

Traffic Impact Study

Flathead County Rail Park

Kalispell, Montana



Prepared for
Flathead County Economic Development Association

Prepared by
KLJ
May 2013

KLJ Project # 15413003



CERTIFICATION

I hereby certify that this traffic impact study for the Flathead County Rail Park in Kalispell, MT was prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the State of Montana.

This document was originally issued and sealed by Robert Shannon Registration Number PE-16861 on 7/2/13 and the original document is stored at KLJ in Bismarck, ND.

Robert Shannon \s
Robert Shannon P.E.

7/2/13
Date

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EXECUTIVE SUMMARY

The purpose of this report is to document the results of a traffic impact study conducted for the proposed Rail Park in Kalispell, MT. The proposed development will be located on Montclair Drive immediately south of the existing rail park. The main access to the state highway system will be through the intersection of Montclair Drive and US-2/Idaho Street. In general, the property within the vicinity of the proposed site is largely light industrial with some residential uses south of the Rail Park. .

The traffic study will consider the following scenarios: 2013 Background, 2013 Background Plus Site, which adds traffic from the rail park development. The study recommendations are made for each analysis period in terms of safety, access and capacity for the study area.

Findings:

- 2013 Background Scenario
 - The intersection of Flathead Drive and US-2/Idaho Street currently meets MUTCD traffic signal warrants 1, 2, and 4.
 - With existing geometry LOS C is met for all movements and intersections overall, except for eastbound left turns from Montclair Drive onto US-2/Idaho Street, which is LOS F.
- 2013 Background Plus Site Scenario
 - With site development the intersection of Montclair Drive and US-2/Idaho Street experiences LOS F. Installing a signal is recommended.
 - With below recommended improvements all intersections achieve LOS A.
 - For safe railroad crossing and to avoid vehicles on the railroad, lights, gates, and bells should be added to the new railroad spur at-grade railroad crossing on Montclair Drive.

Recommendations:

- Install an actuated coordinated traffic signal at intersection of Flathead Drive and US-2/Idaho Street.
 - Include an eastbound/westbound protected left turn phase at the signal.
 - Construct northbound left and through travel lane to allow for those movements
- Remove stop control on Montclair Drive at the railroad crossing
- Widen the approximately 24 feet for pavement at the existing railroad crossing on Montclair Drive to approximately 40 feet.
- Move intersection of Montclair Drive and US-2/Idaho Street approximately 100 feet further south.
 - Construct eastbound right turn lane with 100 feet of full width turn bay length, plus an 8:1 taper.
- Install an actuated coordinated traffic signal at intersection of Montclair Drive and US-2/Idaho Street.
- Install railroad crossing on Montclair Drive for three new spurs with full complement of lights, gates, and bells.

1.0 INTRODUCTION AND OBJECTIVE

The purpose of this report is to document the results of a traffic impact study conducted for the proposed Flathead County Rail Park expansion in Kalispell, MT. The goals of this study are to assess the traffic impacts associated with the development and identify the level of off-site access and traffic control improvements required to service the project, provide a technically sound basis to identify/negotiate mitigation requirements in response to off-site traffic impacts and to provide the site engineer input on the proposed access plan, internal site circulation and truck access.

The proposed development will be located at Flathead County Rail Park south of the access road between Whitefish Stage and the BNSF rail line. The site includes Northwest Drywall with a railroad spur north of the access road, and CHS grain elevators plus four additional railroad spurs south of the access road. Access to CHS will be provided via a driveway on Oregon Lane with a secondary access on the west side of the site also on Oregon Lane. The following intersections will be studied due to their proximity to the proposed development:

- Montclair Drive and US 2/Idaho Street
- Flathead Drive and US 2/Idaho Street
- Montclair Drive and Flathead Drive
- Montclair Drive and Oregon Lane
- Montclair Drive and site access road
- Whitefish Stage and site access road

The traffic study will consider the following scenarios: 2013 Background, 2013 Background Plus Site, 2018 (5 year growth) Background, 2018 Background Plus Site. The study recommendations are made for each analysis period in terms of safety, access and capacity for the study area.

Existing roadways and the proposed development location can be found in **Figure 1, Project Location Map**. **Figure 2, Site Plan** shows the layout of development and rail lines associated with the rail park development. Capacity analysis conducted at study intersections were based on the "Highway Capacity Manual" (HCM 2010) published by the Transportation Research Board (TRB). Site trips were generated according to the methods outlined in the "Trip Generation 8th Edition" and "Trip Generation Handbook 2nd Edition" both published by the Institute of Transportation Engineers (ITE). Synchro 8 was the capacity software used in the analysis.

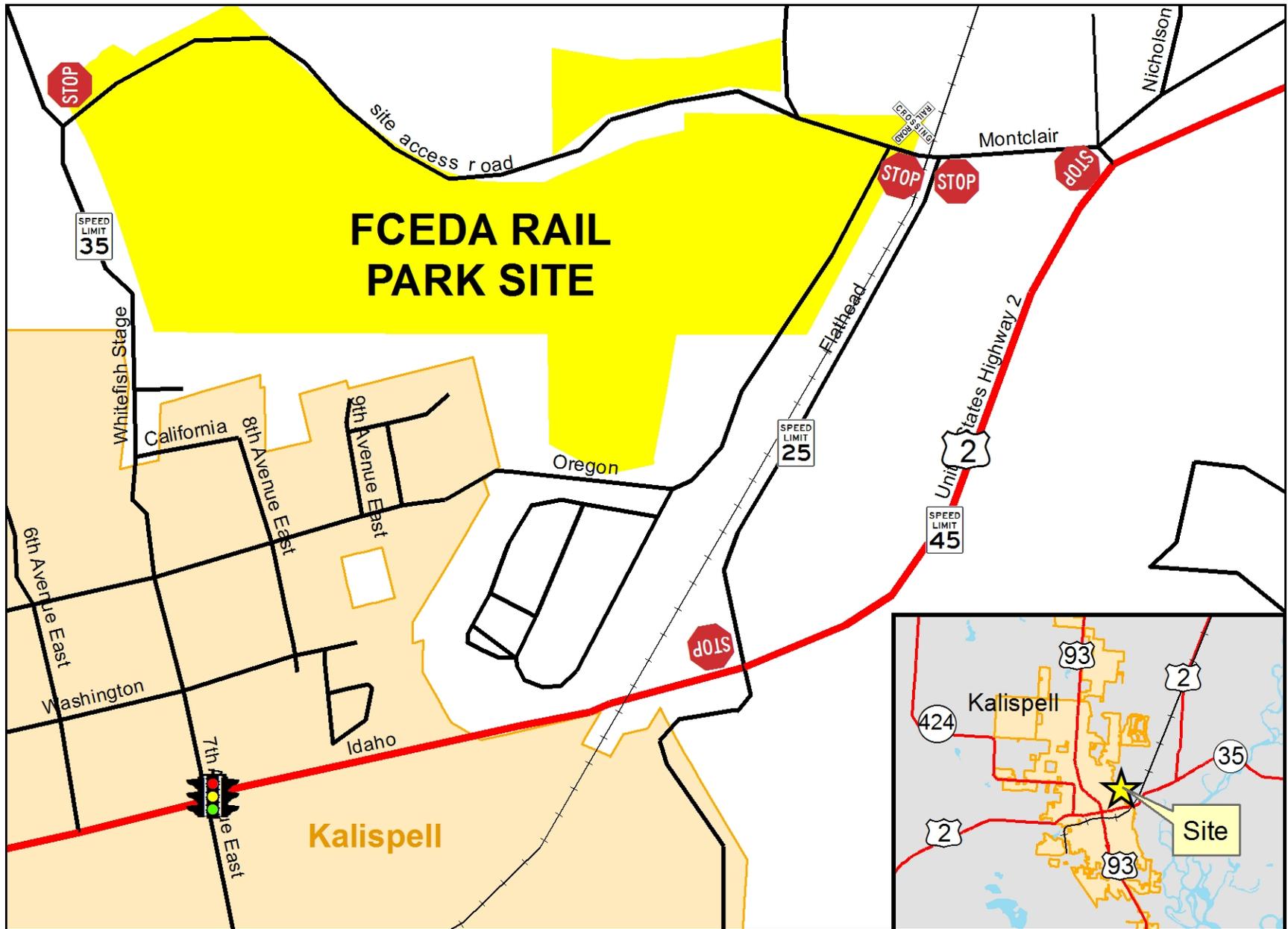


Figure 1: Project Location Map



Figure 2: Site Plan

2.0 2013 BASE CONDITIONS

The 2013 base condition will analyze the existing roadway network, background traffic and the surrounding area adjacent to the development to provide a basis of comparison to the build alternative.

2.1 Existing Roadways

Montclair Drive is an east-west local street north of the proposed site. The two-way road consists of a 24-foot paved 2-lane section with no striping or painted markings. Montclair Drive has an existing at-grade railroad crossing with stop signs (shown below) between Flathead Drive and Oregon Lane. Montclair Drive is the main point of access off of US Highway 2 for the existing rail park. The speed limit on Montclair Drive is 25 MPH.



Figure 3: Montclair Drive looking east at the railroad crossing

US Highway 2 or Idaho Street is an east-west principal arterial east and south of the rail park site. The street has a 4-lane cross-section with a grass center median and left turn lanes at intersections. There are street lights and curb and gutter on the approximately 100 feet of right-of-way. The posted speed limit is 45 mph through the project area. The intersections on Montclair Drive and Flathead Drive are two-way stops with free movements on US Highway 2.



Figure 4: US-2 @ Flathead Drive looking west

Flathead Drive and Oregon Lane are parallel north-south streets east of the proposed development. They run on either side of the elevated BNSF rail line. Both are paved streets with approximately 24 feet of pavement with no striping. The posted speed limit on both streets is 25 mph. The secondary access point for the FCEDA rail park site is on Oregon Lane.

Whitefish Stage is a local north-south street on the west of the rail park site. It is a paved road with 2-3 foot shoulders and no curb. It has approximately 30 feet of striped pavement with no turn lanes. The posted speed limit is 35 mph. The site access road connects through the site to Whitefish Stage.

The site access road for lack of a proper name is a dirt and gravel road that runs east-west through the property connecting to Whitefish Stage and Montclair Drive. This dirt road is approximately 30 feet wide and includes a few speed bumps. There are currently a few businesses that use the road to access their facilities including Klingler Lumber.

A summary of the existing lane configurations at the study intersections is provided in **Table 1, Existing Lane Configuration**. Included are the full width turn bay lengths when turn lanes are present.

Table 1 Existing Lane Configuration					
Intersection	Intersection Approach				Traffic Control
	Eastbound	Westbound	Northbound	Southbound	
Montclair Drive and US 2/Idaho Street	LTR	LTR	L(75'), T,T,TR(250')	L(75'), T,TR	EB/WB Stop
Flathead Drive and US 2/Idaho Street	L(75'), T,TR	L(175'), T,TR	R	LTR	NB/SB Stop
Montclair Drive and Flathead Drive	LTR	LTR	LTR	-	NB Stop
Montclair Drive and Oregon Lane	LTR	LTR	LTR	-	NB Stop
Montclair Drive and site access road	LTR	-	LTR	LTR	EB Stop
Whitefish Stage and site access road	-	LTR	LTR	LTR	WB Stop
Notes: (1) L= Left-turn lane; T = Through lane; R = Right-turn lane; LT, LR, TR, LTR = Shared lanes (2) (xxx') = Full width turn bay length					

2.2 Background Traffic Volumes

To evaluate the current traffic volumes on the area roadways, the most recent AADT (Annual Average Daily Traffic) was compiled from the Montana Department of Transportation (MDT) traffic volume maps and from PM peak hour movement counts collected in April 2013. See **Figure 5, 2013 Background Peak Hour Turning Movement Counts** for the 2013 peak hour turning movements. See **Appendix A** for the 2013 background traffic volume worksheets.

2.3 2013 Background Capacity Analysis

The study intersections were analyzed using existing geometry, existing traffic control and the 2013 peak hour volumes. A LOS (Level of Service) was determined for each study intersection to assess how the intersections are currently operating in terms of capacity.

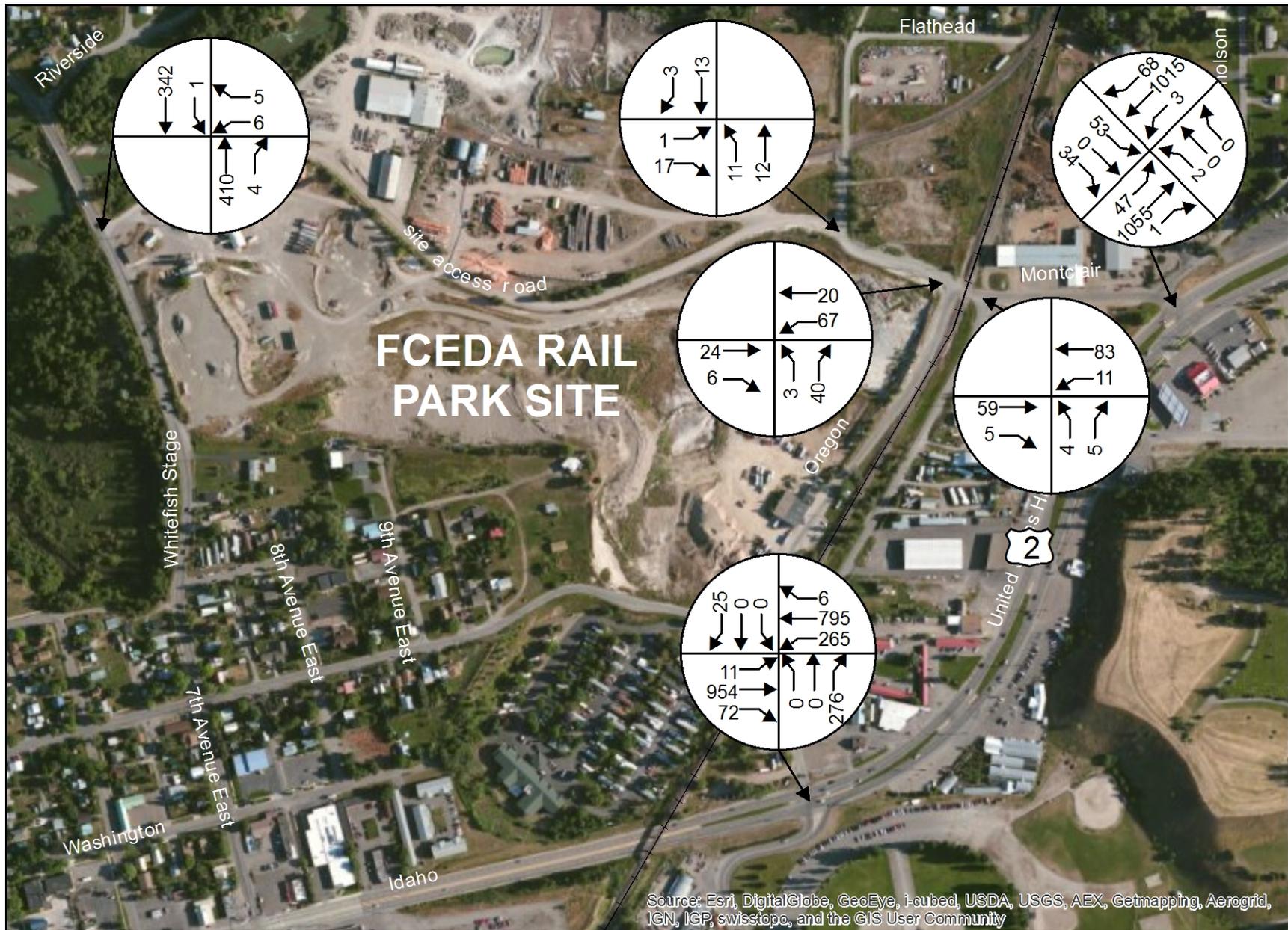


Figure 5: 2013 Background Peak Hour Turning Movement Counts

LOS (Level of Service) Concepts¹

LOS for an AWSC (all-way stop-controlled) or a TWSC (two-way stop-controlled) intersection is determined by the computed or measured control delay. LOS for an AWSC intersection is defined for each approach as well as for the intersection as a whole. LOS for a TWSC intersection is defined for each minor movement and is not defined for the intersection as a whole. The LOS criteria for stop-controlled intersections and unsignalized intersections are somewhat different from the criteria for signalized intersections primarily because different transportation facilities create different driver perceptions. The expectation is that a signalized intersection is designed to carry higher traffic volumes and experience greater delay than an unsignalized intersection. Please refer to **Table 2, Level of Service Control Delay** for a control delay range expressed as seconds of delay per vehicle and the corresponding LOS letter grade.

Table 2 Level of Service Control Delay		
LOS	Signalized Intersections (s/veh)	AWSC/TWSC Intersections (s/veh)
A	0-10	0-10
B	>10-20	>10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	>80	>50

None of the six intersections analyzed are signalized. The following is a summary of the 2013 capacity analysis results for each study intersection. Please refer to **Table 3, 2013 Background Traffic Capacity Results** for the LOS at each approach and for the intersection overall. See **Appendix B** for the 2013 background traffic capacity analysis worksheets.

