

## MEMORANDUM

**TO:** Mr. Steven Marshall, Western Transport, LLC

**FROM:** Rich Follmer

**DATE:** January 29, 2020

**SUBJECT:** **TransPort Colorado – Comment Response Summary**  
FHU Reference No. 118335-01

FHU has completed the 3<sup>rd</sup> revised Traffic Impact Analysis for TransPort Colorado. As support information, the following table summarizes each of the traffic impact-related comments that were provided by the City of Aurora (City) and by the Colorado Department of Transportation (CDOT) for the second submittal (report dated November, 2019). Comments/responses are provided in two separate tables, one for each agency. Comments and responses for the 1<sup>st</sup> report submittal have also been included for reference and they begin on page 9.

### Responses to 1<sup>st</sup> TIA Submittal (report dated November 2019)

<b>City of Aurora Traffic Engineering</b>	
<b>Comment</b>	<b>Response</b>
<p>Cover Page</p> <p>1) Include section on CDOT SHAC auxiliary lanes (previously requested). Include anticipated length for auxiliary lanes, typically in a table, and often will include the 95th percentile and a recommendation based on 2040. Taper rates for auxiliary lane transitions based on classification of roadway/speed. Or a section identifying that auxiliary length determination would follow in a later DTIS.</p> <p>2) Where does the 9% come from? Include ITE document name/reference as this will not be supported by City staff without proper reference/application, which may result in a requirement for all analysis to be updated.</p> <p>3) Include a discussion of heavy vehicle percentages and justification for what is provided in Synchro. Potentially figure with % Heavy Vehicles would help clarify.</p> <p>4) See comments throughout.</p>	<p>1) Auxiliary lane needs have been identified within the study. Storage length needs will be evaluated in ISP and DTIS analyses.</p> <p>2) This percentage is consistent with the interactions seen between the TAZ in the <i>NEATS Refresh</i> model that represents Subarea 5 and the other two TAZs that encompass TransPort Colorado.</p> <p>3) Heavy vehicle percentages of 20 and 19 percent, respectively, were used in the AM and PM peak hours for Subarea 1. This is an increase of 8 percent when compared to existing conditions and is consistent with percentages for sites with similar land use mixes.</p> <p>Heavy vehicle percentages of 16 and 15 percent, respectively, were used in the AM and PM peak hours for Subarea 2. This is an increase of 4 percent when compared to existing conditions and is consistent with percentages for sites with similar land use mixes.</p> <p>4) Acknowledged.</p>

<b>City of Aurora Traffic Engineering</b>	
<b>Comment</b>	<b>Response</b>
Page 15 – Detail out where this 9% is coming from. Previous submission said "Using guidelines form ITE", so please include a sentence or so where this is researched or defined.	Previous reference to ITE guidance was in error, please see response to Comment 2 from the Cover Page.
Page 30 – Add explanation. It appears 32nd Ave & Manila Rd. Was a 4-hr warrant completed and not met?	The eastbound left turn movement at 32 <sup>nd</sup> Avenue/Manilla Road is projected to operate at LOS F during the AM Peak. This intersection is not projected to meet signalization warrants however, and the volume in question is below 10 vph.

<b>Colorado Department of Transportation</b>	
<b>Comment</b>	<b>Response</b>
Overall - The TIA was slightly hard to understand what your final intention for the report was. It seemed like you put three different analysis together but didn't really tie them together. It made since when we met. The document just needs to be clarified on what the objectives are and the conclusion needs to wrap those up as a package. It might makes since of a combined scenario 1 and 2 also.	<p>The traffic study has been prepared/formatted to meet several objectives related to the differing timeframes for development – Build-Out of all of Transport Colorado to start. The revised report now includes a section on projected Year 2040 development levels.</p> <p>The study also includes information for Subareas 1 and 2 to assist in the City of Aurora development approval process for each subarea. As such, the Build-Out timeframe for each subarea was evaluated although it is likely that some development will occur simultaneously in each one.</p> <p><i>Comment and response is the same as for the first submittal.</i></p>
DRCOG is the travel demand model that we use. Please add language that would describe what that model is showing and how that information might have impacted your analysis.	<p>This study uses the <i>NEATS Refresh</i> travel demand model since it is a DRCOG model with more up-to-date land use information; the only travel demand model that will be accepted by the City of Aurora. As parcel development progresses and improvements along the state highway system are required, the DRCOG travel demand model will be used, particularly when evaluating modifications to the I-70/Manila Road interchange and for the construction of the I-70/Quail Run Road interchange.</p> <p><i>Comment and response similar as for the first submittal.</i></p>

<b>Colorado Department of Transportation</b>	
<b>Comment</b>	<b>Response</b>
<p>We understand that you do not know what the build out is. Yet some assumption stated on build out year would be useful in both the full site and the different scenarios.</p>	<p>Market and economic forces will dictate the entire development timeframe for TransPort Colorado; a timeframe that may be 30-40 years. The revised TIA now includes a section related to the anticipated development levels for the Year 2040 along with projected infrastructure improvements. Subarea 1 is projected to take 20 years to develop completely (Year 2040), while Subarea 2 will only be approximately ½ developed by the Year 2040 although the Subarea 2 section assumes a 20-year construction for analysis purposes.</p>
<i>Comment and response is the same as for the first submittal.</i>	
<p>There is some strange things when you compare the existing traffic counts with the background future counts. The existing traffic on US-36 is 1600 vehicle daily trips. The Background future daily traffic is less than that. What is going on in that location to lower trips? Manila Rd in the background future north of US-36 is supposedly 3500 daily volumes. Yet existing is only 300 daily volumes. Is that really going to change that much from today if this development doesn't go in?</p>	<p>Background conditions assume a new interchange at I-70/Quail Run Road which will encourage drivers to access Imboden Road to the north via the new interchange which results in a reduction of traffic in that area of US 36, specifically to the west of TransPort Colorado. Projected increases in activity associated with the Colorado Air and Space Port is the cause for the substantially higher traffic volumes along Manila Road that are not associated with Transport Colorado since the TAZ employment for that area increases to over 4,100 in the Build-Out NEATS Refresh model.</p>
<i>Comment and response is the same as for the first submittal.</i>	
<p>Figure 7 is the existing land use. It would be good to have proposed map in this document.</p>	<p>Figure 7 is a site plan of the proposed land uses. All existing property is currently vacant. Any reference to “existing” is related to the existing zoning.</p>
<i>Comment and response is the same as for the first submittal.</i>	
<p>Table I should have ITE codes and floor to area ratios (FAR). The industrial FAR is 15% and the ware house is 7%. That is really small comparatively to other sites that we have seen. Put your assumptions on why these are so small.</p>	<p>Square footage estimates for TransPort Colorado parcels are based on land use best practices for the industrial land uses considered for this development.</p>
<i>Comment and response is the same as for the first submittal.</i>	

Colorado Department of Transportation	
Comment	Response
Internal Capture and Pass-by trips percentage seem really high. The Colorado State Access code has direction on what to use.	Internal Capture was calculated using the average rate from NCHRP 684. As a clearer picture of the proposed land uses associated with mixed-use development in TransPort Colorado becomes available, these rates will be refined. A pass-by percentage of 5% was used for planning areas designated as mixed-use when considering that many land uses that would be considered mixed-use range from 30-50% as presented in the ITE Trip Generation Handbook 3 <sup>rd</sup> Edition. 5% is a conservative estimate.
Comment and response is the same as for the first submittal.	
Figure 8 Site distribution seems really off. It is strange that there is no percentages for US-36 west of site. Yet on figure 9 there is site traffic on US 36 west of Imboden Rd. It would be good to explain a little more that went into coming up with this trip distribution. This graphic should also include all the sites and not just the main site.	Site distribution was determined using select links for the TAZs that comprise the TransPort Colorado development from the Build-Out NEATS Refresh model. Distribution percentages were only presented for external nodes on Figure 9 since it is anticipated that some of the traffic oriented to/from Watkins Road to the south and I-70 to/from the west will achieve access via US 36 to the west of the site. In this particular instance, traffic on US 36 to the west is attributed to a portion of properties west of Quail Run Road; however, traffic from sites east of Quail Run Road oriented in this direction will likely use I-70 from either the Quail Run Road or Manila Road interchanges. It is not feasible to provide individual distributions and routing decisions for each individual planning area.
Comment and response is the same as for the first submittal.	
Figure 9 Has some questionable traffic volumes on the roads. Peterson Rd and Schumaker Rd both have the same volume but everything seems to be coming from the west. That is also the same for 56th and 64th Ave. The 6100 between Manila and Quail Run seems low unless there is access to Manila and Quail Run that is not shown in this graphic. The volumes to I-70 should be shown since you have a huge amount of trips distributed on I-70.	Figure 9 volumes for Petterson Road and Schumaker Road are identical because at this time uniform land use is anticipated in Subarea 6 with no connection to the north so they were distributed equally to the adjacent roadways. The 6100 trips along Cavanaugh Road are associated with a portion of Subarea 5. Other connections to both US 36 and Quail Run Road are anticipated and trips have been loaded directly onto these links. Traffic volumes along I-70 have been added to the figures.
Comment and response is the same as for the first submittal.	

<b>Colorado Department of Transportation</b>	
<b>Comment</b>	<b>Response</b>
<p>Section IV.D states an eight lane facility at Quail run. Yet I-70 is only 4 lanes. That does not make sense at all. Manilla being a 6 lane facility also doesn't make sense as long as I-70 is 4 lanes. All that traffic will not be able to get there.</p> <p><i>Comment and response is the same as for the first submittal.</i></p>	<p>Continued development along the I-70 corridor to the east of the metro area will necessitate increased capacity along I-70. CDOT staff has indicated that a system level feasibility study will be starting in the fall of 2019 to further study I-70 in a broader sense adjacent to TransPort Colorado. This TIA is not intended for use in sizing the appropriate interstate cross-section, but can be used as a guide to help inform decisions that look more holistically at the I-70 corridor.</p>
<p>Section IV.E makes it sound like truckers like roundabouts and that is not true.</p> <p><i>Comment and response is the same as for the first submittal.</i></p>	<p>Roundabouts will be considered as potential options, particularly within the TransPort Colorado boundary because of the benefits identified in the TIA.</p>
<p>Table 3. List Rail Transload facility is used in the land use but not listed in the overall development. That should be consistent.</p> <p><i>Comment and response is the same as for the first submittal.</i></p>	<p>The rail portion of the site generates a fraction of a percent of the total traffic and has been included in the industrial category for the full buildout trip generation. See the Subarea 1 trip generation for a more detailed look at trip generation estimates for the rail facility in PA-16.</p>
<p>There is no background traffic volumes for Scenario 1 and Scenario 2. Provide this information.</p> <p><i>Comment and response is the same as for the first submittal.</i></p>	<p>Background traffic volume projections are now included on Figures 16 and 21 for Subareas 1 and 2.</p>
<p>Did all of turning movement traffic shown in this report including heavy vehicle? State Highway Access Code stated to count one truck = 3 pce, please revise your traffic volumes throughout.</p> <p><i>Comment and response is the same as for the first submittal.</i></p>	<p>HCM methodology was used for the calculation of level of service. This methodology is the industry standard and considers HV% and applies appropriate adjustments to the calculations.</p>
<p>As mentioned previously, CDOT uses and accepts DRCOG Travel Demand Model. DRCOG Focus 2.2 Travel Demand Model has incorporated additional land uses with coordination with Arapahoe and Adams counties and the City of Aurora for reasonableness. The NEATS Refresh Travel demand model is used for sensitivity analysis purposes.</p>	<p>City of Aurora requires the use of the NEATS Refresh model for projects within the NEATS study area. We recognize that CDOT will require use of the DRCOG model for improvements to the CDOT roadway network.</p>

<b>Colorado Department of Transportation</b>	
<b>Comment</b>	<b>Response</b>
Please add background daily traffic volume (before build-out) figure, particularly along I-70. Please verify daily buildout background traffic volumes 10 times higher than background daily traffic along US 36, however, only a little of traffic to/from Imboden Rd and Manila Rd.	Background volumes along I-70 are included on Figures 6 and 12. These volumes represent growth of other parcels near TransPort Colorado particularly as they relate to the Colorado Air and Space Port as well as the Rocky Mountain Rail Park adjacent to Petterson Road. An explanation of how background traffic was developed is included on page 9 of the report and raw travel demand model results are included in Appendix D.
Still don't get the answer for this: There is some strange things when you compare the existing traffic counts with the background future counts. The existing traffic on US-36 is 1600 vehicle daily trips. The Background future daily traffic is less than that. What is going on in that location to lower trips? Manila Rd in the background future north of US-36 is supposedly 3500 daily volumes. Yet existing is only 300 daily volumes. Is that really going to change that much from today if this development doesn't go in?	Future Background traffic volumes along US 36 range from 5,500 to 13,800 as illustrated on Figure 6, which is substantially more than existing traffic. Development of the Colorado Air and Space Port to the immediate north of TransPort will be a major contributor to background growth along Manila Road.
Transport Colorado will take more than 20 years to completely develop. What are the percentages in 10 years, 20 years, and soon?	We agree that the full buildout of TransPort Colorado is more than 20 years. Section V of the report outlines a 2040 scenario in which it has been estimated that roughly 41 percent of the land area of TransPort Colorado is developed.
What year of the short term? 5 years from now?	A short-term scenario was not explicitly analyzed in the master TIS. The subarea analysis looks at full buildout of the first two subareas as though they develop independently of one another in a 20-year timeframe.
There's no percentage of trip distribute to US-36 west of site as shown on Figure 8, why?	There is no graphical representation of trips along US-36 to the west as it is assumed that trips assigned to both I-70 to the west and Watkins Road will use Colfax Avenue. However, the degree at which this occurs varies widely from parcel to parcel due to the large size of the property but is most concentrated from trips generated by properties in Subarea 3 (southwest quadrant of the development). Overall, at buildout of the entire site it is expected that fewer than 5% of site traffic will use US 36 west of the current Imboden Road alignment.
Figure 9 shows the same traffic volumes at Peterson Rd and Schumaker, where are these traffic from? It seems all traffic coming from the west. Similarly, at 64th Ave and 56th Ave.?	A uniform land use was used which has resulted in symmetrical traffic volumes on these roadways. As individual site plans are available these will be revised, but it should be noted that no development is anticipated in Subarea 6 prior to 2040.



January 29, 2020

Memorandum to Steven Marshall, Western Transport, LLC

Page 7

<b>Colorado Department of Transportation</b>	
<b>Comment</b>	<b>Response</b>
All improvements to state facilities will need to follow CDOT Standards. CDOT's I60I process will apply to any interchange modifications or construction of a new interchange. The latest DRCOG model will need to be used for the I60I processes, the NEATS model is not an accepted model.	The Master TIS is intended to outline development plans and gain approval for zoning changes with the City of Aurora. City of Aurora requires the use of the NEATS Refresh model for projects within the NEATS study area. It is recognized that CDOT will require use of the DRCOG model for improvements to the CDOT roadway network, particularly when evaluating improvement along I-70 and US 36.
CDOT is in the process of starting a system level study for the I-70 corridor from E-470 to Strasberg, coordination with Transport will be needed throughout the study. The study is expected to start in Fall 2019 and be completed by Winter 2020.	TransPort Colorado welcomes the opportunity to participate as a stakeholder in the system level study. Please let us know when our involvement is needed.
Where a grade separation with the UPRR is planned US36 will likely need to be relocated, please show on the development plan.	Discussions with the PUC have begun regarding the need for improvements at rail crossings. While realignment of US 36 may be needed to achieve grade separation, TransPort Colorado does not own property to the south of US 36. The TransPort Colorado team will evaluate grade-separation options when the need for grade-separation is understood given land use absorption and traffic volume impacts.
The current I-70 bridge over Manila is substandard only allowing for a two lane road and maximum of 14.5 feet in height.	We concur that the bridge characteristics are not ideal and improvements will be needed in the future. We hope that Improvement options will be confirmed via CDOT's I-70 system level study.
This referral is for an amendment to the Transport Colorado FDP. CDOT has no comment on the proposed changes to the land use matrix. The Public Improvement Plan shows that there will be impacts to State Highways in the area, including Hwy 36 (Colfax) and I-70. New interchanges or modifications to the interchange will need to be approved through the I60I process. Any new access to a State Highway will need a State Highway Access Permit.	Interchange improvements needing to be approved through the I60I process are acknowledged. It is anticipated that a I60I process will be initiated in the near future.
CDOT will need to review the Drainage Report when it is available. Any grading in the State right-of-way will require a special use permit.	Acknowledged.
Any proposed construction, utility, survey, or landscaping work within CDOT right-of-way will require a Special Use Permit issued by the Department.	Acknowledged.
Railroad Crossings will also need to be coordinated with CDOT.	Discussions with the PUC will occur and CDOT will be included in future discussions.
With the exception of the land portion south of SH 36, all of Transport necessitates roadway crossing of the UPRR mainline, immediately	Discussions with the PUC will occur and CDOT will be included in future discussions.

January 29, 2020

Memorandum to Steven Marshall, Western Transport, LLC

Page 8

<b>Colorado Department of Transportation</b>	
<b>Comment</b>	<b>Response</b>
adjacent to SH 36. It is incumbent of the City to work out the provision for Transport to take responsibility to improve both the north and south half of SH 36 contiguous to their project. Any additional RoW for SH 36 will need to come from the south side. Adams County has a 140-ft RoW profile for US 36, we ask that the GDP, more specifically, the Public Improvement Plan figure 2 show what the Aurora cross section for SH 36 will be. Whereby rail crossings are in close proximity to the highway, CDOT does have an office which assist with coordinating safe designs and often signalized crossings. As advisory, when roadway improvements anticipate RR crossing enhancements, obtaining such permits tend to be more complicated and require significant lead time to process. It is not uncommon for long and more frequent trains to cause delay and create temporary congestion, and for CDOT to require auxiliary lanes on the highway for the queuing of vehicles.	
It would appear that a portion of the property may abut the I-70 RoW. Please be advised that A-lines are in-place along I-70 restricting access. It is not clear from the NEATS refresh study, if Cavanaugh and other major arterials are planned for grade-separated crossings of I-70. Absent of these crossings, higher levels of traffic will need to pass-through interchanges.	We acknowledge the need to preserve A-line continuity. A new interchange is anticipated at the Quail Run Road alignment, however, and A-line issues should be discussed during the I-70 system level study and will be confirmed during future I60I discussions.



