PHF	0.67	0.82			0.89	0.50
Hourly Flow Rate, HFR	14	384			252	40
Percent Heavy Vehicles	1	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				15		10
Peak Hour Factor, PHF				0.81		0.55
Hourly Flow Rate, HFR				18		18
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	14						36	
C(m) (vph)	1275						509	
v/c	0.01						0.07	
95% queue length	0.03						0.23	
Control Delay	7.9						12.6	
LOS	A						B	
Approach Delay							12.6	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Loomis
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Loomis
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	10	315		225	20	
Peak-Hour Factor, PHF	0.67	0.82		0.89	0.50	
Peak-15 Minute Volume	4	96		63	10	
Hourly Flow Rate, HFR	14	384		252	40	
Percent Heavy Vehicles	1	--	--	--	--	
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1		1	0	
Configuration	LT				TR	
Upstream Signal?		No		No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				15		10
Peak Hour Factor, PHF				0.81		0.55
Peak-15 Minute Volume				5		5
Hourly Flow Rate, HFR				18		18
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	384	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	1					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	1					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	292					684		272
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		272
Potential Capacity		760
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		760
Probability of Queue free St.	1.00	0.98
Step 2: LT from Major St.	4	1
Conflicting Flows		292
Potential Capacity		1275
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1275
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		684
Potential Capacity		387
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99
Movement Capacity		383

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		684	
Potential Capacity		387	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.99		
Maj. L, Min T Adj. Imp Factor.	0.99		
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99	
Movement Capacity		383	
Results for Two-stage process:			
a			
y			
C t		383	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				18		18
Movement Capacity (vph)				383		760
Shared Lane Capacity (vph)					509	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				383		760
Volume				18		18
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					509	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	14						36	
C(m) (vph)	1275						509	
v/c	0.01						0.07	
95% queue length	0.03						0.23	
Control Delay	7.9						12.6	
LOS	A						B	
Approach Delay							12.6	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(il), Volume for stream 2 or 5	384	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.9	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Post Office
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Post Office
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		340			235	
Peak-Hour Factor, PHF		0.90			0.84	
Hourly Flow Rate, HFR		377			279	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume						
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage		/			/	
Lanes						
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Post Office
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Post Office
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		340			235	
Peak-Hour Factor, PHF		0.90			0.84	
Peak-15 Minute Volume		94			70	
Hourly Flow Rate, HFR		377			279	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume						
Peak Hour Factor, PHF						
Peak-15 Minute Volume						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						
Lanes						
Configuration						

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)								
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)								
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)								
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage								
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)								
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)								
t(f)								

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x								
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Result for 2 stage process:				
a				
y				
C t				
Probability of Queue free St.		1.00		1.00
Step 4: LT from Minor St.		7		10
Part 1 - First Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Maj. L, Min T Impedance factor				
Maj. L, Min T Adj. Imp Factor.				
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Results for Two-stage process:				
a				
y				
C t				

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)						
Movement Capacity (vph)						
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

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TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Sherman
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2016
Project ID:	
East/West Street:	Sherman
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		325	5	5	225	
Peak-Hour Factor, PHF		0.85	0.38	0.25	0.84	
Hourly Flow Rate, HFR		382	13	20	267	
Percent Heavy Vehicles		--	--	1	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	20		10			
Peak Hour Factor, PHF	0.35		0.58			
Hourly Flow Rate, HFR	57		17			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage		No	/			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		20		74				
C(m) (vph)		1169		635				
v/c		0.02		0.12				
95% queue length		0.05		0.40				
Control Delay		8.1		11.4				
LOS		A		B				
Approach Delay				11.4				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Sherman
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2016
Project ID:
East/West Street: Sherman
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		325	5	5	225	
Peak-Hour Factor, PHF		0.85	0.38	0.25	0.84	
Peak-15 Minute Volume		96	3	5	67	
Hourly Flow Rate, HFR		382	13	20	267	
Percent Heavy Vehicles		--	--	1	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	20		10			
Peak Hour Factor, PHF	0.35		0.58			
Peak-15 Minute Volume	14		4			
Hourly Flow Rate, HFR	57		17			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		267
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		1	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.0		5.5			
2-stage		4.1	4.0		5.5			

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		1	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		395	695		388			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)	388	307						
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			388			
Potential Capacity			717			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			717			
Probability of Queue free St.			0.98		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			395			
Potential Capacity			1169			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1169			
Probability of Queue free St.			0.98		1.00	
Maj L-Shared Prob Q free St.			0.98			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.98	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			695			
Potential Capacity			539			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.98	
Maj. L, Min T Adj. Imp Factor.					0.98	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.96	
Movement Capacity			530			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity			712		665	
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			1.00		0.98	
Movement Capacity			712		652	
Probability of Queue free St.			1.00		1.00	

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity	749	608
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	1.00
Movement Capacity	734	608
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a	0.91	0.91
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows	388	
Potential Capacity	802	751
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.98
Movement Capacity	802	736
Part 2 - Second Stage		
Conflicting Flows	307	
Potential Capacity	846	683
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	829	667
Part 3 - Single Stage		
Conflicting Flows	695	
Potential Capacity	539	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.96
Movement Capacity	530	
Results for Two-stage process:		
a	0.91	0.91
y	0.91	
C t	614	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	57		17			
Movement Capacity (vph)	614		717			
Shared Lane Capacity (vph)		635				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	614		717			
Volume	57		17			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		635				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		20		74				
C(m) (vph)		1169		635				
v/c		0.02		0.12				
95% queue length		0.05		0.40				
Control Delay		8.1		11.4				
LOS		A		B				
Approach Delay				11.4				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		267
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		8.1
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.2

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TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Baldwin Hall
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Baldwin Hall
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	209			259	5
Peak-Hour Factor, PHF	0.75	0.80			0.92	0.50
Hourly Flow Rate, HFR	6	261			281	10
Percent Heavy Vehicles	1	--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				5		5
Peak Hour Factor, PHF				1.00		0.38
Hourly Flow Rate, HFR				5		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	6						18	
C(m) (vph)	1276						637	
v/c	0.00						0.03	
95% queue length	0.01						0.09	
Control Delay	7.8						10.8	
LOS	A						B	
Approach Delay							10.8	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Baldwin Hall
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Baldwin Hall
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	209		259	5	
Peak-Hour Factor, PHF	0.75	0.80		0.92	0.50	
Peak-15 Minute Volume	2	65		70	2	
Hourly Flow Rate, HFR	6	261		281	10	
Percent Heavy Vehicles	1	--	--	--	--	
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1		1	0	
Configuration	LT				TR	
Upstream Signal?		No		No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				5		5
Peak Hour Factor, PHF				1.00		0.38
Peak-15 Minute Volume				1		3
Hourly Flow Rate, HFR				5		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	261	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	1					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	1					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	291					559		286
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							286	
Potential Capacity							746	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							746	
Probability of Queue free St.					1.00		0.98	
Step 2: LT from Major St.					4		1	
Conflicting Flows							291	
Potential Capacity							1276	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1276	
Probability of Queue free St.					1.00		1.00	
Maj L-Shared Prob Q free St.							0.99	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.99		0.99	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							559	
Potential Capacity							464	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.99			
Maj. L, Min T Adj. Imp Factor.					1.00			
Cap. Adj. factor due to Impeding mvmnt					0.98		1.00	
Movement Capacity							462	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		559
Potential Capacity		464
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.98	1.00
Movement Capacity		462
Results for Two-stage process:		
a		
y		
C t		462

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				5		13
Movement Capacity (vph)				462		746
Shared Lane Capacity (vph)					637	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				462		746
Volume				5		13
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					637	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	6						18	
C(m) (vph)	1276						637	
v/c	0.00						0.03	
95% queue length	0.01						0.09	
Control Delay	7.8						10.8	
LOS	A						B	
Approach Delay							10.8	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	261	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.8	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.0	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		204	22	17	247	
Peak-Hour Factor, PHF		0.89	0.60	0.61	0.90	
Hourly Flow Rate, HFR		229	36	27	274	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1 0		0 1		
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	11		11			
Peak Hour Factor, PHF	0.29		0.38			
Hourly Flow Rate, HFR	37		28			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		27		65				
C(m) (vph)		1293		631				
v/c		0.02		0.10				
95% queue length		0.06		0.34				
Control Delay		7.8		11.4				
LOS		A		B				
Approach Delay				11.4				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		204	22	17	247	
Peak-Hour Factor, PHF		0.89	0.60	0.61	0.90	
Peak-15 Minute Volume		57	9	7	69	
Hourly Flow Rate, HFR		229	36	27	274	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	11		11			
Peak Hour Factor, PHF	0.29		0.38			
Peak-15 Minute Volume	9		7			
Hourly Flow Rate, HFR	37		28			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		274
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		3	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.6		5.8			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		3	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		265	575		247			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			247			
Potential Capacity			819			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			819			
Probability of Queue free St.			0.97		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			265			
Potential Capacity			1293			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1293			
Probability of Queue free St.			0.98		1.00	
Maj L-Shared Prob Q free St.			0.98			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.98	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			575			
Potential Capacity			549			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.98	
Maj. L, Min T Adj. Imp Factor.					0.98	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.95	
Movement Capacity			538			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	575	
Potential Capacity	549	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.95
Movement Capacity	538	
Results for Two-stage process:		
a		
y		
C t	538	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	37		28			
Movement Capacity (vph)	538		819			
Shared Lane Capacity (vph)		631				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	538		819			
Volume	37		28			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		631				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		27		65				
C(m) (vph)		1293		631				
v/c		0.02		0.10				
95% queue length		0.06		0.34				
Control Delay		7.8		11.4				
LOS		A		B				
Approach Delay				11.4				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		274
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.2

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	22	182	11	11	247	5
Peak-Hour Factor, PHF	0.63	0.80	0.42	0.75	0.92	0.38
Hourly Flow Rate, HFR	34	227	26	14	268	13
Percent Heavy Vehicles	3	--	--	3	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5	5	5	5	5	11
Peak Hour Factor, PHF	0.50	0.50	0.38	1.00	0.25	0.56
Hourly Flow Rate, HFR	10	10	13	5	20	19
Percent Heavy Vehicles	50	0	33	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	34	14		33			44	
C(m) (vph)	1276	1306		509			478	
v/c	0.03	0.01		0.06			0.09	
95% queue length	0.08	0.03		0.21			0.30	
Control Delay	7.9	7.8		12.6			13.3	
LOS	A	A		B			B	
Approach Delay				12.6			13.3	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	22	182	11	11	247	5
Peak-Hour Factor, PHF	0.63	0.80	0.42	0.75	0.92	0.38
Peak-15 Minute Volume	9	57	7	4	67	3
Hourly Flow Rate, HFR	34	227	26	14	268	13
Percent Heavy Vehicles	3	--	--	3	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?	No			No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5	5	5	5	5	11
Peak Hour Factor, PHF	0.50	0.50	0.38	1.00	0.25	0.56
Peak-15 Minute Volume	2	2	3	1	5	5
Hourly Flow Rate, HFR	10	10	13	5	20	19
Percent Heavy Vehicles	50	0	33	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	227	268
Shared ln volume, major rt vehicles:	26	13
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	3	3	50	0	33	0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	1.00	1.00	1.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	6.4	5.3	5.9	7.3	6.7	6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	3	3	50	0	33	0	0	0
t(f)	2.2	2.2	4.0	4.0	3.6	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	281	253	630	617	240	622	623	274
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	240	274
Potential Capacity	758	764
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	758	764
Probability of Queue free St.	0.98	0.98
Step 2: LT from Major St.	4	1
Conflicting Flows	253	281
Potential Capacity	1306	1276
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1306	1276
Probability of Queue free St.	0.99	0.97
Maj L-Shared Prob Q free St.	0.99	0.97
Step 3: TH from Minor St.	8	11
Conflicting Flows	617	623
Potential Capacity	501	391
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	479	374
Probability of Queue free St.	0.98	0.95
Step 4: LT from Minor St.	7	10
Conflicting Flows	630	622
Potential Capacity	412	388
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.91	0.94
Maj. L, Min T Adj. Imp Factor.	0.93	0.95
Cap. Adj. factor due to Impeding mvmnt	0.90	0.93
Movement Capacity	373	363

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	617	623
Potential Capacity	501	391
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	479	374
Result for 2 stage process:		
a		
y		
C t	479	374
Probability of Queue free St.	0.98	0.95
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	630	622
Potential Capacity	412	388
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.91	0.94
Maj. L, Min T Adj. Imp Factor.	0.93	0.95
Cap. Adj. factor due to Impeding mvmnt	0.90	0.93
Movement Capacity	373	363
Results for Two-stage process:		
a		
y		
C t	373	363

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	10	10	13	5	20	19
Movement Capacity (vph)	373	479	758	363	374	764
Shared Lane Capacity (vph)		509			478	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	373	479	758	363	374	764
Volume	10	10	13	5	20	19
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		509			478	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	34	14		33			44	
C(m) (vph)	1276	1306		509			478	
v/c	0.03	0.01		0.06			0.09	
95% queue length	0.08	0.03		0.21			0.30	
Control Delay	7.9	7.8		12.6			13.3	
LOS	A	A		B			B	
Approach Delay				12.6			13.3	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	0.99
v(il), Volume for stream 2 or 5	227	268
v(i2), Volume for stream 3 or 6	26	13
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.97	0.99
d(M,LT), Delay for stream 1 or 4	7.9	7.8
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.2	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Henry
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Henry
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		226	5	11	242	
Peak-Hour Factor, PHF		0.81	0.58	0.44	0.89	
Hourly Flow Rate, HFR		279	8	25	271	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.25		0.38			
Hourly Flow Rate, HFR	20		13			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		25		33				
C(m) (vph)		1287		632				
v/c		0.02		0.05				
95% queue length		0.06		0.17				
Control Delay		7.9		11.0				
LOS		A		B				
Approach Delay				11.0				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Henry
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Henry
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		226	5	11	242	
Peak-Hour Factor, PHF		0.81	0.58	0.44	0.89	
Peak-15 Minute Volume		70	2	6	68	
Hourly Flow Rate, HFR		279	8	25	271	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.25		0.38			
Peak-15 Minute Volume	5		3			
Hourly Flow Rate, HFR	20		13			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2	Left-Turn						
	Through						
S5	Left-Turn						
	Through						

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		271
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.2		5.6			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		287	604		283			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			283			
Potential Capacity			797			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			797			
Probability of Queue free St.			0.98		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			287			
Potential Capacity			1287			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1287			
Probability of Queue free St.			0.98		1.00	
Maj L-Shared Prob Q free St.			0.98			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.98	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			604			
Potential Capacity			568			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.98	
Maj. L, Min T Adj. Imp Factor.					0.98	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.97	
Movement Capacity			557			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	604	
Potential Capacity	568	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.97
Movement Capacity	557	
Results for Two-stage process:		
a		
y		
C t	557	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	20		13			
Movement Capacity (vph)	557		797			
Shared Lane Capacity (vph)		632				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	557		797			
Volume	20		13			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		632				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		25		33				
C(m) (vph)		1287		632				
v/c		0.02		0.05				
95% queue length		0.06		0.17				
Control Delay		7.9		11.0				
LOS		A		B				
Approach Delay				11.0				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		271
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		7.9
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.2