Table 3 2013 Background Traffic Capacity Results							
Intersection	Lane Geometry	Traffic Control	Level Of Service/ Delay (seconds)				
			Overall	Intersection Approach			
				EB	WB	NB	SB
Montclair Drive and US 2/Idaho Street	Existing	EB/WB Stop	B 11.7	F 296.8	F 100.6	-	-
Flathead Drive and US 2/Idaho Street	Existing	NB/SB Stop	A 4.4	-	- 3.9	C 22.3	B 11.6
Montclair Drive and Flathead Drive	Existing	NB Stop	A 1.0	-	-	A 9.1	-
Montclair Drive and Oregon Lane	Existing	NB Stop	A 5.5	-	-	A 8.8	-
Montclair Drive and site access road	Existing	EB Stop	A -	-	-	-	-
Whitefish Stage and site access road	Existing	WB Stop	A 0.2	-	C 15.3	-	-

Montclair Drive and US 2/Idaho Street

While this intersection operates at an overall LOS B it experiences significant delay at the eastbound and westbound approaches, both are LOS F. With 53 eastbound left turns in the PM peak experiencing on average almost 300 seconds of delay.

¹ Discussion in the Level of Service Concepts section is taken from: "Highway Capacity Manual", Transportation Research Board, 2000, Chapters 10, 17.

Flathead Drive and US 2/Idaho Street

This intersection is unique in that the northbound approach has only a right out option, forcing all 276 northbound vehicles in the peak hour to turn right. This reduces the delay the northbound approach experiences which operates at a LOS C. It is also virtually impossible for southbound vehicle to make any movement other than turn right. No southbound left turns or through movements were observed during peak hour counts.

Montclair Drive and Flathead Drive

At this T-intersection, only the northbound approach is stop controlled and currently operates at a LOS A. There are only a few northbound left-turns in the peak hour and it is in the middle of the LOS A range.

Montclair Drive and Oregon Lane and Railroad Crossing

At this T-intersection, only the northbound approach is stop controlled and currently operates at a LOS A. However, there are stop signs at the railroad crossing. Many vehicle observe this stop sign and come to a complete stop before crossing the railroad, others do not. There are no gates, bells, or lights at this at-grade railroad crossing. Eastbound vehicles observing this stop sign block this intersection to all movements, which is not ideal.

Part of this planned rail park project is to remove trains from this existing railroad line through Kalispell. The track will be removed south of US-2. It will not be removed across Montclair Drive and this section may still be used for train car storage. It is anticipated that this section of the track will rarely be used and never during peak traffic hours. These changes mean that there will be virtually no conflicts between trains and vehicles at this crossing, therefore, no additional safety improvements like lights and gates will be necessary. Removing the stop signs and widening the railroad crossing will allow for larger trucks with higher turning radius to maneuver from Oregon Lane to Montclair. All approaches currently operate at or above LOS A with existing traffic and existing traffic control devices.

Recommended Changes to Geometry: Remove railroad stop control and widen at-grade crossing to accommodate trucks with a high turning radius.

Montclair Drive and site access road

The site access road serves few PM peak hour trips. Most trips are employees leaving the rail park. This intersection has such a low peak hour volumes that no delay is measurable. It operates at a LOS A for all approaches.

Whitefish Stage and site access road

Whitefish stage provides an important north south connection between US-2/Idaho Street and West Reserve Drive. Whitefish Stage carries a considerable number of vehicles in the PM peak hour; however the site access road serves few vehicles therefore this intersection experiences little delay. It operates at a LOS A overall and LOC for the westbound approach.

Signal Warrant Analysis

Signal Warrant analysis was considered at the above mentioned intersections, however only the two intersections on US-2 at Montclair Drive and Flathead Drive have traffic volumes high enough to meet warrants and analysis was performed for those intersections using existing traffic data and guidance from the 2009 MUTCD. The analysis was conducted to determine whether installation of a new traffic control signal is currently justified. The satisfaction of a traffic signal warrant or warrants does not necessitate that a traffic control signal

be installed. If additional data were required, reasonable judgment was used to determine the estimated volumes. See **Appendix C** for the 2013 background signal warrant analysis worksheets. The following warrants from the MUTCD were analyzed:

- | | |
|---|--|
| Warrant 1 – Eight-Hour Vehicular Volume | Warrant 6 – Coordinated Signal System |
| Warrant 2 – Four-Hour Vehicular Volume | Warrant 7 – Crash Experience |
| Warrant 3 – Peak Hour | Warrant 8 – Roadway Network |
| Warrant 4 – Pedestrian Volume | Warrant 9 – Intersection Near a Grade Crossing |
| Warrant 5 – School Crossing | |

The intersection of Flathead Drive and US-2/Idaho Street currently meets signal warrants. It meets warrants 1, 2, and 3 based on eight hour, four hour, and peak hour vehicular volume with the northbound right turns from Woodland Park Drive. The 265 peak hour westbound left turns conflict with the 1026 eastbound through and right turn movements. Below is the MUTCD Warrant 3 graph with a point plotted for the intersection of Flathead Drive and US-2/Idaho Street under existing conditions. **Recommended Changes to Geometry: Install an actuated traffic signal at the intersection of Flathead Drive and US-2/Idaho Street.**

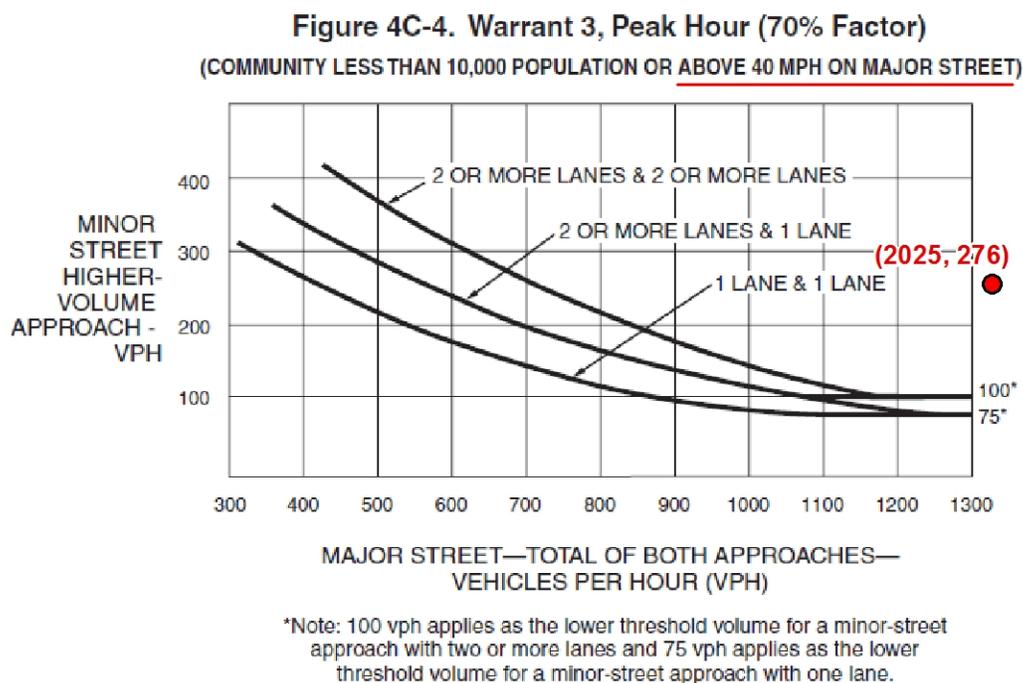


Figure 6: Signal Warrant 3 Graph with Data Point for Flathead Drive and US-2/Idaho Street

Signal warrant analysis often excludes right turns on the minor street as the vehicles making these turn movements may not be subject to the delay caused by waiting for gaps in the major street traffic. This intersection is unique in that all northbound approach vehicles are forced to turn right. Still, if we remove all right turn vehicles from the minor street, the intersection still meets signal warrants. The high number of westbound left turn conflicting with the eastbound vehicles is enough to meet signal warrants. See **Figure 7** for the signal warrant 3 graph with all minor street traffic removed.

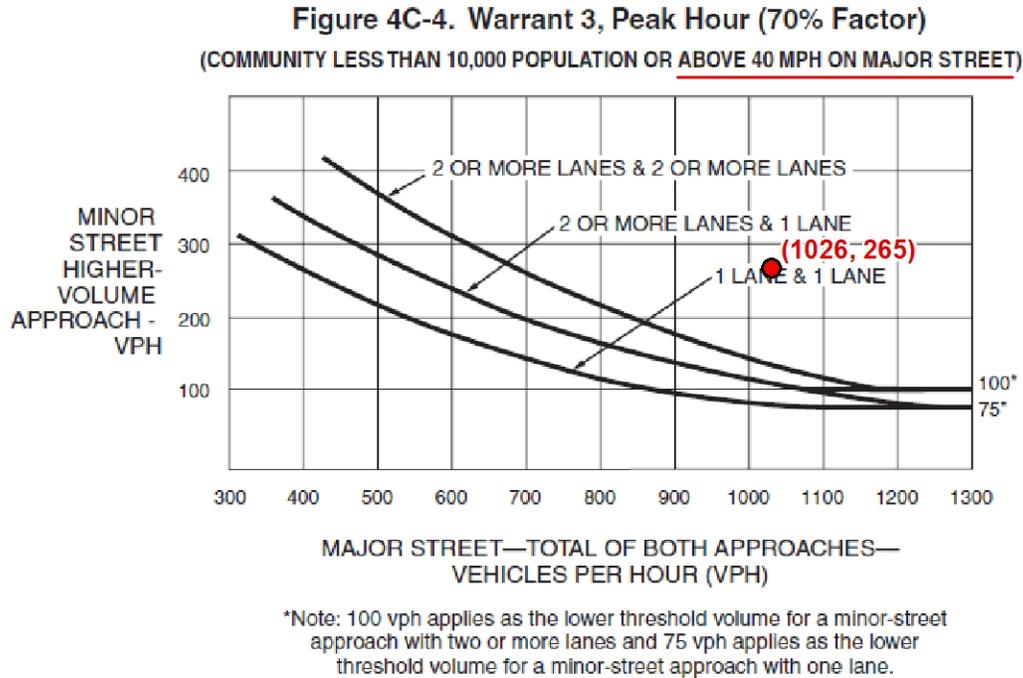


Figure 7: Signal Warrant 3 Graph with Data Point for Flathead Drive and US-2/Idaho Street with rights removed

It should be noted even with the extreme proximity to the at-grade railroad crossing at both intersections of Montclair Drive and Flathead Drive and Montclair Drive and Oregon Lane that signal warrant 9 does not apply. The MUTCD states, *“The Intersection Near a Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.”*

In this case, the intersection of the at-grade crossing on Montclair Drive is not controlled by a stop or yield sign, therefore signal warrant 9 does not apply to these intersections. Widening the existing at-grade railroad crossing is recommended.

2.4 Crash Analysis

A 3-year crash history was analyzed from January 1, 2010 to December 31, 2012 for the study area to determine any crash patterns and possible countermeasures. See **Table 4, Summary of Crashes** for a summary of crashes at each intersection where a crash occurred. A crash rate per million entering vehicles (MEV) was calculated for any intersection where a crash occurred.

Table 4 Summary of Crashes													
Location	Number of Collisions	Crash Rate (MEV)	Collision Type ¹							Collision Severity ²			
			HO	RA	RE	SS - Same	SS - Opp	LT	O	Fatal	InjA	InjB	PDO
Montclair Drive and US 2/Idaho Street	17	0.61	2	7	6	-	-	-	2	1	1	3	12
Flathead Drive and US 2/Idaho Street	11	0.37	1	-	10	-	-	-	-	-	2	2	7
Montclair Drive and Flathead Drive	0	0.00	-	-	-	-	-	-	-	-	-	-	-
Montclair Drive and Oregon Lane	0	0.00	-	-	-	-	-	-	-	-	-	-	-
Montclair Drive and site access road	0	0.00	-	-	-	-	-	-	-	-	-	-	-
Whitefish Stage and site access road	0	0.00	-	-	-	-	-	-	-	-	-	-	-
Collision Type ¹ : HO - Head On, RA - Right Angle, RE - Rear End, SS-Same - Sideswipe Same Direction,													
SS-Opp - Sideswipe Opposite Direction, LT - Left Turn, O - Other													
Collision Severity ² : Fatal - Fatality, InjA - Incapacitating Injury, InjB - Non-Incapacitating Injury, PDO - Property Damage Only													

A crash rate (MEV) above 1.0 usually indicates a crash issue. All of the intersections had a score lower than 1.0. There were only crashes at the two intersections on US-2/Idaho Street. The intersection of Montclair Drive and US-2/Idaho Street had 17 crashes in the three years from January 1, 2010 to December 31, 2012. One of those crashes was a fatal pedestrian crash that occurred at night. This intersection averages over 5 crashes per year, which is above the threshold to meet traffic signal warrant 7. However, signal warrant 7 is only met if an adequate trial of alternatives has failed to reduce crashes. No known safety alternatives have been tried to reduce crashes at this intersection, therefore the signal warrant 7 is not met.

The intersection of Flathead Drive and US-2/Idaho Street had 11 crashes and no fatalities in the three years from January 1, 2010 to December 31, 2012. There were four rear-end crashes that resulted in eight injuries. None of the crashes indicated a problem with sight distance or geometry at the study intersections.

Figure 8, 2010-2012 Crash Locations is a map with a red dot indicating each crash on the map.



Figure 8: 2010-2012 Crash Locations

3.0 2013 BASE PLUS SITE CONDITIONS

The 2013 background plus site (or full-build) condition includes the traffic generated by the proposed FCEDA Rail Park development. The development would consist of two light industrial operations, Northwest Drywall on 3 acres and CHS with grain elevators on an additional 6.6 acres.

3.1 Assigned Trip Calculations

Traffic volumes for the study intersections under the 2013 background plus site scenario were developed using the following method. The existing 2013 traffic was established as the background traffic near the development. Traffic generated by the proposed development was estimated using the 2008 Institute of Transportation Engineers (ITE) Trip Generation 8th Edition. This resource was used to estimate the peak hourly trips. The ITE development type, independent variable, number of trips and directional distribution of said trips can be found in **Table 5, ITE Trip Generation.**

Table 5 ITE Trip Generation											
PM Peak Hour Trip Generation								Trip Distribution		Total Primary Trips	
ITE Code	Land Use	Ind. Variable (Acres)	Peak Hr Trip Gen. Avg. Rate	Total Peak Hr Trips	Internal % /Trips	Passby % /Trips	Primary Trips (new)	Enter	Exit	Enter	Exit
110	General Light Industrial Northwest Drywall	3.0	7.26	22	0% /0	0% /0	22	22%	78%	5	17
110	General Light Industrial CHS	6.6	7.26	48	0% /0	0% /0	48	22%	78%	11	37
TOTAL										16	54

The trips generated from the ITE manual are the total number of peak hour trips that would access the site. No portion of these would be internal trips (generated trips that do not access the major street system), pass-by trips (pulled existing traffic off the adjacent road between the origin and destination of the original trip) or diverted trips (attracted from traffic on roadways within the vicinity of the generator but require a diversion from that roadway to another roadway to gain access to the site due to the nature of the businesses).

The total number of trips generated was compared to the information we gathered from the planned facilities. Both Northwest Drywall and CHS provided some information pertaining to the number of trips their sites will generate as well as the number of trucks estimated to access their sites. Both companies anticipate 10-20 PM peak hour trips, with an additional two to five trucks in the peak hour. Again, this information is consistent with the ITE trip generation rates used.

Trip distribution was based on existing traffic on each road as well as logical routes to access US-2/Idaho Street. The existing traffic on routes to and from the new rail park site influenced which roads the traffic generated

from the site would use to access the site. Many new trips will use Montclair, as existing trips do, to access US-2/Idaho Street and then travel to their final destination.

The macro level traffic distribution was converted to turning movement percentages at each study intersection in order to apply the new trips generated by the proposed development onto the existing roadway network. These trips were added onto the baseline traffic to create the 2013 Background Plus Site Traffic volumes that were used in the analysis. See **Figure 9, 2013 Background Plus Site Total Peak Hour Trips** for the estimated 2013 traffic upon full build of the proposed development.

The exception to the trip generation rates occurs during the peak harvest season. The CHS facility and grain elevators average 20 to 30 trucks per day throughout most of the year; however during the peak harvest season the number swells to 550 to 700 trucks per day that will need to access the site. This is a large increase in the number of trips entering and exiting the site. While most of these trucks will try to avoid PM peak hour times, there will certainly some added peak hour truck trips in the harvest peak season. Most of the trucks will be entering Kalispell via State Highway 35 and then US-2, but some will be entering through US-93 and then on US-2.

See **Figure 10, 2013 Background Plus Site Total Peak Hour Harvest Trips** for the estimated 2013 traffic upon full build of the proposed development during the peak harvest season.