## Responses to 1<sup>st</sup> TIA Submittal (report dated April 2019)

<b>City of Aurora Traffic Engineering</b>	
<b>Comment</b>	<b>Response</b>
General	Comments related to typos or grammatical errors have been revised but are not specifically identified in this table.
<p>Cover Page</p> <p>1) Include trip generation for peak hours for the full buildout condition. Provide figures showing TMC and lane recommendations.</p> <p>2) Each section needs to have a discussion on auxiliary lanes and the SHAC requirements. Many intersections will need additional auxiliary lanes.</p> <p>3) Signal warrant analysis must be conducted for proposed signals. Provide the 4-hour warrant in the appendix and reference it in the report.</p> <p>4) The lane configuration of 32nd/Quail Run/Imboden needs to be adjusted. Right now there are two connections from the realigned Quail Run to Imboden which seems redundant. Eliminate the low volume connection (or switch to RI/RO).</p> <p>5) The intersection control for the realigned Quail Run/Imboden is unclear.</p> <p>6) Address CDOT's comments on US 36 and I-70.</p> <p>7) Update heavy vehicle %. 2% does not seem reasonable based on the proposed development.</p> <p>8) See comments throughout, including in the appendix.</p>	<p>1) Not required per staff discussion and email correspondence.</p> <p>2) Auxiliary lane information for Subareas 1 and 2 is provided in the report.</p> <p>3) Signal warrant information is provided in the Subarea 1 and 2 sections of the report and warrant graphs can be found in Appendices F and H.</p> <p>4) This revision has been made and is included in the revised report.</p> <p>5) Please see Figures 11, 15, 20 and 25 for traffic control information for the several analysis periods.</p> <p>6) Included in this response memorandum.</p> <p>7) Truck percentage information has been updated and has been included in the operational analyses based on existing truck percentages and on engineering judgment.</p> <p>8) Noted.</p>
Page 2, Figure 1 – Callout sub areas 1 & 2 on the map	Figure 1 has been modified to add Subareas 1 and 2.
Page 4, Figure 2 – Label as Quail Run Rd	The section of Quail Run Road that intersects 48 <sup>th</sup> Avenue has been labeled.
Page 10, Figure 5 – Verify, I don't think a grade sep is called out here in NEATS	Including a grade separation at the Imboden Road rail crossing was an error. It has been removed from this figure.
Page 10, Figure 5 – this color doesn't match map	Major Arterial color in the Legend has been changed to match the figure color.
Page 10, Figure 5 – Call it a “mobility hub”	Type 2 Transit Hub text has been revised to Type 2 Mobility Hub.
Page 11, Figure 6 – Lots of numbers are higher than NEATS. This seems counterintuitive, please explain	<p>Comment appears to be related to the Year 2040 Daily Traffic Volumes of <i>NEATS Refresh</i> (Figure 11).</p> <p>Background traffic projections were determined by using the <i>NEATS Refresh Build-Out</i> volumes minus the Transport Colorado model estimates in the three TAZs that comprise the Transport Colorado study area. These were used in consideration that Build-Out of Transport Colorado is projected to be beyond Year 2040.</p>

January 29, 2020

Memorandum to Steven Marshall, Western Transport, LLC

Page 10

<b>City of Aurora Traffic Engineering</b>	
<b>Comment</b>	<b>Response</b>
Page 11, Figure 6 – state that the developer will be responsible for constructing Quail Run Rd	Per email correspondence, information on financial obligations are not stated in the TIS.
Page 11, Figure 6 – Include an image of the raw model in this area	Raw model data for overall <i>NEATS Refresh</i> Build-Out and the three TAZs that comprise the Transport Colorado study area are included in Appendix D.
Page 12 – Is buildout in 2040?	Build-Out of Transport Colorado is anticipated to be beyond Year 2040. An estimate of development levels and corresponding vehicle-trips and impacts are included in a new section of the TIA for the Year 2040.
Page 14 – include peak hour calculations for full buildout	Peak hour trip generation has been included in Table I of the updated report.
Page 15 – Which ITE guideline is this? 9% seems high	This was incorrectly stated as an ITE guideline in the original TIA. 9% is $\frac{1}{4}$ of the internal capture projections for the Mixed-Use parcels. This estimate was discussed with City staff at the comment review meeting and it was determined to be acceptable for interactions between the Mixed-Use components of Transport Colorado and the large employment base contained in the other Subareas.
Page 16, Figure 8 – should be higher than 0 (related to the accounting of distribution percentages)	Modifications to the distribution percentages related to the Mixed-Use parcels have been revised (1% has been added to Imboden Road to the north of 56 <sup>th</sup> Avenue) and for vehicle distribution along Quail Run Road to the south of I-70. Other distribution percentages have been reduced slightly to accommodate these revisions.
Page 16, Figure 8 - Show all interior roadways on this map. Show distribution percentages on all roadways. (Figure 8)	Per email correspondence, trip distribution percentages on internal collectors is not required.
Page 17, Figure 9 – Quail Run is planned to be continuous. Why has this been changed?	The alignment of the Imboden Road/Quail Run Road corridor does not allow for the continuation of Quail Run Road in a true north/south alignment. Quail Run Road will connect to the new alignment at approximately 32 <sup>nd</sup> Avenue. The Quail Run Road configuration lines up with its current alignment to the south of US 36.
Page 20, Figure 11 – It seems like 2 connections aren't necessary, consider consolidating into 1 and eliminating the low volume connection	The street connections at this location have been reduced to only one.
Page 20, Figure 11 – How would this intersection be configured/controlled?	Related to the previous comment and response, a new “T” intersection will be the main connection of Imboden Road to the new Imboden Road/Quail Run Road alignment. The leftover segment of existing Imboden Road will continue northward to serve the adjacent properties.
Page 21 – Add a figure with TMC for full build out. Also add a figure with proposed intersection control and lane configurations for full buildout.	This comment relates to Subarea I. Figure 20 now includes locations of projected new traffic signals and it identifies the locations for auxiliary lanes using the <i>State Highway Access Code</i> criteria.

<b>City of Aurora Traffic Engineering</b>	
<b>Comment</b>	<b>Response</b>
Add a section on the SHAC requirements and auxiliary lanes.	
Page 23 – State what year this analysis is for	Subarea I is not projected to be completely constructed until Year 2040.
Page 23 – Were warrants analyzed? If not, they need to be.	Figure 20 identifies the projected locations of new traffic signals using the MUTCD Warrant 2 and 3 criteria (see also Appendix F).
Page 23 – What analysis software was used for this? When will they fail?	HCS software was used to analyze LOS for the temporary roundabouts. Single lane roundabouts are projected to fail at around 800 acres of development in Subarea I. Temporary roundabouts are considered a viable traffic control option to bridge the time between existing conditions and the reconstruction of the I-70/ Manila Road interchange.
Page 24, Figure 13 – Two similar comments related to the continuity of Cavanaugh Road and 42 <sup>nd</sup> Avenue	These roadways are projected to only be used for access to specific parcels in these locations within Subarea I, i.e., not continuous to other streets.
Page 24, Figure 13 – this Z movement is not ideal. Can 32 <sup>nd</sup> be extended directly to Imboden? See previous comment about connecting to Imboden at only one location	A portion of the Imboden Road/Quail Run Road alignment will be built to allow east-west connectivity through the site as a way to provide appropriate access for Subarea I parcels and for fire safety. The “Z” alignment provides a definitive location for the new Imboden Road/Quail Run Road alignment which will reduce future roadway reconstruction.
Page 26, Figure 15 - CDOT needs to review interchange configuration.	All modifications to interchanges will be vetted with CDOT through MIMR and I60I processes as individual Subarea I parcels are being considered for development.
Page 27 - What does this mean? Are roundabouts recommended for a certain amount of time before the signal is warranted? I don't think this is reasonable.	Roundabouts are viewed as a <u>temporary</u> solution to provide additional capacity at the ramp terminals until major interchange reconstruction is required. They are not deemed as an immediate traffic control need, however; the existing interchange configuration and traffic control will last several years and will be reevaluated as individual parcels are proposed for development. The temporary roundabouts will bridge the time necessary to obtain approvals to reconstruct the I-70/Manila Road bridge. Roundabout capacity will gradually decrease, but they are considered a viable traffic control option as a temporary measure.
Page 27 – when will grade separations be constructed?	Grade-separations are not considered a required improvement for the Build-Out of Subarea I. At-grade improvements should be constructed to provide capacity and safety improvements during the development of Subarea I.
Page 27 – Explain how these thresholds were developed and provide justification for the acreage shown.	Level of service analyses were conducted at the Subarea I intersections that included increasing levels of development until roadway and intersection

<b>City of Aurora Traffic Engineering</b>	
<b>Comment</b>	<b>Response</b>
	capacities were identified to require changes in laneage and/or traffic control.
Page 27 – Is analysis for this threshold provided? This should be based on ADT and not acres. Counts would have to be collected prior to each parcel development. This comment applies to subarea 2 as well.	It is agreed that traffic data and development information will be used to identify the timeframes when improvements are necessary. Table 5 now includes a column that identifies an approximate year for each major improvement based on a development timeframe of 20 years.
Page 28 - State which edition of Trip Generation manual was used	The 10 <sup>th</sup> Edition was used and is included in the revised TIA text.
Page 33 - change wording to “acceptable” – all instances	The TIA has been updated with this language.
Page 33 – Why? (related to the need for roundabouts at the I-70/Manila Road interchange)	Traffic generation for Subarea 2 is substantially lower than Subarea 1. Roundabouts at the I-70/Manila Road ramp terminals were explored but deemed unnecessary since acceptable LOS is achieved with existing geometry.
Page 33 - when will grade separations be constructed?	Grade-separations are not considered a required improvement for the Build-Out of Subarea 2. At-grade improvements should be constructed to provide capacity and safety improvements during the development of Subarea 2.
Page 33- Fire life safety concerns over two points of access	Acknowledged.
Page 33 - Was analysis conducted to determine acreage? Explain how these assumptions were developed.	Level of service analyses were conducted at the Subarea 2 intersections that included increasing levels of development until roadway and intersection capacities were identified to require changes in laneage and/or traffic control. Table 8 now includes a column that identifies an approximate year for each major improvement based on a development timeframe of 20 years.
Page 34, Figure 19 – LOS e is not acceptable. The text said that a signal was required here. Show a signal.	Figure 25 (formerly Figure 19) has been corrected to include a traffic signal at this location.
Page 34, Figure 19 – Volumes are beyond City’s threshold for dual lefts	Analyses find that LOS B can be obtained during both the AM and PM peak hours with a single left turn lane given the interactions of other movements and installation of a traffic signal. The requirement for a second left turn lane should be confirmed as development increases and as traffic volumes grow.
Page 34, Figure 19 – Numerous comments regarding turn lanes	Figure 25 (formerly Figure 19) now includes the auxiliary lane requirements using the <i>State Highway Access Code</i> criteria.
Page 35 – this bullet point is vague, explain in more detail	This bullet has been divided into two bullets to represent the widening (or paving) of existing roadways and for the construction of new ones.

<b>City of Aurora Traffic Engineering</b>	
<b>Comment</b>	<b>Response</b>
Page 35 – include specific requirements at each location	Reference is made to review the information contained on Figure 11.
Appendix C - Existing Conditions – Are these accurate? I would expect them to be higher (related to HV%)	The percentage of heavy vehicles has been increased based on discussions with City staff.
Appendix C - Existing Conditions – Are these PHF from the counts?	PHF for existing conditions are from field collected data. Fairly light traffic within the study area results in some low PHF's which have been increased for higher traffic volumes in the Build-Out scenarios.
Appendix E - Analysis Worksheets, Subarea 1 – Why is pt/pm phasing used? Explain. This applies to all new signals	Protected/Permitted left turn phasing is used for intersection approaches if only one left turn lane is deemed to provide acceptable intersection and/or movement operations.

<b>Colorado Department of Transportation</b>	
<b>Comment</b>	<b>Response</b>
Overall - The TIA was slightly hard to understand what your final intention for the report was. It seemed like you put three different analysis together but didn't really tie them together. It made sense when we met. The document just needs to be clarified on what the objectives are and the conclusion needs to wrap those up as a package. It might make sense of a combined scenario 1 and 2 also.	<p>The traffic study has been prepared/formatted to meet several objectives related to the differing timeframes for development – Build-Out of all of Transport Colorado to start; the revised report now includes a section on projected Year 2040 development levels.</p> <p>The study also includes information for Subareas 1 and 2 to assist in the development approval process for each subarea. As such, the complete Build-Out for each subarea was evaluated although it is likely that some development will occur simultaneously in each one.</p>
DRCOG is the travel demand model that we use. Please add language that would describe what that model is showing and how that information might have impacted your analysis.	This study uses the <i>NEATS Refresh</i> travel demand model since it is a DRCOG model with more up-to-date land use information. As parcel development progresses and improvements along the state highway system are required, the DRCOG travel demand model will be used, particularly when evaluating modifications to the I-70/Manila Road interchange and for the construction of the I-70/Quail Run Road interchange.
We understand that you do not know what the build out is. Yet some assumption stated on build out year would be useful in both the full site and the different scenarios.	Market and economic forces will dictate the entire development timeframe for Transport Colorado, a timeframe that may be 30-40 years. The revised TIA now includes a section related to the anticipated development levels for the Year 2040 along with projected infrastructure improvements. Subarea 1 is projected to take 20 years to develop completely (Year 2040), while Subarea 2 will only be approximately ½ developed by the Year 2040 although the Subarea 2 section assumes a 20-year construction for analysis purposes.

<b>Colorado Department of Transportation</b>	
<b>Comment</b>	<b>Response</b>
There is some strange things when you compare the existing traffic counts with the background future counts. The existing traffic on US-36 is 1600 vehicle daily trips. The Background future daily traffic is less than that. What is going on in that location to lower trips? Manila Rd in the background future north of US-36 is supposedly 3500 daily volumes. Yet existing is only 300 daily volumes. Is that really going to change that much from today if this development doesn't go in?	Background conditions assume a new interchange at I-70/Quail Run Road which will encourage drivers to access Imboden Road to the north via the new interchange which results in a reduction of traffic in that area of US 36, specifically to the west of Transport Colorado. Projected increases in activity associated with the Colorado Air and Space Port is the cause for the substantially higher traffic volumes along Manilla Road that are not associated with Transport Colorado as the TAZ employment for that area increases to over 4,100 in the Build-Out <i>NEATS Refresh</i> model.
Figure 7 is the existing land use. It would be good to have proposed map in this document.	Figure 7 is a site plan of the proposed land uses. All existing property is currently vacant. Any reference to "existing" is related to the existing zoning.
Table 1 should have ITE codes and floor to area ratios (FAR). The industrial FAR is 15% and the ware house is 7%. That is really small comparatively to other sites that we have seen. Put your assumptions on why these are so small.	Square footage estimates for Transport Colorado parcels are based on land use best practices for the industrial land uses considered for this development.
Internal Capture and Pass-by trips percentage seem really high. The Colorado State Access code has direction on what to use.	Internal Capture was calculated using the average rate from NCHRP 684. As a clearer picture of the proposed land uses associated with mixed-use development in Transport Colorado becomes available, these rates will be refined. A pass-by percentage of 5% was used for planning areas designated as mixed-use when considering that many land uses that would be considered mixed-use range from 30-50% as presented in the <i>ITE Trip Generation Handbook 3<sup>rd</sup> Edition</i> . 5% is a conservative estimate.
Figure 8 Site distribution seems really off. It is strange that there is no percentages for US-36 west of site. Yet on figure 9 there is site traffic on US 36 west of Imboden Rd. It would be good to explain a little more that went into coming up with this trip distribution. This graphic should also include all the sites and not just the main site.	Site distribution was determined using select links for the TAZs that comprise the Transport Colorado development from the Build-Out <i>NEATS Refresh</i> model. Distribution percentages were only presented for external nodes on Figure 9 since it is anticipated that some of the traffic oriented to/from Watkins Road to the south and I-70 to/from the west will achieve access via US 36 to the west of the site. In this particular instance, traffic on US 36 to the west is attributed to a portion of properties west of Quail Run Road; however, traffic from sites east of Quail Run Road oriented in this direction will likely use I-70 from either the Quail Run Road or Manila Road interchanges. It is not feasible to provide individual distributions and routing decisions for each individual planning area.
Figure 9 Has some questionable traffic volumes on the roads. Peterson Rd and Schumaker Rd both have the same volume but everything seems to be coming from the west. That is also the same for	Figure 9 volumes for Petterson Road and Schumaker Road are identical because at this time uniform land use is anticipated in Subarea 6 with no connection to the north so they were distributed equally to the adjacent



January 29, 2020

Memorandum to Steven Marshall, Western Transport, LLC

Page 15

<b>Colorado Department of Transportation</b>	
<b>Comment</b>	<b>Response</b>
56th and 64th Ave. The 6100 between Manila and Quail Run seems low unless there is access to Manila and Quail Run that is not shown in this graphic. The volumes to I-70 should be shown since you have a huge amount of trips distributed on I-70.	roadways. The 6100 trips along Cavanaugh Road are associated with a portion of Subarea 5. Other connections to both US 36 and Quail Run Road are anticipated and trips have been loaded directly onto these links. Traffic volumes along I-70 have been added to the figures.
Section IV.D states an eight lane facility at Quail run. Yet I-70 is only 4 lanes. That does not make sense at all. Manila being a 6 lane facility also doesn't make sense as long as I-70 is 4 lanes. All that traffic will not be able to get there.	Continued development along the I-70 corridor to the east of the metro area will necessitate increased capacity along I-70. CDOT staff has indicated that a system level feasibility study will be starting in the fall of 2019 to further study I-70 in a broader sense adjacent to Transport Colorado. This TIA is not intended for use in sizing the appropriate interstate cross-section, but can be used as a guide to help inform decisions that look more holistically at the I-70 corridor.
Section IV.E makes it sound like truckers like roundabouts and that is not true.	Roundabouts will be considered as potential options, particularly within the Transport Colorado boundary, because of the benefits identified in the TIA.
Table 3. List Rail Transload facility is used in the land use but not listed in the overall development. That should be consistent.	The rail portion of the site generates a fraction of a percent of the total traffic and has been included in the industrial category for the full buildout trip generation. See the Subarea 1 trip generation for a more detailed look at trip generation estimates for the rail facility in PA-16.
There is no background traffic volumes for Scenario 1 and Scenario 2. Provide this information.	Background traffic volume projections are now included on Figures 16 and 21 for Subareas 1 and 2.
Did all of turning movement traffic shown in this report including heavy vehicle? State Highway Access Code stated to count one truck = 3 pce, please revise your traffic volumes throughout.	HCM methodology was used for the calculation of level of service. This methodology is the industry standard and considers HV% and applies appropriate adjustments to the calculations.
Resident Engineer and Permits Comments do not require responses; they are simply statements of actions to be taken as Transport Colorado progresses.	