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	33	138	22	5	204	71
Peak-Hour Factor, PHF	0.57	0.98	0.56	0.50	0.92	0.72
Hourly Flow Rate, HFR	57	140	39	10	221	98
Percent Heavy Vehicles	5	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	22	99	5	33	49	38
Peak Hour Factor, PHF	0.92	0.68	1.00	0.58	0.61	0.80
Hourly Flow Rate, HFR	23	145	5	56	80	47
Percent Heavy Vehicles	5	1	0	0	4	3
Percent Grade (%)		0			3	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	57	10		173			183	
C(m) (vph)	1224	1397		374			351	
v/c	0.05	0.01		0.46			0.52	
95% queue length	0.15	0.02		2.52			3.15	
Control Delay	8.1	7.6		22.8			26.3	
LOS	A	A		C			D	
Approach Delay				22.8			26.3	
Approach LOS				C			D	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	33	138	22	5	204	71
Peak-Hour Factor, PHF	0.57	0.98	0.56	0.50	0.92	0.72
Peak-15 Minute Volume	14	35	10	2	55	25
Hourly Flow Rate, HFR	57	140	39	10	221	98
Percent Heavy Vehicles	5	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?	No			No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	22	99	5	33	49	38
Peak Hour Factor, PHF	0.92	0.68	1.00	0.58	0.61	0.80
Peak-15 Minute Volume	6	36	1	14	20	12
Hourly Flow Rate, HFR	23	145	5	56	80	47
Percent Heavy Vehicles	5	1	0	0	4	3
Percent Grade (%)		0			3	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	140	221
Shared ln volume, major rt vehicles:	39	98
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	5	2	5	1	0	0	4	3
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	3.00	3.00	3.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.2	4.1	7.2	6.5	6.2	7.7	7.1	6.5
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	5	2	5	1	0	0	4	3
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	319	179	628	613	160	638	583	270
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	160	270
Potential Capacity	890	749
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	890	749
Probability of Queue free St.	0.99	0.94
Step 2: LT from Major St.	4	1
Conflicting Flows	179	319
Potential Capacity	1397	1224
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1397	1224
Probability of Queue free St.	0.99	0.95
Maj L-Shared Prob Q free St.	0.99	0.95
Step 3: TH from Minor St.	8	11
Conflicting Flows	613	583
Potential Capacity	409	382
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	384	359
Probability of Queue free St.	0.62	0.78
Step 4: LT from Minor St.	7	10
Conflicting Flows	628	638
Potential Capacity	391	353
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.73	0.58
Maj. L, Min T Adj. Imp Factor.	0.79	0.68
Cap. Adj. factor due to Impeding mvmnt	0.74	0.67
Movement Capacity	290	237

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	613	583
Potential Capacity	409	382
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.94	0.94
Movement Capacity	384	359
Result for 2 stage process:		
a		
y		
C t	384	359
Probability of Queue free St.	0.62	0.78
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	628	638
Potential Capacity	391	353
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.73	0.58
Maj. L, Min T Adj. Imp Factor.	0.79	0.68
Cap. Adj. factor due to Impeding mvmnt	0.74	0.67
Movement Capacity	290	237
Results for Two-stage process:		
a		
y		
C t	290	237

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	23	145	5	56	80	47
Movement Capacity (vph)	290	384	890	237	359	749
Shared Lane Capacity (vph)		374			351	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	290	384	890	237	359	749
Volume	23	145	5	56	80	47
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		374			351	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	57	10		173			183	
C(m) (vph)	1224	1397		374			351	
v/c	0.05	0.01		0.46			0.52	
95% queue length	0.15	0.02		2.52			3.15	
Control Delay	8.1	7.6		22.8			26.3	
LOS	A	A		C			D	
Approach Delay				22.8			26.3	
Approach LOS				C			D	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.95	0.99
v(il), Volume for stream 2 or 5	140	221
v(i2), Volume for stream 3 or 6	39	98
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.95	0.99
d(M,LT), Delay for stream 1 or 4	8.1	7.6
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.4	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Loomis
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Loomis
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	11	220			237	11
Peak-Hour Factor, PHF	0.34	0.91			0.86	0.60
Hourly Flow Rate, HFR	32	241			275	18
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				17		17
Peak Hour Factor, PHF				0.65		0.46
Hourly Flow Rate, HFR				26		36
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	32						62	
C(m) (vph)	1269						573	
v/c	0.03						0.11	
95% queue length	0.08						0.36	
Control Delay	7.9						12.0	
LOS	A						B	
Approach Delay							12.0	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Loomis
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Loomis
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	11	220			237	11
Peak-Hour Factor, PHF	0.34	0.91			0.86	0.60
Peak-15 Minute Volume	8	60			69	5
Hourly Flow Rate, HFR	32	241			275	18
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				17		17
Peak Hour Factor, PHF				0.65		0.46
Peak-15 Minute Volume				7		9
Hourly Flow Rate, HFR				26		36
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	241	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	2					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	2					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	293					589		284
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		284
Potential Capacity		748
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		748
Probability of Queue free St.	1.00	0.95
Step 2: LT from Major St.	4	1
Conflicting Flows		293
Potential Capacity		1269
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1269
Probability of Queue free St.	1.00	0.97
Maj L-Shared Prob Q free St.		0.97
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		589
Potential Capacity		444
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.93	0.97
Movement Capacity		433

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		589	
Potential Capacity		444	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.97		
Maj. L, Min T Adj. Imp Factor.	0.98		
Cap. Adj. factor due to Impeding mvmnt	0.93	0.97	
Movement Capacity		433	
Results for Two-stage process:			
a			
y			
C t		433	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				26		36
Movement Capacity (vph)				433		748
Shared Lane Capacity (vph)					573	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				433		748
Volume				26		36
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					573	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	32						62	
C(m) (vph)	1269						573	
v/c	0.03						0.11	
95% queue length	0.08						0.36	
Control Delay	7.9						12.0	
LOS	A						B	
Approach Delay							12.0	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	1.00
v(il), Volume for stream 2 or 5	241	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.97	
d(M,LT), Delay for stream 1 or 4	7.9	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Post Office
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Post Office
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		214			264	
Peak-Hour Factor, PHF		0.83			0.86	
Hourly Flow Rate, HFR		257			306	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume						
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage		/			/	
Lanes						
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Post Office
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Post Office
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		214			264	
Peak-Hour Factor, PHF		0.83			0.86	
Peak-15 Minute Volume		64			77	
Hourly Flow Rate, HFR		257			306	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume						
Peak Hour Factor, PHF						
Peak-15 Minute Volume						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						
Lanes						
Configuration						

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)								
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)								
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)								
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage								
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)								
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)								
t(f)								

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x								
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Result for 2 stage process:				
a				
y				
C t				
Probability of Queue free St.		1.00		1.00
Step 4: LT from Minor St.		7		10
Part 1 - First Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Maj. L, Min T Impedance factor				
Maj. L, Min T Adj. Imp Factor.				
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Results for Two-stage process:				
a				
y				
C t				

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)						
Movement Capacity (vph)						
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Sherman
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Sherman
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		220	17	5	253	
Peak-Hour Factor, PHF		0.84	0.71	0.75	0.94	
Hourly Flow Rate, HFR		261	23	6	269	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1 0		0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.50		0.75			
Hourly Flow Rate, HFR	10		6			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		6		16				
C(m) (vph)		1273		676				
v/c		0.00		0.02				
95% queue length		0.01		0.07				
Control Delay		7.8		10.5				
LOS		A		B				
Approach Delay				10.5				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: AM Peak
Intersection: SR 86 @ Sherman
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Sherman
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		220	17	5	253	
Peak-Hour Factor, PHF		0.84	0.71	0.75	0.94	
Peak-15 Minute Volume		65	6	2	67	
Hourly Flow Rate, HFR		261	23	6	269	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.50		0.75			
Peak-15 Minute Volume	2		2			
Hourly Flow Rate, HFR	10		6			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		269
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		3	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.0		5.5			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		3	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		284	553		272			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			272			
Potential Capacity			813			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			813			
Probability of Queue free St.			0.99		1.00	

Step 2: LT from Major St.			4		1	
Conflicting Flows			284			
Potential Capacity			1273			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1273			
Probability of Queue free St.			1.00		1.00	
Maj L-Shared Prob Q free St.			0.99			

Step 3: TH from Minor St.			8		11	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.99		0.99	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	

Step 4: LT from Minor St.			7		10	
Conflicting Flows			553			
Potential Capacity			617			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.99	
Maj. L, Min T Adj. Imp Factor.					1.00	
Cap. Adj. factor due to Impeding mvmnt			1.00		0.99	
Movement Capacity			614			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	553	
Potential Capacity	617	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.99
Movement Capacity	614	

Results for Two-stage process:	
a	
y	
C t	614

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	10		6			
Movement Capacity (vph)	614		813			
Shared Lane Capacity (vph)		676				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	614		813			
Volume	10		6			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		676				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		6		16				
C(m) (vph)		1273		676				
v/c		0.00		0.02				
95% queue length		0.01		0.07				
Control Delay		7.8		10.5				
LOS		A		B				
Approach Delay				10.5				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		269
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.8
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.0

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ Baldwin Hall
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2036
Project ID:	
East/West Street:	Baldwin Hall
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	247			242	5
Peak-Hour Factor, PHF	0.75	0.84			0.85	0.50
Hourly Flow Rate, HFR	6	294			284	10
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				5		5
Peak Hour Factor, PHF				0.25		0.38
Hourly Flow Rate, HFR				20		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	6						33	
C(m) (vph)	1268						522	
v/c	0.00						0.06	
95% queue length	0.01						0.20	
Control Delay	7.9						12.4	
LOS	A						B	
Approach Delay							12.4	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Baldwin Hall
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Baldwin Hall
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	247		242	5	
Peak-Hour Factor, PHF	0.75	0.84		0.85	0.50	
Peak-15 Minute Volume	2	74		71	2	
Hourly Flow Rate, HFR	6	294		284	10	
Percent Heavy Vehicles	2	--	--	--	--	
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1		1	0	
Configuration	LT				TR	
Upstream Signal?		No		No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				5		5
Peak Hour Factor, PHF				0.25		0.38
Peak-15 Minute Volume				5		3
Hourly Flow Rate, HFR				20		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	294	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	2					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	2					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	294					595		289
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							289	
Potential Capacity							743	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							743	
Probability of Queue free St.					1.00		0.98	
Step 2: LT from Major St.					4		1	
Conflicting Flows							294	
Potential Capacity							1268	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1268	
Probability of Queue free St.					1.00		1.00	
Maj L-Shared Prob Q free St.							0.99	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.99		0.99	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							595	
Potential Capacity							440	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.99			
Maj. L, Min T Adj. Imp Factor.					1.00			
Cap. Adj. factor due to Impeding mvmnt					0.98		1.00	
Movement Capacity							438	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		595	
Potential Capacity		440	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.99		
Maj. L, Min T Adj. Imp Factor.	1.00		
Cap. Adj. factor due to Impeding mvmnt	0.98	1.00	
Movement Capacity		438	
Results for Two-stage process:			
a			
y			
C t		438	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				20		13
Movement Capacity (vph)				438		743
Shared Lane Capacity (vph)					522	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				438		743
Volume				20		13
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					522	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	6						33	
C(m) (vph)	1268						522	
v/c	0.00						0.06	
95% queue length	0.01						0.20	
Control Delay	7.9						12.4	
LOS	A						B	
Approach Delay							12.4	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5	294	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.9	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.0	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		242	11	5	242	
Peak-Hour Factor, PHF		0.85	0.50	0.42	0.42	
Hourly Flow Rate, HFR		284	22	11	576	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1 0		0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	17		11			
Peak Hour Factor, PHF	0.44		0.63			
Hourly Flow Rate, HFR	38		17			
Percent Heavy Vehicles	7		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		11		55				
C(m) (vph)		1255		441				
v/c		0.01		0.12				
95% queue length		0.03		0.43				
Control Delay		7.9		14.3				
LOS		A		B				
Approach Delay				14.3				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		242	11	5	242	
Peak-Hour Factor, PHF		0.85	0.50	0.42	0.42	
Peak-15 Minute Volume		71	6	3	144	
Hourly Flow Rate, HFR		284	22	11	576	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	17		11			
Peak Hour Factor, PHF	0.44		0.63			
Peak-15 Minute Volume	10		4			
Hourly Flow Rate, HFR	38		17			
Percent Heavy Vehicles	7		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		576
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		2	7		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.7		5.8			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		2	7		0			
t(f)		2.2	3.6		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		306	893		295			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9			12	
Conflicting Flows			295				
Potential Capacity			774				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			774				
Probability of Queue free St.			0.98			1.00	

Step 2: LT from Major St.			4			1	
Conflicting Flows			306				
Potential Capacity			1255				
Pedestrian Impedance Factor			1.00			1.00	
Movement Capacity			1255				
Probability of Queue free St.			0.99			1.00	
Maj L-Shared Prob Q free St.			0.99				

Step 3: TH from Minor St.			8			11	
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor			1.00			1.00	
Cap. Adj. factor due to Impeding mvmnt			0.99			0.99	
Movement Capacity							
Probability of Queue free St.			1.00			1.00	

Step 4: LT from Minor St.			7			10	
Conflicting Flows			893				
Potential Capacity			373				
Pedestrian Impedance Factor			1.00			1.00	
Maj. L, Min T Impedance factor						0.99	
Maj. L, Min T Adj. Imp Factor.						0.99	
Cap. Adj. factor due to Impeding mvmnt			0.99			0.97	
Movement Capacity			370				

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8			11	
Part 1 - First Stage							
Conflicting Flows							
Potential Capacity							
Pedestrian Impedance Factor							
Cap. Adj. factor due to Impeding mvmnt							
Movement Capacity							
Probability of Queue free St.							