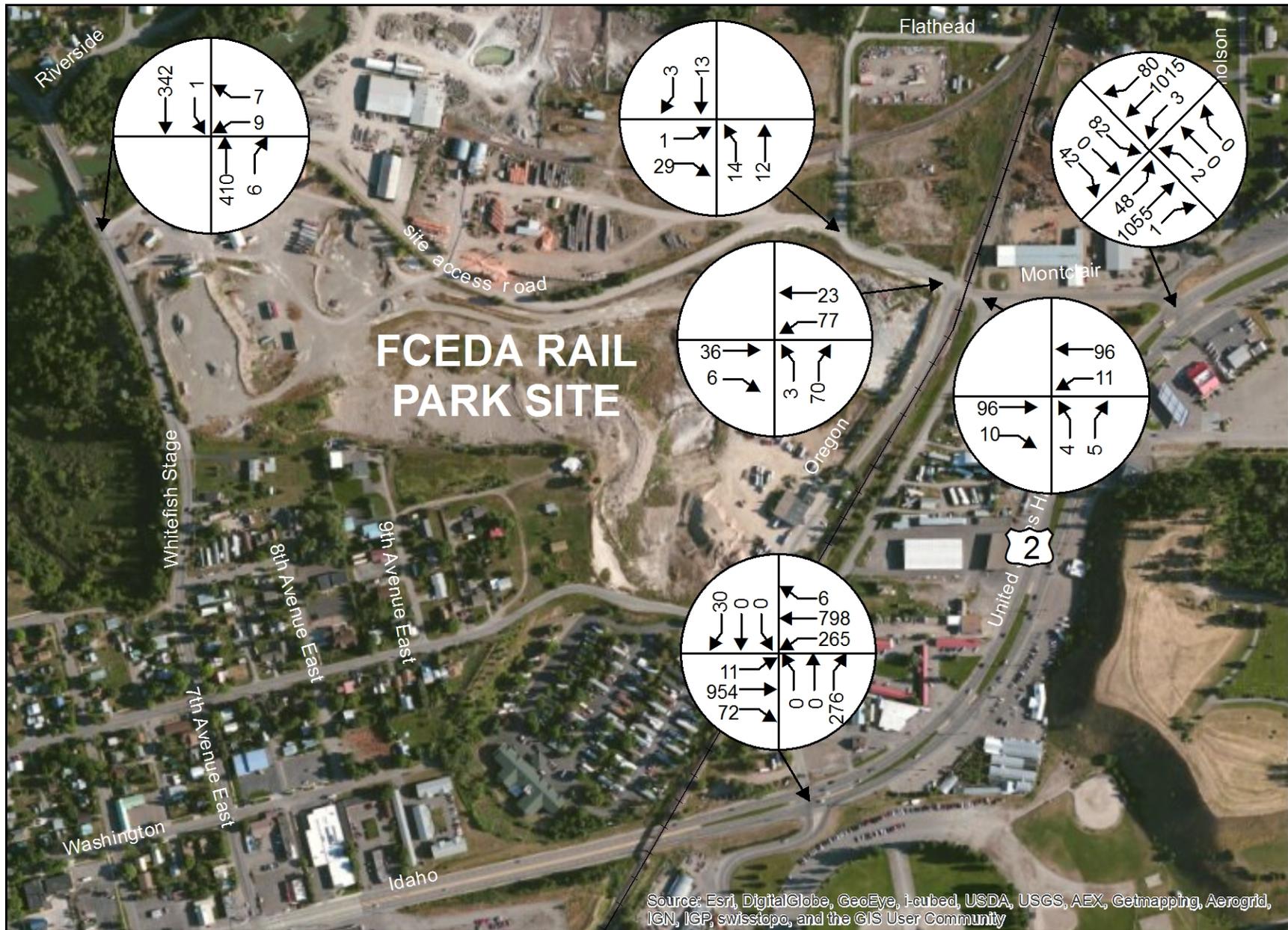


Figure 9: 2013 Background Plus Site Total Peak Hour Trips

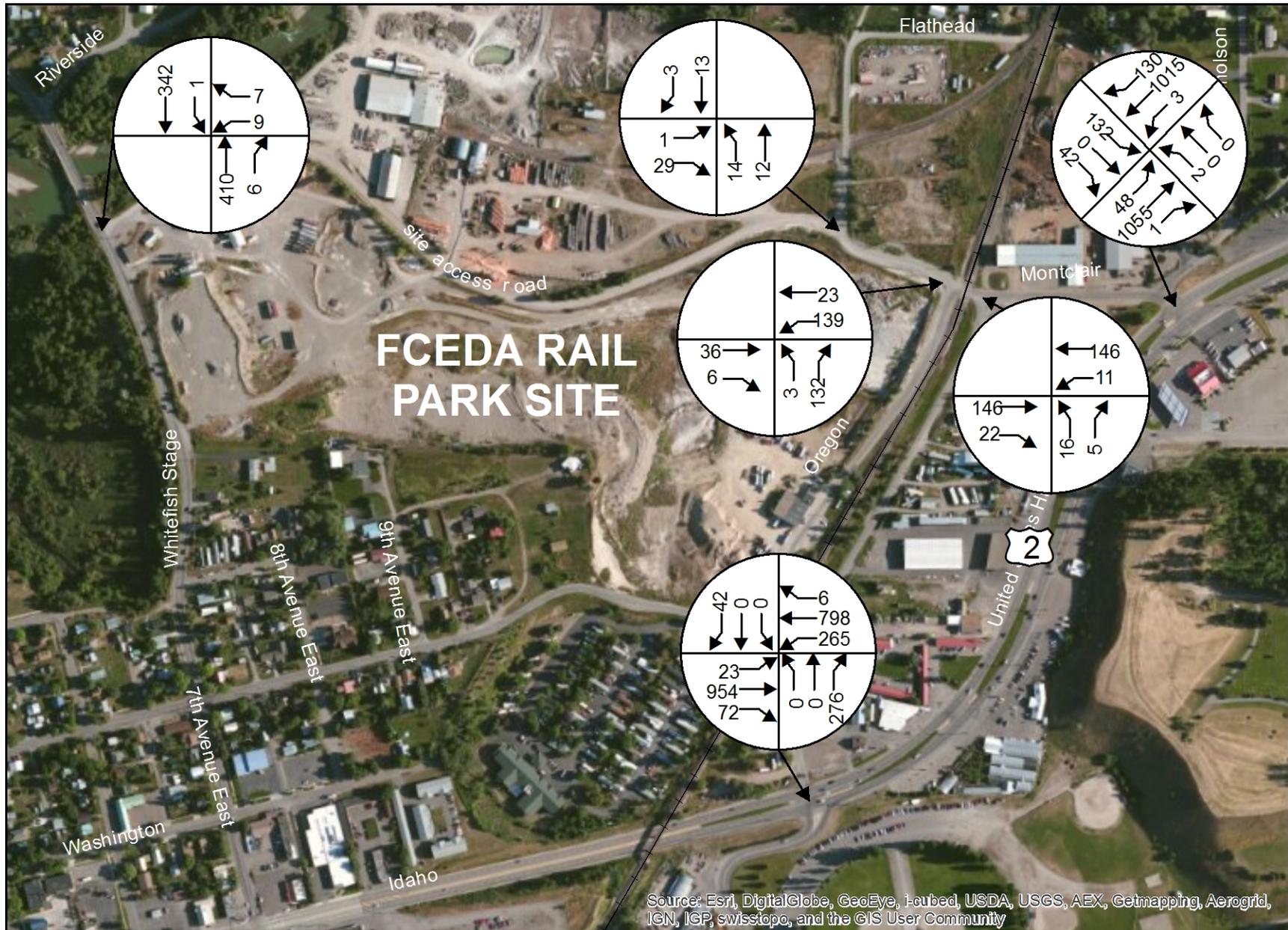


Figure 10: 2013 Background Plus Site Total Peak Hour Harvest Trips

3.2 2013 Background Plus Site Capacity Analysis

The study intersections were analyzed with the projected 2013 background plus site traffic volumes. The analysis produces the same results, however, when the peak harvest season traffic is assumed. Without geometric improvements, the only intersection that experiences a LOS worse than C is Montclair Drive and US-2/Idaho Street. That intersection experiences LOS F when the proposed development is added to existing geometry and traffic control. In fact, the delay on the eastbound approach is so great that the Synchro software cannot calculate the delay.

The following is a summary of the 2013 background plus site capacity analysis results without improvement for each study intersection. Please refer to **Table 6, 2013 Background Plus Site without Improvements Traffic Capacity Results** for the LOS at each approach and for the intersection overall. See **Appendix D** for the 2013 background plus site capacity analysis worksheets.

Table 6 2013 Background Plus Site without Improvements Traffic Capacity Results							
Intersection	Lane Geometry	Traffic Control	Level Of Service/ Delay (seconds)				
			Overall	Intersection Approach			
				EB	WB	NB	SB
Montclair Drive and US 2/Idaho Street	Existing	EB/WB Stop	F 533.0	F error	F 107.5	-	-
Flathead Drive and US 2/Idaho Street	Existing	NB/SB Stop	A 4.5	-	- 3.9	C 22.3	B 11.7
Montclair Drive and Flathead Drive	Existing	NB Stop	A 0.8	-	-	A 9.9	-
Montclair Drive and Oregon Lane	Existing	NB Stop	A 6.0	-	-	A 9.4	-
Montclair Drive and site access road	Existing	EB Stop	A -	-	-	-	-
Whitefish Stage and site access road	Existing	WB Stop	A 0.3	-	C 15.6	-	-

Geometric and traffic control device improvements were developed for the intersection of Montclair Drive and US-2/Idaho Street until a LOS C was attained. The full width turn bay length for each auxiliary lane was set as the 95th percentile storage length for either the turn lane or the adjacent through lane, whichever was longer.

A traffic signal was also proposed at the intersection of Flathead Drive and US-2/Idaho Street. This intersection meets warrants today. While adding a signal will not reduce the overall intersection delay or improve the already LOS A, it will reduce the delay for some westbound left turns and northbound and southbound approaches improve to LOS A, while still maintaining a LOS A for the overall intersection. The geometric changes at this intersection also included adding a shared left/through lane to the northbound approach, which would change some trips from right turns (the only movement currently allowed) to through or left turns.

The following is a summary of the 2013 background plus site capacity analysis results for each study intersection. Please refer to **Table 7, 2013 Background Plus Site with Improvements Traffic Capacity**

Results for the LOS at each approach and for the intersection overall. See **Appendix D** for the 2013 background plus site capacity analysis worksheets.

Table 7 2013 Background Plus Site with Improvements Traffic Capacity Results							
Intersection	Lane Geometry	Traffic Control	Level Of Service/ Delay (seconds)				
			Overall	Intersection Approach			
				EB	WB	NB	SB
Montclair Drive and US 2/Idaho Street	Revised	Signalized	A 6.2	B 15.1	B 12.5	A 5.9	A 5.4
Flathead Drive and US 2/Idaho Street	Revised	Signalized	A 9.0	B 13.9	A 5.2	A 6.0	A 0.5
Montclair Drive and Flathead Drive	Existing	NB Stop	A 0.8	-	-	A 9.9	-
Montclair Drive and Oregon Lane	Existing	NB Stop	A 6.0	-	-	A 9.4	-
Montclair Drive and site access road	Existing	EB Stop	A -	-	-	-	-
Whitefish Stage and site access road	Existing	WB Stop	A 0.3	-	C 15.6	-	-

Montclair Drive and US-2/Idaho Street

The intersection experiences LOS F with the additional trips from the planned development. Increased traffic to the eastbound approach pushed the LOS above the F threshold and signal warrants 2 and 3 are met. **Figure 11, Signal Warrant 2 Graph with Data Point of Montclair Drive and US-2/Idaho Street**, shows that with the rail park development this intersection meets traffic signal warrants. A right turn pocket is also recommended at this intersection and to allow for adequate geometric space for Montclair Drive to be perpendicular at the intersection it is recommended that the location be moved south approximately 100 feet. This will allow for a better connection to Nicholson Drive and for a 100 foot long right turn pocket to be included in the intersection design. Adding this signal will most likely mean that the existing traffic signal located on US-2/Idaho Street and the old Walmart approximately 700 feet north of Montclair Drive should be removed to maintain good signal spacing along the principal arterial US-2.

Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor)

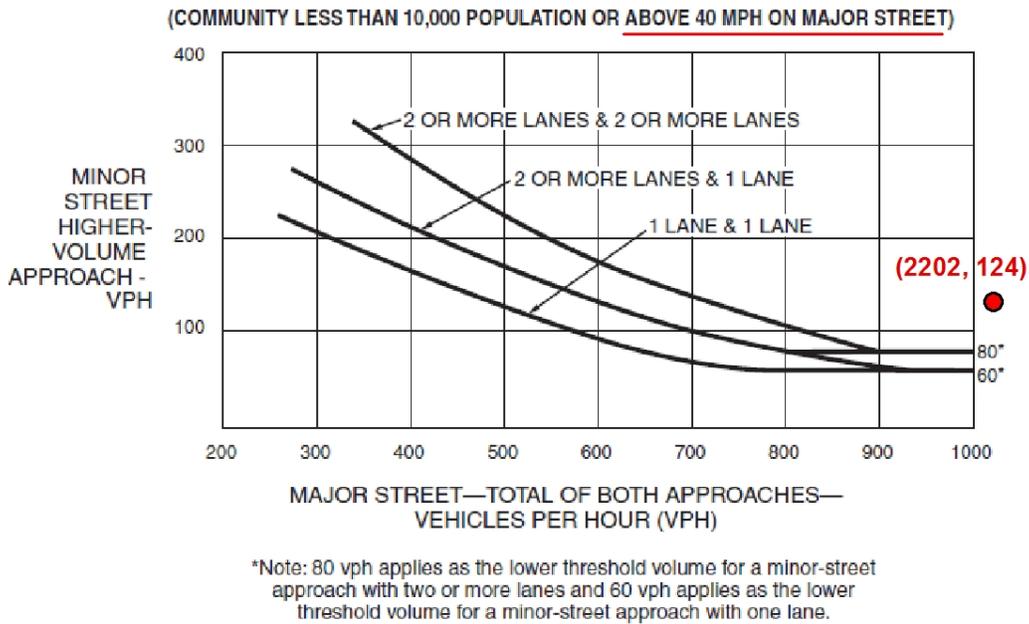


Figure 11: Signal Warrant 2 Graph with Data Point of Montclair Drive and US-2/Idaho Street

Recommended Changes to Geometry:

- Move intersection approximately 100' further south.
- Construct eastbound right turn lane with 100' of full width turn bay length.
- Install an actuated coordinated traffic signal.
- Remove existing signal at US-2/Idaho Street and old Walmart access.

Figures 12 and 13, Existing and Recommended Geometry of Montclair Drive and US-2/Idaho Street show what the intersection looks like today and what the recommended signalized intersection may look like.

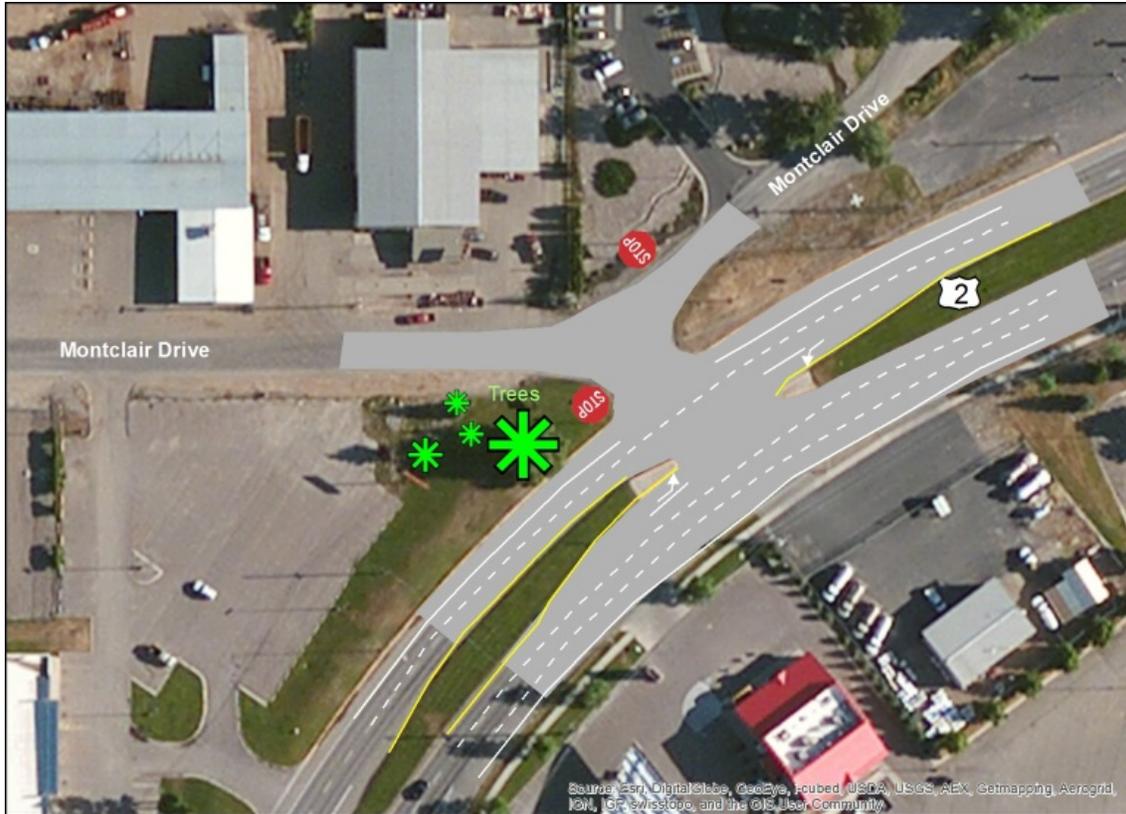


Figure 12: Existing Geometry of Montclair Drive and US-2/Idaho Street



Figure 13: Recommended Geometry of Montclair Drive and US-2/Idaho Street

Flathead Drive and US-2/Idaho Street

The LOS at this intersection would be A with or without a traffic signal. This intersection meets signal warrants today and adding a signal would decrease delay on the northbound and southbound approaches. A traffic signal would also allow for northbound left turn and through movements. With the planned development this intersection would add a few southbound right turns and some of those vehicles will be large trucks. The recommended signal should include protected and permitted left turns on the eastbound and westbound movements. The high volume of westbound left turns will be facilitated by a protected green phase at the signal. It should also be noted that traffic signals at both Montclair Drive and Flathead Drive will still maintain one half mile spacing on US-2/Idaho Street, protecting the nature of the principal arterial route.