# **TRANSPORT COLORADO**

## **Revised Traffic Impact Analysis**

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## TABLE OF CONTENTS

	<u>Page</u>
<b>I. INTRODUCTION.....</b>	<b>1</b>
<b>II. EXISTING CONDITIONS.....</b>	<b>3</b>
II.A. Land Use.....	3
II.B. Roadway System.....	3
II.C. Rail Facility .....	5
II.D. Traffic Volumes.....	5
II.E. Traffic Control.....	7
II.F. Traffic Operations.....	7
<b>III. BACKGROUND CONDITIONS.....</b>	<b>9</b>
III.A. Roadway Network Plan.....	9
III.B. Background Traffic Volumes.....	9
<b>IV. TRANSPORT COLORADO BUILD-OUT CONDITIONS .....</b>	<b>12</b>
IV.A. TransPort Colorado Land Uses.....	12
IV.B. TransPort Colorado Build-Out Trip Generation Estimates .....	14
IV.C. Trip Assignment .....	15
IV.D. Recommended Roadway Laneage.....	19
IV.E. Large Truck Influence at Roundabouts.....	19
IV.F. Bear Gulch Trail Connectivity .....	19
IV.G. CDOT Coordination .....	19
<b>V. YEAR 2040 CONDITIONS.....</b>	<b>21</b>
V.A. Year 2040 Background Traffic.....	21
V.B. Year 2040 Land Uses.....	21
V.C. Year 2040 Trip Generation Estimates & Assignment.....	21
V.D. Year 2040 Total Daily Traffic Volumes.....	21
V.E. Year 2040 Recommended Roadway Laneage .....	23
<b>VI. SUBAREA I .....</b>	<b>27</b>
VI.A. Subarea I Land Uses.....	27
VI.B. Subarea I Trip Generation Estimates & Assignment.....	27
VI.C. Subarea I Operational Conditions (Estimated Year 2040).....	30
VI.D. Subarea I Roadway Network and Traffic Control .....	34
VI.E. Subarea I Improvements.....	34

<b>VII. SUBAREA 2.....</b>	<b>35</b>
VII.A. Subarea 2 Land Uses.....	35
VII.B. Subarea 2 Trip Generation Estimates and Assignment.....	35
VII.C. Subarea 2 Operational Conditions .....	41
VII.D. Subarea 2 Roadway Network & Traffic Control.....	41
VII.E. Improvements Summary.....	41
<b>VIII. SUMMARY AND RECOMMENDATIONS.....</b>	<b>44</b>

## Appendices

Appendix A.	Recorded Traffic Volumes
Appendix B.	Level of Service Criteria
Appendix C.	Analysis Worksheets – Existing Conditions
Appendix D.	NEATS <i>Refresh</i> Build-Out Travel Demand Model Information
Appendix E.	Trip Generation Estimates
Appendix F.	Subarea 1 Warrant Graphs
Appendix G.	Analysis Worksheets – Subarea 1
Appendix H.	Subarea 2 Warrant Graphs
Appendix I.	Analysis Worksheets – Subarea 2

## List of Figures

	<u>Page</u>
Figure 1.	Vicinity Map..... 2
Figure 2.	Surrounding Roadway Characteristics..... 4
Figure 3.	Existing Traffic Volumes..... 6
Figure 4.	Existing Operational Conditions..... 8
Figure 5.	Transportation System Plan (Reproduced from <i>NEATS Refresh</i> ) ..... 10
Figure 6.	Build-Out Background Daily Traffic Volumes..... 11
Figure 7.	TransPort Colorado Proposed Site Plan ..... 13
Figure 8.	Build-Out Site Trip Distribution ..... 16
Figure 9.	TransPort Colorado Build-Out Site Generated Daily Traffic Volumes ..... 17
Figure 10.	TransPort Colorado Build-Out Total Daily Traffic Volumes..... 18
Figure 11.	Build-Out Recommended Roadway Laneage..... 20
Figure 12.	Year 2040 Background Daily Traffic Volumes..... 22
Figure 13.	Year 2040 TransPort Colorado Site Generated Daily Traffic Volumes..... 24

Figure 14.	Year 2040 TransPort Colorado Total Daily Traffic Volumes.....	25
Figure 15.	Year 2040 Recommended Roadway Laneage.....	26
Figure 16.	Year 2040 Background Traffic Volumes for Subarea 1 .....	28
Figure 17.	Subarea 1 Land Uses.....	29
Figure 18.	Subarea 1 Site Generated Traffic Volumes.....	31
Figure 19.	Subarea 1 Total Traffic Volumes.....	32
Figure 20.	Subarea 1 Operational Conditions and Roadway Recommendations .....	33
Figure 21.	Year 2040 Background for Subarea 2 Traffic Volumes .....	36
Figure 22.	Subarea 2 Land Uses.....	37
Figure 23.	Subarea 2 Site Generated Traffic Volumes.....	39
Figure 24.	Subarea 2 Total Traffic Volumes.....	40
Figure 25.	Subarea 2 Operational Conditions and Roadway Recommendations .....	42

## List of Tables

	<u>Page</u>
Table 1.	TransPort Colorado Build-Out Trip Generation Estimates ..... 14
Table 2.	Year 2040 Trip Generation Estimates..... 23
Table 3.	Subarea 1 Land Area..... 27
Table 4.	Subarea 1 Trip Generation Estimates..... 30
Table 5.	Subarea 1 Improvement Recommendations ..... 34
Table 6.	Subarea 2 Land Area..... 35
Table 7.	Subarea 2 Trip Generation Estimates..... 38
Table 8.	Subarea 2 Improvement Recommendations ..... 43

## I. INTRODUCTION

TransPort Colorado is planning to develop a master-planned business environment of approximately 5,378 acres in the city of Aurora, Colorado. The project is known as TransPort Colorado and will be developed with industrial, data center, warehousing, and commercial land uses with several parcels having a rail-service component. The project will have access to national highway and rail transportation corridors, and to national and international air infrastructure. **Figure I** provides a vicinity map of the project location.

The project is located adjacent to the Colorado Air and Space Port (Space Port), formerly known as Front Range Airport, and it is also within close proximity of Denver International Airport (DEN). The project will have access to I-70, a major east-west interstate highway system, via existing and planned interchanges. I-25 is located approximately 23 miles to the west of the project site and is the primary interstate access route between New Mexico and Montana. Complementing these two vital interstate highway links is the alignment of the Union Pacific Railroad (UPRR) tracks along the north side of United States (US) 36. One of TransPort Colorado's economic benefits will be its rail access for rail-served properties and transload facilities.

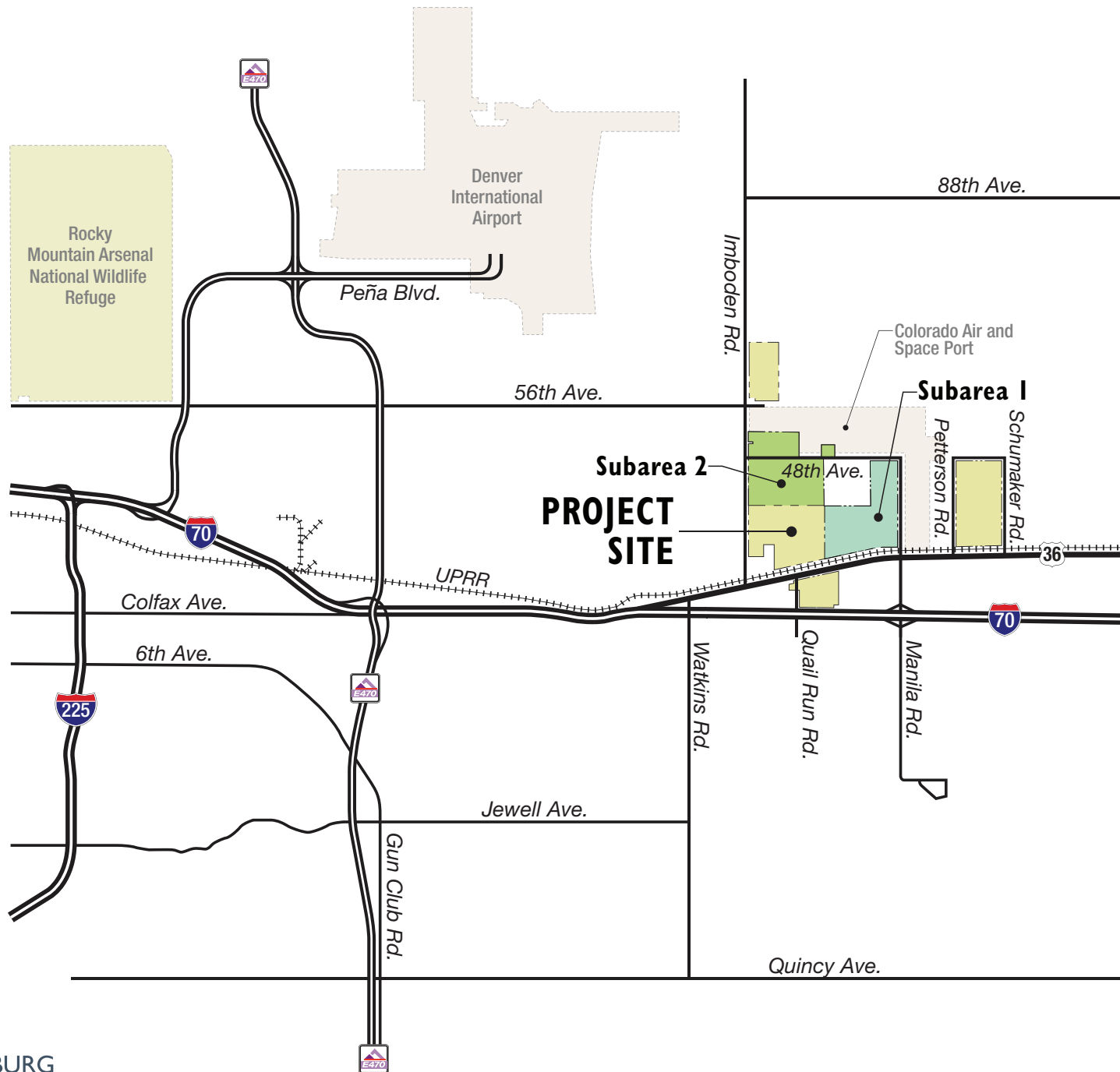
The majority of the project is bounded by US 36, the UPRR, and I-70 along its south edge, by 48<sup>th</sup> Avenue to the north, by Imboden Road on the west, and by Manila Road to the east. Two additional properties are included in the development, the largest of which is located east of the Space Port north-south runaway. This parcel consists of approximately 1,100 acres and is bounded by US 36 on the south, 48<sup>th</sup> Avenue to the north, and between Petterson and Schumaker Roads. The second parcel is about 300 acres and is adjacent to Imboden Road between 56<sup>th</sup> and 64<sup>th</sup> Avenues.

This Traffic Impact Analysis (TIA) provides an assessment of the traffic impacts related to the development of TransPort Colorado. Specific elements of this report are based on correspondence with the City of Aurora in 2018, and this revised TIA includes modifications related to the City's review of the original report. It is coupled with the following subarea evaluations requested by TransPort Colorado:

- Evaluation of existing operational conditions
- Trip generation estimates for the proposed land uses
- Analysis of project impacts
- Consistency with the *Northeast Aurora Transportation Study Refresh (NEATS Refresh)*
- Discussion of large truck influences primarily regarding potential roundabouts
- Discussion on pedestrian trail construction adjacent Bear Gulch
- Recommendations for public improvements

***These analyses are structured in several sections. Project impacts focus first on the build-out of all of TransPort Colorado, followed by an assessment of project impacts for the Year 2040, then for two subarea development scenarios.*** The report is structured in this manner to understand:

- The holistic impacts of TransPort Colorado for its entire build-out; the Build-Out scenario references the *NEATS Refresh* recommended roadway network with the understanding that ultimate build-out of TransPort Colorado will be beyond the *NEATS Refresh* planning horizon
- What improvements may be needed for a 20-year planning horizon (Year 2040)
- The impacts of two subareas to understand these subarea improvement requirements since these two land areas are where development is first expected to occur



**FIGURE I**  
**Vicinity**  
**Map**



## II. EXISTING CONDITIONS

### II.A. Land Use

The area that immediately surrounds the site is largely undeveloped with the exception of the Space Port to the north, the Prairie View housing development along the west side of Imboden Road, and the Galambs Mobile Home community along the south side of US 36. Residential and commercial uses exist in the Towns of Watkins and Bennett, while the Prosper residential and commercial site is developing approximately 3 miles to the west along the south side of I-70.

### II.B. Roadway System

The TransPort Colorado site will occupy over 8 square miles of land to the east of the Denver metropolitan area. Several existing roadways are spaced along 1-mile land sections, although most of these roads currently have very little traffic and are somewhat discontinuous. One interstate highway and one United States highway border the project site or are near its southern boundary. **Figure 2** provides a representation of the surrounding roadway network, its laneage, and its speed limit characteristics. Following are more detailed descriptions of the primary roadways adjacent and near the project site.

#### Interstate 70 (I-70)

I-70 is a major interstate route that bisects the State of Colorado at its approximate north/south midpoint. Not only is this route the primary east/west corridor for interstate travel in Colorado, but this route provides access to numerous states outside Colorado, from Utah to Maryland. I-70 has four travel lanes for vehicle movements and is posted with a speed limit of 75 miles per hour (MPH).

There are two interchanges with I-70 near the project site. The Manila Road interchange is near the midpoint of TransPort Colorado and is proposed to be one of the primary interstate access routes for the TransPort Colorado land uses. Four miles to the west of the Manila Road interchange is the Watkins Road interchange. This interchange can provide access for TransPort Colorado during the earlier stages of development.





#### United States 36 (US 36)

The southern boundary of the project lies along approximately 4 miles of UPRR trackage that is directly adjacent to the north side of US 36. The UPRR and US 36 parallel each other along the entire length of TransPort Colorado's southern boundary. The centerline-to-centerline distance between these two facilities is approximately 100 feet. US 36 is two lanes wide, and it has a posted speed limit of 55 MPH. Several section line roadways intersect US 36, and each intersecting roadway is controlled by stop signs at US 36. The Colorado Department of Transportation (CDOT) classifies US 36 as a Rural Highway (R-B) in this area.

#### Imboden, Quail Run, Cavanaugh, Manila, Petterson, and Schumaker Roads

Each of these roadways exists at 1-mile intervals adjacent, within, or near TransPort Colorado, with each having a north/south orientation. Only Imboden and Petterson Roads are continuous for any significant distance adjacent to TransPort Colorado, however. Both of these roadways extend from US 36 to the north past the TransPort Colorado boundary. Quail Run Road extends from US 36 to the south of I-70 and is grade-separated via an underpass with I-70.

# LEGEND

-  = Number of Through Lanes
-  = Paved Roadway
-  = Gravel Roadway
-  = Posted Speed Limit



Cavanaugh Road is a dead-end street that extends from US 36 southward but does not cross I-70. Manila Road parallels part of the Space Port boundary and continues toward the south, past US 36 and I-70 into Arapahoe County.

Schumaker Road is a dead-end street that extends from US 36 southward but does not cross I-70. It does not exist immediately north of US 36 but is adjacent to the east boundary of TransPort Colorado, extending northward from 38<sup>th</sup> Avenue, midway through the property, and beyond the TransPort Colorado boundary to the north. Only Imboden and Manila Roads provide access to the main entryway for the Space Port, and they have posted speeds of 45 MPH.

Quail Run, Cavanaugh, Petterson, and Schumaker Roads have roadway sections that are not paved. At-grade crossings of the UPRR exist only at Imboden, Manila, and Petterson Roads.

### **48<sup>th</sup> and 56<sup>th</sup> Avenues**

48<sup>th</sup> and 56<sup>th</sup> Avenues have an east/west orientation and are separated by a 1-mile distance. 48<sup>th</sup> Avenue is paved between Imboden and Manila Roads. Most of 48<sup>th</sup> Avenue in the vicinity of the project is two lanes wide; however, to the west of Imboden Road, it is an unimproved one-lane roadway that provides access only to a private residence.

56<sup>th</sup> Avenue is a two-lane roadway that extends westward from Imboden Road towards the City and County of Denver, while to the east of Imboden Road, it exists for only an approximate 1-mile distance along the northern boundary of the Space Port. 56<sup>th</sup> Avenue is two lanes wide and its alignment to the east of Imboden Road is gravel.

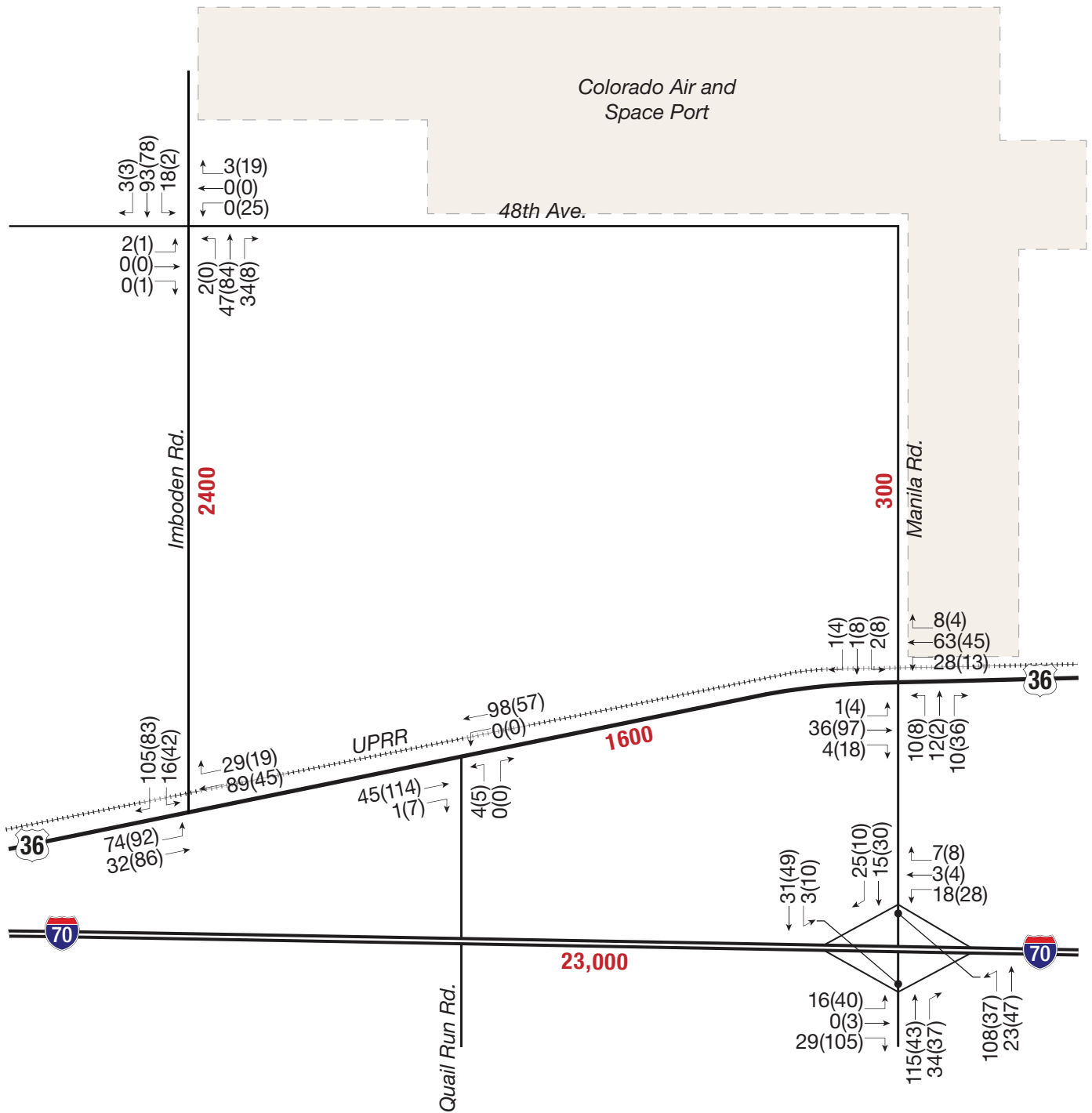
## **II.C. Rail Facility**

The UPRR parallels the southern boundary of TransPort Colorado. The UPRR trackage extends from the Denver metropolitan area to the east into Kansas and points beyond. There is only one track within the railroad right-of-way, and approximately three trains use this track each day.

## **II.D. Traffic Volumes**

Existing traffic volumes were recorded at six intersections adjacent to TransPort Colorado in September 2018, including the two interchange ramp terminals with I-70 at Manila Road. These movements were recorded during the AM and PM peak hours, the typical time periods when vehicle activity is greatest. As shown on **Figure 3**, vehicle movements along the adjacent roadways and at the interchange ramp terminals are relatively low when compared to traffic volume levels in other parts of the Denver metropolitan area. All left, through, and right turn movements are less than 125 vehicles per hour (vph), with only a few movements greater than 100 vph.

Daily traffic volumes were also recorded. These measurements include the level of vehicle activity on a roadway for a 24-hour period. Referring to **Figure 3**, it can be seen that daily traffic volume levels along Imboden Road are about 2,400 vehicles per day (vpd), while along Manila Road, the level is only about 300 vpd. US 36 traffic volumes are about 1,600 vpd, and traffic volume along I-70 is 23,000 vpd adjacent to the site. Daily traffic volumes along I-70 and US 36 were acquired from CDOT's Online Transportation Information System (OTIS). **Appendix A** includes the recorded traffic volume data.



#### LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

XXXX = Daily Traffic Volumes

## II.E. Traffic Control

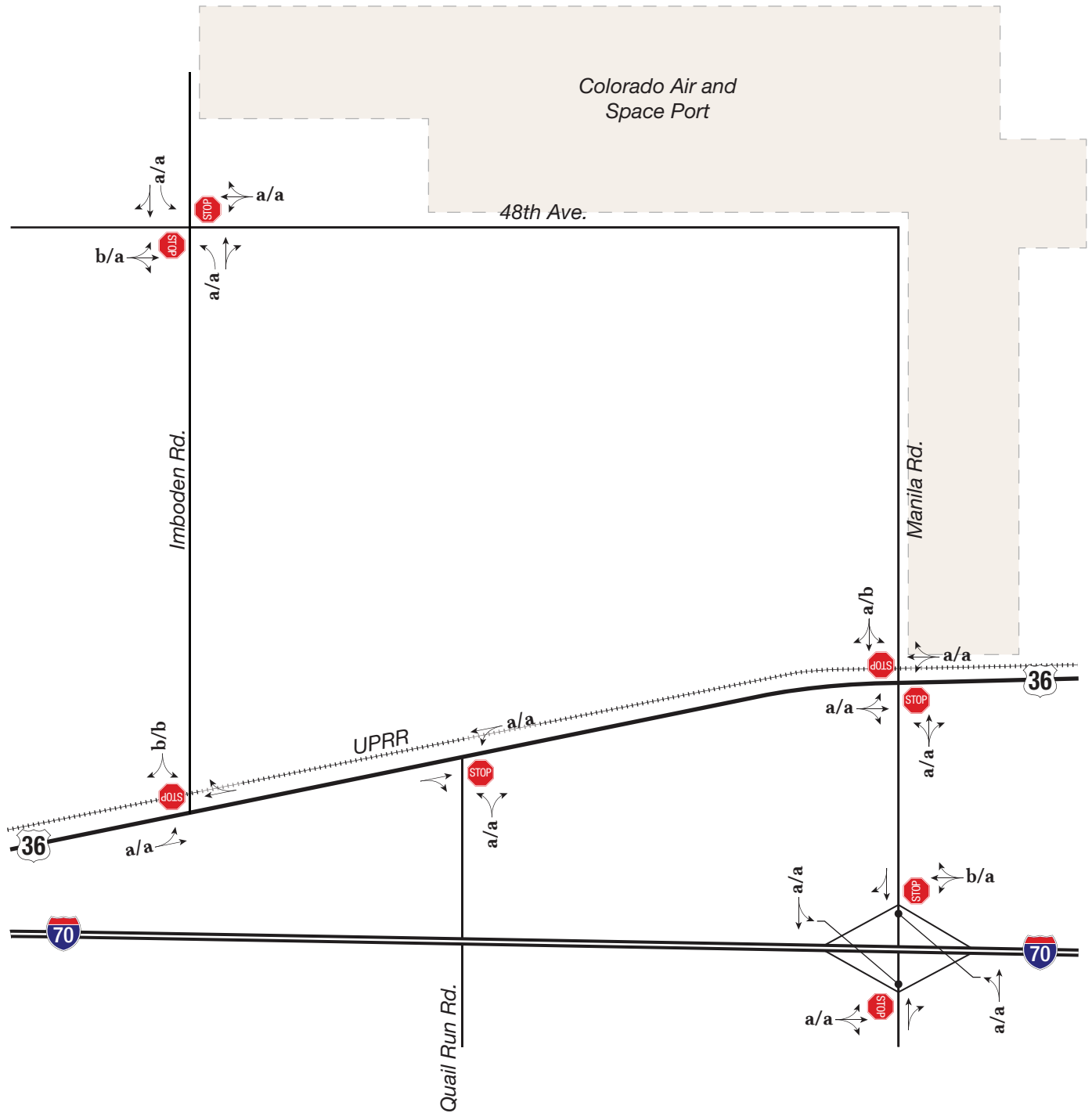
Control of vehicle movements at intersections surrounding TransPort Colorado is carried out via stop signs. All stop signs are used on the “minor” street intersection or ramp terminal approaches where vehicle right-of-way assignment is necessary.

## II.F. Traffic Operations



Traffic operations within the study area were evaluated according to techniques documented in the *Highway Capacity Manual*, 6<sup>th</sup> Edition (Transportation Research Board, 2016) using the existing traffic volumes, intersection geometry, and traffic control. Level of Service (LOS) is a qualitative measure of traffic operational conditions based on roadway capacity and vehicle delay. LOS is described by a letter designation ranging from A to F, with LOS A representing almost free-flow travel, while LOS F represents congested conditions.

For stop-controlled intersections, LOS is calculated for each vehicle movement that must yield the right-of-way to an oncoming or crossing vehicle. In urbanized areas, LOS D is typically considered to be acceptable for peak hour traffic operations and is the standard set in the City of Aurora Traffic Impact Study guidelines.

**Figure 4** shows the existing traffic control, intersection geometry, and results of the LOS analyses. **Appendix B** includes the LOS criteria, and **Appendix C** includes the analysis worksheets. All intersections currently operate within acceptable parameters, at LOS B or better, during peak hours.



#### LEGEND

- X/X** = AM/PM Peak Hour Signalized Intersection Level of Service
- x/x** = AM/PM Peak Hour Unsignalized Intersection Level of Service
-  = Stop Sign
-  = Traffic Signal

### III. BACKGROUND CONDITIONS

#### III.A. Roadway Network Plan

The *Northeast Area Transportation Study Refresh (NEATS Refresh)* was recently updated for the City of Aurora (project completion in October 2018). This publication summarized the build-out transportation recommendations for the *NEATS Refresh* planning area for the roadway, transit and trail systems. The boundary for this study effort was approximately between Picadilly Road on the west, Schumaker Road on the east, Jewell Avenue and I-70 on the south, and 72<sup>nd</sup> Avenue on the north.

Besides an assessment of roadway improvement needs, future transit hubs were identified at two locations and a trail element was identified within the TransPort Colorado study area. These improvements are graphically depicted on **Figure 5** and they can be summarized as:

##### Freeway Access

- New interchanges constructed at the Quail Run and Schumaker Road alignments along I-70

##### Minor Arterials

- Quail Run Road south of 48<sup>th</sup> Avenue
- Schumaker Road

##### Potential UPRR Grade-Separated Crossings

- Quail Run Road
- Manila Road
- Schumaker Road

##### Trail Amenity

- Bear Gulch Trail

##### Major Arterials

- Imboden Road/Quail Run Road alignment
- Manila Road
- 48<sup>th</sup> Avenue
- 56<sup>th</sup> Avenue

##### Collector Streets

- Imboden Road north of US 36

##### Transit Hubs

- Imboden Road/Quail Run Road alignment at US 36
- 48<sup>th</sup> Avenue/Manila Road intersection

It should be noted that the current development plans for TransPort Colorado were not entirely known when *NEATS Refresh* was prepared.

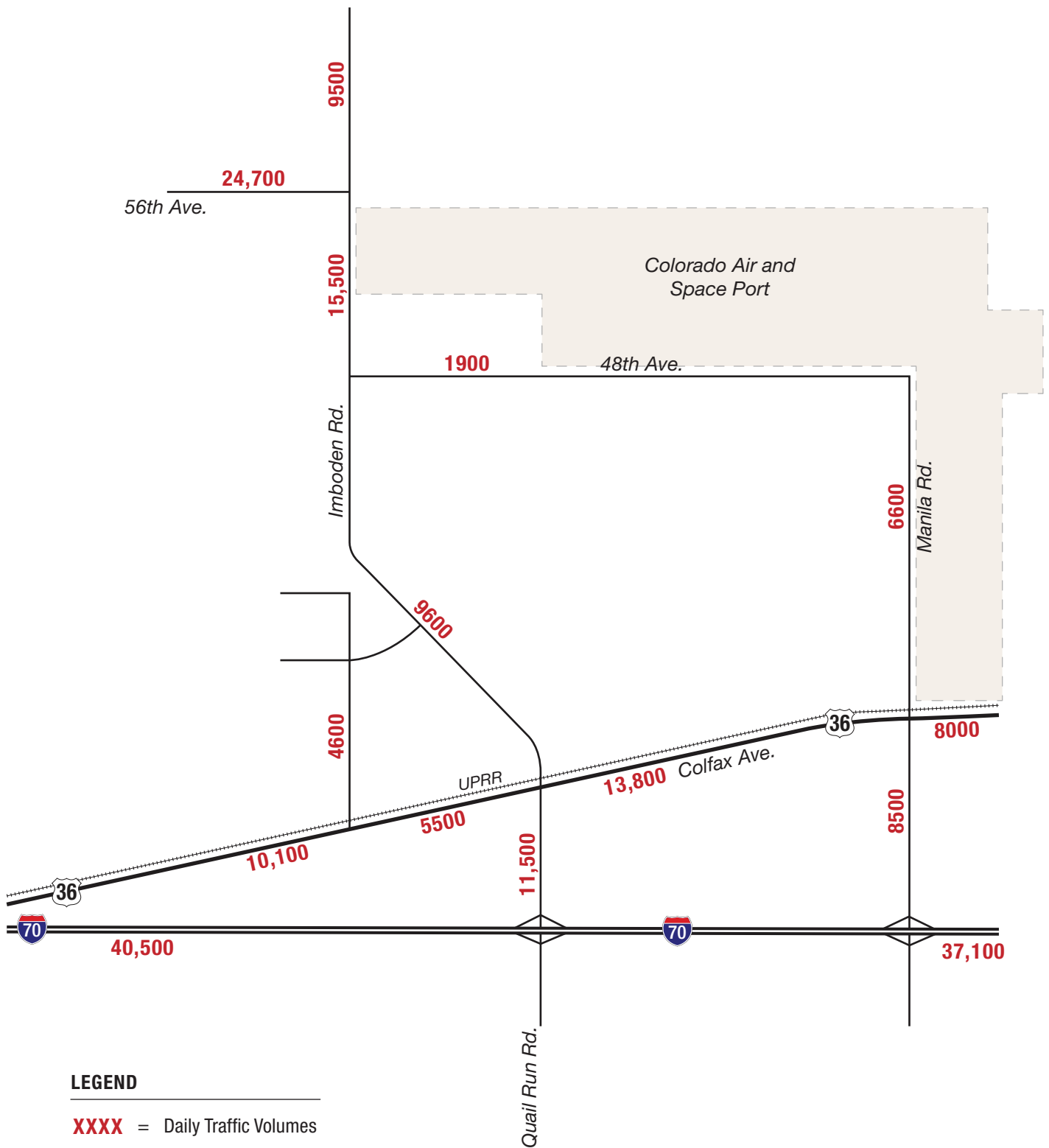
#### III.B. Background Traffic Volumes

Background traffic volume projections started with information contained in *NEATS Refresh*. But to truly understand a Background traffic volume scenario, i.e., one without any TransPort Colorado development, the *NEATS Refresh* travel demand model was adjusted to reflect zero land use in the Traffic Analysis Zones that encompass the TransPort Colorado study area. As such, the traffic volumes represented on **Figure 6** contain projected background traffic volumes for the build-out of the *NEATS Refresh* area without the development of TransPort Colorado. **Appendix D** provides a representation of the *NEATS Refresh* raw travel demand model information with TransPort Colorado land uses.

The *NEATS Refresh* travel demand model is considered a more accurate model for this area of Aurora since it has been modified with additional land use information given current and planned development proposals. The Denver Regional Council of Governments (DRCOG) model is not considered as accurate for these reasons. As such, the traffic volume projections of **Figure 6** contain higher traffic volume levels than what the DRCOG model predicts for the surrounding roadway network. It is understood, however, that future analysis of TransPort Colorado that involves CDOT approvals will need to use the DRCOG model for background traffic projections.







## IV. TRANSPORT COLORADO BUILD-OUT CONDITIONS

This section summarizes the daily traffic volume projections and TransPort Colorado Build-Out roadway network requirements which is projected to be beyond the Year 2040. **Section V summarizes development information, daily traffic volume projections, and improvement recommendations for Year 2040.**

The information in this section uses Build-Out daily traffic volume projections to reflect the roadway typical section needs so that future improvements can be planned accordingly. As noted previously, Subareas 1 and 2 are described and evaluated in subsequent sections and they evaluate roadway improvement needs at a more finite level for those land areas. The TransPort Colorado Build-Out analyses concentrate on a more holistic understanding of the hierarchy of the roadway network and anticipated roadway laneage.

### IV.A. TransPort Colorado Land Uses

TransPort Colorado is planned for several land uses that require a relatively large number of acres for material storage and industrial uses, while other uses rely on large buildings that may not have a large employee component. Heavy industrial, data center, and warehouse uses are located directly adjacent to the Space Port. These uses are coupled with a commercial component that is situated between I-70 and US 36, and between Quail Run and Cavanaugh Roads, with over 500 acres of mixed-use retail, service, hotel and residential uses.

In summary, the land use division of project acreage once undevelopable land such as right-of-way requirements, power line easements, drainage areas, open space, etc., is removed can be summarized as:

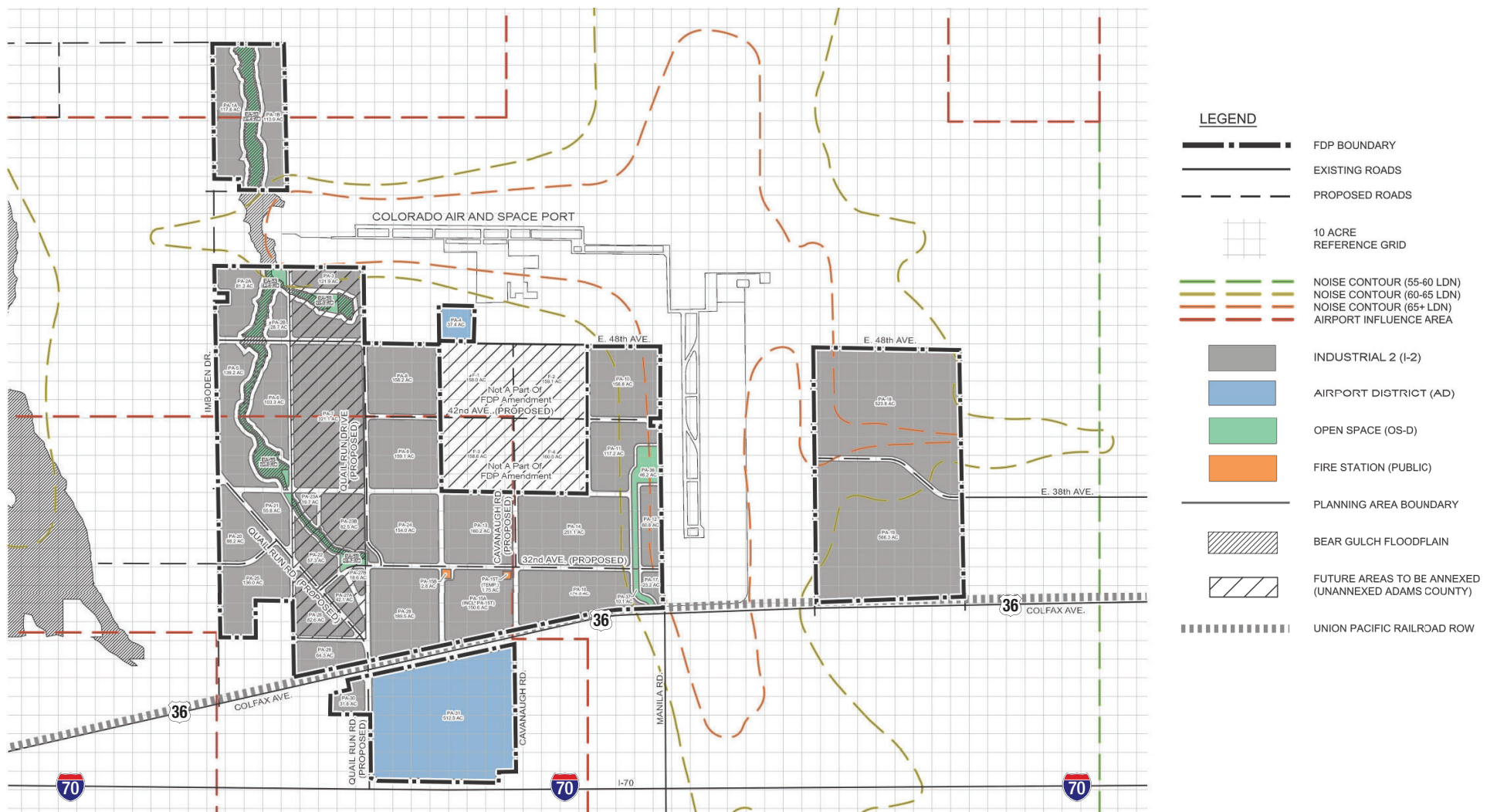
▪ Industrial =	2,484 acres ±
▪ Data Center =	562 acres ±
▪ Warehousing =	1,385 acres ±
▪ Mixed-Use Commercial =	<u>532 acres ±</u>
<b>TOTAL =</b>	<b>4,963 acres ±</b>

**Figure 7** represents the proposed site plan for TransPort Colorado. As shown on **Figure 7**, several of the industrial uses form a somewhat inverted “L” shape around non-affiliated parcels directly south of the Space Port. Some of these industrial parcels will be served by rail for bulk inbound deliveries of goods and materials. It is understood that deliveries of these bulk materials, sometimes after processing into other goods for sale, will be delivered to the Denver metropolitan area and beyond by over-the-road vehicles. Subareas 4 and 6 are also slated for industrial uses but will not be served by rail.

The data center and warehousing land areas are identified as Mixed Commercial, their current zoning. They straddle Bear Gulch and are adjacent to Imboden Road and/or 48<sup>th</sup> Avenue. These uses are expected to include large buildings for the purposes of product storage (warehousing) and for the processing of electronic data (data center). Both uses are not projected to have the same number of employees as is typically expected for a land use with the same size building, but they are projected to have a square foot (sf) to employee ratio that is less.

Subarea 5 is located in the southern portion of TransPort Colorado between I-70 and US 36, and it is planned that these parcels will have a variety of retail services that can support not only patrons of TransPort Colorado but those of the surrounding communities and for travelers along I-70.

Restaurants, gas stations, banks, tire shops, along with hotels and office components, will serve this burgeoning area of the City of Aurora as it develops over time.



#### IV.B. TransPort Colorado Build-Out Trip Generation Estimates

**Table I** includes the trip generation estimates for the Build-Out of the TransPort Colorado development. These estimates are based on reasonable floor-area-ratios for the individual land uses and on trip generation categories discussed with City of Aurora staff during the preparation of this study. While **Table I** summarizes the trip generation potential for the four land use categories, **Appendix E** includes a more detailed breakdown of trip generation information for each individual TransPort Colorado land parcel.

Trip generation estimates for the Build-Out of TransPort Colorado are based on average weekday data contained in *Trip Generation*, 10<sup>th</sup> Edition, by the Institute of Transportation Engineers (ITE), 2017. Trip generation data is based on the potential for over 38 million square feet of development to occur.

Through correspondence with the City of Aurora, the Light Industrial land use category was used for the trip generation estimates for all industrial sites since certain parcels that may be classified as Heavy Industrial lack sufficient trip generation data.

Additionally, due to the currently unknown mix of office, hotel, and retail uses in planning areas designated for mixed-use development (Subarea 5), land uses that could change over time, the trip generation potential for the mixed-use land areas are based on the ITE Shopping Center category for the purposes of this report. The Shopping Center trip generation category includes a higher retail focus which may result in trip estimates that may be conservative. As such, the trip generation data contained in **Table I** likely reflects a worst-case scenario of the trip generation potential of TransPort Colorado.