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	893	
Potential Capacity	373	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.97
Movement Capacity	370	
Results for Two-stage process:		
a		
y		
C t	370	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	38		17			
Movement Capacity (vph)	370		774			
Shared Lane Capacity (vph)		441				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	370		774			
Volume	38		17			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		441				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		11		55				
C(m) (vph)		1255		441				
v/c		0.01		0.12				
95% queue length		0.03		0.43				
Control Delay		7.9		14.3				
LOS		A		B				
Approach Delay				14.3				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		576
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		7.9
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	231	17	5	226	5
Peak-Hour Factor, PHF	0.63	0.89	0.54	0.50	0.88	0.25
Hourly Flow Rate, HFR	7	259	31	10	256	20
Percent Heavy Vehicles	3	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	17	5	17	5	5	5
Peak Hour Factor, PHF	0.80	0.25	0.94	0.25	0.63	0.75
Hourly Flow Rate, HFR	21	20	18	20	7	6
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	7	10		59			33	
C(m) (vph)	1281	1272		571			424	
v/c	0.01	0.01		0.10			0.08	
95% queue length	0.02	0.02		0.35			0.25	
Control Delay	7.8	7.9		12.0			14.2	
LOS	A	A		B			B	
Approach Delay				12.0			14.2	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	231	17	5	226	5
Peak-Hour Factor, PHF	0.63	0.89	0.54	0.50	0.88	0.25
Peak-15 Minute Volume	2	65	8	2	64	5
Hourly Flow Rate, HFR	7	259	31	10	256	20
Percent Heavy Vehicles	3	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	17	5	17	5	5	5
Peak Hour Factor, PHF	0.80	0.25	0.94	0.25	0.63	0.75
Peak-15 Minute Volume	5	5	5	5	2	2
Hourly Flow Rate, HFR	21	20	18	20	7	6
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	259	256
Shared ln volume, major rt vehicles:	31	20
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	3	2	0	0	0	0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	1.00	1.00	1.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	5.9	5.3	5.6	7.3	6.7	6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	3	2	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	276	290	580	584	274	594	590	266
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	274	266
Potential Capacity	806	772
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	806	772
Probability of Queue free St.	0.98	0.99
Step 2: LT from Major St.	4	1
Conflicting Flows	290	276
Potential Capacity	1272	1281
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1272	1281
Probability of Queue free St.	0.99	0.99
Maj L-Shared Prob Q free St.	0.99	0.99
Step 3: TH from Minor St.	8	11
Conflicting Flows	584	590
Potential Capacity	518	409
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	510	402
Probability of Queue free St.	0.96	0.98
Step 4: LT from Minor St.	7	10
Conflicting Flows	580	594
Potential Capacity	520	406
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.95
Maj. L, Min T Adj. Imp Factor.	0.97	0.96
Cap. Adj. factor due to Impeding mvmnt	0.97	0.94
Movement Capacity	503	380

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	584	590
Potential Capacity	518	409
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity	510	402
Result for 2 stage process:		
a		
y		
C t	510	402
Probability of Queue free St.	0.96	0.98
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	580	594
Potential Capacity	520	406
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.97	0.95
Maj. L, Min T Adj. Imp Factor.	0.97	0.96
Cap. Adj. factor due to Impeding mvmnt	0.97	0.94
Movement Capacity	503	380
Results for Two-stage process:		
a		
y		
C t	503	380

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	21	20	18	20	7	6
Movement Capacity (vph)	503	510	806	380	402	772
Shared Lane Capacity (vph)		571			424	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	503	510	806	380	402	772
Volume	21	20	18	20	7	6
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		571			424	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	7	10		59			33	
C(m) (vph)	1281	1272		571			424	
v/c	0.01	0.01		0.10			0.08	
95% queue length	0.02	0.02		0.35			0.25	
Control Delay	7.8	7.9		12.0			14.2	
LOS	A	A		B			B	
Approach Delay				12.0			14.2	
Approach LOS				B			B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	0.99
v(il), Volume for stream 2 or 5	259	256
v(i2), Volume for stream 3 or 6	31	20
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.99	0.99
d(M,LT), Delay for stream 1 or 4	7.8	7.9
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.1	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Henry
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Henry
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		247	5	5	242	
Peak-Hour Factor, PHF		0.81	0.50	0.42	0.75	
Hourly Flow Rate, HFR		304	10	11	322	
Percent Heavy Vehicles		--	--	40	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.50		0.63			
Hourly Flow Rate, HFR	10		7			
Percent Heavy Vehicles	25		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		11		17				
C(m) (vph)		1060		577				
v/c		0.01		0.03				
95% queue length		0.03		0.09				
Control Delay		8.4		11.4				
LOS		A		B				
Approach Delay				11.4				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ Henry
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	
Project ID:	
East/West Street:	Henry
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		247	5	5	242	
Peak-Hour Factor, PHF		0.81	0.50	0.42	0.75	
Peak-15 Minute Volume		76	2	3	81	
Hourly Flow Rate, HFR		304	10	11	322	
Percent Heavy Vehicles		--	--	40	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.50		0.63			
Peak-15 Minute Volume	2		2			
Hourly Flow Rate, HFR	10		7			
Percent Heavy Vehicles	25		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		322
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		40	25		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.5	5.4		5.6			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		40	25		0			
t(f)		2.6	3.7		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5
Single-Stage Process

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		314	653		309			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process

7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			309			
Potential Capacity			775			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			775			
Probability of Queue free St.			0.99		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			314			
Potential Capacity			1060			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1060			
Probability of Queue free St.			0.99		1.00	
Maj L-Shared Prob Q free St.			0.99			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.99		0.99	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			653			
Potential Capacity			495			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.99	
Maj. L, Min T Adj. Imp Factor.					0.99	
Cap. Adj. factor due to Impeding mvmnt			0.99		0.98	
Movement Capacity			490			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	653	
Potential Capacity	495	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.99
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.98
Movement Capacity	490	
Results for Two-stage process:		
a		
y		
C t	490	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	10		7			
Movement Capacity (vph)	490		775			
Shared Lane Capacity (vph)		577				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	490		775			
Volume	10		7			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		577				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		11		17				
C(m) (vph)		1060		577				
v/c		0.01		0.03				
95% queue length		0.03		0.09				
Control Delay		8.4		11.4				
LOS		A		B				
Approach Delay				11.4				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		322
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.99
d(M,LT), Delay for stream 1 or 4		8.4
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	27	187	38	5	187	49
Peak-Hour Factor, PHF	0.75	0.88	0.71	0.63	0.86	0.78
Hourly Flow Rate, HFR	36	212	53	7	217	62
Percent Heavy Vehicles	4	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	22	60	5	33	77	27
Peak Hour Factor, PHF	0.85	0.90	0.63	0.73	0.77	0.86
Hourly Flow Rate, HFR	25	66	7	45	100	31
Percent Heavy Vehicles	0	4	0	0	2	8
Percent Grade (%)		-7			3	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	36	7		98			176	
C(m) (vph)	1272	1299		469			384	
v/c	0.03	0.01		0.21			0.46	
95% queue length	0.09	0.02		0.79			2.48	
Control Delay	7.9	7.8		14.7			22.2	
LOS	A	A		B			C	
Approach Delay				14.7			22.2	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	27	187	38	5	187	49
Peak-Hour Factor, PHF	0.75	0.88	0.71	0.63	0.86	0.78
Peak-15 Minute Volume	9	53	13	2	54	16
Hourly Flow Rate, HFR	36	212	53	7	217	62
Percent Heavy Vehicles	4	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	22	60	5	33	77	27
Peak Hour Factor, PHF	0.85	0.90	0.63	0.73	0.77	0.86
Peak-15 Minute Volume	6	17	2	11	25	8
Hourly Flow Rate, HFR	25	66	7	45	100	31
Percent Heavy Vehicles	0	4	0	0	2	8
Percent Grade (%)		-7			3	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	212	217
Shared ln volume, major rt vehicles:	53	62
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	4	2	0	4	0	0	2	8
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	3.00	3.00	3.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	5.7	5.1	5.5	7.7	7.1	6.6
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	4	2	0	4	0	0	2	8
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.4

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	279	265	638	603	238	609	599	248
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	238	248
Potential Capacity	844	760
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	844	760
Probability of Queue free St.	0.99	0.96
Step 2: LT from Major St.	4	1
Conflicting Flows	265	279
Potential Capacity	1299	1272
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1299	1272
Probability of Queue free St.	0.99	0.97
Maj L-Shared Prob Q free St.	0.99	0.97
Step 3: TH from Minor St.	8	11
Conflicting Flows	603	599
Potential Capacity	519	376
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	498	361
Probability of Queue free St.	0.87	0.72
Step 4: LT from Minor St.	7	10
Conflicting Flows	638	609
Potential Capacity	503	370
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.69	0.83
Maj. L, Min T Adj. Imp Factor.	0.76	0.87
Cap. Adj. factor due to Impeding mvmnt	0.73	0.86
Movement Capacity	368	320

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	603	599
Potential Capacity	519	376
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.96	0.96
Movement Capacity	498	361
Result for 2 stage process:		
a		
y		
C t	498	361
Probability of Queue free St.	0.87	0.72
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	638	609
Potential Capacity	503	370
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.69	0.83
Maj. L, Min T Adj. Imp Factor.	0.76	0.87
Cap. Adj. factor due to Impeding mvmnt	0.73	0.86
Movement Capacity	368	320
Results for Two-stage process:		
a		
y		
C t	368	320

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	25	66	7	45	100	31
Movement Capacity (vph)	368	498	844	320	361	760
Shared Lane Capacity (vph)		469			384	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	368	498	844	320	361	760
Volume	25	66	7	45	100	31
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		469			384	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	36	7		98			176	
C(m) (vph)	1272	1299		469			384	
v/c	0.03	0.01		0.21			0.46	
95% queue length	0.09	0.02		0.79			2.48	
Control Delay	7.9	7.8		14.7			22.2	
LOS	A	A		B			C	
Approach Delay				14.7			22.2	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.97	0.99
v(il), Volume for stream 2 or 5	212	217
v(i2), Volume for stream 3 or 6	53	62
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.97	0.99
d(M,LT), Delay for stream 1 or 4	7.9	7.8
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.3	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/13/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ Loomis
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2036
Project ID:	
East/West Street:	Loomis
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	11	242			237	11
Peak-Hour Factor, PHF	0.45	0.83			0.72	0.55
Hourly Flow Rate, HFR	24	291			329	19
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				17		11
Peak Hour Factor, PHF				0.54		1.00
Hourly Flow Rate, HFR				31		11
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	24						42	
C(m) (vph)	1222						434	
v/c	0.02						0.10	
95% queue length	0.06						0.32	
Control Delay	8.0						14.2	
LOS	A						B	
Approach Delay							14.2	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/13/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Loomis
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Loomis
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	11	242		237	11	
Peak-Hour Factor, PHF	0.45	0.83		0.72	0.55	
Peak-15 Minute Volume	6	73		82	5	
Hourly Flow Rate, HFR	24	291		329	19	
Percent Heavy Vehicles	0	--	--	--	--	
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1		1	0	
Configuration	LT				TR	
Upstream Signal?		No		No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				17		11
Peak Hour Factor, PHF				0.54		1.00
Peak-15 Minute Volume				8		3
Hourly Flow Rate, HFR				31		11
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	291	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	348					677		338
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		338
Potential Capacity		696
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		696
Probability of Queue free St.	1.00	0.98
Step 2: LT from Major St.	4	1
Conflicting Flows		348
Potential Capacity		1222
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1222
Probability of Queue free St.	1.00	0.98
Maj L-Shared Prob Q free St.		0.98
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		677
Potential Capacity		391
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.98	
Maj. L, Min T Adj. Imp Factor.	0.98	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.98
Movement Capacity		383

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		677	
Potential Capacity		391	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.98		
Maj. L, Min T Adj. Imp Factor.	0.98		
Cap. Adj. factor due to Impeding mvmnt	0.97	0.98	
Movement Capacity		383	
Results for Two-stage process:			
a			
y			
C t		383	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				31		11
Movement Capacity (vph)				383		696
Shared Lane Capacity (vph)					434	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				383		696
Volume				31		11
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					434	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	24						42	
C(m) (vph)	1222						434	
v/c	0.02						0.10	
95% queue length	0.06						0.32	
Control Delay	8.0						14.2	
LOS	A						B	
Approach Delay							14.2	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	1.00
v(il), Volume for stream 2 or 5	291	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	8.0	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.2	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	MID Peak
Intersection:	SR 86 @ Post Office
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2036
Project ID:	
East/West Street:	Post Office
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		253			0	
Peak-Hour Factor, PHF		0.83			0.80	
Hourly Flow Rate, HFR		304			0	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume						
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			/			/
Lanes						
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Post Office
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Post Office
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		253			0	
Peak-Hour Factor, PHF		0.83			0.80	
Peak-15 Minute Volume		76			0	
Hourly Flow Rate, HFR		304			0	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume						
Peak Hour Factor, PHF						
Peak-15 Minute Volume						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						
Lanes						
Configuration						

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)								
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)								
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)								
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage								
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)								
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)								
t(f)								

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x								
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Result for 2 stage process:				
a				
y				
C t				
Probability of Queue free St.		1.00		1.00
Step 4: LT from Minor St.		7		10
Part 1 - First Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Maj. L, Min T Impedance factor				
Maj. L, Min T Adj. Imp Factor.				
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Results for Two-stage process:				
a				
y				
C t				

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)						
Movement Capacity (vph)						
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Sherman
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Sherman
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		247	11	11	247	
Peak-Hour Factor, PHF		0.90	0.63	0.58	0.79	
Hourly Flow Rate, HFR		274	17	18	312	
Percent Heavy Vehicles		--	--	14	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1 0		0 1		
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	11		5			
Peak Hour Factor, PHF	0.56		0.33			
Hourly Flow Rate, HFR	19		15			
Percent Heavy Vehicles	11		25			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		18		34				
C(m) (vph)		1205		617				
v/c		0.01		0.06				
95% queue length		0.05		0.17				
Control Delay		8.0		11.2				
LOS		A		B				
Approach Delay				11.2				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: MID Peak
Intersection: SR 86 @ Sherman
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Sherman
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		247	11	11	247	
Peak-Hour Factor, PHF		0.90	0.63	0.58	0.79	
Peak-15 Minute Volume		69	4	5	78	
Hourly Flow Rate, HFR		274	17	18	312	
Percent Heavy Vehicles		--	--	14	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	11		5			
Peak Hour Factor, PHF	0.56		0.33			
Peak-15 Minute Volume	5		4			
Hourly Flow Rate, HFR	19		15			
Percent Heavy Vehicles	11		25			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		312
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		14	11		25			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.2	5.1		5.8			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		14	11		25			
t(f)		2.3	3.6		3.5			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2 V(t)	Movement 2 V(l,prot)	Movement 5 V(t)	Movement 5 V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		291	630		282			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			282			
Potential Capacity			745			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			745			
Probability of Queue free St.			0.98		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			291			
Potential Capacity			1205			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1205			
Probability of Queue free St.			0.99		1.00	
Maj L-Shared Prob Q free St.			0.98			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.98	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			630			
Potential Capacity			551			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.98	
Maj. L, Min T Adj. Imp Factor.					0.99	
Cap. Adj. factor due to Impeding mvmnt			0.99		0.97	
Movement Capacity			543			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		

Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00

Step 4: LT from Minor St.	7	10

Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		

Part 3 - Single Stage		
Conflicting Flows	630	
Potential Capacity	551	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.99
Cap. Adj. factor due to Impeding mvmnt	0.99	0.97
Movement Capacity	543	

Results for Two-stage process:	
a	
y	
C t	543

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	19		15			
Movement Capacity (vph)	543		745			
Shared Lane Capacity (vph)		617				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	543		745			
Volume	19		15			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		617				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		18		34				
C(m) (vph)		1205		617				
v/c		0.01		0.06				
95% queue length		0.05		0.17				
Control Delay		8.0		11.2				
LOS		A		B				
Approach Delay				11.2				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.99
v(il), Volume for stream 2 or 5		312
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		8.0
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Baldwin Hall
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2036
Project ID:	
East/West Street:	Baldwin Hall
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	11	363			253	5
Peak-Hour Factor, PHF	0.75	0.85			0.80	0.63
Hourly Flow Rate, HFR	14	427			316	7
Percent Heavy Vehicles	0	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				5		5
Peak Hour Factor, PHF				0.63		0.38
Hourly Flow Rate, HFR				7		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	14						20	
C(m) (vph)	1248						511	
v/c	0.01						0.04	
95% queue length	0.03						0.12	
Control Delay	7.9						12.3	
LOS	A						B	
Approach Delay							12.3	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Baldwin Hall
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Baldwin Hall
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	11	363		253	5	
Peak-Hour Factor, PHF	0.75	0.85		0.80	0.63	
Peak-15 Minute Volume	4	107		79	2	
Hourly Flow Rate, HFR	14	427		316	7	
Percent Heavy Vehicles	0	--	--	--	--	
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1		1	0	
Configuration	LT				TR	
Upstream Signal?		No		No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				5		5
Peak Hour Factor, PHF				0.63		0.38
Peak-15 Minute Volume				2		3
Hourly Flow Rate, HFR				7		13
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	427	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	323					775		320
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		320
Potential Capacity		713
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		713
Probability of Queue free St.	1.00	0.98
Step 2: LT from Major St.	4	1
Conflicting Flows		323
Potential Capacity		1248
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		1248
Probability of Queue free St.	1.00	0.99
Maj L-Shared Prob Q free St.		0.99
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		775
Potential Capacity		339
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.99	
Maj. L, Min T Adj. Imp Factor.	0.99	
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99
Movement Capacity		335