Recommended Changes to Geometry:

- **Install an actuated coordinated traffic signal.**
- **Including an eastbound/westbound protected left turn phase at the signal.**
- **Construct northbound left and through travel lane to allow for those movements.**

Figures 14 and 15, Existing and Recommended Geometry of Flathead Drive and US-2/Idaho Street show what the intersection looks like today and what the recommended signalized intersection may look like.

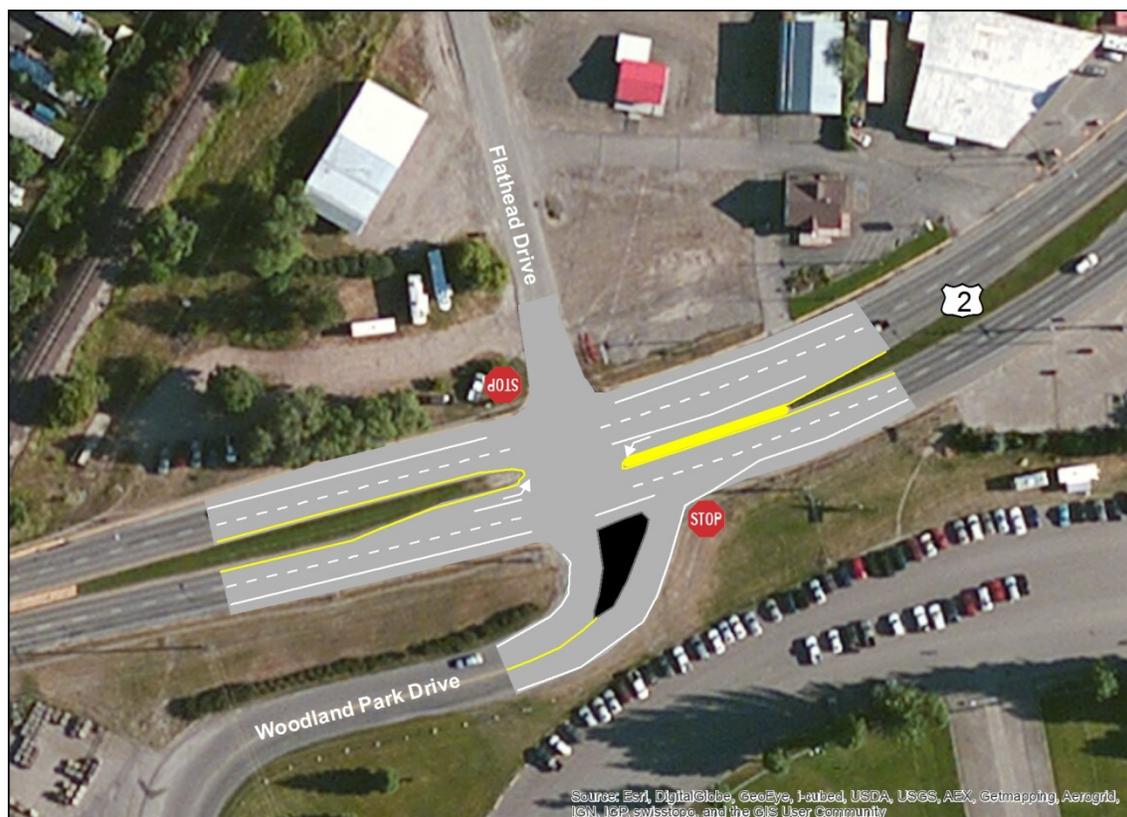


Figure 14: Existing Geometry of Flathead Drive and US-2/Idaho Street

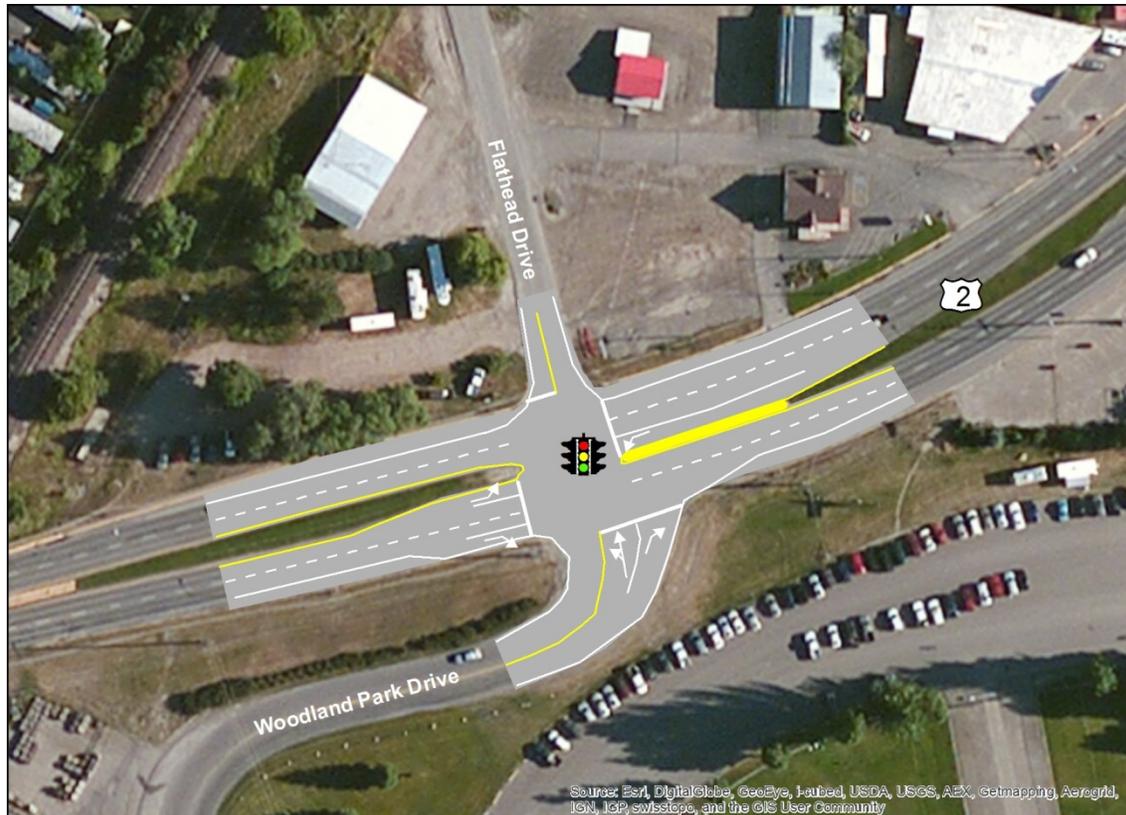


Figure 15: Recommended Geometry of Flathead Drive and US-2/Idaho Street

Other Intersections

The existing geometry is adequate for all other intersection analyzed. **No other intersection improvements are recommended.**

Signal Warrant Analysis

Signal Warrant analysis was performed at the above mentioned intersections using background plus site traffic data and guidance from the 2009 MUTCD. The analysis was conducted to determine whether installation of a new traffic control signal would be justified. The satisfaction of a traffic signal warrant or warrants does not necessitate that a traffic control signal be installed. If additional data were required, reasonable judgment was used to determine the estimated volumes. See **Appendix E** for the background plus site signal warrant analysis worksheets.

The intersections of Montclair Drive and US-2/Idaho Street and Flathead Drive and US-2/Idaho Street both meet signal warrants with the proposed development. The intersection of Montclair Drive and US-2/Idaho Street would experience LOS F without the signal and LOS A with the signal as shown in **Tables 6 and 7**. A traffic signal is shown at this location in **Figure 12**.

The proposed signal at Flathead Drive and US-2/Idaho Street is warranted even without the traffic associated with the proposed development. MDT and the City of Kalispell should work toward installing a signal at this location immediately. It may be beneficial to determine a cost sharing agreement between all benefited parties for the cost of the modifications at this intersection.

4.0 RAILROAD CROSSINGS

In 2011 there was a vehicle train crash on the BNSF Railroad line at an at-grade railroad crossing in Flathead County. Reducing the number of at-grade railroad crossings will reduce the train/vehicle conflict point and should help reduce the number of collisions with trains. The rail park development will potentially allow for BNSF to close six existing at-grade railroad crossings in Kalispell.

4.1 Montclair Drive

There is an existing BNSF rail line crossing on Montclair Drive between Flathead Drive and Oregon Lane. This existing railroad crossing is stop controlled. A photo of this railroad crossing is below in *Figure 16*.



Figure 16: Existing Railroad Crossing on Montclair Drive

Being stop controlled is problematic because vehicles stopping at this railroad crossing will block traffic entering and exiting on both Flathead Drive and Oregon Lane. Therefore, it is recommended that the stop control be removed. Again, signal warrant 9 does not apply to the conditions at this railroad crossing.

A main part of the rail park development is to move the CHS facility with its accompanying rail line from downtown Kalispell to the rail park, thus remove the rail line and several at-grade railroad crossings from Kalispell. The site plan shown in *Figure 2* indicates that three new railroad spurs will be added to the rail park to accommodate the CHS rail facility. All three of these railroad spurs will be active and will need to cross Montclair Drive. The existing rail line across Montclair Drive will also be maintained to use as storage down to US-2. This means that there will be four at-grade rail crossings on Montclair Drive in about the space of 150 feet.

While there will be four railroad crossings they will all be short spurs used for storage. They will not be active mainline traffic. In fact, the existing line will be used for train car storage very rarely and never is peak traffic times. It shouldn't pose an issue for traffic on Montclair Drive. There is a possibility of trucks exiting the rail park and doing a virtual "U" turn from northbound Oregon Lane to southbound Flathead

Drive. While this will be seldom it is recommended that Montclair Drive at the existing railroad crossing be widened to accommodate this potential truck movement.

Recommended Changes to Geometry:

- Remove stop control on Montclair Drive at the railroad crossing
- Widen the approximately 24 feet for pavement at the existing railroad crossing on Montclair Drive to approximately 40 feet
- Install railroad crossing on Montclair Drive for three new spurs with full complement of lights, gates, and bells.

The three planned new railroad spurs immediately west of Oregon Lane will cross Montclair Drive and to help ensure safety at these railroad crossings it is recommended that a full complement of lights, gates, and bells, be installed to prevent any vehicles from entering the railroad right-of-way while a train is approaching. This safety feature can be accommodated west of Oregon Lane and will not prevent vehicles on Montclair Drive from accessing Oregon Lane, which is the major movement at this intersection.

Recommended Changes to Geometry:

- Install railroad crossing on Montclair Drive for three new spurs with full complement of lights, gates, and bells.

Figures 17 and 18, Existing and Recommended Geometry of Montclair Drive at-grade railroad crossings show what the area looks like today and what the recommended improvements may look like.



Figure 17: Existing Geometry of Montclair Drive and Railroad Crossing

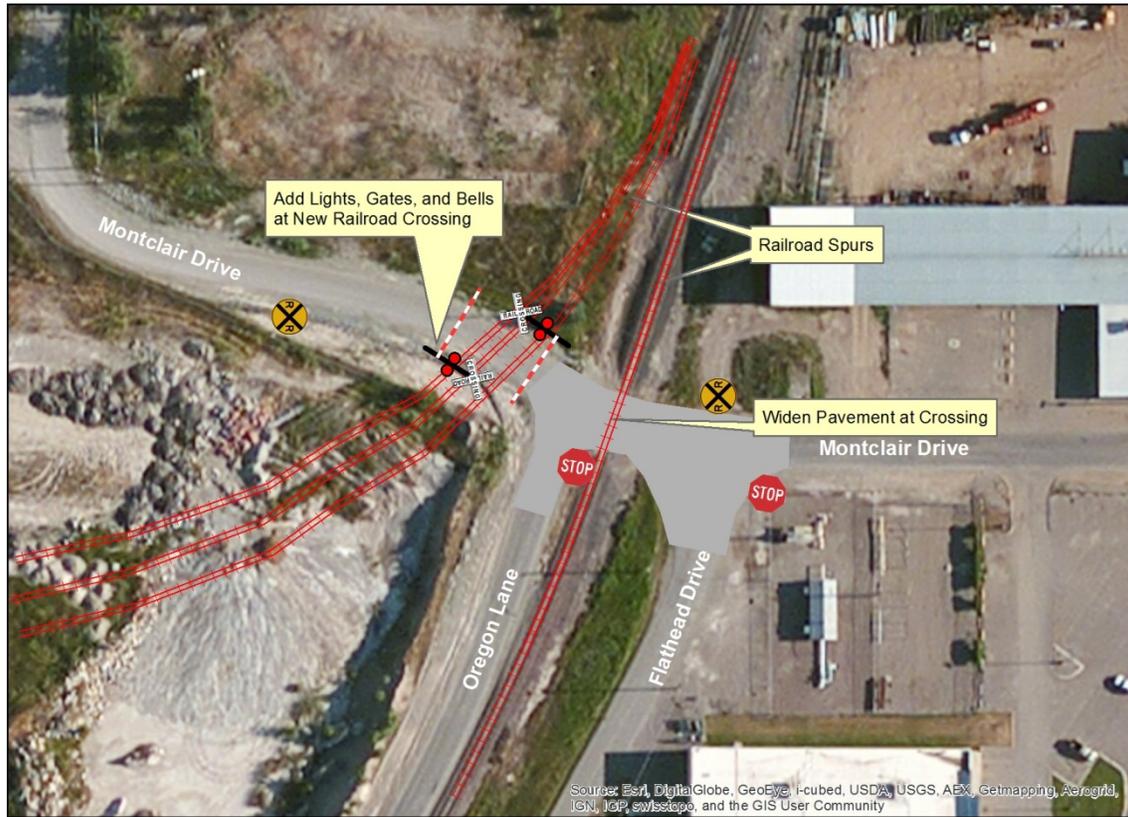


Figure 18: Recommended Geometry of Montclair Drive and Railroad Crossings

Figure 19 is an example photograph of a railroad crossing with lights, gates, and bells installed prevent vehicles from accessing the tracks when a train is approaching.



Figure 19: Example of Railroad Crossing with Lights, Gates, and Bells

5.0 RECOMMENDED IMPROVEMENTS AND COSTS

5.1 Recommended Improvements

There were several recommendations made throughout this report. They are all listed below and can be found in the executive summary at the beginning of this as well.

Recommendations:

- Install an actuated coordinated traffic signal at intersection of Flathead Drive and US-2/Idaho Street.
 - Include an eastbound/westbound protected left turn phase at the signal.
 - Construct northbound left and through travel lane to allow for those movements
- Remove stop control on Montclair Drive at the railroad crossing
- Widen the approximately 24 feet for pavement at the existing railroad crossing on Montclair Drive to approximately 40 feet.
- Move intersection of Montclair Drive and US-2/Idaho Street approximately 100 feet further south.
 - Construct eastbound right turn lane with 100 feet of full width turn bay length, plus an 8:1 taper.
- Install an actuated coordinated traffic signal at intersection of Montclair Drive and US-2/Idaho Street.
- Install railroad crossing on Montclair Drive for three new spurs with full complement of lights, gates, and bells.

Figure 20, Recommended Improvements is map of the rail park study area showing recommended improvements.



Figure 20: Recommended Improvements

5.2 Estimated Costs

The objective of this traffic study is to understand the impact the proposed rail park development will have on the surrounding transportation system and to recommend improvements to accommodate the increase in traffic or to lessen the impact.

To better understand the recommended improvements we have included planning level cost estimates. The recommended transportation improvements discussed above have not been surveyed or designed and the cost estimates do not reflect that level of detail. Rather the cost estimates are a best guess dollar value based on similar projects completed recently. The costs also include a 20% contingency for unforeseen expenditures associated with the improvements.