**Table I. TransPort Colorado Build-Out Trip Generation Estimates**

Trip Generation Category	Acres (±)	Building Square Footage (ksf) <sup>1</sup>	Daily Vehicle-Trips	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
Industrial <sup>2</sup>	2,484	16,024	61,205	3,039	414	3,453	324	2,173	2,497
Data Center	562	10,440	4,361	5,765	1,475	7,240	1,665	5,183	6,848
Warehousing	1,385	4,405	17,450	287	235	522	130	304	434
Mixed-Use	532	6,954	118,655	2,343	1,437	3,780	6,481	7,021	13,502
<b>Subtotal =</b>			<b>201,671</b>	<b>11,434</b>	<b>3,561</b>	<b>14,995</b>	<b>8,600</b>	<b>14,680</b>	<b>23,281</b>
Mixed Use Internal Capture Reductions <sup>3</sup>			-42,715	-680	-680	-1,360	-2,430	-2,430	-4,860
Mixed Use Pass-By Reductions <sup>4</sup>			-5,933	-95	-95	-190	-338	-338	-676
<b>NET EXTERNAL TRIP GENERATION =</b>			<b>153,059</b>	<b>10,659</b>	<b>2,786</b>	<b>13,445</b>	<b>5,832</b>	<b>11,912</b>	<b>17,745</b>

<sup>1</sup> Building square footage amounts represent the maximum allowable development.

<sup>2</sup> Per the City of Aurora, the Light Industrial trip generation category was used for all industrial parcels.

<sup>3</sup> Internal Capture reductions were estimated based on mixed-use sites in Planning Areas 30 and 31 at a rate of 36 percent, the average rate reported for mixed-use sites in NCHRP Report 684.

<sup>4</sup> Pass-by trip reductions are at a rate of 5 percent.

### ***Trip Generation Estimates Discussion***

**Internal Capture** – Internal capture was estimated within the planning areas designated for mixed-use development at a rate of 36 percent, the average percentage reported by the National Cooperative Highway Research Program Report 684. This internal capture rate resulted in the reduction of almost 43,000 daily trips.

Due to both the large size and relative isolation of the TransPort Colorado development, it is estimated that there will be additional interactions that take place between the industrial/warehousing/data center uses and the mixed-use parcels that would result in trips to the adjacent roadway network but not to the regional transportation network (i.e., outside the basic TransPort Colorado boundary). An additional 9 percent of traffic to/from Subarea 5 is projected to interact with the industrial/warehousing/data center planning areas. This percentage is consistent with the interactions seen between the TAZ in the *NEATS Refresh* model that represents Subarea 5 and the other two TAZs that encompass TransPort. This results in 10,679 inbound and outbound trips (total = 21,358 trips) between Subarea 5 and the industrial/warehousing/data center planning areas never leaving the roadway network encompassed by the TransPort Colorado development. As a result of this interaction, while the net new trips to the roadway network is about 153,000, only about 132,000 impact the roadway network beyond the TransPort Colorado site.

**Pass-By Trips** – Not all vehicle-trips generated by the 38 million square feet of development will be new. Some trips will have a direct relationship with motorists that are traveling along I-70, ones that will take advantage of the land use mix in Subarea 5. While ITE pass-by percentages can be upwards of 50 percent for some uses, a reduction of only 5 percent was used for Subarea 5 due to the lack of solidified plans for the mixed-use sites that have direct frontage along I-70. As noted in **Table I**, there are projected to be nearly 6,000 pass-by trips that will use the development that are not new to the external roadway network but that will divert their trip to/from Subarea 5.

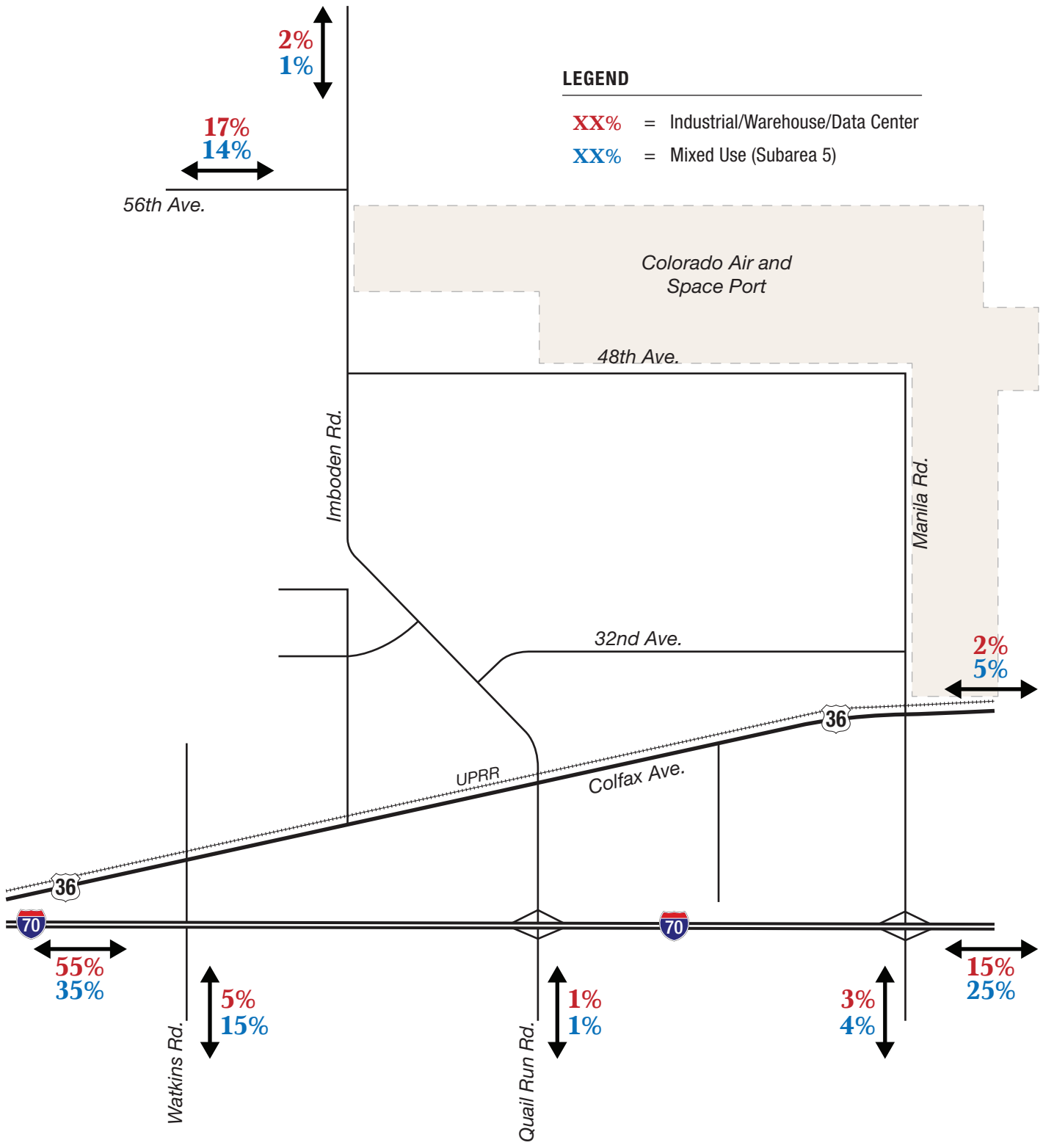
### **IV.C. Trip Assignment**

Estimates of vehicle routing to/from TransPort Colorado were developed based on information contained in the travel demand model for *NEATS Refresh* as well as on engineering judgment. The industrial, data center and warehousing land uses are projected to have a strong orientation to/from the west along I-70 since the population density of the Denver metropolitan area is in this direction.

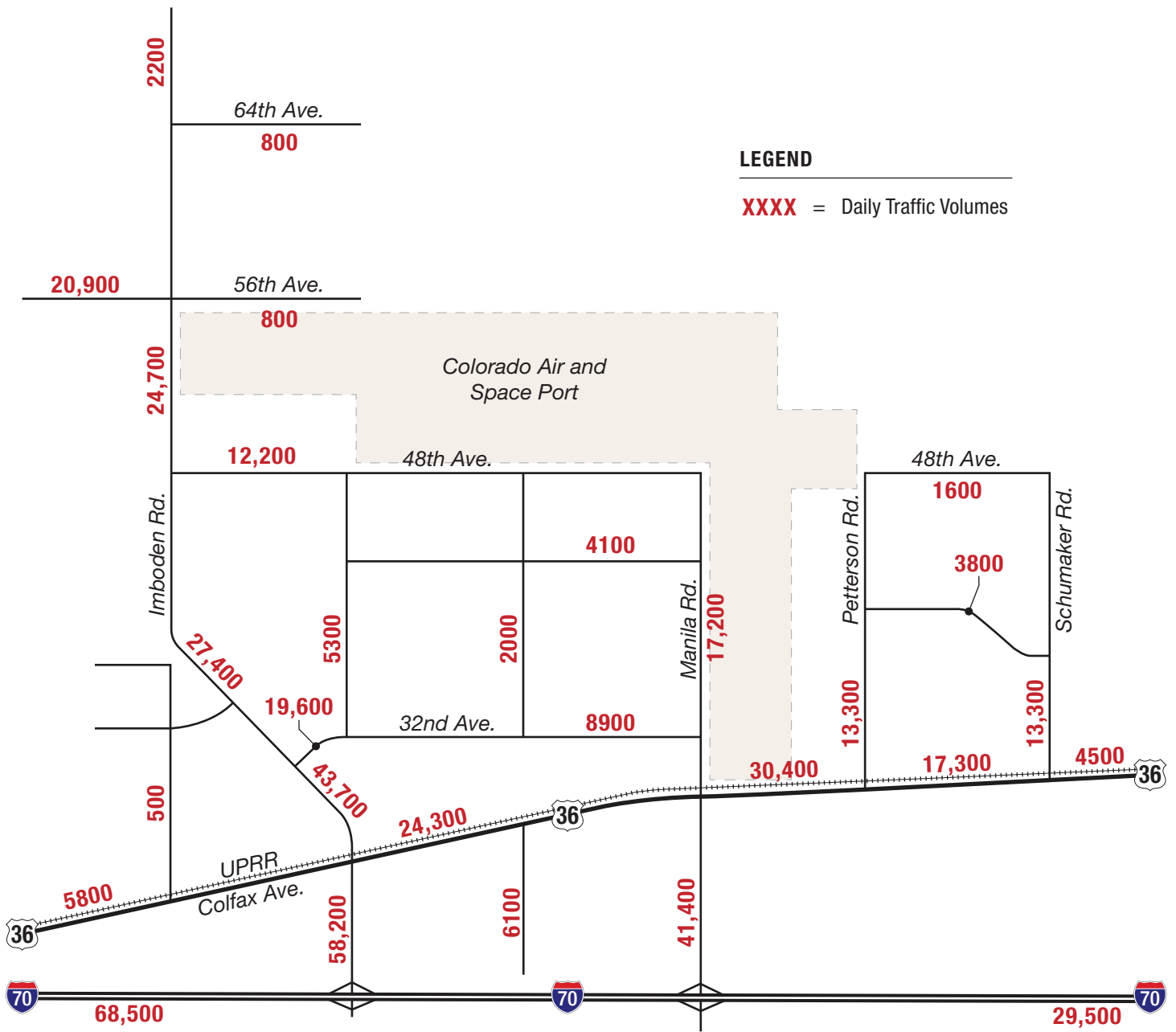
The mixed-use properties in Subarea 5 are expected to have a somewhat different trip assignment since these land uses will serve not only TransPort Colorado and motorists along I-70, but the Towns of Watkins and Bennett and nearby developments that are currently being planned or are under construction. A higher distribution of vehicle-trips is oriented to/from the east as a result since Denver metropolitan area residents have other mixed-use options to the west.

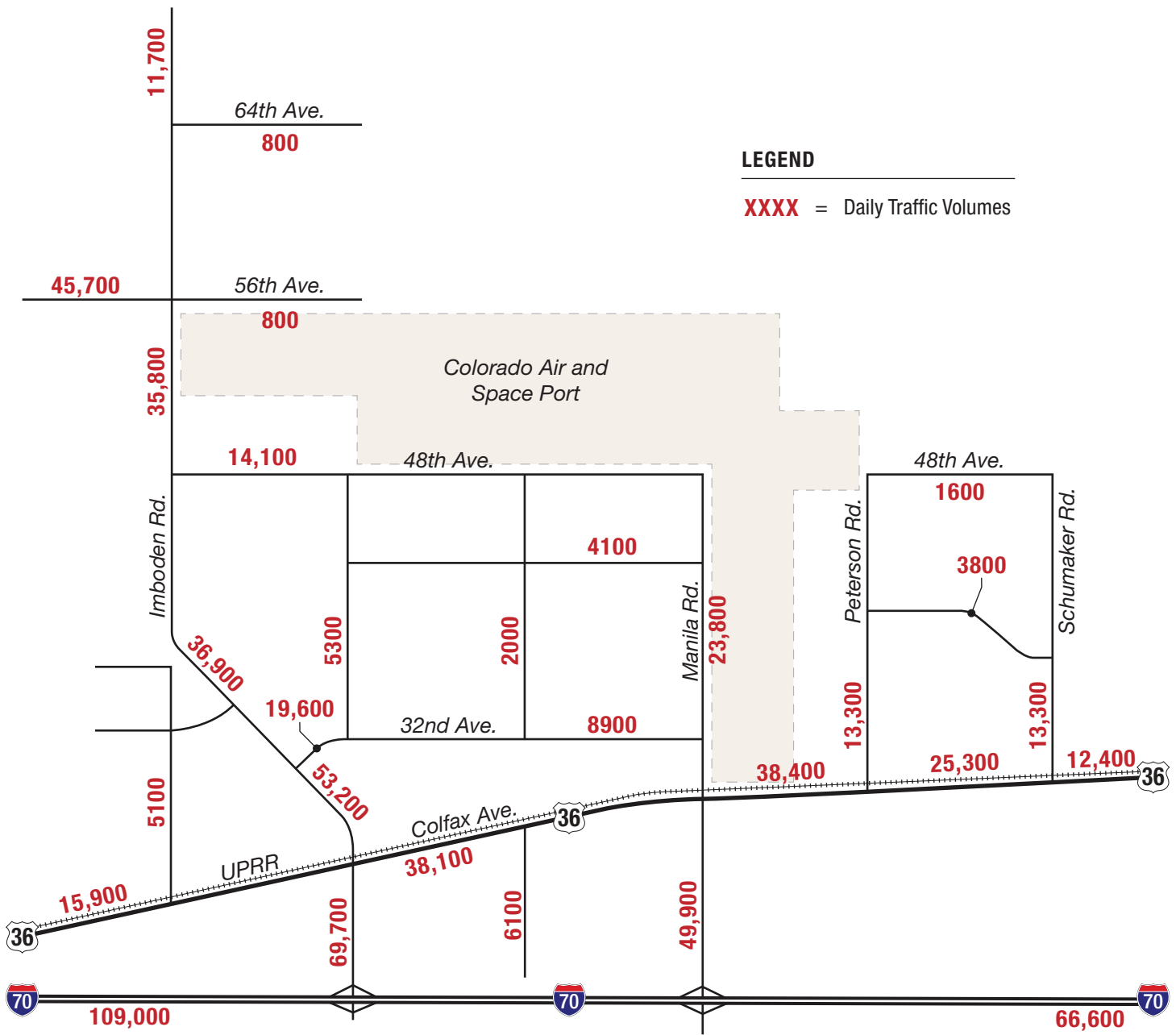
**Figure 8** provides a summary of the trip distribution estimates, while **Figure 9** illustrates the projected site generated daily traffic volumes for the TransPort Colorado Build-Out scenario. **Figure 10** is the combination of Background traffic projections (**Figure 6**) and the TransPort Colorado site generated traffic volumes.

As indicated on these figures, at Build-Out of the site, TransPort Colorado will contribute a significant amount of the projected total traffic volumes on the surrounding roadway network by the time it is completed. At Build-Out, traffic volumes along the major roadway segments, particularly near I-70, will exceed 44,000 vpd along Manila Road and will be about 67,000 vpd on Quail Run Road. Traffic volumes will gradually decrease toward the north along Imboden Road and eastward along US 36. Given the industrial and data center/warehousing characteristics of the site, several internal roadways are projected to be under 10,000 vpd.









#### IV.D. Recommended Roadway Laneage

The TransPort Colorado Build-Out roadway laneage assessed in this report is based on the average daily traffic volume projections. This analysis considers the Build-Out of TransPort Colorado in which all planning areas develop to their maximum potential.

Laneage recommendations are shown on **Figure 11**. Several laneage requirements are more robust than outlined in *NEATS Refresh* as a result of the higher trip generation potential of the TransPort Colorado site than what was included in the *NEATS Refresh* travel demand model. These laneage revisions include an eight-lane cross-section for Quail Run Road between I-70 and US 36 (6 through lanes with continuous acceleration/deceleration lanes), a six-lane cross-section for Imboden Road from 56<sup>th</sup> Avenue along its realignment to Quail Run Road at US 36, and a four-lane cross-section along US 36 from TransPort Colorado's eastern boundary at Schumaker Road to the west toward Watkins.

Manila Road between US 36 and I-70 can be planned as a 4-lane roadway. While projected traffic volumes imply that this segment of Manila Road may require six lanes by Build-Out of TransPort Colorado, it does not consider the influence that a new interchange on I-70 at the Schumaker Road alignment will have, one that will allow more direct access for Subarea 6 vehicle movements that will provide congestion relief along Manila Road.

#### IV.E. Large Truck Influence at Roundabouts

There is the potential that roundabouts can be considered for varying intersections within or adjacent to the TransPort Colorado development area. Given the level of industrial and warehousing land uses, a higher percentage of large (semi) trucks are anticipated to use the TransPort Colorado roadway network. Large trucks can benefit by the installation of roundabouts due to a lessening of start/stop movements and the freer flow of vehicles through a roundabout. As such, roundabouts are viable options in the proper locations.

To succeed, roundabouts will need to be designed correctly for the influence of large vehicles. They may need to be larger than roundabouts at other locations and they potentially will include truck aprons. Analyses of approach geometry, the inside and outside roundabout diameters, circulating movements through the roundabouts, and fastest-path evaluations are all important design issues that will need to be considered if roundabouts are a desired intersection traffic control option.