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.99	0.99	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		775	
Potential Capacity		339	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.99		
Maj. L, Min T Adj. Imp Factor.	0.99		
Cap. Adj. factor due to Impeding mvmnt	0.97	0.99	
Movement Capacity		335	
Results for Two-stage process:			
a			
y			
C t		335	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				7		13
Movement Capacity (vph)				335		713
Shared Lane Capacity (vph)					511	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep				335		713
Volume				7		13
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					511	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	14						20	
C(m) (vph)	1248						511	
v/c	0.01						0.04	
95% queue length	0.03						0.12	
Control Delay	7.9						12.3	
LOS	A						B	
Approach Delay							12.3	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(il), Volume for stream 2 or 5	427	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.99	
d(M,LT), Delay for stream 1 or 4	7.9	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		352	17	27	231	
Peak-Hour Factor, PHF		0.86	0.88	0.43	0.85	
Hourly Flow Rate, HFR		409	19	62	271	
Percent Heavy Vehicles		--	--	1	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	22		22			
Peak Hour Factor, PHF	0.63		0.61			
Hourly Flow Rate, HFR	34		36			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		62		70				
C(m) (vph)		1137		502				
v/c		0.05		0.14				
95% queue length		0.17		0.49				
Control Delay		8.3		13.3				
LOS		A		B				
Approach Delay				13.3				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ E College
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: East College
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		352	17	27	231	
Peak-Hour Factor, PHF		0.86	0.88	0.43	0.85	
Peak-15 Minute Volume		102	5	16	68	
Hourly Flow Rate, HFR		409	19	62	271	
Percent Heavy Vehicles		--	--	1	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	22		22			
Peak Hour Factor, PHF	0.63		0.61			
Peak-15 Minute Volume	9		9			
Hourly Flow Rate, HFR	34		36			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		271
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		1	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.6		5.8			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		1	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x		428	813		418			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			418			
Potential Capacity			670			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			670			
Probability of Queue free St.			0.95		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			428			
Potential Capacity			1137			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1137			
Probability of Queue free St.			0.95		1.00	
Maj L-Shared Prob Q free St.			0.94			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.94		0.94	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			813			
Potential Capacity			420			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.94	
Maj. L, Min T Adj. Imp Factor.					0.95	
Cap. Adj. factor due to Impeding mvmnt			0.95		0.90	
Movement Capacity			397			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.94		0.94	
Movement Capacity						
Result for 2 stage process:						
a						
y						
C t						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			7		10	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Part 2 - Second Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Part 3 - Single Stage						
Conflicting Flows			813			
Potential Capacity			420			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.94	
Maj. L, Min T Adj. Imp Factor.					0.95	
Cap. Adj. factor due to Impeding mvmnt			0.95		0.90	
Movement Capacity			397			
Results for Two-stage process:						
a						
y						
C t			397			

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	34		36			
Movement Capacity (vph)	397		670			
Shared Lane Capacity (vph)		502				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	397		670			
Volume	34		36			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		502				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		62		70				
C(m) (vph)		1137		502				
v/c		0.05		0.14				
95% queue length		0.17		0.49				
Control Delay		8.3		13.3				
LOS		A		B				
Approach Delay				13.3				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.95
v(il), Volume for stream 2 or 5		271
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.94
d(M,LT), Delay for stream 1 or 4		8.3
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.5

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	5	347	17	5	226	5
Peak-Hour Factor, PHF	0.25	0.83	0.81	0.75	0.80	0.25
Hourly Flow Rate, HFR	20	418	20	6	282	20
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	22	5	33	5	5	11
Peak Hour Factor, PHF	0.69	0.50	0.75	0.50	0.25	0.92
Hourly Flow Rate, HFR	31	10	44	10	20	11
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	20	6		85			41	
C(m) (vph)	1270	1133		492			346	
v/c	0.02	0.01		0.17			0.12	
95% queue length	0.05	0.02		0.62			0.40	
Control Delay	7.9	8.2		13.8			16.8	
LOS	A	A		B			C	
Approach Delay				13.8			16.8	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ E John
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: East John
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	5	347	17	5	226	5
Peak-Hour Factor, PHF	0.25	0.83	0.81	0.75	0.80	0.25
Peak-15 Minute Volume	5	105	5	2	71	5
Hourly Flow Rate, HFR	20	418	20	6	282	20
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	22	5	33	5	5	11
Peak Hour Factor, PHF	0.69	0.50	0.75	0.50	0.25	0.92
Peak-15 Minute Volume	8	2	11	2	5	3
Hourly Flow Rate, HFR	31	10	44	10	20	11
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		-6			1	
Flared Approach: Exists?/Storage			No /			No /
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	418	282
Shared ln volume, major rt vehicles:	20	20
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	0	0	0	0	0	0	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	1.00	1.00	1.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	5.9	5.3	5.6	7.3	6.7	6.3
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	0	0	0	0	0	0	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	302	438	788	782	428	799	782	292
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	428	292
Potential Capacity	678	746
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	678	746
Probability of Queue free St.	0.94	0.99
Step 2: LT from Major St.	4	1
Conflicting Flows	438	302
Potential Capacity	1133	1270
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1133	1270
Probability of Queue free St.	0.99	0.98
Maj L-Shared Prob Q free St.	0.99	0.98
Step 3: TH from Minor St.	8	11
Conflicting Flows	782	782
Potential Capacity	426	314
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity	414	305
Probability of Queue free St.	0.98	0.93
Step 4: LT from Minor St.	7	10
Conflicting Flows	788	799
Potential Capacity	405	293
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.91	0.95
Maj. L, Min T Adj. Imp Factor.	0.93	0.96
Cap. Adj. factor due to Impeding mvmnt	0.92	0.90
Movement Capacity	371	263

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	782	782
Potential Capacity	426	314
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity	414	305
Result for 2 stage process:		
a		
y		
C t	414	305
Probability of Queue free St.	0.98	0.93
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	788	799
Potential Capacity	405	293
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.91	0.95
Maj. L, Min T Adj. Imp Factor.	0.93	0.96
Cap. Adj. factor due to Impeding mvmnt	0.92	0.90
Movement Capacity	371	263
Results for Two-stage process:		
a		
y		
C t	371	263

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	31	10	44	10	20	11
Movement Capacity (vph)	371	414	678	263	305	746
Shared Lane Capacity (vph)		492			346	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	371	414	678	263	305	746
Volume	31	10	44	10	20	11
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		492			346	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	20	6		85			41	
C(m) (vph)	1270	1133		492			346	
v/c	0.02	0.01		0.17			0.12	
95% queue length	0.05	0.02		0.62			0.40	
Control Delay	7.9	8.2		13.8			16.8	
LOS	A	A		B			C	
Approach Delay				13.8			16.8	
Approach LOS				B			C	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.98	0.99
v(il), Volume for stream 2 or 5	418	282
v(i2), Volume for stream 3 or 6	20	20
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.98	0.99
d(M,LT), Delay for stream 1 or 4	7.9	8.2
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.2	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Henry
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2036
Project ID:	
East/West Street:	Henry
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		352	5	11	247	
Peak-Hour Factor, PHF		0.88	0.50	0.44	0.87	
Hourly Flow Rate, HFR		400	10	25	283	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration		TR		LT		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	5		5			
Peak Hour Factor, PHF	0.38		0.50			
Hourly Flow Rate, HFR	13		10			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		25		23				
C(m) (vph)		1160		559				
v/c		0.02		0.04				
95% queue length		0.07		0.13				
Control Delay		8.2		11.7				
LOS		A		B				
Approach Delay				11.7				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst:	XW
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Henry
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2036
Project ID:	
East/West Street:	Henry
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		352	5	11	247	
Peak-Hour Factor, PHF		0.88	0.50	0.44	0.87	
Peak-15 Minute Volume		100	2	6	71	
Hourly Flow Rate, HFR		400	10	25	283	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	5		5			
Peak Hour Factor, PHF	0.38		0.50			
Peak-15 Minute Volume	3		2			
Hourly Flow Rate, HFR	13		10			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-6			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		283
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		0	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-6.00	-6.00	-6.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.2		5.6			
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		0	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		410	738		405			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			405			
Potential Capacity			696			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			696			
Probability of Queue free St.			0.99		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			410			
Potential Capacity			1160			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1160			
Probability of Queue free St.			0.98		1.00	
Maj L-Shared Prob Q free St.			0.97			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.97		0.97	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			738			
Potential Capacity			496			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.97	
Maj. L, Min T Adj. Imp Factor.					0.98	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.97	
Movement Capacity			485			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor						
Cap. Adj. factor due to Impeding mvmnt						
Movement Capacity						
Probability of Queue free St.						

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.97	0.97
Movement Capacity		
Result for 2 stage process:		
a		
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	738	
Potential Capacity	496	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.97
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.97
Movement Capacity	485	
Results for Two-stage process:		
a		
y		
C t	485	

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)	13		10			
Movement Capacity (vph)	485		696			
Shared Lane Capacity (vph)		559				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	485		696			
Volume	13		10			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		559				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		25		23				
C(m) (vph)		1160		559				
v/c		0.02		0.04				
95% queue length		0.07		0.13				
Control Delay		8.2		11.7				
LOS		A		B				
Approach Delay				11.7				
Approach LOS				B				

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		283
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.97
d(M,LT), Delay for stream 1 or 4		8.2
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.2

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	66	264	55	11	176	49
Peak-Hour Factor, PHF	0.86	0.95	0.90	0.63	0.74	0.83
Hourly Flow Rate, HFR	76	277	61	17	237	59
Percent Heavy Vehicles	1	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	17	88	11	38	99	44
Peak Hour Factor, PHF	0.75	0.79	0.42	0.84	0.90	0.75
Hourly Flow Rate, HFR	22	111	26	45	110	58
Percent Heavy Vehicles	0	1	0	5	0	0
Percent Grade (%)		-7			3	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	76	17		159			213	
C(m) (vph)	1271	1221		391			282	
v/c	0.06	0.01		0.41			0.76	
95% queue length	0.19	0.04		2.02			7.59	
Control Delay	8.0	8.0		20.5			54.2	
LOS	A	A		C			F	
Approach Delay				20.5			54.2	
Approach LOS				C			F	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Limber/Allegheny
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Limber/Allegheny
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	66	264	55	11	176	49
Peak-Hour Factor, PHF	0.86	0.95	0.90	0.63	0.74	0.83
Peak-15 Minute Volume	19	69	15	4	59	15
Hourly Flow Rate, HFR	76	277	61	17	237	59
Percent Heavy Vehicles	1	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?	No			No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	17	88	11	38	99	44
Peak Hour Factor, PHF	0.75	0.79	0.42	0.84	0.90	0.75
Peak-15 Minute Volume	6	28	7	11	28	15
Hourly Flow Rate, HFR	22	111	26	45	110	58
Percent Heavy Vehicles	0	1	0	5	0	0
Percent Grade (%)		-7			3	
Flared Approach: Exists?/Storage		No /			No /	
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	277	237
Shared ln volume, major rt vehicles:	61	59
Sat flow rate, major th vehicles:	1700	1700
Sat flow rate, major rt vehicles:	1700	1700
Number of major street through lanes:	1	1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1	4.1	7.1	6.5	6.2	7.1	6.5	6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	1	2	0	1	0	5	0	0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	3.00	3.00	3.00
t(3,lt)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1	4.1	5.7	5.1	5.5	7.8	7.1	6.5
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20	2.20	3.50	4.00	3.30	3.50	4.00	3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	1	2	0	1	0	5	0	0
t(f)	2.2	2.2	3.5	4.0	3.3	3.5	4.0	3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x	296	338	844	790	308	828	790	266
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s		1500		1500		1500		1500
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows	308	266
Potential Capacity	782	760
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	782	760
Probability of Queue free St.	0.97	0.92
Step 2: LT from Major St.	4	1
Conflicting Flows	338	296
Potential Capacity	1221	1271
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity	1221	1271
Probability of Queue free St.	0.99	0.94
Maj L-Shared Prob Q free St.	0.98	0.93
Step 3: TH from Minor St.	8	11
Conflicting Flows	790	790
Potential Capacity	440	285
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.91	0.91
Movement Capacity	400	259
Probability of Queue free St.	0.72	0.58
Step 4: LT from Minor St.	7	10
Conflicting Flows	844	828
Potential Capacity	396	250
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.52	0.66
Maj. L, Min T Adj. Imp Factor.	0.63	0.73
Cap. Adj. factor due to Impeding mvmnt	0.58	0.71
Movement Capacity	229	177

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	790	790
Potential Capacity	440	285
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.91	0.91
Movement Capacity	400	259
Result for 2 stage process:		
a		
y		
C t	400	259
Probability of Queue free St.	0.72	0.58
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Part 3 - Single Stage		
Conflicting Flows	844	828
Potential Capacity	396	250
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor	0.52	0.66
Maj. L, Min T Adj. Imp Factor.	0.63	0.73
Cap. Adj. factor due to Impeding mvmnt	0.58	0.71
Movement Capacity	229	177
Results for Two-stage process:		
a		
y		
C t	229	177

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	22	111	26	45	110	58
Movement Capacity (vph)	229	400	782	177	259	760
Shared Lane Capacity (vph)		391			282	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep	229	400	782	177	259	760
Volume	22	111	26	45	110	58
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		391			282	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	76	17		159			213	
C(m) (vph)	1271	1221		391			282	
v/c	0.06	0.01		0.41			0.76	
95% queue length	0.19	0.04		2.02			7.59	
Control Delay	8.0	8.0		20.5			54.2	
LOS	A	A		C			F	
Approach Delay				20.5			54.2	
Approach LOS				C			F	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.94	0.99
v(il), Volume for stream 2 or 5	277	237
v(i2), Volume for stream 3 or 6	61	59
s(il), Saturation flow rate for stream 2 or 5	1700	1700
s(i2), Saturation flow rate for stream 3 or 6	1700	1700
P*(oj)	0.93	0.98
d(M,LT), Delay for stream 1 or 4	8.0	8.0
N, Number of major street through lanes	1	1
d(rank,1) Delay for stream 2 or 5	0.6	0.1

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Loomis
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2036
Project ID:	
East/West Street:	Loomis
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	11	347			247	22
Peak-Hour Factor, PHF	0.67	0.82			0.89	0.50
Hourly Flow Rate, HFR	16	423			277	44
Percent Heavy Vehicles	1	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				17		11
Peak Hour Factor, PHF				0.81		0.55
Hourly Flow Rate, HFR				20		19
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	16						39	
C(m) (vph)	1245						465	
v/c	0.01						0.08	
95% queue length	0.04						0.27	
Control Delay	7.9						13.5	
LOS	A						B	
Approach Delay							13.5	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Loomis
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Loomis
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume	11	347		247	22	
Peak-Hour Factor, PHF	0.67	0.82		0.89	0.50	
Peak-15 Minute Volume	4	106		69	11	
Hourly Flow Rate, HFR	16	423		277	44	
Percent Heavy Vehicles	1	--	--	--	--	
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1		1	0	
Configuration	LT				TR	
Upstream Signal?		No		No		

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume				17		11
Peak Hour Factor, PHF				0.81		0.55
Peak-15 Minute Volume				5		5
Hourly Flow Rate, HFR				20		19
Percent Heavy Vehicles				0		0
Percent Grade (%)		0			2	
Flared Approach: Exists?/Storage				/		No /
RT Channelized?						
Lanes				0		0
Configuration					LR	

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:	423	
Shared ln volume, major rt vehicles:	0	
Sat flow rate, major th vehicles:	1700	
Sat flow rate, major rt vehicles:	1700	
Number of major street through lanes:	1	

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)	4.1					7.1		6.2
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)	1					0		0
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			0.00	0.00	0.00	2.00	2.00	2.00
t(3,lt)	0.00					0.70		0.00
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage	4.1					6.8		6.4
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)	2.20					3.50		3.30
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)	1					0		0
t(f)	2.2					3.5		3.3

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x	321					754		299
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s						1500		
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.					9		12	
Conflicting Flows							299	
Potential Capacity							733	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							733	
Probability of Queue free St.					1.00		0.97	
Step 2: LT from Major St.					4		1	
Conflicting Flows							321	
Potential Capacity							1245	
Pedestrian Impedance Factor					1.00		1.00	
Movement Capacity							1245	
Probability of Queue free St.					1.00		0.99	
Maj L-Shared Prob Q free St.							0.98	
Step 3: TH from Minor St.					8		11	
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor					1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt					0.98		0.98	
Movement Capacity								
Probability of Queue free St.					1.00		1.00	
Step 4: LT from Minor St.					7		10	
Conflicting Flows							754	
Potential Capacity							349	
Pedestrian Impedance Factor					1.00		1.00	
Maj. L, Min T Impedance factor					0.98			
Maj. L, Min T Adj. Imp Factor.					0.99			
Cap. Adj. factor due to Impeding mvmnt					0.96		0.99	
Movement Capacity							345	

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.					8		11	
Part 1 - First Stage								
Conflicting Flows								
Potential Capacity								
Pedestrian Impedance Factor								
Cap. Adj. factor due to Impeding mvmnt								
Movement Capacity								
Probability of Queue free St.								

Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor	1.00	1.00	
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98	
Movement Capacity			
Result for 2 stage process:			
a			
y			
C t			
Probability of Queue free St.	1.00	1.00	
Step 4: LT from Minor St.	7	10	
Part 1 - First Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 2 - Second Stage			
Conflicting Flows			
Potential Capacity			
Pedestrian Impedance Factor			
Cap. Adj. factor due to Impeding mvmnt			
Movement Capacity			
Part 3 - Single Stage			
Conflicting Flows		754	
Potential Capacity		349	
Pedestrian Impedance Factor	1.00	1.00	
Maj. L, Min T Impedance factor	0.98		
Maj. L, Min T Adj. Imp Factor.	0.99		
Cap. Adj. factor due to Impeding mvmnt	0.96	0.99	
Movement Capacity		345	
Results for Two-stage process:			
a			
y			
C t		345	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)				20		19
Movement Capacity (vph)				345		733
Shared Lane Capacity (vph)					465	

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
C sep				345		733
Volume				20		19
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh					465	
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	16						39	
C(m) (vph)	1245						465	
v/c	0.01						0.08	
95% queue length	0.04						0.27	
Control Delay	7.9						13.5	
LOS	A						B	
Approach Delay							13.5	
Approach LOS							B	

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	0.99	1.00
v(il), Volume for stream 2 or 5	423	
v(i2), Volume for stream 3 or 6	0	
s(il), Saturation flow rate for stream 2 or 5	1700	
s(i2), Saturation flow rate for stream 3 or 6	1700	
P*(oj)	0.98	
d(M,LT), Delay for stream 1 or 4	7.9	
N, Number of major street through lanes	1	
d(rank,1) Delay for stream 2 or 5	0.1	

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TWO-WAY STOP CONTROL SUMMARY

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Post Office
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year: 2036
Project ID:
East/West Street: Post Office
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		374			259	
Peak-Hour Factor, PHF		0.90			0.84	
Hourly Flow Rate, HFR		415			308	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume						
Peak Hour Factor, PHF						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage		/			/	
Lanes						
Configuration						

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: XW
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Post Office
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Post Office
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		374			259	
Peak-Hour Factor, PHF		0.90			0.84	
Peak-15 Minute Volume		104			77	
Hourly Flow Rate, HFR		415			308	
Percent Heavy Vehicles		--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes		1			1	
Configuration		T			T	
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume						
Peak Hour Factor, PHF						
Peak-15 Minute Volume						
Hourly Flow Rate, HFR						
Percent Heavy Vehicles						
Percent Grade (%)		-4			0	
Flared Approach: Exists?/Storage				/		/
RT Channelized?						
Lanes						
Configuration						

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		
Shared ln volume, major rt vehicles:		
Sat flow rate, major th vehicles:		
Sat flow rate, major rt vehicles:		
Number of major street through lanes:		

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)								
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)								
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-4.00	-4.00	-4.00	0.00	0.00	0.00
t(3,lt)								
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage								
2-stage								

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)								
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)								
t(f)								

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)	
Arrival Type	
Effective Green, g (sec)	
Cycle Length, C (sec)	
Rp (from Exhibit 16-11)	
Proportion vehicles arriving on green P	
g(q1)	
g(q2)	
g(q)	

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1	4	7	8	9	10	11	12
	L	L	L	T	R	L	T	R
V c,x								
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)								
s								
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.	9	12
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 2: LT from Major St.	4	1
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Maj L-Shared Prob Q free St.		
Step 3: TH from Minor St.	8	11
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		
Maj. L, Min T Adj. Imp Factor.		
Cap. Adj. factor due to Impeding mvmnt	1.00	1.00
Movement Capacity		

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.	8	11
Part 1 - First Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor		
Cap. Adj. factor due to Impeding mvmnt		
Movement Capacity		
Probability of Queue free St.		

Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Result for 2 stage process:				
a				
y				
C t				
Probability of Queue free St.		1.00		1.00
Step 4: LT from Minor St.		7		10
Part 1 - First Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 2 - Second Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor				
Cap. Adj. factor due to Impeding mvmnt				
Movement Capacity				
Part 3 - Single Stage				
Conflicting Flows				
Potential Capacity				
Pedestrian Impedance Factor		1.00		1.00
Maj. L, Min T Impedance factor				
Maj. L, Min T Adj. Imp Factor.				
Cap. Adj. factor due to Impeding mvmnt		1.00		1.00
Movement Capacity				
Results for Two-stage process:				
a				
y				
C t				

Worksheet 8-Shared Lane Calculations

Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (vph)						
Movement Capacity (vph)						
Shared Lane Capacity (vph)						

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep						
Volume						
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh						
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config								
v (vph)								
C(m) (vph)								
v/c								
95% queue length								
Control Delay								
LOS								
Approach Delay								
Approach LOS								

Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	1.00
v(il), Volume for stream 2 or 5		
v(i2), Volume for stream 3 or 6		
s(il), Saturation flow rate for stream 2 or 5		
s(i2), Saturation flow rate for stream 3 or 6		
P*(oj)		
d(M,LT), Delay for stream 1 or 4		
N, Number of major street through lanes		
d(rank,1) Delay for stream 2 or 5		

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TWO-WAY STOP CONTROL SUMMARY

Analyst:	RB
Agency/Co.:	WRA
Date Performed:	10/14/2016
Analysis Time Period:	PM Peak
Intersection:	SR 86 @ Sherman
Jurisdiction:	Meadville
Units: U. S. Customary	
Analysis Year:	2036
Project ID:	
East/West Street:	Sherman
North/South Street:	SR 86
Intersection Orientation: NS	Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		357	5	5	247	
Peak-Hour Factor, PHF		0.85	0.38	0.25	0.84	
Hourly Flow Rate, HFR		419	13	20	294	
Percent Heavy Vehicles		--	--	1	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	22		11			
Peak Hour Factor, PHF	0.35		0.58			
Hourly Flow Rate, HFR	62		18			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		20		80				
C(m) (vph)		1133		610				
v/c		0.02		0.13				
95% queue length		0.05		0.45				
Control Delay		8.2		11.8				
LOS		A		B				
Approach Delay				11.8				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

Phone: Fax:
E-Mail:

TWO-WAY STOP CONTROL(TWSC) ANALYSIS

Analyst: RB
Agency/Co.: WRA
Date Performed: 10/14/2016
Analysis Time Period: PM Peak
Intersection: SR 86 @ Sherman
Jurisdiction: Meadville
Units: U. S. Customary
Analysis Year:
Project ID:
East/West Street: Sherman
North/South Street: SR 86
Intersection Orientation: NS Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street Movements	1 L	2 T	3 R	4 L	5 T	6 R
Volume		357	5	5	247	
Peak-Hour Factor, PHF		0.85	0.38	0.25	0.84	
Peak-15 Minute Volume		105	3	5	74	
Hourly Flow Rate, HFR		419	13	20	294	
Percent Heavy Vehicles		--	--	1	--	--
Median Type/Storage	TWLTL			/ 1		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street Movements	7 L	8 T	9 R	10 L	11 T	12 R
Volume	22		11			
Peak Hour Factor, PHF	0.35		0.58			
Peak-15 Minute Volume	16		5			
Hourly Flow Rate, HFR	62		18			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		-7			0	
Flared Approach: Exists?/Storage			No	/		/
RT Channelized?						
Lanes	0		0			
Configuration		LR				

Pedestrian Volumes and Adjustments

Movements	13	14	15	16
Flow (ped/hr)	0	0	0	0

Lane Width (ft)	16.0	16.0	12.0	12.0
Walking Speed (ft/sec)	4.0	4.0	4.0	4.0
Percent Blockage	0	0	0	0

Upstream Signal Data

	Prog. Flow vph	Sat Flow vph	Arrival Type	Green Time sec	Cycle Length sec	Prog. Speed mph	Distance to Signal feet
S2 Left-Turn							
Through							
S5 Left-Turn							
Through							

Worksheet 3-Data for Computing Effect of Delay to Major Street Vehicles

	Movement 2	Movement 5
Shared ln volume, major th vehicles:		294
Shared ln volume, major rt vehicles:		0
Sat flow rate, major th vehicles:		1700
Sat flow rate, major rt vehicles:		1700
Number of major street through lanes:		1

Worksheet 4-Critical Gap and Follow-up Time Calculation

Critical Gap Calculation

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(c,base)		4.1	7.1		6.2			
t(c,hv)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
P(hv)		1	0		0			
t(c,g)			0.20	0.20	0.10	0.20	0.20	0.10
Percent Grade			-7.00	-7.00	-7.00	0.00	0.00	0.00
t(3,lt)		0.00	0.70		0.00			
t(c,T): 1-stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2-stage	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
t(c) 1-stage		4.1	5.0		5.5			
2-stage		4.1	4.0		5.5			

Follow-Up Time Calculations

Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
t(f,base)		2.20	3.50		3.30			
t(f,HV)	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
P(HV)		1	0		0			
t(f)		2.2	3.5		3.3			

Worksheet 5-Effect of Upstream Signals

Computation 1-Queue Clearance Time at Upstream Signal

	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
V prog				

Total Saturation Flow Rate, s (vph)								
Arrival Type								
Effective Green, g (sec)								
Cycle Length, C (sec)								
Rp (from Exhibit 16-11)								
Proportion vehicles arriving on green P								
g(q1)								
g(q2)								
g(q)								

Computation 2-Proportion of TWSC Intersection Time blocked	Movement 2		Movement 5	
	V(t)	V(l,prot)	V(t)	V(l,prot)
alpha				
beta				
Travel time, t(a) (sec)				
Smoothing Factor, F				
Proportion of conflicting flow, f				
Max platooned flow, V(c,max)				
Min platooned flow, V(c,min)				
Duration of blocked period, t(p)				
Proportion time blocked, p	0.000		0.000	

Computation 3-Platoon Event Periods	Result
p(2)	0.000
p(5)	0.000
p(dom)	
p(subo)	
Constrained or unconstrained?	

Proportion unblocked for minor movements, p(x)	(1) Single-stage Process	(2) Two-Stage Process Stage I	(3) Two-Stage Process Stage II
p(1)			
p(4)			
p(7)			
p(8)			
p(9)			
p(10)			
p(11)			
p(12)			

Computation 4 and 5 Single-Stage Process								
Movement	1 L	4 L	7 L	8 T	9 R	10 L	11 T	12 R
V c,x		432	760		426			
s								
Px								
V c,u,x								
C r,x								
C plat,x								

Two-Stage Process				
	7	8	10	11

	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2	Stage1	Stage2
V(c,x)	426	334						
s		1500						
P(x)								
V(c,u,x)								
C(r,x)								
C(plat,x)								

Worksheet 6-Impedance and Capacity Equations

Step 1: RT from Minor St.			9		12	
Conflicting Flows			426			
Potential Capacity			687			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			687			
Probability of Queue free St.			0.97		1.00	
Step 2: LT from Major St.			**4**		**1**	
Conflicting Flows			432			
Potential Capacity			1133			
Pedestrian Impedance Factor			1.00		1.00	
Movement Capacity			1133			
Probability of Queue free St.			0.98		1.00	
Maj L-Shared Prob Q free St.			0.98			
Step 3: TH from Minor St.			**8**		**11**	
Conflicting Flows						
Potential Capacity						
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.98	
Movement Capacity						
Probability of Queue free St.			1.00		1.00	
Step 4: LT from Minor St.			**7**		**10**	
Conflicting Flows			760			
Potential Capacity			506			
Pedestrian Impedance Factor			1.00		1.00	
Maj. L, Min T Impedance factor					0.98	
Maj. L, Min T Adj. Imp Factor.					0.98	
Cap. Adj. factor due to Impeding mvmnt			0.98		0.96	
Movement Capacity			497			

Worksheet 7-Computation of the Effect of Two-stage Gap Acceptance

Step 3: TH from Minor St.			8		11	
Part 1 - First Stage						
Conflicting Flows						
Potential Capacity			695		647	
Pedestrian Impedance Factor			1.00		1.00	
Cap. Adj. factor due to Impeding mvmnt			1.00		0.98	
Movement Capacity			695		633	
Probability of Queue free St.			1.00		1.00	

Part 2 - Second Stage		
Conflicting Flows		
Potential Capacity	736	586
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	1.00
Movement Capacity	720	586
Part 3 - Single Stage		
Conflicting Flows		
Potential Capacity		
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.98
Movement Capacity		
Result for 2 stage process:		
a	0.91	0.91
y		
C t		
Probability of Queue free St.	1.00	1.00
Step 4: LT from Minor St.	7	10
Part 1 - First Stage		
Conflicting Flows	426	
Potential Capacity	783	730
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	1.00	0.98
Movement Capacity	783	714
Part 2 - Second Stage		
Conflicting Flows	334	
Potential Capacity	831	658
Pedestrian Impedance Factor	1.00	1.00
Cap. Adj. factor due to Impeding mvmnt	0.98	0.97
Movement Capacity	813	641
Part 3 - Single Stage		
Conflicting Flows	760	
Potential Capacity	506	
Pedestrian Impedance Factor	1.00	1.00
Maj. L, Min T Impedance factor		0.98
Maj. L, Min T Adj. Imp Factor.		0.98
Cap. Adj. factor due to Impeding mvmnt	0.98	0.96
Movement Capacity	497	
Results for Two-stage process:		
a	0.91	0.91
y	0.91	
C t	591	

Worksheet 8-Shared Lane Calculations

Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume (vph)	62		18			
Movement Capacity (vph)	591		687			
Shared Lane Capacity (vph)		610				

Worksheet 9-Computation of Effect of Flared Minor Street Approaches

Movement	7 L	8 T	9 R	10 L	11 T	12 R
C sep	591		687			
Volume	62		18			
Delay						
Q sep						
Q sep +1						
round (Qsep +1)						
n max						
C sh		610				
SUM C sep						
n						
C act						