Table 8 Planning Level Cost Estimates		
#	Improvement	Cost
1	*Install signal at Flathead Dr. and US-2	*\$300,000
2	Remove Stop control on Montclair Dr at RR	~\$0
3	Widen railroad crossing on Montclair Dr	\$10,000
4	Move and realign Montclair Dr and US-2	\$70,000
5	Install signal at Montclair Dr. and US-2	\$300,000
6	Install lights, gates, bells at new RR crossing	\$2,000,000
7	New pavement for site access roads	\$450,000
Total		\$3,130,000
*Not a necessary improvement for the rail park development		
**All Costs are in 2013 US Dollars		

APPENDIX A
2013 Base Traffic Volumes

US-2 / Idaho and Montclair Date 4-16-13																
Adjusted																
	US-2				Access				US-2				Montclair			
	From North			From East			From South			From West						
Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total
5:00	13	282	1	0	0	0	2	1	280	9	17	0	19	624		
5:15	23	298	1	0	0	0	0	0	309	10	11	0	5	657		
5:30	17	215	1	0	0	0	0	0	263	17	0	0	18	531		
5:45	13	219	0	0	0	0	0	0	203	11	6	0	10	462		
Total	66	1014	3	0	0	0	2	1	1055	47	34	0	52	2274		

US-2 / Idaho and Montclair Date 4-17-13																
Adjusted																
	Flathead Dr				US-2				Park Dr				US-2			
	From North			From East			From South			From West						
Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total
5:00	9	0	0	2	204	57	56	0	0	19	224	3	574			
5:15	4	0	0	1	216	78	94	0	0	18	291	3	705			
5:30	9	0	0	3	183	65	72	0	0	18	222	4	576			
5:45	3	0	0	0	192	65	54	0	0	17	217	1	549			
Total	25	0	0	6	795	265	276	0	0	72	954	11	2404			

US-2 / Idaho and Montclair Date 4-18-13																
Adjusted																
	Montclair				Site Access				Montclair				Site Access			
	From North			From East			From South			From West						
Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total
5:00	1	5	0	0	0	0	0	0	2	1	6	0	0	15		
5:15	0	2	0	0	0	0	0	4	3	4	0	0	1	14		
5:30	1	3	0	0	0	0	0	3	4	3	0	0	0	14		
5:45	1	3	0	0	0	0	0	3	3	4	0	0	0	14		
Total	3	13	0	0	0	0	0	0	12	11	17	0	1	57		

Whitefish Stage and Site Access Date 4-17-13																
Adjusted																
	Whitefish Stage				Site Access				Whitefish Stage				Site Access			
	From North			From East			From South			From West						
Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total
5:00	0	84	1	2	0	1	1	104	0	0	0	0	0	193		
5:15	0	87	0	2	0	1	3	101	0	0	0	0	194			
5:30	0	84	0	0	0	3	0	104	0	0	0	0	191			
5:45	0	87	0	1	0	1	0	101	0	0	0	0	190			
Total	0	342	1	5	0	6	4	410	0	0	0	0	768			

US-2 / Idaho and Montclair Date 4-17-13														
Adjusted														
	Flathead Dr			Montclair			Flathead Dr			Montclair				
	From North			From East			From South			From West				
Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total	
5:00	0	0	0	0	15	5	0	0	0	2	17	0	39	
5:15	0	0	0	0	24	0	1	0	2	3	14	0	44	
5:30	0	0	0	0	22	3	2	0	1	0	14	0	42	
5:45	0	0	0	0	22	3	2	0	1	0	14	0	42	
Total	0	0	0	0	83	11	5	0	4	5	59	0	167	

NOT COUNTED														
Adjusted														
	From North			Montclair			Oregon			Montclair				
	From North			From East			From South			From West				
Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Total	
5:00	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:15	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:30	0	0	0	0	0	0	0	0	0	0	0	0	0	
5:45	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	20	67	40	0	3	6	24	0	160	

APPENDIX B
2013 Background Capacity
Analysis Worksheets

Intersection Capacity Utilization

2: US 2 & Montclair

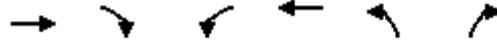
7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕		↗	↕	↗	↗	↕	↗
Volume (vph)	53	0	34	2	0	0	47	1055	1	3	1015	68
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right			No			No			No			No
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	0	87	0	0	2	0	47	1055	1	3	1015	68
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Turning Factor (vph)	0.95	0.91	0.85	0.95	0.95	0.85	0.95	1.00	0.85	0.95	1.00	0.85
Saturated Flow (vph)	0	1734	0	0	1805	0	1805	3618	1615	1805	3618	1615
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)		0.00			0.00			0.00			0.00	
Protected Option Allowed		No			No			Yes			Yes	
Reference Time (s)			0.0			0.0	3.1	35.0	0.1	0.2	33.7	5.1
Adj Reference Time (s)			0.0			0.0	8.0	39.0	8.0	8.0	37.7	9.1
Permitted Option												
Adj Saturation A (vph)	0	1933		0	1220		120	1809		120	1809	
Reference Time A (s)	0.0	5.4		0.0	0.2		46.9	35.0		3.0	33.7	
Adj Saturation B (vph)	0	0		0	0		NA	NA		NA	NA	
Reference Time B (s)	11.5	14.0		8.1	8.1		NA	NA		NA	NA	
Reference Time (s)		5.4			0.2			46.9			33.7	
Adj Reference Time (s)		9.4			8.0			50.9			37.7	
Split Option												
Ref Time Combined (s)	0.0	6.0		0.0	0.1		3.1	35.0		0.2	33.7	
Ref Time Seperate (s)	3.5	0.0		0.1	0.0		3.1	35.0		0.2	33.7	
Reference Time (s)	6.0	6.0		0.1	0.1		35.0	35.0		33.7	33.7	
Adj Reference Time (s)	10.0	10.0		8.0	8.0		39.0	39.0		37.7	37.7	
Summary												
	EB WB		NE SW		Combined							
Protected Option (s)	NA		47.0									
Permitted Option (s)	9.4		50.9									
Split Option (s)	18.0		76.7									
Minimum (s)	9.4		47.0		56.4							
Right Turns												
	NER		SWR									
Adj Reference Time (s)	8.0		9.1									
Cross Thru Ref Time (s)	9.4		8.0									
Oncoming Left Ref Time (s)	8.0		8.0									
Combined (s)	25.4		25.1									
Intersection Summary												
Intersection Capacity Utilization			47.0%		ICU Level of Service				A			
Reference Times and Phasing Options do not represent an optimized timing plan.												

Intersection Capacity Utilization
6: Flathead & Montclair

7/2/2013

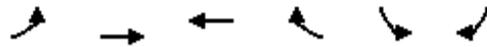


Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	59	5	11	83	4	5
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right		No				No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	64	0	0	94	9	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.99	0.85	0.95	0.99	0.90	0.85
Saturated Flow (vph)	1878	0	0	1889	1703	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00			0.00	0.00	
Protected Option Allowed	No			No	No	
Reference Time (s)		0.0				0.0
Adj Reference Time (s)		0.0				0.0
Permitted Option						
Adj Saturation A (vph)	1878		0	690	114	
Reference Time A (s)	4.1		0.0	16.3	9.5	
Adj Saturation B (vph)	1878		0	0	NA	
Reference Time B (s)	4.1		8.7	14.0	NA	
Reference Time (s)	4.1			14.0		
Adj Reference Time (s)	8.1			18.0		
Split Option						
Ref Time Combined (s)	4.1		0.0	6.0	0.6	
Ref Time Seperate (s)	3.8		0.7	5.2	0.3	
Reference Time (s)	4.1		6.0	6.0	0.6	
Adj Reference Time (s)	8.1		10.0	10.0	8.0	
Summary						
	EB WB		NB	Combined		
Protected Option (s)	NA		NA			
Permitted Option (s)	18.0		Err			
Split Option (s)	18.1		8.0			
Minimum (s)	18.0		8.0	26.0		
Right Turns						
Adj Reference Time (s)						
Cross Thru Ref Time (s)						
Oncoming Left Ref Time (s)						
Combined (s)						
Intersection Summary						
Intersection Capacity Utilization	21.6%		ICU Level of Service		A	
Reference Times and Phasing Options do not represent an optimized timing plan.						

Intersection Capacity Utilization

8: Access/Montclair

7/2/2013



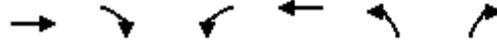
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1	17	11	12	13	3
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right				No	No	
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	0	18	23	0	16	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	1.00	0.92	0.85	0.93	0.85
Saturated Flow (vph)	0	1895	1751	0	1772	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00		0.00		0.00	
Protected Option Allowed	No		No		No	
Reference Time (s)				0.0	0.0	
Adj Reference Time (s)				0.0	0.0	
Permitted Option						
Adj Saturation A (vph)	0	1051	1751			118
Reference Time A (s)	0.0	2.1	1.6			16.3
Adj Saturation B (vph)	0	0	1751			NA
Reference Time B (s)	8.1	9.1	1.6			NA
Reference Time (s)	2.1		1.6			
Adj Reference Time (s)	8.0		8.0			
Split Option						
Ref Time Combined (s)	0.0	1.1	1.6			1.1
Ref Time Seperate (s)	0.1	1.1	0.8			0.9
Reference Time (s)	1.1	1.1	1.6			1.1
Adj Reference Time (s)	8.0	8.0	8.0			8.0
Summary	EB WB		SB		Combined	
Protected Option (s)	NA		NA			
Permitted Option (s)	8.0		Err			
Split Option (s)	16.0		8.0			
Minimum (s)	8.0		8.0		16.0	

Right Turns
Adj Reference Time (s)
Cross Thru Ref Time (s)
Oncoming Left Ref Time (s)
Combined (s)

Intersection Summary			
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Reference Times and Phasing Options do not represent an optimized timing plan.			

Intersection Capacity Utilization
9: Oregon & Montclair

7/2/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	24	6	67	20	3	40
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right		No				No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	30	0	0	87	43	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.97	0.85	0.95	0.96	0.86	0.85
Saturated Flow (vph)	1843	0	0	1827	1629	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00			0.00	0.00	
Protected Option Allowed	No			No	No	
Reference Time (s)		0.0				0.0
Adj Reference Time (s)		0.0				0.0
Permitted Option						
Adj Saturation A (vph)	1843		0	146	109	
Reference Time A (s)	2.0		0.0	71.3	47.5	
Adj Saturation B (vph)	1843		0	0	NA	
Reference Time B (s)	2.0		12.5	13.7	NA	
Reference Time (s)	2.0			13.7		
Adj Reference Time (s)	8.0			17.7		
Split Option						
Ref Time Combined (s)	2.0		0.0	5.7	3.2	
Ref Time Seperate (s)	1.6		4.5	1.3	0.2	
Reference Time (s)	2.0		5.7	5.7	3.2	
Adj Reference Time (s)	8.0		9.7	9.7	8.0	
Summary						
	EB WB		NB	Combined		
Protected Option (s)	NA		NA			
Permitted Option (s)	17.7		Err			
Split Option (s)	17.7		8.0			
Minimum (s)	17.7		8.0	25.7		

Right Turns	
Adj Reference Time (s)	
Cross Thru Ref Time (s)	
Oncoming Left Ref Time (s)	
Combined (s)	

Intersection Summary			
Intersection Capacity Utilization	21.4%	ICU Level of Service	A
Reference Times and Phasing Options do not represent an optimized timing plan.			

Intersection Capacity Utilization

13: Park Dr/Flathead Dr & US 2

7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑	↗	↖	↑↑	↗		↖	↗		↕	
Volume (vph)	11	954	72	265	795	6	0	0	276	0	0	25
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right			No			No			No			No
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	11	954	72	265	795	6	0	0	276	0	0	25
Lane Utilization Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85	0.95	0.85	0.85
Saturated Flow (vph)	1805	3618	1615	1805	3618	1615	0	1900	1615	0	1615	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)		0.00			0.00			0.00			0.00	
Protected Option Allowed		Yes			Yes			No			No	
Reference Time (s)	0.7	31.6	5.3	17.6	26.4	0.4			20.5			0.0
Adj Reference Time (s)	8.0	35.6	9.3	21.6	30.4	8.0			24.5			0.0
Permitted Option												
Adj Saturation A (vph)	120	1809		120	1809		0	1900		0	1615	
Reference Time A (s)	11.0	31.6		264.3	26.4		0.0	0.0		0.0	1.9	
Adj Saturation B (vph)	NA	NA		NA	NA		0	1900		0	1615	
Reference Time B (s)	NA	NA		NA	NA		0.0	0.0		0.0	1.9	
Reference Time (s)		31.6			264.3			0.0			1.9	
Adj Reference Time (s)		35.6			268.3			8.0			8.0	
Split Option												
Ref Time Combined (s)	0.7	31.6		17.6	26.4		0.0	0.0		0.0	1.9	
Ref Time Seperate (s)	0.7	31.6		17.6	26.4		0.0	0.0		0.0	0.0	
Reference Time (s)	31.6	31.6		26.4	26.4		0.0	0.0		1.9	1.9	
Adj Reference Time (s)	35.6	35.6		30.4	30.4		0.0	0.0		8.0	8.0	
Summary												
	EB WB		NB SB		Combined							
Protected Option (s)	57.3		NA									
Permitted Option (s)	268.3		8.0									
Split Option (s)	66.0		8.0									
Minimum (s)	57.3		8.0		65.3							
Right Turns												
	EBR	WBR	NBR									
Adj Reference Time (s)	9.3	8.0	24.5									
Cross Thru Ref Time (s)	8.0	0.0	35.6									
Oncoming Left Ref Time (s)	21.6	8.0	8.0									
Combined (s)	39.0	16.0	68.2									
Intersection Summary												
Intersection Capacity Utilization			56.8%		ICU Level of Service				B			
Reference Times and Phasing Options do not represent an optimized timing plan.												

Intersection Capacity Utilization

17: Whitefish Stage & Oregon

7/2/2013

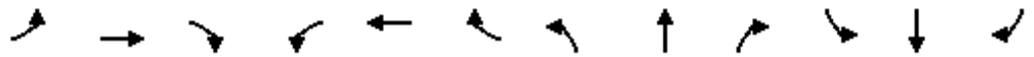


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	9	9	9	9	9	9	9	9	9	9	9	9
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right	No			No			No			No		
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	0	27	0	0	27	0	0	27	0	0	27	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	0.93	0.85	0.95	0.93	0.85	0.95	0.93	0.85	0.95	0.93	0.85
Saturated Flow (vph)	0	1775	0	0	1775	0	0	1775	0	0	1775	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00		0.00		0.00		0.00		0.00		0.00	
Protected Option Allowed	No		No		No		No		No		No	
Reference Time (s)	0.0		0.0		0.0		0.0		0.0		0.0	
Adj Reference Time (s)	0.0		0.0		0.0		0.0		0.0		0.0	
Permitted Option												
Adj Saturation A (vph)	0	1351	0	1351	0	1351	0	1351	0	1351	0	1351
Reference Time A (s)	0.0	2.4	0.0	2.4	0.0	2.4	0.0	2.4	0.0	2.4	0.0	2.4
Adj Saturation B (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Reference Time B (s)	8.6	9.8	8.6	9.8	8.6	9.8	8.6	9.8	8.6	9.8	8.6	9.8
Reference Time (s)	2.4		2.4		2.4		2.4		2.4		2.4	
Adj Reference Time (s)	8.0		8.0		8.0		8.0		8.0		8.0	
Split Option												
Ref Time Combined (s)	0.0	1.8	0.0	1.8	0.0	1.8	0.0	1.8	0.0	1.8	0.0	1.8
Ref Time Seperate (s)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Reference Time (s)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Adj Reference Time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Summary	EB WB	NB SB		Combined								
Protected Option (s)	NA	NA										
Permitted Option (s)	8.0	8.0										
Split Option (s)	16.0	16.0										
Minimum (s)	8.0	8.0		16.0								
Right Turns												
Adj Reference Time (s)												
Cross Thru Ref Time (s)												
Oncoming Left Ref Time (s)												
Combined (s)												
Intersection Summary												
Intersection Capacity Utilization	13.3%		ICU Level of Service					A				
Reference Times and Phasing Options do not represent an optimized timing plan.												

Intersection Capacity Utilization

19: Whitefish Stage

7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↘	↘	↑↑	↘	↘	↑	↘	↘	↑	↘
Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right	No			No			No			No		
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Utilization Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85
Saturated Flow (vph)	1805	3618	1615	1805	3618	1615	1805	1900	1615	1805	1900	1615
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00		0.00				0.00		0.00		0.00	
Protected Option Allowed	Yes		Yes				Yes		Yes		Yes	
Reference Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adj Reference Time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Permitted Option												
Adj Saturation A (vph)	120	1809	120		1809	120		1900	120		1900	
Reference Time A (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Adj Saturation B (vph)	0	3618	0		3618	0		1900	0		1900	
Reference Time B (s)	8.0	0.0	8.0		0.0	8.0		0.0	8.0		0.0	
Reference Time (s)	0.0		0.0				0.0		0.0		0.0	
Adj Reference Time (s)	8.0		8.0				8.0		8.0		8.0	
Split Option												
Ref Time Combined (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Ref Time Seperate (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Reference Time (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Adj Reference Time (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Summary	EB WB		NB SB		Combined							
Protected Option (s)	16.0		16.0									
Permitted Option (s)	8.0		8.0									
Split Option (s)	0.0		0.0									
Minimum (s)	0.0		0.0		0.0							
Right Turns	EBR		WBR		NBR		SBR					
Adj Reference Time (s)	8.0		8.0		8.0		8.0					
Cross Thru Ref Time (s)	0.0		0.0		0.0		0.0					
Oncoming Left Ref Time (s)	0.0		0.0		0.0		0.0					
Combined (s)	0.0		0.0		0.0		0.0					

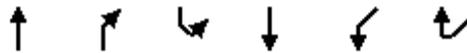
Intersection Summary

Intersection Capacity Utilization 0.0% ICU Level of Service A
 Reference Times and Phasing Options do not represent an optimized timing plan.