#### IV.F. Bear Gulch Trail Connectivity

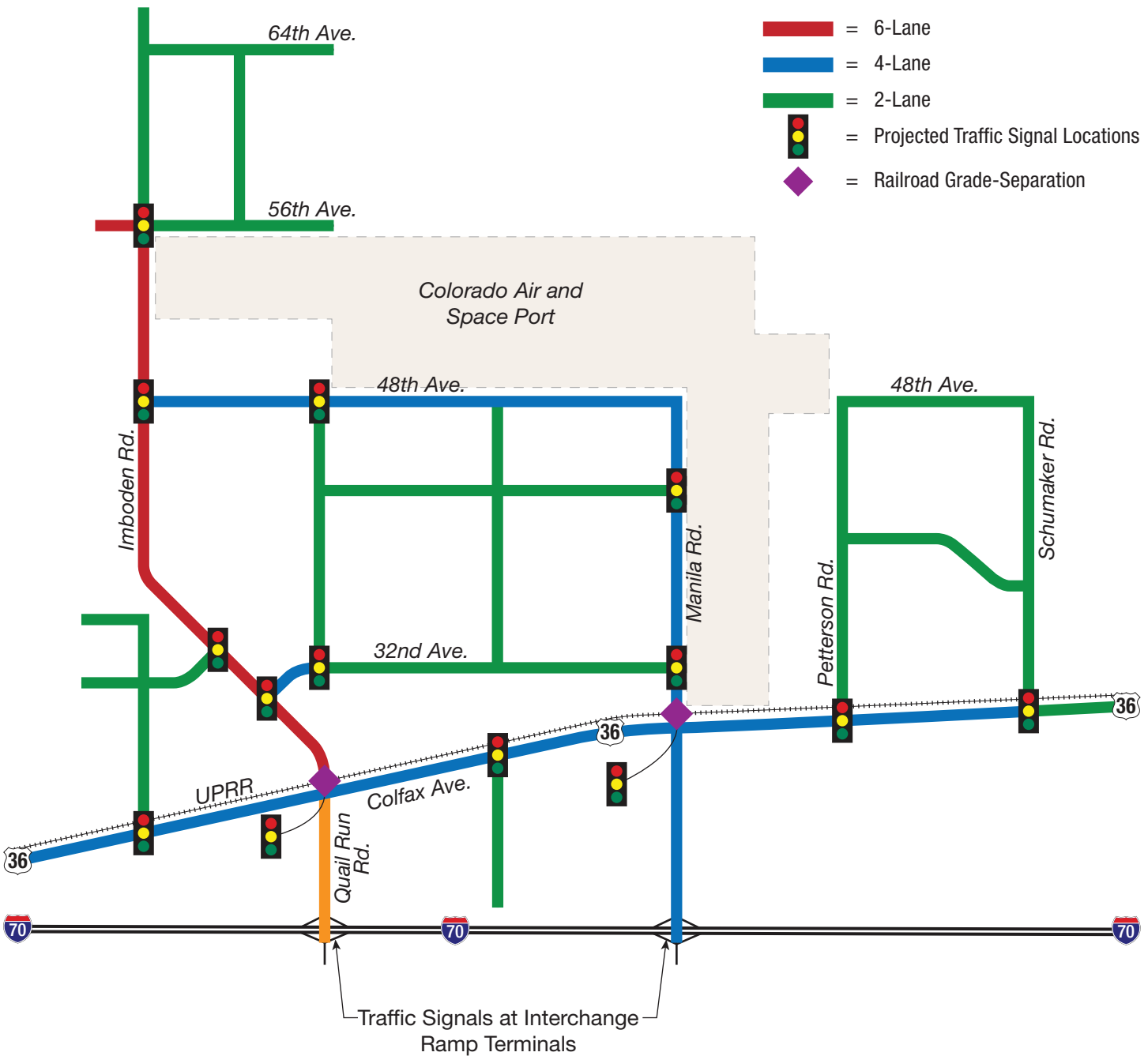
Bear Gulch extends through the western portion of TransPort Colorado between Imboden and Quail Run Roads. TransPort Colorado will construct the Bear Gulch Trail through its land area with input from the City of Aurora and will rely on information contained in *NEATS Refresh* as a starting point. Coordination with City staff will occur at the proper time to formalize the trail alignment and its connectivity outside the TransPort Colorado land area boundary.

#### IV.G. CDOT Coordination

It will be necessary for TransPort Colorado to coordinate with CDOT related to construction of roadway improvements along US 36 and at I-70 interchanges. The new Quail Run Road interchange and modifications to the existing Manila Road interchange will need to be approved through CDOT's I601 process. Improvements along US 36 will require CDOT approval, and any new access will require a State Highway Access Permit.

LEGEND

-  = 6-Lane with Continuous Accel/Decel Lanes
-  = 6-Lane
-  = 4-Lane
-  = 2-Lane
-  = Projected Traffic Signal Locations
-  = Railroad Grade-Separation



## V. YEAR 2040 CONDITIONS

This section provides information on the level of potential development by the Year 2040, the associated traffic volumes, and roadway infrastructure requirements. As noted previously, the Build-Out of TransPort Colorado is projected to be beyond the Year 2040, but since most planning horizons are based on a future 20-year scenario, an assessment for the Year 2040 has now been included.

### V.A. Year 2040 Background Traffic

Daily traffic volume projections represented on **Figure 12** for the Year 2040 have been developed based on the *NEATS Refresh* Year 2040 daily traffic volumes with zero development in the TransPort Colorado land areas.

### V.B. Year 2040 Land Uses

TransPort Colorado has prepared an economic analysis that provides the best estimates of the levels of development for the Year 2040 timeframe. It is not anticipated that each land use type will develop linearly from zero development to Year 2040 to Build-Out, however. For example, the construction of mixed-use commercial property will lag behind other land uses given its location within TransPort Colorado, the roadway/interchange connections to serve it, and the existence of other land uses to support it. Considering these factors, the development absorption estimates for the 2040 TransPort Colorado land uses are:

▪ Industrial =	1,316 acres ±
▪ Data Center =	412 acres ±
▪ Warehousing =	264 acres ±
▪ Mixed-Use Commercial =	<u>26 acres ±</u>
<b>TOTAL =</b>	<b>2,018 acres ±</b>

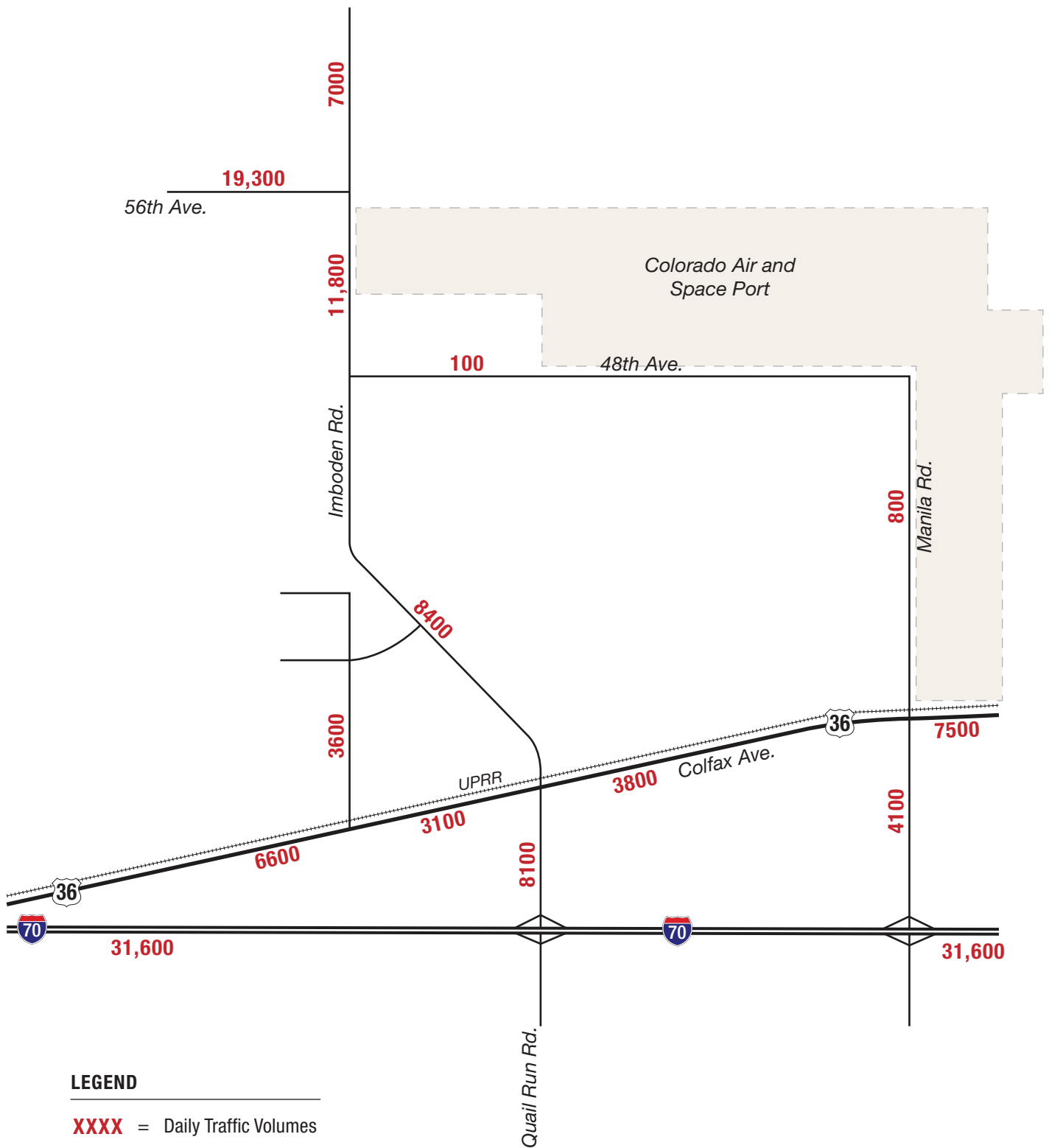
This level of development represents about 41 percent of the total TransPort Colorado size.

### V.C. Year 2040 Trip Generation Estimates & Assignment

Trip generation estimates of traffic volumes have been developed using the same parameters and trip characteristics as note in **Section IV. Table 2** on page 23 and **Figure 13** represent the trip generation estimates and assignment of vehicle trips, respectively.

### V.D. Year 2040 Total Daily Traffic Volumes

The site generated traffic volumes of **Figure 13** were added to the estimated Year 2040 Background traffic volumes, which were developed similarly to how the background traffic volumes were estimated for the Build-Out timeframe. **Figure 14** is the combination of the site generated and background traffic volumes for the Year 2040.



**Table 2. Year 2040 Trip Generation Estimates**

Trip Generation Category	Acres (±)	Building Square Footage (ksf)	Daily Vehicle-Trips	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
Industrial <sup>1</sup>	1,316	8,232	31,904	1,837	251	2,088	202	1,351	1,553
Data Center	412	2,070	3,681	2,088	624	2,712	738	1,996	2,735
Warehousing	264	2,070	2,050	120	98	218	53	124	177
Mixed-Use	26	341	15,252	294	180	474	696	754	1,449
<b>Subtotal =</b>			<b>52,886</b>	<b>4,339</b>	<b>1,153</b>	<b>5,492</b>	<b>1,689</b>	<b>4,225</b>	<b>5,914</b>
Mixed Use Internal Capture Reductions <sup>2</sup>			-5,220	-85	-85	-170	-261	-261	-522
Mixed Use Pass-By Reductions <sup>3</sup>			-720	-12	-12	-24	-36	-36	-72
<b>NET EXTERNAL TRIP GENERATION =</b>			<b>46,946</b>	<b>4,242</b>	<b>1,056</b>	<b>5,298</b>	<b>1,392</b>	<b>3,928</b>	<b>5,320</b>

<sup>1</sup> Per the City of Aurora, the Light Industrial trip generation category was used for all industrial parcels.  
<sup>2</sup> Internal Capture reductions were estimated based on mixed-use sites in Planning Areas 30 and 31 at a rate of 36 percent, the average rate reported for mixed-use sites in NCHRP Report 684.  
<sup>3</sup> Pass-by was reductions are at a rate of 5 percent for mixed-use.

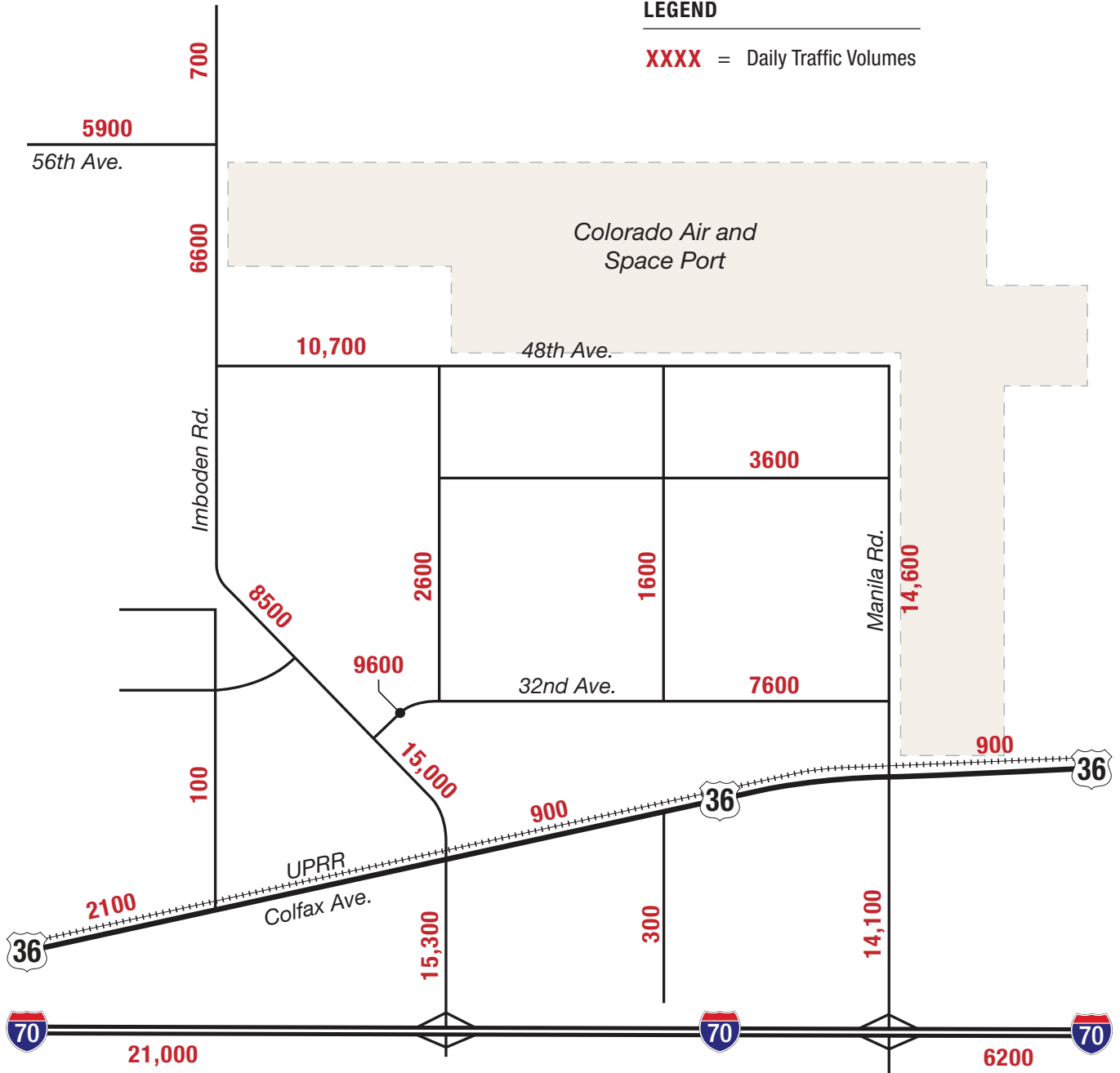
**V.E. Year 2040 Recommended Roadway Laneage**

**Figure 15** provides a graphical representation of the recommended roadway laneage that is projected to be needed by the Year 2040 based on the land use density predictions and on the daily traffic volume estimates of **Figure 14**.

Given the incremental development of TransPort Colorado toward the Build-Out scenario, it can be seen on **Figure 15** that roadway laneage and other infrastructure requirements are a proportional share of what is predicted for the Build-Out timeframe. For example, the Imboden Road/Quail Run Road typical section does not need to be six lanes although it is predicted that the connection to I-70 via a new interchange will be constructed consistent with the recommendations of *NEATS Refresh*.

# LEGEND

XXXX = Daily Traffic Volumes

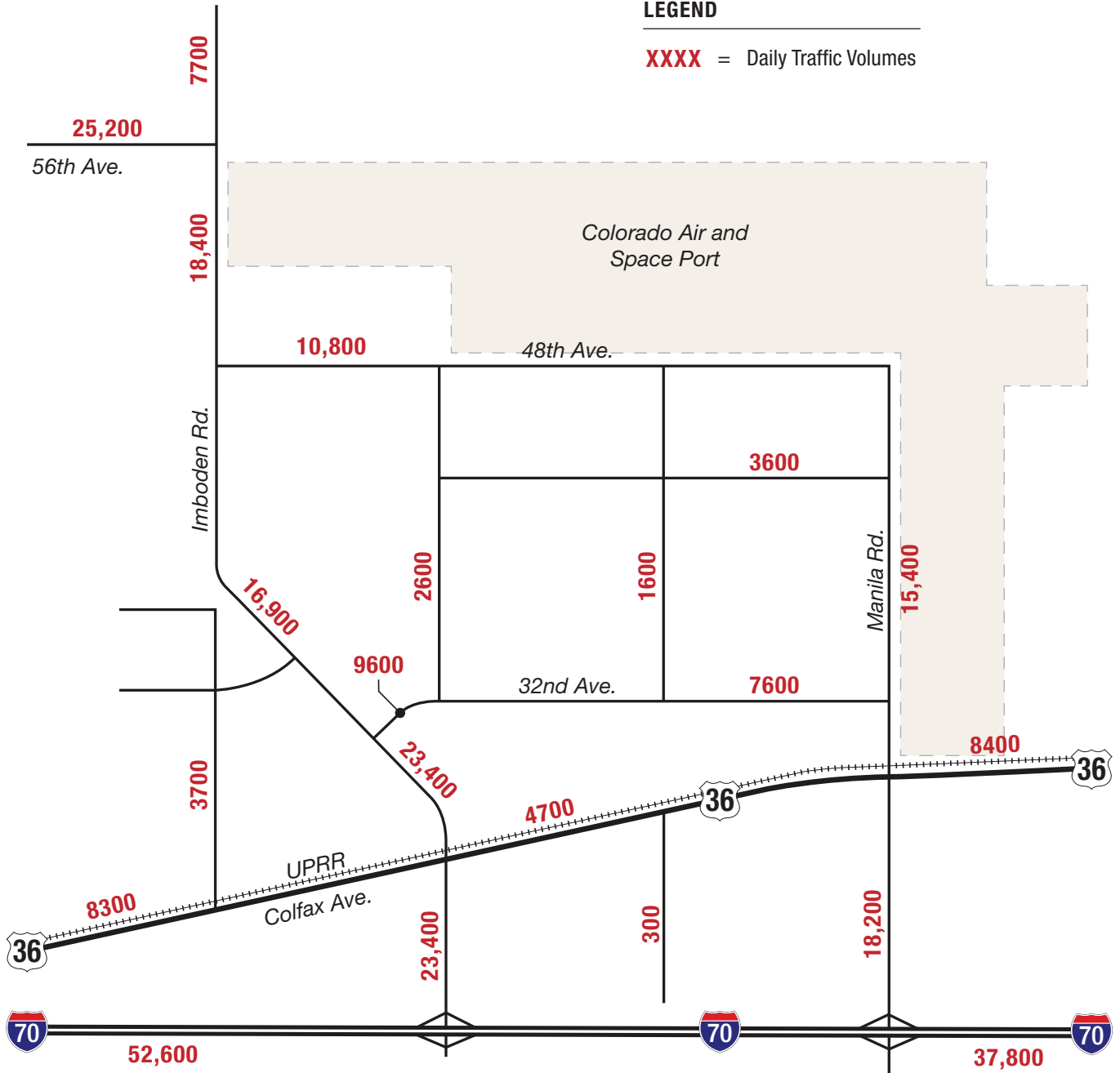


**FIGURE 13**  
**Year 2040 TransPort Colorado**  
**Site Generated Daily Traffic Volumes**



# LEGEND

XXXX = Daily Traffic Volumes





## VI. SUBAREA I

As noted in the Introduction, two subareas of TransPort Colorado have been evaluated for trip generation estimates and roadway requirements. Although it is unknown exactly where the initial land sales will occur, Subareas 1 and 2 are the likely locations. As such, they are included in this report to assist in the development review process with the City. Subareas 1 and 2 have been evaluated as if they are developed separately from one another; therefore, the information contained in this section and the following section (**Section VII, Subarea 2**) contain similar information on the projected development types, along with trip generation projections, traffic operational data, and roadway network and traffic control recommendations.