Worksheet 10-Delay, Queue Length, and Level of Service

Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		20		80				
C(m) (vph)		1133		610				
v/c		0.02		0.13				
95% queue length		0.05		0.45				
Control Delay		8.2		11.8				
LOS		A		B				
Approach Delay				11.8				
Approach LOS				B				

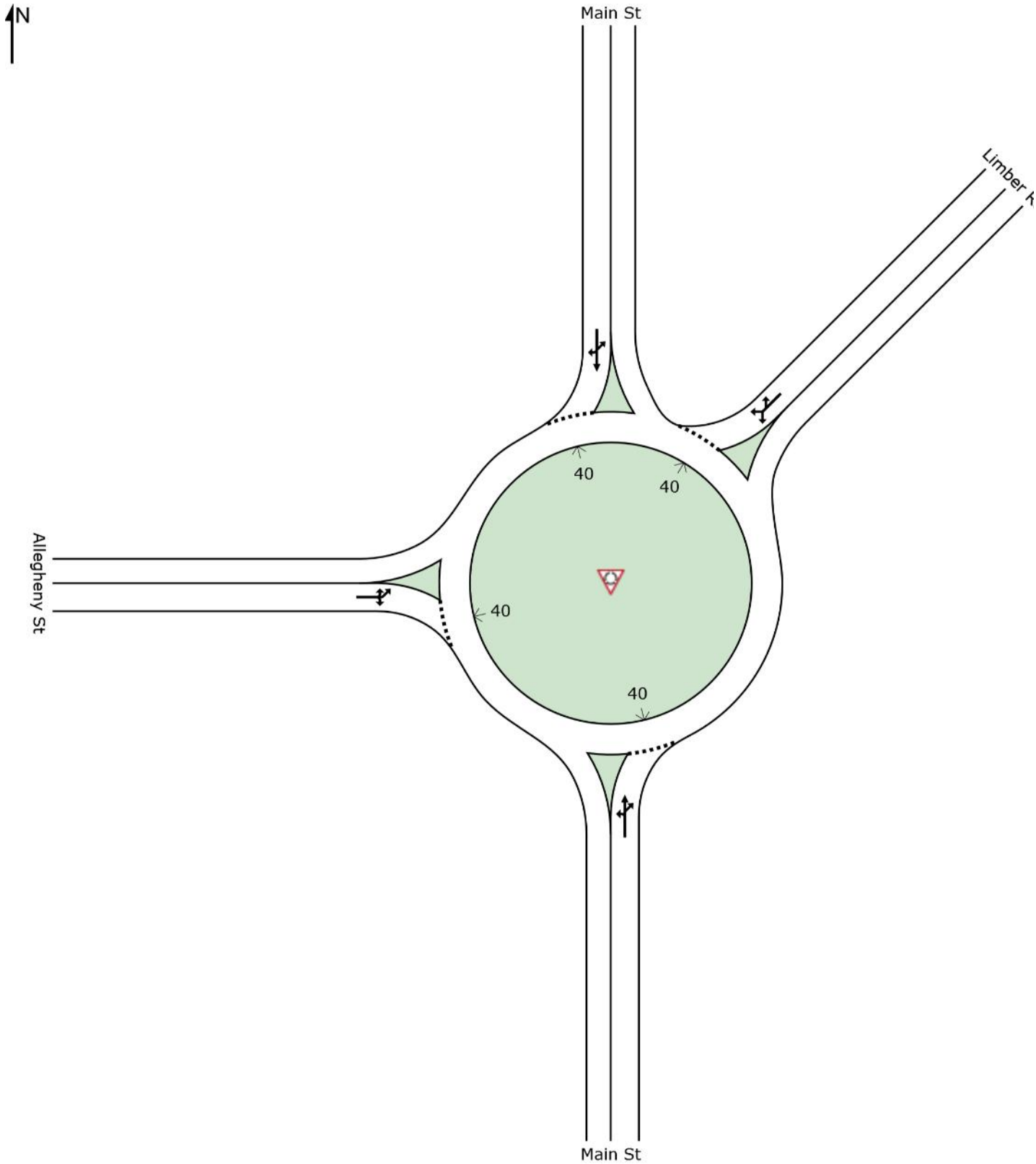
Worksheet 11-Shared Major LT Impedance and Delay

	Movement 2	Movement 5
p(oj)	1.00	0.98
v(il), Volume for stream 2 or 5		294
v(i2), Volume for stream 3 or 6		0
s(il), Saturation flow rate for stream 2 or 5		1700
s(i2), Saturation flow rate for stream 3 or 6		1700
P*(oj)		0.98
d(M,LT), Delay for stream 1 or 4		8.2
N, Number of major street through lanes		1
d(rank,1) Delay for stream 2 or 5		0.2

SITE LAYOUT

Site: 101 [2036 AM - Main St @ Allegheny St / Limber Rd]

Roundabout Analysis
Roundabout



MOVEMENT SUMMARY

Site: 101 [2036 AM - Main St @ Allegheny St / Limber Rd]

Roundabout Analysis
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Main St											
3	L2	37	4.0	0.225	5.8	LOS A	1.2	30.4	0.31	0.17	21.8
8	T1	153	6.2	0.225	6.0	LOS A	1.2	30.4	0.31	0.17	21.8
18a	R1	24	5.6	0.225	6.0	LOS A	1.2	30.4	0.31	0.17	21.6
Approach		214	5.8	0.225	6.0	LOS A	1.2	30.4	0.31	0.17	21.8
NorthEast: Limber Rd											
1ax	L1	24	4.5	0.159	5.9	LOS A	0.7	18.7	0.41	0.29	21.8
16ax	R1	110	1.1	0.159	5.6	LOS A	0.7	18.7	0.41	0.29	21.7
16bx	R3	6	0.0	0.159	5.5	LOS A	0.7	18.7	0.41	0.29	21.4
Approach		140	1.7	0.159	5.6	LOS A	0.7	18.7	0.41	0.29	21.7
North: Main St											
7b	L3	6	0.0	0.336	7.3	LOS A	1.9	47.8	0.42	0.29	21.8
4	T1	226	2.2	0.336	7.5	LOS A	1.9	47.8	0.42	0.29	21.5
14	R2	79	3.2	0.336	7.6	LOS A	1.9	47.8	0.42	0.29	21.1
Approach		311	2.4	0.336	7.5	LOS A	1.9	47.8	0.42	0.29	21.4
West: Allegheny St											
5	L2	37	10.7	0.163	6.5	LOS A	0.8	20.2	0.45	0.33	21.4
5a	L1	54	4.3	0.163	5.9	LOS A	0.8	20.2	0.45	0.33	21.3
12	R2	42	2.9	0.163	5.8	LOS A	0.8	20.2	0.45	0.33	21.0
Approach		133	5.6	0.163	6.1	LOS A	0.8	20.2	0.45	0.33	21.3
All Vehicles		798	3.7	0.336	6.5	LOS A	1.9	47.8	0.39	0.26	21.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2036 MD - Main St @ Allegheny St / Limber Rd - Copy]

Roundabout Analysis
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Main St											
3	L2	30	4.2	0.297	6.9	LOS A	1.6	42.4	0.37	0.23	21.7
8	T1	205	5.0	0.297	7.0	LOS A	1.6	42.4	0.37	0.23	21.6
18a	R1	42	6.5	0.297	7.1	LOS A	1.6	42.4	0.37	0.23	21.5
Approach		276	5.1	0.297	7.0	LOS A	1.6	42.4	0.37	0.23	21.6
NorthEast: Limber Rd											
1ax	L1	24	0.0	0.114	5.2	LOS A	0.5	13.3	0.44	0.31	21.8
16ax	R1	66	3.7	0.114	5.5	LOS A	0.5	13.3	0.44	0.31	21.7
16bx	R3	5	0.0	0.114	5.2	LOS A	0.5	13.3	0.44	0.31	21.4
Approach		95	2.6	0.114	5.4	LOS A	0.5	13.3	0.44	0.31	21.7
North: Main St											
7b	L3	5	0.0	0.271	6.2	LOS A	1.4	36.4	0.34	0.20	22.0
4	T1	205	1.8	0.271	6.4	LOS A	1.4	36.4	0.34	0.20	21.8
14	R2	54	2.1	0.271	6.4	LOS A	1.4	36.4	0.34	0.20	21.4
Approach		264	1.8	0.271	6.4	LOS A	1.4	36.4	0.34	0.20	21.7
West: Allegheny St											
5	L2	36	10.3	0.177	6.5	LOS A	0.8	21.8	0.43	0.30	21.4
5a	L1	84	1.5	0.177	5.7	LOS A	0.8	21.8	0.43	0.30	21.3
12	R2	30	8.3	0.177	6.4	LOS A	0.8	21.8	0.43	0.30	21.0
Approach		150	5.0	0.177	6.0	LOS A	0.8	21.8	0.43	0.30	21.2
All Vehicles		786	3.7	0.297	6.4	LOS A	1.6	42.4	0.38	0.24	21.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2036 PM - Main St @ Allegheny St / Limber Rd - Copy - Copy]

Roundabout Analysis
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Main St											
3	L2	70	1.8	0.431	8.9	LOS A	2.7	68.7	0.45	0.31	21.3
8	T1	280	1.4	0.431	8.8	LOS A	2.7	68.7	0.45	0.31	21.2
18a	R1	58	0.0	0.431	8.7	LOS A	2.7	68.7	0.45	0.31	21.1
Approach		408	1.3	0.431	8.8	LOS A	2.7	68.7	0.45	0.31	21.2
NorthEast: Limber Rd											
1ax	L1	18	0.0	0.162	6.3	LOS A	0.8	20.0	0.53	0.43	21.6
16ax	R1	93	2.6	0.162	6.5	LOS A	0.8	20.0	0.53	0.43	21.6
16bx	R3	12	0.0	0.162	6.3	LOS A	0.8	20.0	0.53	0.43	21.2
Approach		123	2.0	0.162	6.5	LOS A	0.8	20.0	0.53	0.43	21.5
North: Main St											
7b	L3	12	0.0	0.269	6.5	LOS A	1.4	35.4	0.41	0.27	21.9
4	T1	187	0.0	0.269	6.5	LOS A	1.4	35.4	0.41	0.27	21.7
14	R2	52	4.6	0.269	7.0	LOS A	1.4	35.4	0.41	0.27	21.3
Approach		250	1.0	0.269	6.6	LOS A	1.4	35.4	0.41	0.27	21.6
West: Allegheny St											
5	L2	40	0.0	0.215	6.0	LOS A	1.1	27.2	0.42	0.29	21.4
5a	L1	105	1.1	0.215	6.1	LOS A	1.1	27.2	0.42	0.29	21.3
12	R2	47	5.1	0.215	6.5	LOS A	1.1	27.2	0.42	0.29	21.0
Approach		192	1.8	0.215	6.2	LOS A	1.1	27.2	0.42	0.29	21.2
All Vehicles		973	1.4	0.431	7.4	LOS A	2.7	68.7	0.45	0.31	21.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix F: Improvement Cost Estimates

SR 0086 (N MAIN STREET) STREETSCAPING & TRAFFIC CALMING
IMMEDIATE ALTERNATIVE COST ESTIMATE

DESCRIPTION	*Unit*	*Unit Price*	*Qty.*	*Total*
CONSTRUCTION COSTS				
PEDESTRIAN CROSSING SIGNS	S.F.	$35.00	37	$1,295.00
HIGH VISIBILITY CROSSWALKS	EACH	$550.00	12	$6,600.00
IN-ROADWAY PEDESTRIAN CROSSING SIGNS	EACH	$250.00	10	$2,500.00
MOBILIZATION --> % OF ROADWAY ITEMS	%	-	10.0%	$1,039.50
MAINTENANCE AND PROTECTION OF TRAFFIC --> % OF ROADWAY ITEMS	%	-	25%	$2,598.75
CONSTRUCTION SUBTOTAL				$14,033.25
CONTINGENCY		5%		$701.66
SUBTOTAL				$14,734.91
CONSTRUCTION INSPECTION		12%		$1,768.19
CONSTRUCTION TOTAL				$16,503.10

TOTAL FY 2017				$16,503.10

SR 0086 (N MAIN STREET) STREETSCAPING & TRAFFIC CALMING
SHORT TERM ALTERNATIVE (PHASE 1) COST ESTIMATE

DESCRIPTION	Unit	Unit Price	Qty.	Total
CONSTRUCTION COSTS				
EXCAVATION - Pavement box (18" depth)	C.Y.	$25.00	519	$12,975.00
FOREIGN BORROW EXCAVATION	C.Y.	$45.00	481	$21,645.00
MILLING AND TACK COAT	S.Y.	$4.00	2,659	$10,636.00
PAVEMENT - WEARING	S.Y.	$14.00	2,735	$38,290.00
PAVEMENT - BINDER	S.Y.	$16.00	76	$1,216.00
PAVEMENT - BASE	S.Y.	$32.00	76	$2,432.00
PAVEMENT - SUBBASE	S.Y.	$20.00	76	$1,520.00
PAVEMENT - DECORATIVE	S.Y.	$160.00	76	$12,160.00
CURB - PLAIN CEMENT	L.F.	$45.00	1,479	$66,555.00
ORNAMENTAL OVERHEAD GATEWAY SIGN	EACH	$55,000.00	1	$55,000.00
MOBILIZATION --> % OF ROADWAY ITEMS	%	-	7.5%	$12,557.18
DRAINAGE --> % OF ROADWAY ITEMS	%	-	10%	$16,742.90
EROSION CONTROL & STORMWATER MANAGEMENT --> % OF ROADWAY ITEMS	%	-	10%	$16,742.90
LANDSCAPING --> % OF ROADWAY ITEMS	%	-	25%	$41,857.25
MAINTENANCE AND PROTECTION OF TRAFFIC --> % OF ROADWAY ITEMS	%	-	10%	$16,742.90
SIGNING AND PAVEMENT MARKING --> % OF ROADWAY ITEMS	%	-	3%	$5,022.87
CONSTRUCTION SUBTOTAL				$332,095.00
CONTINGENCY		30%		$99,628.50
SUBTOTAL				$431,723.49
CONSTRUCTION INSPECTION		12%		$51,806.82
CONSTRUCTION TOTAL				$483,530.31
UTILITY RELOCATION COSTS				
MISCELLANEOUS UTILITY RELOCATIONS	%	-	10.0%	$16,742.90
UTILITY SUBTOTAL				$16,742.90
CONTINGENCY		30%		$5,022.87
UTILITY RELOCATION TOTAL				$21,765.77
DESIGN COST				
	%	-	12.0%	$60,635.53
TOTAL FY 2017				$565,931.61

Inflation Rate	3%
Number of Years	4

TOTAL FY 2020				$636,961.02

SR 0086 (N MAIN STREET) STREETSCAPING & TRAFFIC CALMING
SHORT TERM ALTERNATIVE (PHASE 2) COST ESTIMATE

DESCRIPTION	*Unit*	*Unit Price*	*Qty.*	*Total*
CONSTRUCTION COSTS				
EXCAVATION - Pavement box (18" depth)	C.Y.	$25.00	343	$8,575.00
MILLING AND TACK COAT	S.Y.	$4.00	674	$2,696.00
PAVEMENT - WEARING	S.Y.	$14.00	1,359	$19,026.00
PAVEMENT - BINDER	S.Y.	$16.00	686	$10,976.00
PAVEMENT - BASE	S.Y.	$32.00	686	$21,952.00
PAVEMENT - SUBBASE	S.Y.	$20.00	686	$13,720.00
PAVEMENT - CONCRETE	S.Y.	$120.00	138	$16,560.00
PAVEMENT - DECORATIVE	S.Y.	$160.00	686	$109,760.00
CLEARING AND GRUBBING --> % OF ROADWAY ITEMS	%	-	2%	$4,065.30
MOBILIZATION --> % OF ROADWAY ITEMS	%	-	7.5%	$15,244.88
DRAINAGE --> % OF ROADWAY ITEMS	%	-	10%	$20,326.50
EROSION CONTROL & STORMWATER MANAGEMENT --> % OF ROADWAY ITEMS	%	-	10%	$20,326.50
LANDSCAPING --> % OF ROADWAY ITEMS	%	-	2%	$4,065.30
MAINTENANCE AND PROTECTION OF TRAFFIC --> % OF ROADWAY ITEMS	%	-	10%	$20,326.50
SIGNING AND PAVEMENT MARKING --> % OF ROADWAY ITEMS	%	-	2%	$4,065.30
CONSTRUCTION SUBTOTAL				$291,685.28
CONTINGENCY		20%		$58,337.06
SUBTOTAL				$350,022.33
CONSTRUCTION INSPECTION		12%		$42,002.68
CONSTRUCTION TOTAL				$392,025.01