Intersection Capacity Utilization

21: Whitefish Stage & Access

7/2/2013



Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	410	4	1	342	6	5
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right		No				No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	414	0	0	343	11	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	1.00	0.85	0.95	1.00	0.91	0.85
Saturated Flow (vph)	1897	0	0	1900	1722	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00			0.00	0.00	
Protected Option Allowed	No			No	No	
Reference Time (s)		0.0				0.0
Adj Reference Time (s)		0.0				0.0
Permitted Option						
Adj Saturation A (vph)	1897		0	1825	115	
Reference Time A (s)	26.2		0.0	22.6	11.5	
Adj Saturation B (vph)	NA		NA	NA	NA	
Reference Time B (s)	NA		NA	NA	NA	
Reference Time (s)	26.2			22.6		
Adj Reference Time (s)	30.2			26.6		
Split Option						
Ref Time Combined (s)	26.2		0.0	21.7	0.8	
Ref Time Seperate (s)	25.9		0.1	21.6	0.4	
Reference Time (s)	26.2		21.7	21.7	0.8	
Adj Reference Time (s)	30.2		25.7	25.7	8.0	
Summary						
	NB SB		SW		Combined	
Protected Option (s)	NA		NA			
Permitted Option (s)	30.2		Err			
Split Option (s)	55.9		8.0			
Minimum (s)	30.2		8.0		38.2	

Right Turns	
Adj Reference Time (s)	
Cross Thru Ref Time (s)	
Oncoming Left Ref Time (s)	
Combined (s)	

Intersection Summary			
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Reference Times and Phasing Options do not represent an optimized timing plan.			

APPENDIX C
2013 Background Signal
Warrant Analysis Worksheets

Warrants Volume

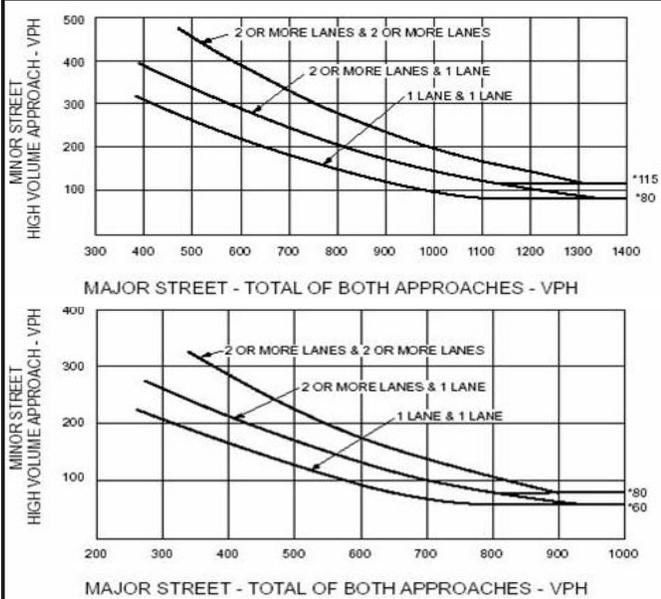
Information			
Analyst	Thomas McMurtry	Intersection	
Agency/Co	KLJ	Jurisdiction	
Date Performed	5/13/2013	Units	U.S. Customary
Project ID	FCEDA TIS	Time Period Analyzed	
East/West Street	US 2	North/South Street	Flathead Dr
File Name	Warrant Flathead 2013	Major Street	East-West

Project Description *FCEDA TIS*

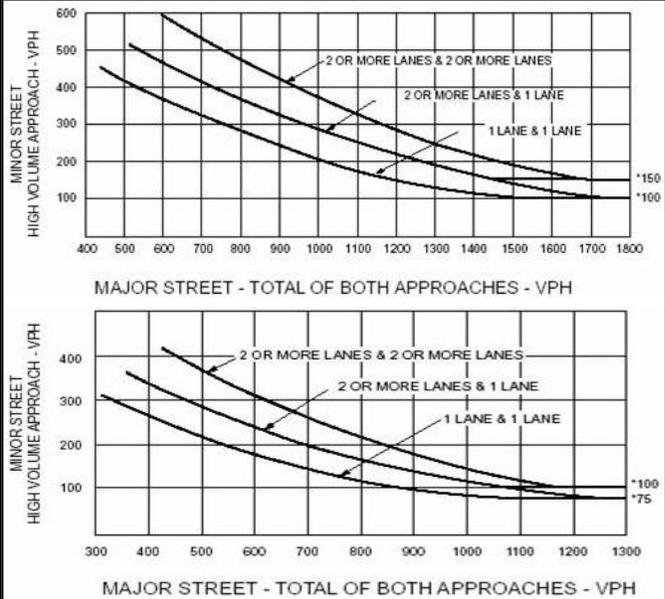
Warrant 1

Condition A - Minimum Vehicular Volume						Condition B - Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)			Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)		
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	100% ^a	80% ^b	70% ^c	Major Street	Minor Street	100% ^a	80% ^b	70% ^c	100% ^a	80% ^b	70% ^c
1.....	1.....	500	400	350	150	120	105	1.....	1.....	750	600	525	75	60	53
2 or more...	1.....	600	480	420	150	120	105	2 or more...	1.....	900	720	630	75	60	53
2 or more...	2 or more...	600	480	420	200	160	140	2 or more...	2 or more...	900	720	630	100	80	70
1.....	2 or more....	500	400	350	200	160	140	1.....	2 or more....	750	600	525	100	80	70

Warrant 2



Warrant 3



Volume Summary

Hours	Major Street Lanes 2+			Minor Street Lanes 1		Speed		Population		
	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
07-08	1180	80	1290	No	No	Yes	Yes	Yes	No	Yes
08-09	1230	90	1350	No	Yes	Yes	Yes	Yes	No	Yes
09-10	1080	80	1190	No	No	Yes	Yes	Yes	No	No
10-11	1200	90	1320	No	Yes	Yes	Yes	Yes	No	Yes
11-12	1420	100	1560	No	Yes	Yes	Yes	Yes	No	Yes
12-13	1630	120	1790	Yes	Yes	Yes	Yes	Yes	No	Yes
13-14	1740	230	1990	Yes	Yes	Yes	Yes	Yes	No	Yes
14-15	1740	230	1990	Yes	Yes	Yes	Yes	Yes	No	Yes
15-16	1960	260	2240	Yes	Yes	Yes	Yes	Yes	No	Yes
16-17	2080	270	2370	Yes	Yes	Yes	Yes	Yes	No	Yes
17-18	2110	280	2410	Yes	Yes	Yes	Yes	Yes	No	Yes
18-19	1640	220	1880	Yes	Yes	Yes	Yes	Yes	No	Yes
Totals	19010	2050	21380	7	10	12	12	12	0	11

Warrants Summary													
Information													
Analyst	Thomas McMurtry					Intersection							
Agency/Co	KLJ					Jurisdiction							
Date Performed	5/13/2013					Units	U.S. Customary						
Project ID	FCEDA TIS					Time Period Analyzed							
East/West Street	US 2					North/South Street	Flathead Dr						
File Name	Warrant Flathead 2013					Major Street	East-West						
Project Description <i>FCEDA TIS</i>													
General						Roadway Network							
Major Street Speed (mph)	45	<input type="checkbox"/>	Population < 10,000				Two Major Routes			<input type="checkbox"/>			
Nearest Signal (ft)	1760	<input type="checkbox"/>	Coordinated Signal System				Weekend Count			<input type="checkbox"/>			
Crashes (per year)	4	<input type="checkbox"/>	Adequate Trials of Alternatives				5-yr Growth Factor			0			
Geometry and Traffic	EB			WB			NB			SB			
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Number of lanes, N	1	2	1	1	2	1	0	0	1	0	1	0	
Lane usage	L	T	R	L	T	R			R		LTR		
Vehicle Volume Averages (vph)	5	692	43	162	678	2	0	0	170	0	0	26	
Peds (ped/h) / Gaps (gaps/h)	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	
Delay (s/veh) / (veh-hr)	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	
Warrant 1: Eight-Hour Vehicular Volume												<input checked="" type="checkbox"/>	
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--												<input type="checkbox"/>	
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--												<input checked="" type="checkbox"/>	
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)												<input checked="" type="checkbox"/>	
Warrant 2: Four-Hour Vehicular Volume												<input checked="" type="checkbox"/>	
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input checked="" type="checkbox"/>	
Warrant 3: Peak Hour												<input checked="" type="checkbox"/>	
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--												<input type="checkbox"/>	
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input checked="" type="checkbox"/>	
Warrant 4: Pedestrian Volume												<input type="checkbox"/>	
4 A. Four Hour Volumes --or--												<input type="checkbox"/>	
4 B. One-Hour Volumes												<input type="checkbox"/>	
Warrant 5: School Crossing												<input type="checkbox"/>	
5. Student Volumes --and--												<input type="checkbox"/>	
5. Gaps Same Period												<input type="checkbox"/>	
Warrant 6: Coordinated Signal System												<input type="checkbox"/>	
6. Degree of Platooning (Predominant direction or both directions)												<input type="checkbox"/>	
Warrant 7: Crash Experience												<input type="checkbox"/>	
7 A. Adequate trials of alternatives, observance and enforcement failed --and--												<input type="checkbox"/>	
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--												<input type="checkbox"/>	
7 C. 80% Volumes for Warrants 1A, 1B --or-- 4 are satisfied												<input checked="" type="checkbox"/>	

Warrant 8: Roadway Network	<input type="checkbox"/>
8 A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2 or 3) --or--	<input type="checkbox"/>
8 B. Weekend Volume (Five hours total)	<input type="checkbox"/>
Warrant 9: Grade Crossing	<input type="checkbox"/>
9 A. Grade Crossing within 140 ft --and--	<input type="checkbox"/>
9 B. Peak-Hour Vehicular Volumes	<input type="checkbox"/>

Warrants Volume

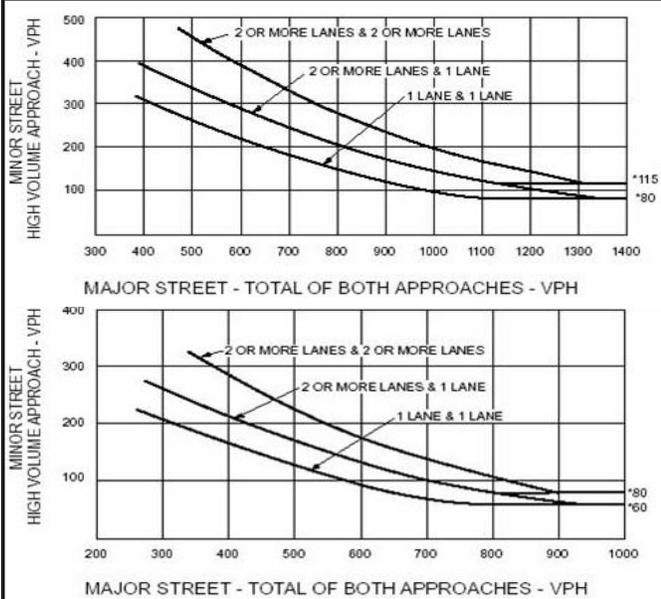
Information			
Analyst	Thomas McMurtry	Intersection	
Agency/Co	KLJ	Jurisdiction	
Date Performed	5/13/2013	Units	U.S. Customary
Project ID	FCEDA TIS	Time Period Analyzed	
East/West Street	Montclair	North/South Street	US 2
File Name	Warrant Montclair 2013	Major Street	North-South

Project Description *FCEDA TIS*

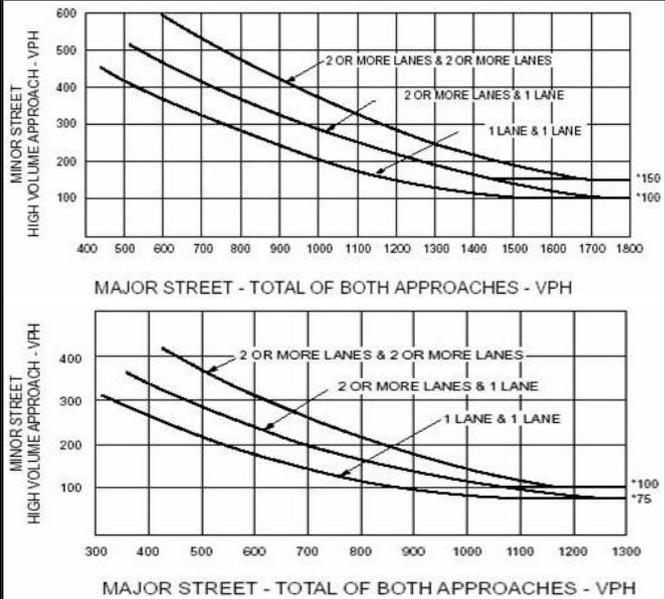
Warrant 1

Condition A - Minimum Vehicular Volume						Condition B - Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)			Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)			Vehicles per hour on higher-volume minor-street approach (one direction only)		
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	100% ^a	80% ^b	70% ^c	Major Street	Minor Street	100% ^a	80% ^b	70% ^c	100% ^a	80% ^b	70% ^c
1.....	1.....	500	400	350	150	120	105	1.....	1.....	750	600	525	75	60	53
2 or more...	1.....	600	480	420	150	120	105	2 or more...	1.....	900	720	630	75	60	53
2 or more...	2 or more...	600	480	420	200	160	140	2 or more...	2 or more...	900	720	630	100	80	70
1.....	2 or more....	500	400	350	200	160	140	1.....	2 or more....	750	600	525	100	80	70

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 2+			Minor Street Lanes 1			Speed		Population		
Hours	Major Volume	Minor Volume	Total Volume	1A (70%)	1A (56%)	1B (70%)	1B (56%)	2 (70%)	3A (70%)	3B (70%)
07-08	980	40	1020	No	No	No	No	No	No	No
08-09	1030	40	1070	No	No	No	No	No	No	No
09-10	880	40	920	No	No	No	No	No	No	No
10-11	1010	40	1050	No	No	No	No	No	No	No
11-12	1180	60	1240	No	No	Yes	Yes	No	No	No
12-13	1340	70	1410	No	No	Yes	Yes	Yes	No	No
13-14	1810	70	1880	No	No	Yes	Yes	Yes	No	No
14-15	1810	70	1880	No	No	Yes	Yes	Yes	No	No
15-16	2020	80	2100	No	No	Yes	Yes	Yes	No	Yes
16-17	2160	80	2240	No	No	Yes	Yes	Yes	No	Yes
17-18	2200	80	2280	No	No	Yes	Yes	Yes	No	Yes
18-19	1700	70	1770	No	No	Yes	Yes	Yes	No	No
Totals	18120	740	18860	0	0	8	8	7	0	3

Warrants Summary												
Information												
Analyst	Thomas McMurtry					Intersection						
Agency/Co	KLJ					Jurisdiction						
Date Performed	5/13/2013					Units	U.S. Customary					
Project ID	FCEDA TIS					Time Period Analyzed						
East/West Street	Montclair					North/South Street	US 2					
File Name	Warrant Montclair 2013					Major Street	North-South					
Project Description <i>FCEDA TIS</i>												
General						Roadway Network						
Major Street Speed (mph)	45	<input type="checkbox"/>	Population < 10,000				Two Major Routes			<input type="checkbox"/>		
Nearest Signal (ft)	695	<input type="checkbox"/>	Coordinated Signal System				Weekend Count			<input type="checkbox"/>		
Crashes (per year)	6	<input type="checkbox"/>	Adequate Trials of Alternatives				5-yr Growth Factor			0		
Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	0	1	0	0	1	0	1	2	1	1	2	1
Lane usage	LTR			LTR			L	T	R	L	T	R
Vehicle Volume Averages (vph)	39	0	22	0	0	0	31	683	0	0	738	56
Peds (ped/h) / Gaps (gaps/h)	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Delay (s/veh) / (veh-hr)	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Warrant 1: Eight-Hour Vehicular Volume												<input checked="" type="checkbox"/>
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--												<input type="checkbox"/>
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--												<input checked="" type="checkbox"/>
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)												<input type="checkbox"/>
Warrant 2: Four-Hour Vehicular Volume												<input checked="" type="checkbox"/>
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input checked="" type="checkbox"/>
Warrant 3: Peak Hour												<input checked="" type="checkbox"/>
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--												<input type="checkbox"/>
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input checked="" type="checkbox"/>
Warrant 4: Pedestrian Volume												<input type="checkbox"/>
4 A. Four Hour Volumes --or--												<input type="checkbox"/>
4 B. One-Hour Volumes												<input type="checkbox"/>
Warrant 5: School Crossing												<input type="checkbox"/>
5. Student Volumes --and--												<input type="checkbox"/>
5. Gaps Same Period												<input type="checkbox"/>
Warrant 6: Coordinated Signal System												<input type="checkbox"/>
6. Degree of Platooning (Predominant direction or both directions)												<input type="checkbox"/>
Warrant 7: Crash Experience												<input type="checkbox"/>
7 A. Adequate trials of alternatives, observance and enforcement failed --and--												<input type="checkbox"/>
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--												<input checked="" type="checkbox"/>
7 C. 80% Volumes for Warrants 1A, 1B --or-- 4 are satisfied												<input checked="" type="checkbox"/>

Warrant 8: Roadway Network	<input type="checkbox"/>
8 A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2 or 3) --or--	<input type="checkbox"/>
8 B. Weekend Volume (Five hours total)	<input type="checkbox"/>
Warrant 9: Grade Crossing	<input type="checkbox"/>
9 A. Grade Crossing within 140 ft --and--	<input type="checkbox"/>
9 B. Peak-Hour Vehicular Volumes	<input type="checkbox"/>

APPENDIX D
2013 Background Plus Site
Capacity Analysis Worksheets

Intersection Capacity Utilization

2: US 2 & Montclair

7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕			↕		↗	↕	↗	↗	↕	↗
Volume (vph)	82	0	42	2	0	0	48	1055	1	3	1015	80
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right			No			No			No			No
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	0	124	0	0	2	0	48	1055	1	3	1015	80
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Turning Factor (vph)	0.95	0.92	0.85	0.95	0.95	0.85	0.95	1.00	0.85	0.95	1.00	0.85
Saturated Flow (vph)	0	1744	0	0	1805	0	1805	3618	1615	1805	3618	1615
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)		0.00			0.00			0.00			0.00	
Protected Option Allowed		No			No			Yes			Yes	
Reference Time (s)			0.0			0.0	3.2	35.0	0.1	0.2	33.7	5.9
Adj Reference Time (s)			0.0			0.0	8.0	39.0	8.0	8.0	37.7	9.9
Permitted Option												
Adj Saturation A (vph)	0	1935		0	1314		120	1809		120	1809	
Reference Time A (s)	0.0	7.7		0.0	0.2		47.9	35.0		3.0	33.7	
Adj Saturation B (vph)	0	0		0	0		NA	NA		NA	NA	
Reference Time B (s)	13.5	16.5		8.1	8.1		NA	NA		NA	NA	
Reference Time (s)		7.7			0.2			47.9			33.7	
Adj Reference Time (s)		11.7			8.0			51.9			37.7	
Split Option												
Ref Time Combined (s)	0.0	8.5		0.0	0.1		3.2	35.0		0.2	33.7	
Ref Time Seperate (s)	5.5	0.0		0.1	0.0		3.2	35.0		0.2	33.7	
Reference Time (s)	8.5	8.5		0.1	0.1		35.0	35.0		33.7	33.7	
Adj Reference Time (s)	12.5	12.5		8.0	8.0		39.0	39.0		37.7	37.7	
Summary												
	EB WB		NE SW		Combined							
Protected Option (s)	NA		47.0									
Permitted Option (s)	11.7		51.9									
Split Option (s)	20.5		76.7									
Minimum (s)	11.7		47.0		58.7							
Right Turns												
	NER		SWR									
Adj Reference Time (s)	8.0		9.9									
Cross Thru Ref Time (s)	11.7		8.0									
Oncoming Left Ref Time (s)	8.0		8.0									
Combined (s)	27.7		25.9									
Intersection Summary												
Intersection Capacity Utilization			48.9%		ICU Level of Service				A			
Reference Times and Phasing Options do not represent an optimized timing plan.												