Background traffic estimates for these subarea scenarios assume a 1.7 percent annual growth rate as determined from data available on CDOT's OTIS at count station 101690, which is located along SH 36 to the east of Imboden Road. Given the relatively low existing traffic levels, these background scenarios do not differ significantly from existing conditions both in volume and in operational results. **Figure 16** and **Figure 21** (in **Section VII**) for Background traffic volume provide estimates for Subareas 1 & 2. These Background estimates include the same traffic volume levels, and they represent a Year 2040 development scenario. Of note, when considering the separate development of these subareas, the construction of the Quail Run Road interchange at I-70 is not required and is, therefore, not represented on these figures.

### VI.A. Subarea I Land Uses

**Figure 17** is a representation of the land area boundary and parcel locations for Subarea I. The land area abuts Manila Road on the east, 48<sup>th</sup> Avenue on the north, US 36 and the UPRR on the south, and on the west, other TransPort Colorado parcels or land areas that are not a part of TransPort Colorado.

Subarea I is projected to take approximately 20 years to develop (approximately Year 2040), and it includes a total of 1,154 acres, but once non-developable land is removed, the summary of acreage is:

**Table 3. Subarea I Land Area**

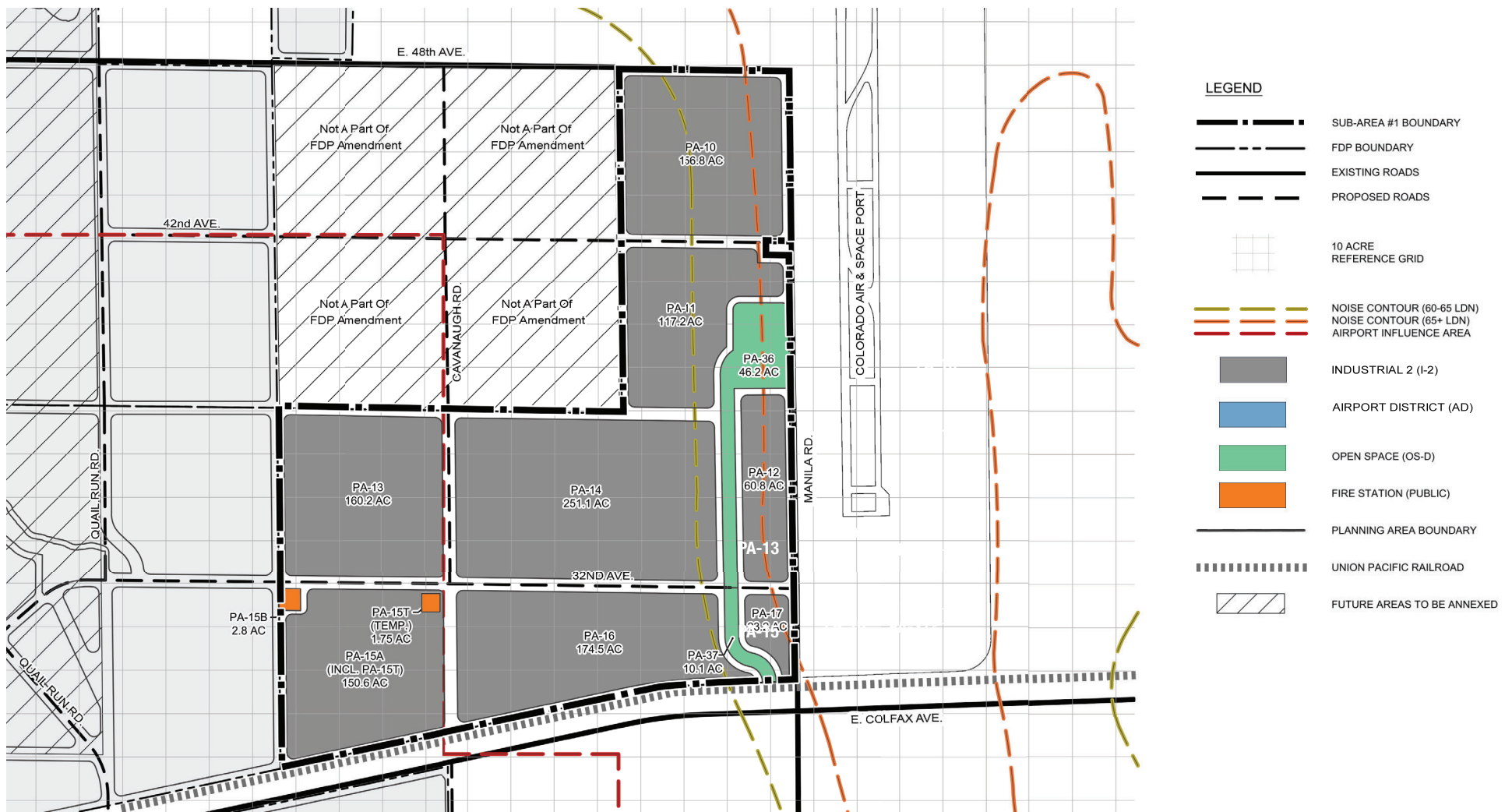
Parcel 10 = 151.1 acres	Parcel 14 = 246.5 acres
Parcel 11 = 116.0 acres	Parcel 15 = 150.0 acres
Parcel 12 = 63.2 acres	Parcel 16 = 171.4 acres
Parcel 13 = 154.2 acres	Parcel 17 = 21.9 acres
<b>TOTAL =</b>	<b>1,074.3 Acres</b>

### VI.B. Subarea I Trip Generation Estimates & Assignment

Subarea I includes only industrial land use types. Through discussions with City of Aurora staff, the trip generation for these land uses, regardless of how dense or what the individual uses on each parcel are, have been estimated using the Light Industrial trip generation category in *Trip Generation*, 10<sup>th</sup> Edition. As such, these estimates may be conservative. Regardless, **Table 4** on Page 30 summarizes the estimates of vehicle trips for Subarea I. Vehicle-trips are projected to exceed 25,000 vpd and 1,200 vph during the AM and PM peak hours.

The assignment of the estimated vehicle-trips of **Table 4** were applied to the projected roadway network using the trip distribution assumptions noted in **Section IV.C. Figure 18** and **Figure 19** provide representations of the site generated and total traffic volume projections for Subarea I.





**FIGURE 17**  
**Subarea I**  
**Land Uses**

**Table 4. Subarea I Trip Generation Estimates**

Planning Area	Land Use	ITE Code	Square Footage (KSF)	Daily	AM Peak Hour			PM Peak Hour		
					In	Out	Total	In	Out	Total
PA-10	Industrial	110	987.3	3,800	214	29	243	23	156	179
PA-11	Industrial	110	757.9	2,931	176	24	200	19	130	149
PA-12	Industrial	110	412.9	1,623	112	15	127	13	85	98
PA-13	Industrial	110	1,007.5	3,877	216	30	246	24	158	182
PA-14	Industrial	110	1,610.6	6,162	307	42	349	33	218	251
PA-15	Industrial	110	980.1	3,773	212	29	241	23	155	178
PA-16	Industrial	110	608.3	2,363	149	21	170	16	112	128
	Transload Facility	Custom	101.3	162	14	2	16	2	14	16
	<b>Subtotal</b>		<b>709.7</b>	<b>2,525</b>	<b>163</b>	<b>23</b>	<b>186</b>	<b>18</b>	<b>126</b>	<b>144</b>
PA-17	Industrial	110	143.1	600	51	7	58	6	41	47
<b>Net External Trip Generation</b>				<b>25,291</b>	<b>1,451</b>	<b>199</b>	<b>1,650</b>	<b>159</b>	<b>1,069</b>	<b>1,228</b>

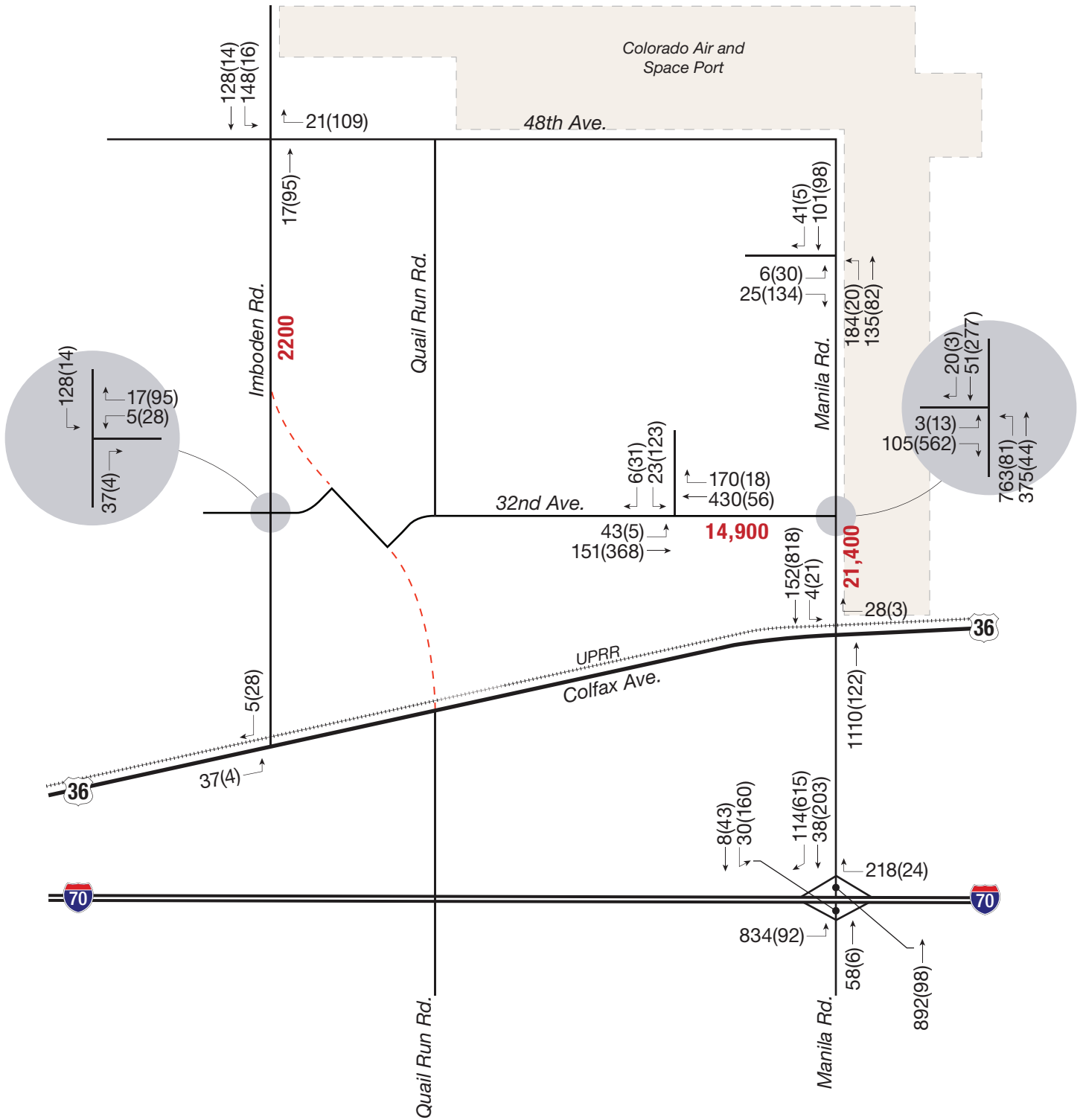
While there are varying levels of projected vehicle-trips at intersections and along the roadway network, two movements should be noted, both of which are at the I-70/Manila Road interchange: (1) the eastbound to northbound left turn (AM peak hour) movement, and (2) the southbound to westbound right turn (PM peak hour) movement. A large portion of the projected vehicle-trips for Subarea I will use this interchange for movements to/from the Denver metropolitan area; therefore, these two movements have the highest levels of projected site traffic. Peak hour vehicle-trips are projected to exceed 800 vph during the AM peak hour and 600 vph during the PM peak hour. Improvements necessary to satisfy this level of vehicle movement are contained in the following section.

### VI.C. Subarea I Operational Conditions (Estimated Year 2040)

An evaluation of intersection operations was conducted for the AM and PM peak hours using the methodologies of the *Highway Capacity Manual*. The results of these analyses find that certain improvements will be necessary to provide acceptable vehicle operations during the peak hours. LOS C or better can be achieved with the traffic control recommendations of **Figure 20**, with the exception of the eastbound left turn at 32<sup>nd</sup> Avenue/Manilla Road, which is projected to operate at LOS F during the AM Peak. This intersection is not projected to meet signalization warrants and the volume in question is below 10 vph. As such, new traffic signals are proposed at three intersections:

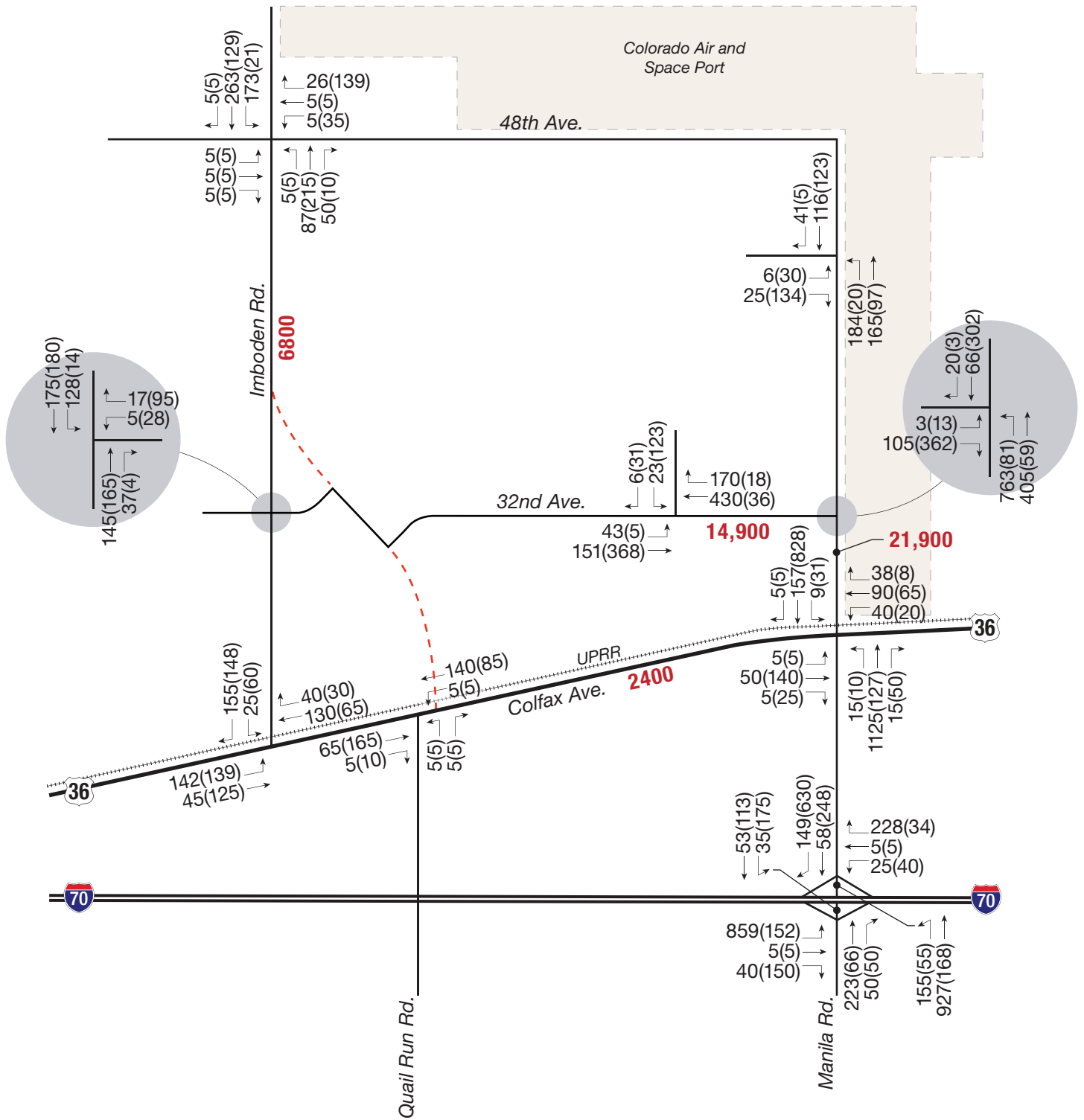
- The I-70/Manila Road interchange ramp terminals (2)
- The US 36/Manila Road intersection

Signalization at these three locations are projected to be required based on review of Warrant 2, Four-Hour Vehicular Volume and Warrant 3, Peak Hour contained in the *Manual on Uniform Traffic Control Devices* (MUTCD). While some of the intersections may not meet the exact threshold criteria for Warrant 2 or Warrant 3, there is enough evidence that these three locations will likely meet signalization criteria by completion of Subarea I. The warrant graphs are included in **Appendix F**. Operational analysis worksheets for Subarea I are included in **Appendix G**. Heavy vehicle percentages of 20 and 19 percent, respectively, were used in the AM and PM peak hours. This is an increase of 8 percent as compared to existing conditions and is consistent with percentages for sites with similar land use mixes.