UTILITY RELOCATION COSTS				
MISCELLANEOUS UTILITY RELOCATIONS	%	-	10.0%	$20,326.50
UTILITY SUBTOTAL				$20,326.50
CONTINGENCY		30%		$6,097.95
UTILITY RELOCATION TOTAL				$26,424.45

DESIGN COST				
	%	-	10.0%	$41,844.95

TOTAL FY 2017				$460,294.41
			Inflation Rate	3%
			Number of Years	8
TOTAL FY 2024				$583,087.18

SR 0086 (N MAIN STREET) STREETSCAPING & TRAFFIC CALMING
SHORT TERM ALTERNATIVE (PHASE 3) COST ESTIMATE

DESCRIPTION	Unit	Unit Price	Qty.	Total
CONSTRUCTION COSTS				
EXCAVATION - Pavement box (18" depth)	C.Y.	$25.00	258	$6,450.00
FOREIGN BORROW EXCAVATION	C.Y.	$45.00	213	$9,585.00
MILLING AND TACK COAT	S.Y.	$4.00	2,510	$10,040.00
PAVEMENT - WEARING	S.Y.	$14.00	2,600	$36,400.00
PAVEMENT - BINDER	S.Y.	$16.00	90	$1,440.00
PAVEMENT - BASE	S.Y.	$32.00	90	$2,880.00
PAVEMENT - SUBBASE	S.Y.	$20.00	90	$1,800.00
PAVEMENT - DECORATIVE	S.Y.	$160.00	90	$14,400.00
SIDEWALK - PLAIN CONCRETE (4" DEPTH)	S.Y.	$95.00	104	$9,880.00
CURB - PLAIN CEMENT	L.F.	$45.00	665	$29,925.00
ORNAMENTAL OVERHEAD GATEWAY SIGN	EACH	$55,000.00	1	$55,000.00
CLEARING AND GRUBBING --> % OF ROADWAY ITEMS	%	-	2%	$2,456.00
MOBILIZATION --> % OF ROADWAY ITEMS	%	-	7.5%	$9,210.00
DRAINAGE --> % OF ROADWAY ITEMS	%	-	35%	$42,980.00
EROSION CONTROL & STORMWATER MANAGEMENT --> % OF ROADWAY ITEMS	%	-	15%	$18,420.00
LANDSCAPING --> % OF ROADWAY ITEMS	%	-	15%	$18,420.00
MAINTENANCE AND PROTECTION OF TRAFFIC --> % OF ROADWAY ITEMS	%	-	10%	$12,280.00
SIGNING AND PAVEMENT MARKING --> % OF ROADWAY ITEMS	%	-	2%	$2,456.00
CONSTRUCTION SUBTOTAL				$284,022.00
CONTINGENCY		30%		$85,206.60
SUBTOTAL				$369,228.60
CONSTRUCTION INSPECTION		12%		$44,307.43
CONSTRUCTION TOTAL				$413,536.03

UTILITY RELOCATION COSTS				
MISCELLANEOUS UTILITY RELOCATIONS	%	-	10.0%	$12,280.00
UTILITY SUBTOTAL				$12,280.00
CONTINGENCY		30%		$3,684.00
UTILITY RELOCATION TOTAL				$15,964.00

DESIGN COST				
	%	-	12.0%	$51,540.00

TOTAL FY 2017			$481,040.04
		Inflation Rate	3%
		Number of Years	12
TOTAL FY 2028			$685,848.07

SR 0086 (N MAIN STREET) STREETSCAPING & TRAFFIC CALMING
LONG TERM ALTERNATIVE COST ESTIMATE

DESCRIPTION	*Unit*	*Unit Price*	*Qty.*	*Total*
CONSTRUCTION COSTS				
EXCAVATION - Pavement box (18" depth)	C.Y.	$25.00	1,537	$38,425.00
PAVEMENT - WEARING	S.Y.	$14.00	2,522	$35,308.00
PAVEMENT - BINDER	S.Y.	$16.00	2,522	$40,352.00
PAVEMENT - BASE	S.Y.	$32.00	2,522	$80,704.00
PAVEMENT - SUBBASE	S.Y.	$20.00	2,522	$50,440.00
PAVEMENT - CONCRETE	S.Y.	$120.00	97	$11,640.00
PAVEMENT - DECORATIVE	S.Y.	$160.00	161	$25,760.00
TRUCK APRON	S.Y.	$120.00	378	$45,360.00
MEDIAN ISLAND - PLAIN CONCRETE (4" DEPTH)	S.Y.	$75.00	135	$10,125.00
SIDEWALK - PLAIN CONCRETE (4" DEPTH)	S.Y.	$95.00	628	$59,660.00
CURB - PLAIN CEMENT	L.F.	$45.00	1,957	$88,065.00
MOUNTABLE CURB, TYPE A	L.F.	$50.00	440	$22,000.00
RETAINING WALL	S.F.	$30.00	931	$27,930.00
CLEARING AND GRUBBING --> % OF ROADWAY ITEMS	%	-	2%	$10,156.78
MOBILIZATION --> % OF ROADWAY ITEMS	%	-	7.5%	$38,087.93
DRAINAGE --> % OF ROADWAY ITEMS	%	-	10%	$50,783.90
EROSION CONTROL & STORMWATER MANAGEMENT --> % OF ROADWAY ITEMS	%	-	12.5%	$63,479.88
LANDSCAPING --> % OF ROADWAY ITEMS	%	-	10%	$50,783.90
MAINTENANCE AND PROTECTION OF TRAFFIC --> % OF ROADWAY ITEMS	%	-	15%	$76,175.85
SIGNING AND PAVEMENT MARKING --> % OF ROADWAY ITEMS	%	-	5%	$25,391.95
CONSTRUCTION SUBTOTAL				$850,629.18
CONTINGENCY		30%		$255,188.75
SUBTOTAL				$1,105,817.93
CONSTRUCTION INSPECTION		12%		$132,698.15
CONSTRUCTION TOTAL				$1,238,516.09
UTILITY RELOCATION COSTS				
UTILITY POLES (WITHIN LEGAL R/W)	Pole	$1,000.00	5	$5,000.00
MISCELLANEOUS UTILITY RELOCATIONS	%	-	10.0%	$50,783.90
UTILITY SUBTOTAL				$55,783.90
CONTINGENCY		30%		$16,735.17
UTILITY RELOCATION TOTAL				$72,519.07
RIGHT-OF-WAY COSTS				
RIGHT-OF-WAY ACQUISITION COST (Partial take, based on land SF)	SF	$20.00	2,639	$52,780.00
TEMPORARY CONSTRUCTION EASEMENT COST (Partial take, based on land SF)	SF	$10.00	1,628	$16,280.00
RIGHT-OF-WAY SUBTOTAL				$69,060.00
CONTINGENCY		30%		$20,718.00
RIGHT-OF-WAY TOTAL				$89,778.00
DESIGN COST				
	%	-	10.0%	$131,103.52
TOTAL FY 2017				$1,531,916.67

Inflation Rate	3%
Number of Years	15

TOTAL FY 2031				$2,386,676.26

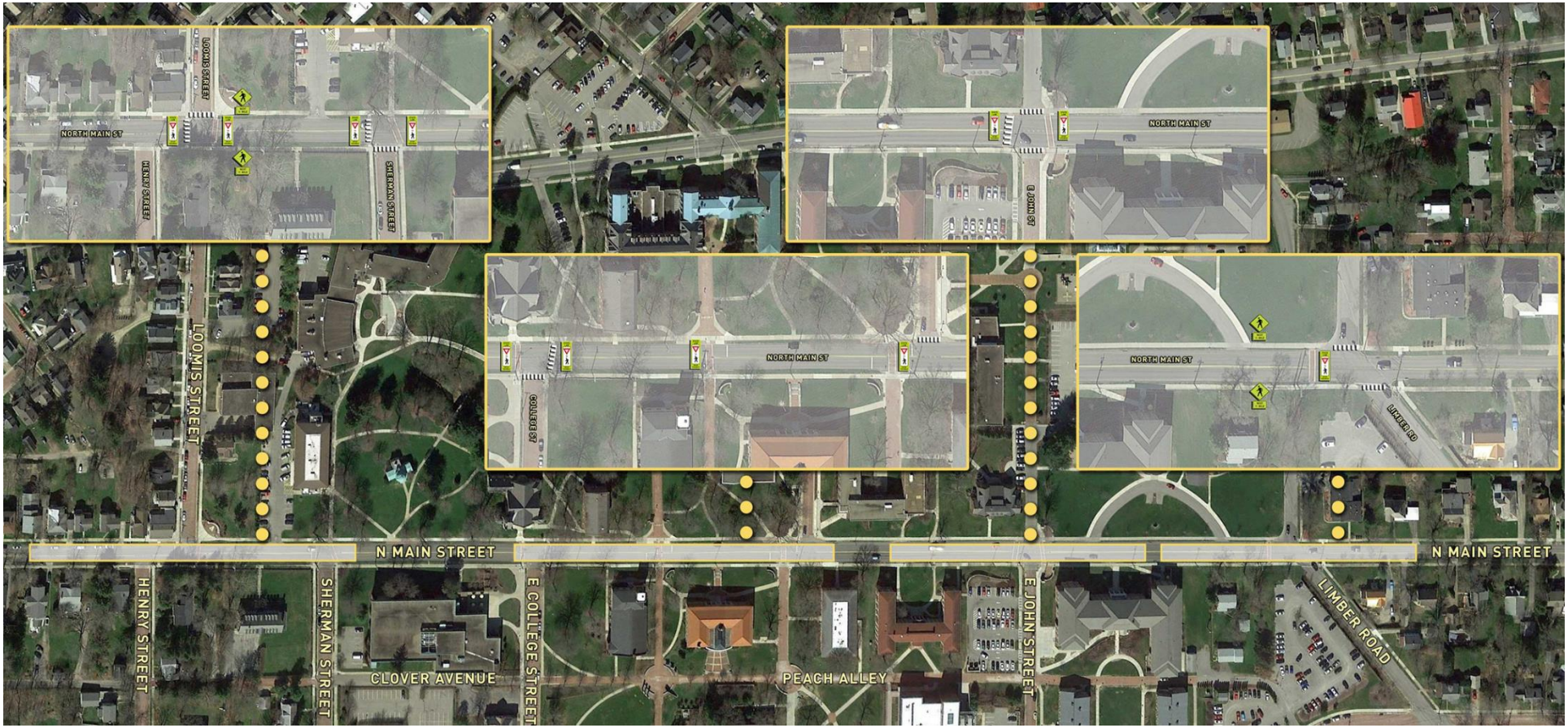
Appendix G:
Project Implementation Sheets

North Main Street Immediate Improvements:

Signing and Marking Upgrades

Conceptual Cost Estimate:	$17,000 (FY 2017)
Timeframe:	Immediate
Responsible Party:	Allegheny College and City of Meadville
Project Partners:	PennDOT

Project Location:	North Main Street (SR 86) in City of Meadville from Loomis Street to Allegheny/Limber Road
Project Description:	Installation of additional pedestrian signing (Pedestrian Crossing signs with Next ½ Mile supplemental placards and In-roadway Pedestrian Crossing Signs at crosswalks) and high-visibility continental style crosswalks in lieu of standard crosswalks
Purpose:	Improve pedestrian safety by increasing driver awareness of pedestrian activity and potentially decreasing vehicle speeds along North Main Street through Allegheny College
Need:	Three pedestrian crashes have occurred within the last 5 years with one of those crashes resulting in a fatality; hundreds of pedestrian crossings occur daily along North Main Street increasing the potential for another crash
Safety Study Goals and Objectives:	*Goal:* Improve pedestrian safety along the study corridor while maintaining mobility for all modal users *Objectives:* Improve pedestrian safety, enhance pedestrian connectivity, maintain/improve existing level of service, minimize/improve pedestrian-vehicle interactions, reduce vehicles speeds, enhance corridor aesthetics
Project Description and Justification:	Traffic congestion from pedestrian-vehicle interactions, pedestrian safety, some pedestrian facilities are inadequate
Land Use Linking to Transportation:	Town/Village Neighborhood
Land Use/Economic Development Opportunity:	Infrastructure efficiency improvement
Community Issues and Opportunities:	Enhance pedestrian access/connectivity, eliminates unneeded or unsafe traffic movements, improve safety and mobility for all modes
Public Agency and Involvement:	Serious injury/fatal crash reduction, natural, historic or cultural preservation, improve connectivity on existing system, improve operational efficiency, public meetings to gather, discuss or explain issues, press releases, newspaper articles
Environmental Impact:	None
Potential Approach and Solution:	Enhance signing and pavement markings to improve pedestrian safety
Alternative(s) Studied:	No-build





Southern End of Campus

Northern End of Campus



North Main Street

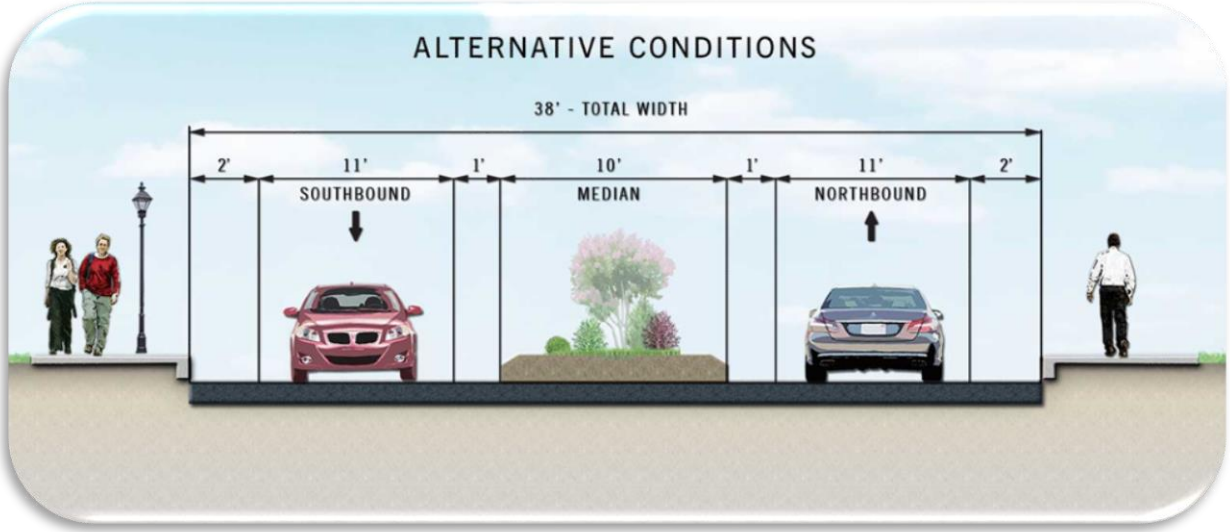
Safety Improvements Project

North Main Street
Short-term Improvements:
Phase 1 (Median & Overhead Gateway Sign)