Intersection Capacity Utilization

6: Flathead & Montclair

7/2/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	96	10	11	96	4	5
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right		No				No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	106	0	0	107	9	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.99	0.85	0.95	0.99	0.90	0.85
Saturated Flow (vph)	1873	0	0	1890	1703	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00			0.00	0.00	
Protected Option Allowed	No			No	No	
Reference Time (s)		0.0				0.0
Adj Reference Time (s)		0.0				0.0
Permitted Option						
Adj Saturation A (vph)	1873		0	751	114	
Reference Time A (s)	6.8		0.0	17.1	9.5	
Adj Saturation B (vph)	1873		0	0	NA	
Reference Time B (s)	6.8		8.7	14.8	NA	
Reference Time (s)	6.8			14.8		
Adj Reference Time (s)	10.8			18.8		
Split Option						
Ref Time Combined (s)	6.8		0.0	6.8	0.6	
Ref Time Seperate (s)	6.2		0.7	6.1	0.3	
Reference Time (s)	6.8		6.8	6.8	0.6	
Adj Reference Time (s)	10.8		10.8	10.8	8.0	
Summary	EB WB		NB	Combined		
Protected Option (s)	NA		NA			
Permitted Option (s)	18.8		Err			
Split Option (s)	21.6		8.0			
Minimum (s)	18.8		8.0	26.8		

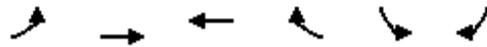
Right Turns
Adj Reference Time (s)
Cross Thru Ref Time (s)
Oncoming Left Ref Time (s)
Combined (s)

Intersection Summary			
Intersection Capacity Utilization	22.3%	ICU Level of Service	A
Reference Times and Phasing Options do not represent an optimized timing plan.			

Intersection Capacity Utilization

8: Access/Montclair

7/2/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↩	↩		↩	
Volume (vph)	1	29	14	12	13	3
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right				No		No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	0	30	26	0	16	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	1.00	0.93	0.85	0.93	0.85
Saturated Flow (vph)	0	1897	1768	0	1772	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)		0.00	0.00		0.00	
Protected Option Allowed		No	No		No	
Reference Time (s)				0.0		0.0
Adj Reference Time (s)				0.0		0.0
Permitted Option						
Adj Saturation A (vph)	0	1285	1768		118	
Reference Time A (s)	0.0	2.8	1.8		16.3	
Adj Saturation B (vph)	0	0	1768		NA	
Reference Time B (s)	8.1	9.9	1.8		NA	
Reference Time (s)		2.8	1.8			
Adj Reference Time (s)		8.0	8.0			
Split Option						
Ref Time Combined (s)	0.0	1.9	1.8		1.1	
Ref Time Seperate (s)	0.1	1.8	0.9		0.9	
Reference Time (s)	1.9	1.9	1.8		1.1	
Adj Reference Time (s)	8.0	8.0	8.0		8.0	
Summary	EB WB		SB		Combined	
Protected Option (s)	NA		NA			
Permitted Option (s)	8.0		Err			
Split Option (s)	16.0		8.0			
Minimum (s)	8.0		8.0		16.0	

Right Turns
Adj Reference Time (s)
Cross Thru Ref Time (s)
Oncoming Left Ref Time (s)
Combined (s)

Intersection Summary			
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Reference Times and Phasing Options do not represent an optimized timing plan.			

Intersection Capacity Utilization

9: Oregon & Montclair

7/2/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	36	6	77	23	3	70
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right		No				No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	42	0	0	100	73	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.98	0.85	0.95	0.96	0.85	0.85
Saturated Flow (vph)	1859	0	0	1827	1623	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00			0.00	0.00	
Protected Option Allowed	No			No	No	
Reference Time (s)		0.0				0.0
Adj Reference Time (s)		0.0				0.0
Permitted Option						
Adj Saturation A (vph)	1859		0	146	108	
Reference Time A (s)	2.7		0.0	81.9	80.9	
Adj Saturation B (vph)	1859		0	0	NA	
Reference Time B (s)	2.7		13.1	14.6	NA	
Reference Time (s)	2.7			14.6		
Adj Reference Time (s)	8.0			18.6		
Split Option						
Ref Time Combined (s)	2.7		0.0	6.6	5.4	
Ref Time Seperate (s)	2.3		5.1	1.5	0.2	
Reference Time (s)	2.7		6.6	6.6	5.4	
Adj Reference Time (s)	8.0		10.6	10.6	9.4	
Summary	EB WB		NB	Combined		
Protected Option (s)	NA		NA			
Permitted Option (s)	18.6		Err			
Split Option (s)	18.6		9.4			
Minimum (s)	18.6		9.4	28.0		
Right Turns						
Adj Reference Time (s)						
Cross Thru Ref Time (s)						
Oncoming Left Ref Time (s)						
Combined (s)						

Intersection Summary

Intersection Capacity Utilization 23.3% ICU Level of Service A
 Reference Times and Phasing Options do not represent an optimized timing plan.

Intersection Capacity Utilization

13: Park Dr/Flathead Dr & US 2

7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	954	72	265	795	6	0	0	276	0	0	30
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right			No			No			No			No
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	11	954	72	265	795	6	0	0	276	0	0	30
Lane Utilization Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85	0.95	0.85	0.85
Saturated Flow (vph)	1805	3618	1615	1805	3618	1615	0	0	1615	0	1615	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)		0.00			0.00			0.00			0.00	
Protected Option Allowed		Yes			Yes			No			No	
Reference Time (s)	0.7	31.6	5.3	17.6	26.4	0.4			20.5			0.0
Adj Reference Time (s)	8.0	35.6	9.3	21.6	30.4	8.0			24.5			0.0
Permitted Option												
Adj Saturation A (vph)	120	1809		120	1809		0	0		0	1615	
Reference Time A (s)	11.0	31.6		264.3	26.4		0.0	0.0		0.0	2.2	
Adj Saturation B (vph)	NA	NA		NA	NA		0	0		0	1615	
Reference Time B (s)	NA	NA		NA	NA		0.0	0.0		0.0	2.2	
Reference Time (s)		31.6			264.3			0.0			2.2	
Adj Reference Time (s)		35.6			268.3			8.0			8.0	
Split Option												
Ref Time Combined (s)	0.7	31.6		17.6	26.4		0.0	0.0		0.0	2.2	
Ref Time Separate (s)	0.7	31.6		17.6	26.4		0.0	0.0		0.0	0.0	
Reference Time (s)	31.6	31.6		26.4	26.4		0.0	0.0		2.2	2.2	
Adj Reference Time (s)	35.6	35.6		30.4	30.4		0.0	0.0		8.0	8.0	
Summary												
	EB WB		NB SB		Combined							
Protected Option (s)	57.3		NA									
Permitted Option (s)	268.3		8.0									
Split Option (s)	66.0		8.0									
Minimum (s)	57.3		8.0		65.3							
Right Turns												
	EBR	WBR	NBR									
Adj Reference Time (s)	9.3	8.0	24.5									
Cross Thru Ref Time (s)	8.0	0.0	35.6									
Oncoming Left Ref Time (s)	21.6	8.0	8.0									
Combined (s)	39.0	16.0	68.2									
Intersection Summary												
Intersection Capacity Utilization			56.8%	ICU Level of Service				B				
Reference Times and Phasing Options do not represent an optimized timing plan.												

Intersection Capacity Utilization

17: Whitefish Stage & Oregon

7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	9	9	9	9	9	9	9	9	9	9	9	9
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right	No			No			No			No		
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	0	27	0	0	27	0	0	27	0	0	27	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	0.93	0.85	0.95	0.93	0.85	0.95	0.93	0.85	0.95	0.93	0.85
Saturated Flow (vph)	0	1775	0	0	1775	0	0	1775	0	0	1775	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00		0.00		0.00		0.00		0.00		0.00	
Protected Option Allowed	No		No		No		No		No		No	
Reference Time (s)	0.0		0.0		0.0		0.0		0.0		0.0	
Adj Reference Time (s)	0.0		0.0		0.0		0.0		0.0		0.0	
Permitted Option												
Adj Saturation A (vph)	0	1351	0	1351	0	1351	0	1351	0	1351	0	1351
Reference Time A (s)	0.0	2.4	0.0	2.4	0.0	2.4	0.0	2.4	0.0	2.4	0.0	2.4
Adj Saturation B (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Reference Time B (s)	8.6	9.8	8.6	9.8	8.6	9.8	8.6	9.8	8.6	9.8	8.6	9.8
Reference Time (s)	2.4		2.4		2.4		2.4		2.4		2.4	
Adj Reference Time (s)	8.0		8.0		8.0		8.0		8.0		8.0	
Split Option												
Ref Time Combined (s)	0.0	1.8	0.0	1.8	0.0	1.8	0.0	1.8	0.0	1.8	0.0	1.8
Ref Time Seperate (s)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Reference Time (s)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Adj Reference Time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Summary	EB WB	NB SB		Combined								
Protected Option (s)	NA	NA										
Permitted Option (s)	8.0	8.0										
Split Option (s)	16.0	16.0										
Minimum (s)	8.0	8.0		16.0								
Right Turns												
Adj Reference Time (s)												
Cross Thru Ref Time (s)												
Oncoming Left Ref Time (s)												
Combined (s)												
Intersection Summary												
Intersection Capacity Utilization	13.3%		ICU Level of Service					A				
Reference Times and Phasing Options do not represent an optimized timing plan.												

Intersection Capacity Utilization

19: Whitefish Stage

7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↘	↘	↑↑	↘	↘	↑	↘	↘	↑	↘
Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right	No			No			No			No		
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Utilization Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85
Saturated Flow (vph)	1805	3618	1615	1805	3618	1615	1805	1900	1615	1805	1900	1615
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00		0.00				0.00		0.00			
Protected Option Allowed	Yes		Yes				Yes		Yes			
Reference Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adj Reference Time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Permitted Option												
Adj Saturation A (vph)	120	1809	120		1809	120		1900	120		1900	
Reference Time A (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Adj Saturation B (vph)	0	3618	0		3618	0		1900	0		1900	
Reference Time B (s)	8.0	0.0	8.0		0.0	8.0		0.0	8.0		0.0	
Reference Time (s)	0.0		0.0				0.0		0.0			
Adj Reference Time (s)	8.0		8.0				8.0		8.0			
Split Option												
Ref Time Combined (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Ref Time Seperate (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Reference Time (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Adj Reference Time (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Summary	EB WB		NB SB		Combined							
Protected Option (s)	16.0		16.0									
Permitted Option (s)	8.0		8.0									
Split Option (s)	0.0		0.0									
Minimum (s)	0.0		0.0		0.0							
Right Turns	EBR		WBR		NBR		SBR					
Adj Reference Time (s)	8.0		8.0		8.0		8.0					
Cross Thru Ref Time (s)	0.0		0.0		0.0		0.0					
Oncoming Left Ref Time (s)	0.0		0.0		0.0		0.0					
Combined (s)	0.0		0.0		0.0		0.0					

Intersection Summary

Intersection Capacity Utilization 0.0% ICU Level of Service A
 Reference Times and Phasing Options do not represent an optimized timing plan.

Intersection Capacity Utilization

21: Whitefish Stage & Access

7/2/2013



Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	410	6	1	342	9	7
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right		No				No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	416	0	0	343	16	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	1.00	0.85	0.95	1.00	0.91	0.85
Saturated Flow (vph)	1896	0	0	1900	1725	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00			0.00	0.00	
Protected Option Allowed	No			No	No	
Reference Time (s)		0.0				0.0
Adj Reference Time (s)		0.0				0.0
Permitted Option						
Adj Saturation A (vph)	1896		0	1825	115	
Reference Time A (s)	26.3		0.0	22.6	16.7	
Adj Saturation B (vph)	NA		NA	NA	NA	
Reference Time B (s)	NA		NA	NA	NA	
Reference Time (s)	26.3			22.6		
Adj Reference Time (s)	30.3			26.6		
Split Option						
Ref Time Combined (s)	26.3		0.0	21.7	1.1	
Ref Time Seperate (s)	26.0		0.1	21.6	0.6	
Reference Time (s)	26.3		21.7	21.7	1.1	
Adj Reference Time (s)	30.3		25.7	25.7	8.0	
Summary						
	NB SB		SW		Combined	
Protected Option (s)	NA		NA			
Permitted Option (s)	30.3		Err			
Split Option (s)	56.0		8.0			
Minimum (s)	30.3		8.0		38.3	
Right Turns						
Adj Reference Time (s)						
Cross Thru Ref Time (s)						
Oncoming Left Ref Time (s)						
Combined (s)						
Intersection Summary						
Intersection Capacity Utilization		31.9%		ICU Level of Service		A
Reference Times and Phasing Options do not represent an optimized timing plan.						

Intersection Capacity Utilization

2: US 2 & Montclair

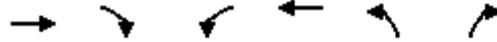
7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR								
Lane Configurations		↕	↗		↕		↗	↕↕	↗	↗	↕↕	↗								
Volume (vph)	82	0	42	2	0	0	48	1055	1	3	1015	80								
Pedestrians																				
Ped Button																				
Pedestrian Timing (s)																				
Free Right	No			No			No			No										
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900								
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0								
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0								
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120								
Volume Combined (vph)	0	82	42	0	2	0	48	1055	1	3	1015	80								
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00								
Turning Factor (vph)	0.95	0.95	0.85	0.95	0.95	0.85	0.95	1.00	0.85	0.95	1.00	0.85								
Saturated Flow (vph)	0	1805	1615	0	1805	0	1805	3618	1615	1805	3618	1615								
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0								
Pedestrian Frequency (%)	0.00		0.00				0.00			0.00										
Protected Option Allowed	No		No				Yes			Yes										
Reference Time (s)			3.1				0.0		3.2		35.0		0.1		0.2		33.7		5.9	
Adj Reference Time (s)			8.0				0.0		8.0		39.0		8.0		8.0		37.7		9.9	
Permitted Option																				
Adj Saturation A (vph)	0	1925		0	120		120	1809		120	1809									
Reference Time A (s)	0.0	5.1		0.0	2.0		47.9	35.0		3.0	33.7									
Adj Saturation B (vph)	0	0		0	0		NA	NA		NA	NA									
Reference Time B (s)	13.5	13.5		8.1	8.1		NA	NA		NA	NA									
Reference Time (s)			5.1						47.9		33.7									
Adj Reference Time (s)			9.1						51.9		37.7									
Split Option																				
Ref Time Combined (s)	0.0	5.5		0.0	0.1		3.2	35.0		0.2	33.7									
Ref Time Seperate (s)	5.5	0.0		0.1	0.0		3.2	35.0		0.2	33.7									
Reference Time (s)	5.5	5.5		0.1	0.1		35.0	35.0		33.7	33.7									
Adj Reference Time (s)	9.5	9.5		8.0	8.0		39.0	39.0		37.7	37.7									
Summary	EB WB		NE SW		Combined															
Protected Option (s)	NA		47.0																	
Permitted Option (s)	9.1		51.9																	
Split Option (s)	17.5		76.7																	
Minimum (s)	9.1		47.0		56.1															
Right Turns	EBR		NER		SWR															
Adj Reference Time (s)	8.0		8.0		9.9															
Cross Thru Ref Time (s)	37.7		9.1		8.0															
Oncoming Left Ref Time (s)	8.0		8.0		8.0															
Combined (s)	53.7		25.1		25.9															
Intersection Summary																				
Intersection Capacity Utilization			46.8%		ICU Level of Service				A											
Reference Times and Phasing Options do not represent an optimized timing plan.																				

Intersection Capacity Utilization
6: Flathead & Montclair

7/2/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	96	10	11	96	4	5
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right		No				No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	106	0	0	107	9	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.99	0.85	0.95	0.99	0.90	0.85
Saturated Flow (vph)	1873	0	0	1890	1703	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00			0.00	0.00	
Protected Option Allowed	No			No	No	
Reference Time (s)		0.0				0.0
Adj Reference Time (s)		0.0				0.0
Permitted Option						
Adj Saturation A (vph)	1873		0	751	114	
Reference Time A (s)	6.8		0.0	17.1	9.5	
Adj Saturation B (vph)	1873		0	0	NA	
Reference Time B (s)	6.8		8.7	14.8	NA	
Reference Time (s)	6.8			14.8		
Adj Reference Time (s)	10.8			18.8		
Split Option						
Ref Time Combined (s)	6.8		0.0	6.8	0.6	
Ref Time Seperate (s)	6.2		0.7	6.1	0.3	
Reference Time (s)	6.8		6.8	6.8	0.6	
Adj Reference Time (s)	10.8		10.8	10.8	8.0	
Summary						
	EB	WB		NB		Combined
Protected Option (s)	NA			NA		
Permitted Option (s)	18.8			Err		
Split Option (s)	21.6			8.0		
Minimum (s)	18.8			8.0		26.8

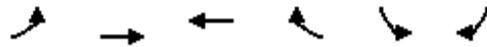
Right Turns	
Adj Reference Time (s)	
Cross Thru Ref Time (s)	
Oncoming Left Ref Time (s)	
Combined (s)	

Intersection Summary			
Intersection Capacity Utilization	22.3%	ICU Level of Service	A
Reference Times and Phasing Options do not represent an optimized timing plan.			

Intersection Capacity Utilization

8: Access/Montclair

7/2/2013



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↩	↩		↩	
Volume (vph)	1	29	14	12	13	3
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right				No		No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	0	30	26	0	16	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	1.00	0.93	0.85	0.93	0.85
Saturated Flow (vph)	0	1897	1768	0	1772	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)		0.00	0.00		0.00	
Protected Option Allowed		No	No		No	
Reference Time (s)				0.0		0.0
Adj Reference Time (s)				0.0		0.0
Permitted Option						
Adj Saturation A (vph)	0	1285	1768		118	
Reference Time A (s)	0.0	2.8	1.8		16.3	
Adj Saturation B (vph)	0	0	1768		NA	
Reference Time B (s)	8.1	9.9	1.8		NA	
Reference Time (s)		2.8	1.8			
Adj Reference Time (s)		8.0	8.0			
Split Option						
Ref Time Combined (s)	0.0	1.9	1.8		1.1	
Ref Time Seperate (s)	0.1	1.8	0.9		0.9	
Reference Time (s)	1.9	1.9	1.8		1.1	
Adj Reference Time (s)	8.0	8.0	8.0		8.0	
Summary	EB WB		SB		Combined	
Protected Option (s)	NA		NA			
Permitted Option (s)	8.0		Err			
Split Option (s)	16.0		8.0			
Minimum (s)	8.0		8.0		16.0	

Right Turns
Adj Reference Time (s)
Cross Thru Ref Time (s)
Oncoming Left Ref Time (s)
Combined (s)

Intersection Summary			
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Reference Times and Phasing Options do not represent an optimized timing plan.			

Intersection Capacity Utilization

9: Oregon & Montclair

7/2/2013



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↑	
Volume (vph)	36	6	77	23	3	70
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right		No				No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	42	0	0	100	73	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.98	0.85	0.95	0.96	0.85	0.85
Saturated Flow (vph)	1859	0	0	1827	1623	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00			0.00	0.00	
Protected Option Allowed	No			No	No	
Reference Time (s)		0.0				0.0
Adj Reference Time (s)		0.0				0.0
Permitted Option						
Adj Saturation A (vph)	1859		0	146	108	
Reference Time A (s)	2.7		0.0	81.9	80.9	
Adj Saturation B (vph)	1859		0	0	NA	
Reference Time B (s)	2.7		13.1	14.6	NA	
Reference Time (s)	2.7			14.6		
Adj Reference Time (s)	8.0			18.6		
Split Option						
Ref Time Combined (s)	2.7		0.0	6.6	5.4	
Ref Time Seperate (s)	2.3		5.1	1.5	0.2	
Reference Time (s)	2.7		6.6	6.6	5.4	
Adj Reference Time (s)	8.0		10.6	10.6	9.4	
Summary	EB WB		NB	Combined		
Protected Option (s)	NA		NA			
Permitted Option (s)	18.6		Err			
Split Option (s)	18.6		9.4			
Minimum (s)	18.6		9.4	28.0		
Right Turns						
Adj Reference Time (s)						
Cross Thru Ref Time (s)						
Oncoming Left Ref Time (s)						
Combined (s)						
Intersection Summary						
Intersection Capacity Utilization		23.3%		ICU Level of Service		A
Reference Times and Phasing Options do not represent an optimized timing plan.						

Intersection Capacity Utilization

13: Park Dr/Flathead Dr & US 2

7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	954	72	265	795	6	0	0	276	0	0	30
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right			No			No			No			No
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	11	954	72	265	795	6	0	0	276	0	0	30
Lane Utilization Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85	0.95	0.85	0.85
Saturated Flow (vph)	1805	3618	1615	1805	3618	1615	0	1900	1615	0	1615	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)		0.00			0.00			0.00			0.00	
Protected Option Allowed		Yes			Yes			No			No	
Reference Time (s)	0.7	31.6	5.3	17.6	26.4	0.4			20.5			0.0
Adj Reference Time (s)	8.0	35.6	9.3	21.6	30.4	8.0			24.5			0.0
Permitted Option												
Adj Saturation A (vph)	120	1809		120	1809		0	1900		0	1615	
Reference Time A (s)	11.0	31.6		264.3	26.4		0.0	0.0		0.0	2.2	
Adj Saturation B (vph)	NA	NA		NA	NA		0	1900		0	1615	
Reference Time B (s)	NA	NA		NA	NA		0.0	0.0		0.0	2.2	
Reference Time (s)		31.6			264.3			0.0			2.2	
Adj Reference Time (s)		35.6			268.3			8.0			8.0	
Split Option												
Ref Time Combined (s)	0.7	31.6		17.6	26.4		0.0	0.0		0.0	2.2	
Ref Time Seperate (s)	0.7	31.6		17.6	26.4		0.0	0.0		0.0	0.0	
Reference Time (s)	31.6	31.6		26.4	26.4		0.0	0.0		2.2	2.2	
Adj Reference Time (s)	35.6	35.6		30.4	30.4		0.0	0.0		8.0	8.0	
Summary												
	EB WB		NB SB		Combined							
Protected Option (s)	57.3		NA									
Permitted Option (s)	268.3		8.0									
Split Option (s)	66.0		8.0									
Minimum (s)	57.3		8.0		65.3							
Right Turns												
	EBR		WBR		NBR							
Adj Reference Time (s)	9.3		8.0		24.5							
Cross Thru Ref Time (s)	8.0		0.0		35.6							
Oncoming Left Ref Time (s)	21.6		8.0		8.0							
Combined (s)	39.0		16.0		68.2							
Intersection Summary												
Intersection Capacity Utilization			56.8%		ICU Level of Service		B					
Reference Times and Phasing Options do not represent an optimized timing plan.												

Intersection Capacity Utilization

17: Whitefish Stage & Oregon

7/2/2013

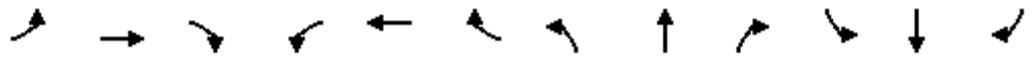


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (vph)	9	9	9	9	9	9	9	9	9	9	9	9
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right	No			No			No			No		
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	0	27	0	0	27	0	0	27	0	0	27	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	0.93	0.85	0.95	0.93	0.85	0.95	0.93	0.85	0.95	0.93	0.85
Saturated Flow (vph)	0	1775	0	0	1775	0	0	1775	0	0	1775	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00		0.00		0.00		0.00		0.00		0.00	
Protected Option Allowed	No		No		No		No		No		No	
Reference Time (s)	0.0		0.0		0.0		0.0		0.0		0.0	
Adj Reference Time (s)	0.0		0.0		0.0		0.0		0.0		0.0	
Permitted Option												
Adj Saturation A (vph)	0	1351	0	1351	0	1351	0	1351	0	1351	0	1351
Reference Time A (s)	0.0	2.4	0.0	2.4	0.0	2.4	0.0	2.4	0.0	2.4	0.0	2.4
Adj Saturation B (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Reference Time B (s)	8.6	9.8	8.6	9.8	8.6	9.8	8.6	9.8	8.6	9.8	8.6	9.8
Reference Time (s)	2.4		2.4		2.4		2.4		2.4		2.4	
Adj Reference Time (s)	8.0		8.0		8.0		8.0		8.0		8.0	
Split Option												
Ref Time Combined (s)	0.0	1.8	0.0	1.8	0.0	1.8	0.0	1.8	0.0	1.8	0.0	1.8
Ref Time Seperate (s)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Reference Time (s)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Adj Reference Time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Summary	EB WB	NB SB		Combined								
Protected Option (s)	NA	NA										
Permitted Option (s)	8.0	8.0										
Split Option (s)	16.0	16.0										
Minimum (s)	8.0	8.0		16.0								
Right Turns												
Adj Reference Time (s)												
Cross Thru Ref Time (s)												
Oncoming Left Ref Time (s)												
Combined (s)												
Intersection Summary												
Intersection Capacity Utilization	13.3%		ICU Level of Service					A				
Reference Times and Phasing Options do not represent an optimized timing plan.												

Intersection Capacity Utilization

19: Whitefish Stage

7/2/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑	↘	↘	↑↑	↘	↘	↑	↘	↘	↑	↘
Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians												
Ped Button												
Pedestrian Timing (s)												
Free Right	No			No			No			No		
Ideal Flow	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120	120	120	120	120	120	120
Volume Combined (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Utilization Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	0.95	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85	0.95	1.00	0.85
Saturated Flow (vph)	1805	3618	1615	1805	3618	1615	1805	1900	1615	1805	1900	1615
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00		0.00				0.00		0.00			
Protected Option Allowed	Yes		Yes				Yes		Yes			
Reference Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Adj Reference Time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Permitted Option												
Adj Saturation A (vph)	120	1809	120		1809	120		1900	120		1900	
Reference Time A (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Adj Saturation B (vph)	0	3618	0		3618	0		1900	0		1900	
Reference Time B (s)	8.0	0.0	8.0		0.0	8.0		0.0	8.0		0.0	
Reference Time (s)	0.0		0.0				0.0		0.0			
Adj Reference Time (s)	8.0		8.0				8.0		8.0			
Split Option												
Ref Time Combined (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Ref Time Seperate (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Reference Time (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Adj Reference Time (s)	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0	
Summary	EB WB		NB SB		Combined							
Protected Option (s)	16.0		16.0									
Permitted Option (s)	8.0		8.0									
Split Option (s)	0.0		0.0									
Minimum (s)	0.0		0.0		0.0							
Right Turns	EBR		WBR		NBR		SBR					
Adj Reference Time (s)	8.0		8.0		8.0		8.0					
Cross Thru Ref Time (s)	0.0		0.0		0.0		0.0					
Oncoming Left Ref Time (s)	0.0		0.0		0.0		0.0					
Combined (s)	0.0		0.0		0.0		0.0					

Intersection Summary

Intersection Capacity Utilization 0.0% ICU Level of Service A
 Reference Times and Phasing Options do not represent an optimized timing plan.

Intersection Capacity Utilization
21: Whitefish Stage & Access

7/2/2013



Movement	NBT	NBR	SBL	SBT	SWL	SWR
Lane Configurations						
Volume (vph)	410	6	1	342	9	7
Pedestrians						
Ped Button						
Pedestrian Timing (s)						
Free Right		No				No
Ideal Flow	1900	1900	1900	1900	1900	1900
Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Green (s)	4.0	4.0	4.0	4.0	4.0	4.0
Refr Cycle Length (s)	120	120	120	120	120	120
Volume Combined (vph)	416	0	0	343	16	0
Lane Utilization Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Factor (vph)	1.00	0.85	0.95	1.00	0.91	0.85
Saturated Flow (vph)	1896	0	0	1900	1725	0
Ped Intf Time (s)	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Frequency (%)	0.00			0.00	0.00	
Protected Option Allowed	No			No	No	
Reference Time (s)		0.0				0.0
Adj Reference Time (s)		0.0				0.0
Permitted Option						
Adj Saturation A (vph)	1896		0	1825	115	
Reference Time A (s)	26.3		0.0	22.6	16.7	
Adj Saturation B (vph)	NA		NA	NA	NA	
Reference Time B (s)	NA		NA	NA	NA	
Reference Time (s)	26.3			22.6		
Adj Reference Time (s)	30.3			26.6		
Split Option						
Ref Time Combined (s)	26.3		0.0	21.7	1.1	
Ref Time Seperate (s)	26.0		0.1	21.6	0.6	
Reference Time (s)	26.3		21.7	21.7	1.1	
Adj Reference Time (s)	30.3		25.7	25.7	8.0	
Summary						
	NB SB		SW		Combined	
Protected Option (s)	NA		NA			
Permitted Option (s)	30.3		Err			
Split Option (s)	56.0		8.0			
Minimum (s)	30.3		8.0		38.3	
Right Turns						
Adj Reference Time (s)						
Cross Thru Ref Time (s)						
Oncoming Left Ref Time (s)						
Combined (s)						
Intersection Summary						
Intersection Capacity Utilization			31.9%		ICU Level of Service	A
Reference Times and Phasing Options do not represent an optimized timing plan.						

APPENDIX E
2013 Background Plus Site Signal
Warrants Analysis Worksheets

Warrants Summary												
Information												
Analyst	Thomas McMurtry					Intersection						
Agency/Co	KLJ					Jurisdiction						
Date Performed	5/13/2013					Units	U.S. Customary					
Project ID	FCEDA TIS					Time Period Analyzed						
East/West Street	Montclair					North/South Street	US 2					
File Name	Warrant Montclair 2013 plus site					Major Street	North-South					
Project Description <i>FCEDA TIS</i>												
General						Roadway Network						
Major Street Speed (mph)	45	<input type="checkbox"/>	Population < 10,000				Two Major Routes			<input type="checkbox"/>		
Nearest Signal (ft)	695	<input type="checkbox"/>	Coordinated Signal System				Weekend Count			<input type="checkbox"/>		
Crashes (per year)	6	<input type="checkbox"/>	Adequate Trials of Alternatives				5-yr Growth Factor			0		
Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	0	1	0	0	1	0	1	2	1	1	2	0
Lane usage	LTR			LTR			L	T	R	L	TR	
Vehicle Volume Averages (vph)	48	0	24	0	0	0	31	683	0	0	738	61
Peds (ped/h) / Gaps (gaps/h)	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Delay (s/veh) / (veh-hr)	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Warrant 1: Eight-Hour Vehicular Volume												<input checked="" type="checkbox"/>
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--												<input type="checkbox"/>
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--												<input checked="" type="checkbox"/>
1 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)												<input type="checkbox"/>
Warrant 2: Four-Hour Vehicular Volume												<input checked="" type="checkbox"/>
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input checked="" type="checkbox"/>
Warrant 3: Peak Hour												<input checked="" type="checkbox"/>
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--												<input type="checkbox"/>
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input checked="" type="checkbox"/>
Warrant 4: Pedestrian Volume												<input type="checkbox"/>
4 A. Four Hour Volumes --or--												<input type="checkbox"/>
4 B. One-Hour Volumes												<input type="checkbox"/>
Warrant 5: School Crossing												<input type="checkbox"/>
5. Student Volumes --and--												<input type="checkbox"/>
5. Gaps Same Period												<input type="checkbox"/>
Warrant 6: Coordinated Signal System												<input type="checkbox"/>
6. Degree of Platooning (Predominant direction or both directions)												<input type="checkbox"/>
Warrant 7: Crash Experience												<input type="checkbox"/>
7 A. Adequate trials of alternatives, observance and enforcement failed --and--												<input type="checkbox"/>
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--												<input checked="" type="checkbox"/>

7 C. 80% Volumes for Warrants 1A, 1B --or-- 4 are satisfied	<input checked="" type="checkbox"/>
Warrant 8: Roadway Network	<input type="checkbox"/>
8 A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2 or 3) --or--	<input type="checkbox"/>
8 B. Weekend Volume (Five hours total)	<input type="checkbox"/>
Warrant 9: Grade Crossing	<input type="checkbox"/>
9 A. Grade Crossing within 140 ft --and--	<input type="checkbox"/>
9 B. Peak-Hour Vehicular Volumes	<input type="checkbox"/>