Conceptual Cost Estimate:	$560,000 (FY 2017); $640,000 (FY 2020)
Timeframe:	Short-term
Responsible Party:	PennDOT and City of Meadville
Project Partners:	Allegheny College

Project Location:	North Main Street (SR 86) in City of Meadville from Baldwin/Alden Halls to Allegheny/Limber Road
Project Description:	Construct a median with vegetative barrier and high-visibility crosswalks (textured pavement) at preferred crossing locations; install an overhead gateway sign at the northern end of campus
Purpose:	Improve pedestrian safety by increasing driver awareness of pedestrian activity and decreasing vehicle speeds along North Main Street through Allegheny College
Need:	Three pedestrian crashes have occurred within the last 5 years with one of those crashes resulting in a fatality; hundreds of pedestrian crossings occur daily along North Main Street increasing the potential for another crash
Safety Study Goals and Objectives:	*Goal:* Improve pedestrian safety along the study corridor while maintaining mobility for all modal users *Objectives:* Improve pedestrian safety, enhance pedestrian connectivity, maintain/improve existing level of service, minimize/improve pedestrian-vehicle interactions, reduce vehicles speeds, enhance corridor aesthetics
Project Description and Justification:	Traffic congestion from pedestrian-vehicle interactions, pedestrian safety, some pedestrian facilities are inadequate
Land Use Linking to Transportation:	Town/Village Neighborhood
Land Use/Economic Development Opportunity:	Infrastructure efficiency improvement
Community Issues and Opportunities:	Enhance pedestrian access/connectivity, eliminates unneeded or unsafe traffic movements, improve safety and mobility for all modes
Public Agency and Involvement:	Serious injury/fatal crash reduction, natural, historic or cultural preservation, improve connectivity on existing system, improve operational efficiency, public meetings to gather, discuss or explain issues, press releases, newspaper articles
Environmental Impact:	None
Potential Approach and Solution:	Construct a median with vegetative barrier to eliminate jaywalking and encourage pedestrians to cross at newly enhanced crosswalks; construct an overhead gateway sign at the northern end of campus
Alternative(s) Studied:	No-build, in-road cycle track, raised cycle track, one-way pair, bulb-outs/planters, chokers/chicanes, narrowed roadway, and community street (complete road closure)







Overhead Gateway Sign Example

North Main Street
Short-term Improvements:
Phase 2 (Raised Crossings)

Conceptual Cost Estimate:	$465,000 (FY 2017); $585,000 (FY 2024)
Timeframe:	Short-term
Responsible Party:	PennDOT and City of Meadville
Project Partners:	Allegheny College

Project Location:	North Main Street (SR 86) in City of Meadville from College Street to Baldwin/Alden Halls
Project Description:	Construct a high-visibility (textured pavement) raised crosswalk and intersection at major pedestrian walkways to improve pedestrian movements
Purpose:	Improve pedestrian safety by increasing driver awareness of pedestrian activity and decreasing vehicle speeds along North Main Street through Allegheny College
Need:	Three pedestrian crashes have occurred within the last 5 years with one of those crashes resulting in a fatality; hundreds of pedestrian crossings occur daily along North Main Street increasing the potential for another crash
Safety Study Goals and Objectives:	*Goal:* Improve pedestrian safety along the study corridor while maintaining mobility for all modal users *Objectives:* Improve pedestrian safety, enhance pedestrian connectivity, maintain/improve existing level of service, minimize/improve pedestrian-vehicle interactions, reduce vehicles speeds, enhance corridor aesthetics
Project Description and Justification:	Traffic congestion from pedestrian-vehicle interactions, pedestrian safety, some pedestrian facilities are inadequate
Land Use Linking to Transportation:	Town/Village Neighborhood
Land Use/Economic Development Opportunity:	Infrastructure efficiency improvement
Community Issues and Opportunities:	Enhance pedestrian access/connectivity, eliminates unneeded or unsafe traffic movements, improve safety and mobility for all modes
Public Agency and Involvement:	Serious injury/fatal crash reduction, natural, historic or cultural preservation, improve connectivity on existing system, improve operational efficiency, public meetings to gather, discuss or explain issues, press releases, newspaper articles
Environmental Impact:	None
Potential Approach and Solution:	Construct a high-visibility (textured pavement) raised crosswalk and intersection at major pedestrian walkways to improve pedestrian movements
Alternative(s) Studied:	No-build, in-road cycle track, raised cycle track, one-way pair, bulb-outs/planters, chokers/chicanes, narrowed roadway, median, and community street (complete road closure)


NORTH MAIN ST
PHASE 2
E COLLEGE STREET
PEACH ALLEY

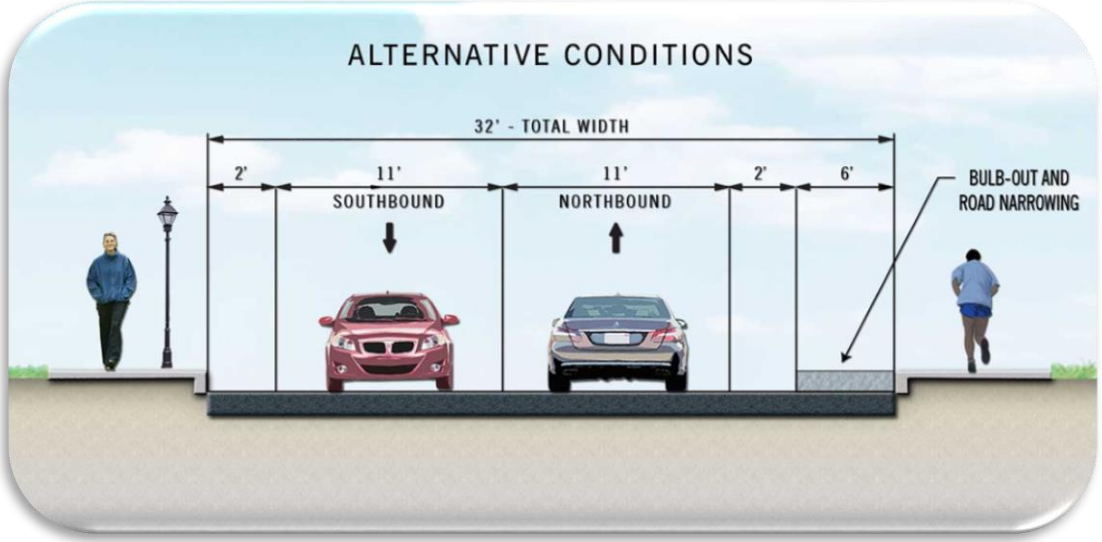
North Main Street Short-term Improvements:

Phase 3 (Roadway Narrowing & Overhead Gateway Sign)

Conceptual Cost Estimate:	$485,000 (FY 2017); $690,000 (FY 2028)
Timeframe:	Short-term
Responsible Party:	PennDOT and City of Meadville
Project Partners:	Allegheny College

Project Location:	North Main Street (SR 86) in City of Meadville from Loomis Street to College Street
Project Description:	Narrow the roadway by relocating the curb line along the eastside of the road and construct high-visibility crosswalks (textured pavement) at preferred crossing locations; install an overhead gateway sign at the southern end of campus
Purpose:	Improve pedestrian safety by increasing driver awareness of pedestrian activity and decreasing vehicle speeds along North Main Street through Allegheny College
Need:	Three pedestrian crashes have occurred within the last 5 years with one of those crashes resulting in a fatality; hundreds of pedestrian crossings occur daily along North Main Street increasing the potential for another crash
Safety Study Goals and Objectives:	*Goal:* Improve pedestrian safety along the study corridor while maintaining mobility for all modal users *Objectives:* Improve pedestrian safety, enhance pedestrian connectivity, maintain/improve existing level of service, minimize/improve pedestrian-vehicle interactions, reduce vehicles speeds, enhance corridor aesthetics
Project Description and Justification:	Traffic congestion from pedestrian-vehicle interactions, pedestrian safety, some pedestrian facilities are inadequate
Land Use Linking to Transportation:	Town/Village Neighborhood
Land Use/Economic Development Opportunity:	Infrastructure efficiency improvement
Community Issues and Opportunities:	Enhance pedestrian access/connectivity, eliminates unneeded or unsafe traffic movements, improve safety and mobility for all modes
Public Agency and Involvement:	Serious injury/fatal crash reduction, natural, historic or cultural preservation, improve connectivity on existing system, improve operational efficiency, public meetings to gather, discuss or explain issues, press releases, newspaper articles
Environmental Impact:	None
Potential Approach and Solution:	Narrow the roadway by relocating the curb line along the eastside of the road and construct high-visibility crosswalks (textured pavement) at preferred crossing locations; improve drainage along the eastside of the road and install an overhead gateway sign at the southern end of campus
Alternative(s) Studied:	No-build, in-road cycle track, raised cycle track, one-way pair, bulb-outs/planters, chokers/chicanes, median, and community street (complete road closure)





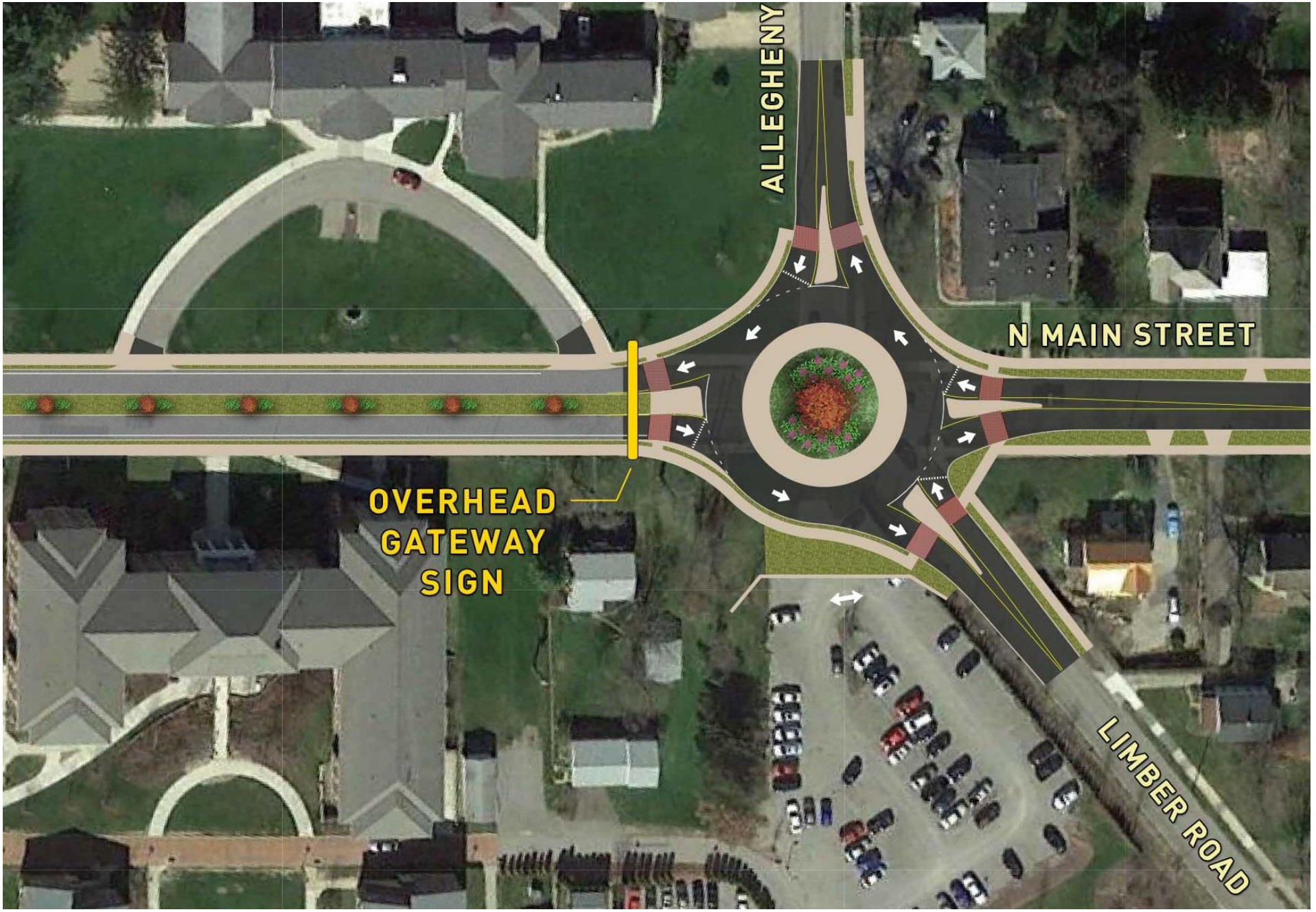


Overhead Gateway Sign Example

North Main Street
Long-term Improvement:
Single Lane Roundabout at Allegheny/Limber Road

Conceptual Cost Estimate:	$1.6 M (FY 2017); $2.4 M (FY 2031)
Timeframe:	Long-term
Responsible Party:	PennDOT and City of Meadville
Project Partners:	Allegheny College

Project Location:	North Main Street (SR 86) in City of Meadville at Allegheny/Limber Road
Project Description:	Construct a single lane roundabout with aesthetically pleasing landscaping/infrastructure to create a northern campus gateway
Purpose:	Improve pedestrian safety by increasing driver awareness of pedestrian activity and decreasing vehicle speeds along North Main Street through Allegheny College; secondarily improve operations of the intersection
Need:	Three pedestrian crashes have occurred within the last 5 years with one of those crashes resulting in a fatality; hundreds of pedestrian crossings occur daily along North Main Street increasing the potential for another crash; intersection will operate at level of service F in 2031
Safety Study Goals and Objectives:	*Goal:* Improve pedestrian safety along the study corridor while maintaining mobility for all modal users *Objectives:* Improve pedestrian safety, enhance pedestrian connectivity, maintain/improve existing level of service, minimize/improve pedestrian-vehicle interactions, reduce vehicles speeds, enhance corridor aesthetics
Project Description and Justification:	Traffic congestion from pedestrian-vehicle interactions, pedestrian safety, reduce vehicles speeds traveling south into campus, some pedestrian facilities are inadequate, improve intersection level of service
Land Use Linking to Transportation:	Town/Village Neighborhood
Land Use/Economic Development Opportunity:	Infrastructure efficiency improvement, enhancement of historic/heritage resource, potential to increase redevelopment surrounding the intersection due to improved operations
Community Issues and Opportunities:	Enhance pedestrian access/connectivity, eliminates unneeded or unsafe traffic movements, improve safety and mobility for all modes
Public Agency and Involvement:	Serious injury/fatal crash reduction, natural, historic or cultural preservation, improve connectivity on existing system, improve operational efficiency, public meetings to gather, discuss or explain issues, press releases, newspaper articles
Environmental Impact:	Potential impact to historical properties
Potential Approach and Solution:	Construct a single lane roundabout with aesthetically pleasing landscaping/infrastructure to create a northern campus gateway
Alternative(s) Studied:	No-build, in-road cycle track, raised cycle track, one-way pair, bulb-outs/planters, chokers/chicanes, median, and community street (complete road closure)



ALLEGHENY COLLEGE

North Main Street

Safety Improvements Project

MEADVILLE PA INTEGRITY STEWARDSHIP PRODUCTIVITY

PENNDOT