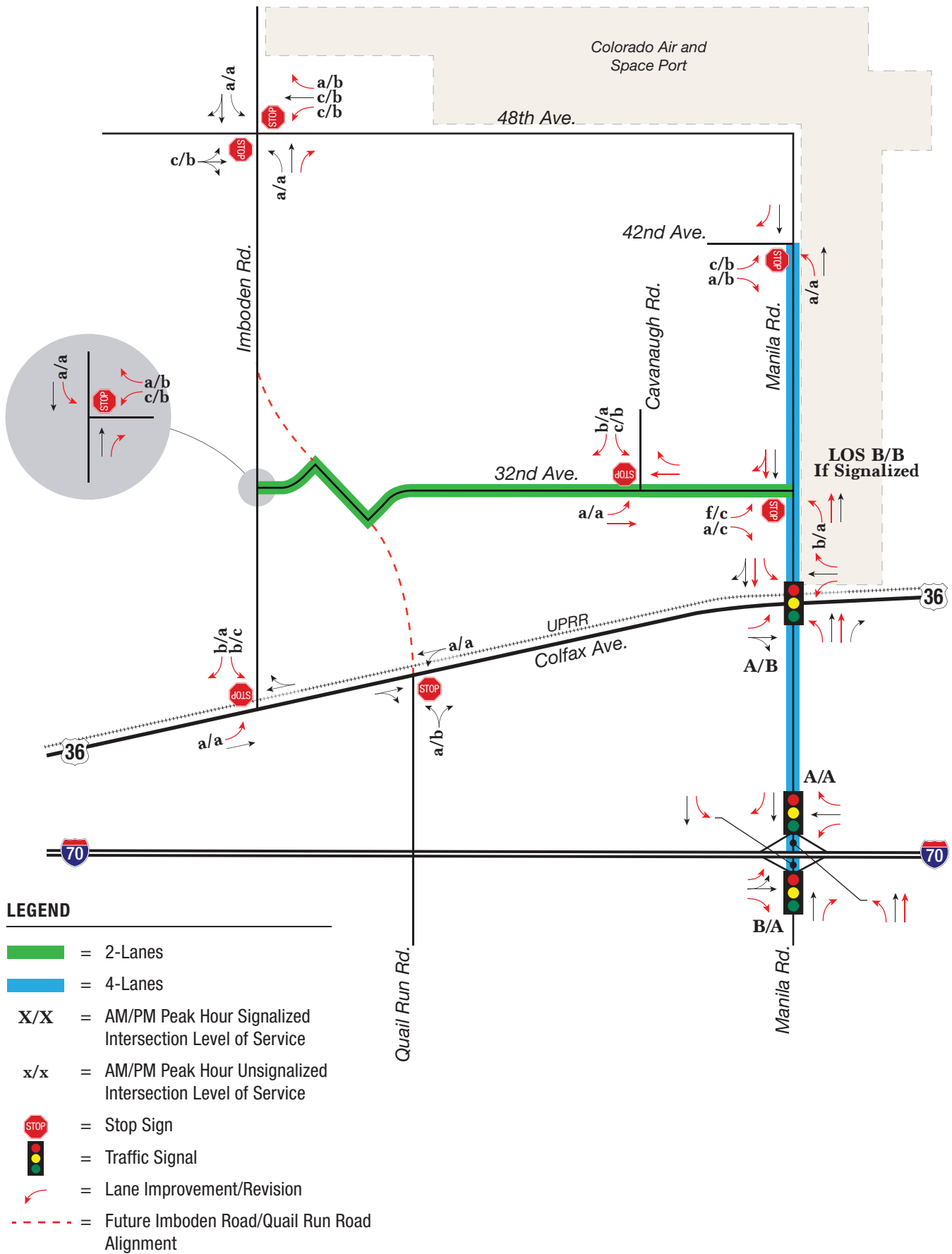


#### LEGEND

- XXX(XXX) = AM(PM) Peak Hour Traffic Volumes
- XXXX** = Daily Traffic Volumes
- - - - = Future Imboden Road/Quail Run Road Alignment







## VI.D. Subarea I Roadway Network and Traffic Control

Some operational results included in the previous section rely on the construction of 32<sup>nd</sup> Avenue between an Imboden Road/Quail Run Road realignment and Manila Road. Only a portion of the Imboden Road/Quail Run Road realignment is necessary, and 32<sup>nd</sup> Avenue will provide an additional east-west travel route to limit unneeded circuitous travel and to provide an alternative life safety route.

New traffic signals are projected to be needed at the I-70 ramp terminals and at US 36 and 32<sup>nd</sup> Avenue along Manila Road at varying times during construction of Subarea I. Roundabouts have been considered at the I-70 ramp terminal intersections and, if constructed, they are only a temporary traffic control measure until more significant interchange reconstruction is necessary. All other intersections are expected to operate acceptably with stop sign control for the side street intersection movements.

## VI.E. Subarea I Improvements

**Table 5** contains a summary of the projected recommendations needed for the Build-Out of Subarea I. The Development Acreage column represents the approximate amount of acreage that can be constructed before the identified improvement is required. Individual analyses of traffic volumes and intersection operations, and auxiliary lane requirements will be conducted for each parcel when they are proposed for development to understand the exact improvements that are required based on the planned land use type and density. The information contained in **Table 5** should be used only as a guide for the transition from one improvement to another as Subarea I develops.

**Table 5. Subarea I Improvement Recommendations**

Location	Improvement	Approximate Development Acreage Corresponding to Identified Improvement	Approximate Year Corresponding to Identified Improvement <sup>1</sup>
32 <sup>nd</sup> Avenue	Construct a two-lane cross-section between Imboden Road and Manila Road	With the development of the first parcel adjacent to 32 <sup>nd</sup> Ave.	2020 – 2021
Manila Road	Widen to four-lanes between 32 <sup>nd</sup> Avenue and the I-70 north ramp terminal and improve the UPRR at-grade crossing; widen north toward 48 <sup>th</sup> Avenue depending on the timing of development of PA's 10, 11, and 12	680–700 Acres	2032 – 2033
I-70/Manila Road Interchange	Reconstruct I-70 bridge and ramp terminals and install turn lanes for entrance and exit movements; signalize ramp terminal intersections	800–820 Acres	2034 – 2035
US 36/Manila Road	Signalize intersection; may require a pre-signal and preemption signal timing at the UPRR crossing	800–820 Acres	2034 – 2035
32 <sup>nd</sup> Avenue/Manila Road	Signalize intersection	910–930 Acres	2036 – 2037

<sup>1</sup>Improvement years assume a linear rate of development.

## VII. SUBAREA 2

As noted previously, Subareas 1 and 2 are evaluated separately since the types of development and exact locations that will first occur in TransPort Colorado are unknown. These subareas are evaluated separately and include information related to the entire Build-Out of either subarea. Following is information related to the complete development of Subarea 2.

### VII.A. Subarea 2 Land Uses

**Figure 22** represents the Subarea 2 land area boundary and parcel locations. The land area abuts Imboden Road along its western edge, Space Port property on the north, and other TransPort Colorado parcels or land areas not part of TransPort Colorado on the east and south. 48<sup>th</sup> Avenue proceeds through the northern section of Subarea 2.

Subarea 2 includes a total of 1,164 acres; however, once non-developable land is removed, the summary of acreage is as shown in **Table 6**.

**Table 6. Subarea 2 Land Area**

Parcel 2a = 78.5 acres	Parcel 6 = 102.8 acres
Parcel 2b = 28.1 acres	Parcel 7 = 314.4 acres
Parcel 3 = 120.2 acres	Parcel 8 = 151.8 acres
Parcel 4 = 36.5 acres	Parcel 9 = 154.4 acres
Parcel 5 = 136.9 acres	
<b>TOTAL =</b>	<b>1,123.6 Acres</b>

### VII.B. Subarea 2 Trip Generation Estimates and Assignment

Subarea 2 will be developed with data center and warehouse land uses; information contained in the current edition of *Trip Generation*, 10<sup>th</sup> Edition was used to estimate the projected vehicle-trips. For the purposes of this individual analysis of Subarea 2, Subarea 2 is projected to take approximately 20 years to develop (approximately Year 2040). **Table 7** summarizes the estimates of vehicle trips for this subarea. Daily trips are projected to approach 12,000 vpd, and the AM and PM peak hour vehicle movements are projected to be between 1,200 vph and 1,300 vph.

The assignment of the projected vehicle-trips of **Table 7** were applied to the proposed roadway network using the trip distribution assumptions noted in **Section IV.C**. **Figure 23** and **Figure 24** show representations of the site generated and total traffic volume projections for Subarea 2.

As with Subarea 1, there are varying levels of projected vehicle-trips at intersections and along the roadway network. Several vehicle movements should be noted:

- Imboden Road/48<sup>th</sup> Avenue Intersection – The westbound left turn lane is projected to reach or exceed 300 vph.
- US 36/Imboden Road Intersection – The eastbound to northbound left turn (AM peak hour) and southbound to westbound right turn (PM peak hour) movements are projected to exceed 400 vph.

Subarea 2 does not have the same level of impact at the I-70/Manila Road interchange as Subarea 1 given the locations of the land areas within these two subareas.

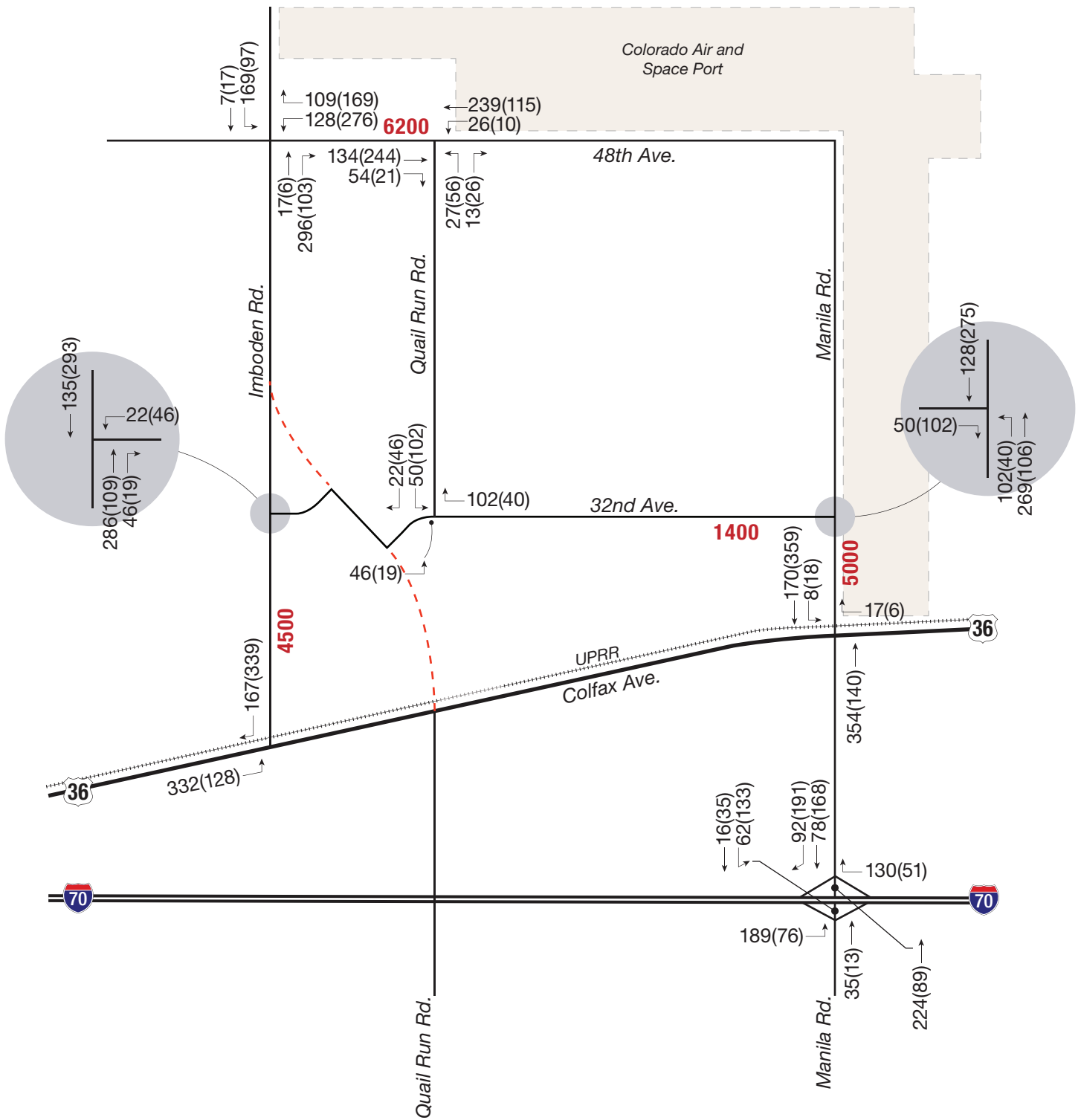




**Table 7. Subarea 2 Trip Generation Estimates**

Planning Area	Land Use	ITE Code	Square Footage (KSF)	Daily	AM Peak Hour			PM Peak Hour		
					In	Out	Total	In	Out	Total
PA-2a	Data Center	160	307.8	305	19	15	34	8	20	28
	Warehouse	150	307.8	532	48	14	62	17	48	65
	<b>Subtotal</b>		<b>615.5</b>	<b>837</b>	<b>67</b>	<b>29</b>	<b>96</b>	<b>25</b>	<b>68</b>	<b>93</b>
PA-2b	Data Center	160	110.2	109	5	4	9	1	5	6
	Warehouse	150	110.2	220	30	9	39	11	30	41
	<b>Subtotal</b>		<b>220.3</b>	<b>329</b>	<b>35</b>	<b>13</b>	<b>48</b>	<b>12</b>	<b>35</b>	<b>47</b>
PA-3	Data Center	160	471.2	467	31	25	56	14	32	46
	Warehouse	150	471.2	790	63	19	82	22	62	84
	<b>Subtotal</b>		<b>942.5</b>	<b>1,257</b>	<b>94</b>	<b>44</b>	<b>138</b>	<b>36</b>	<b>94</b>	<b>130</b>
PA-4	Data Center	160	143.1	142	7	6	13	3	7	10
	Warehouse	150	143.1	272	32	10	42	12	33	45
	<b>Subtotal</b>		<b>286.2</b>	<b>414</b>	<b>39</b>	<b>16</b>	<b>55</b>	<b>15</b>	<b>40</b>	<b>55</b>
PA-5	Data Center	160	536.7	531	35	29	64	16	37	53
	Warehouse	150	536.7	894	69	21	90	25	67	92
	<b>Subtotal</b>		<b>1,073.4</b>	<b>1,425</b>	<b>104</b>	<b>50</b>	<b>154</b>	<b>41</b>	<b>114</b>	<b>155</b>
PA-6	Data Center	160	403.0	399	26	21	47	12	27	39
	Warehouse	150	403.0	682	57	17	74	20	56	76
	<b>Subtotal</b>		<b>806.0</b>	<b>1,081</b>	<b>83</b>	<b>38</b>	<b>121</b>	<b>32</b>	<b>83</b>	<b>115</b>
PA-7	Data Center	160	1,232.6	1,220	85	70	155	39	91	130
	Warehouse	150	1,232.6	1,993	133	40	173	47	129	176
	<b>Subtotal</b>		<b>2,465.1</b>	<b>3,213</b>	<b>218</b>	<b>110</b>	<b>328</b>	<b>86</b>	<b>220</b>	<b>306</b>
PA-8	Data Center	160	595.1	589	39	33	72	18	42	60
	Warehouse	150	595.1	986	74	23	97	27	72	99
	<b>Subtotal</b>		<b>1,190.2</b>	<b>1,575</b>	<b>113</b>	<b>56</b>	<b>169</b>	<b>45</b>	<b>114</b>	<b>159</b>
PA-9	Data Center	160	605.3	599	40	33	73	18	43	61
	Warehouse	150	605.3	1,002	75	23	98	27	73	100
	<b>Subtotal</b>		<b>1,201.6</b>	<b>1,601</b>	<b>115</b>	<b>56</b>	<b>171</b>	<b>45</b>	<b>116</b>	<b>161</b>
<b>Net External Trip Generation</b>				<b>11,732</b>	<b>868</b>	<b>412</b>	<b>1,280</b>	<b>337</b>	<b>884</b>	<b>1,221</b>



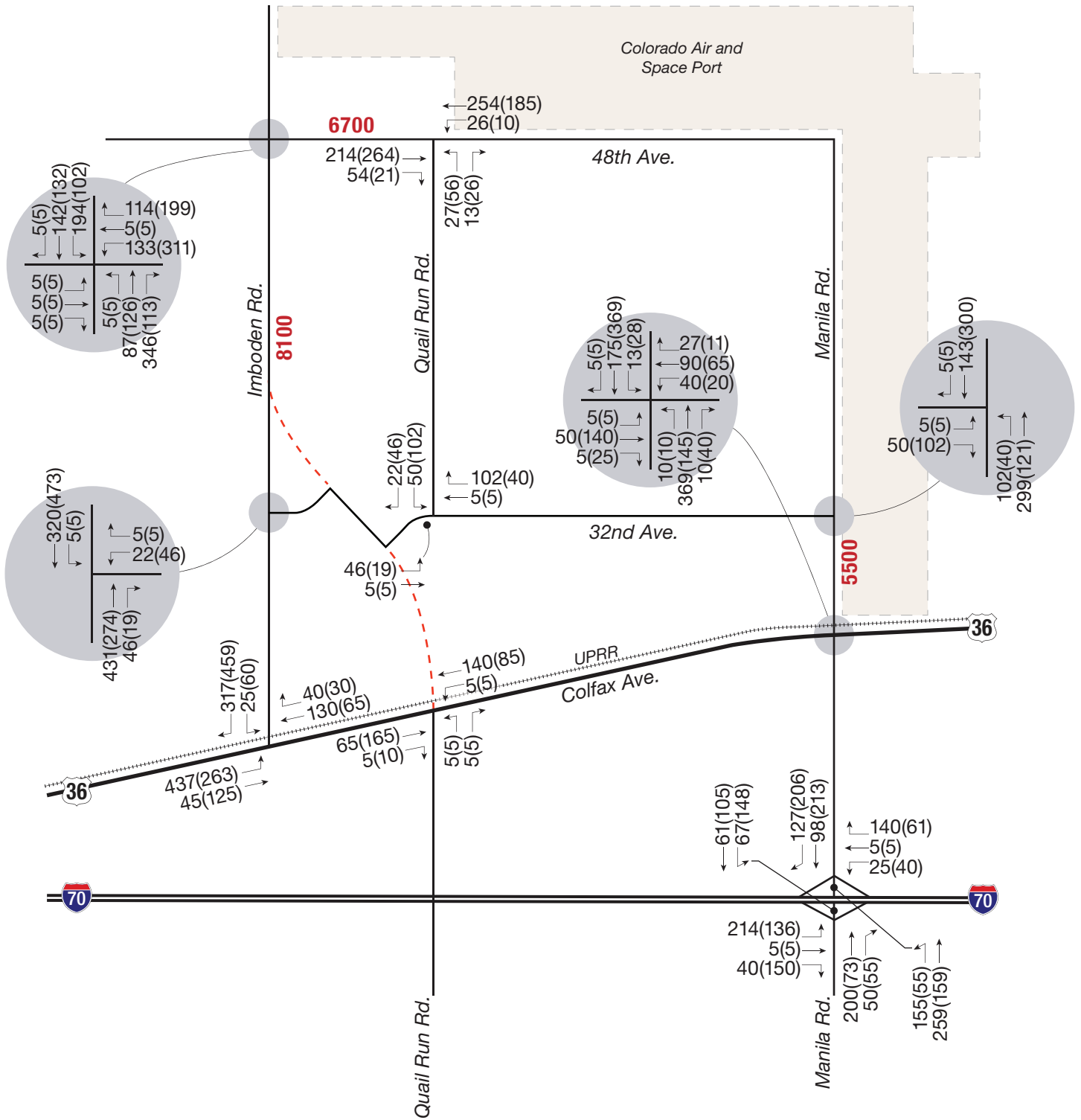


### LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

**XXXX** = Daily Traffic Volumes

- - - - - = Future Imboden Road/Quail Run Road Alignment



### LEGEND

XXX(XXX) = AM(PM) Peak Hour Traffic Volumes

XXXX = Daily Traffic Volumes

- - - - = Future Imboden Road/Quail Run Road Alignment



### VII.C. Subarea 2 Operational Conditions

Intersection operational analyses of Subarea 2 were conducted for the AM and PM peak hours using the methodologies of the *Highway Capacity Manual* also. Two intersections will likely require traffic signals and **Appendix H** provides representations of Warrant 2 (Four-Hour Vehicular Volume) and Warrant 3 (Peak Hour) evaluation graphs. The results of these analyses find that some improvements will be required to provide acceptable vehicle operations during the AM and PM peak hours. LOS D or better can be achieved with the traffic control recommendations of **Figure 25**, which may require the installation of a new traffic signal at the Imboden Road/48<sup>th</sup> Avenue intersection. **Appendix I** includes analysis worksheets for Subarea 2.

When compared to the analyses of Subarea 1, the level of traffic impact at the I-70/Manila Road interchange is substantially less. As such, it is projected that the existing intersection geometry and traffic control will operate acceptably when considering the entire Build-Out of Subarea 2; no interchange improvements are necessary. As individual parcels are proposed for development, an analysis of traffic impacts will be conducted to verify the intersection laneage and traffic control measures that are required. Heavy vehicle percentages of 16 and 15 percent, respectively, were used in the AM and PM peak hours. This is an increase of 4 percent as compared to existing conditions and is consistent with percentages for sites with similar land use mixes.

### VII.D. Subarea 2 Roadway Network & Traffic Control

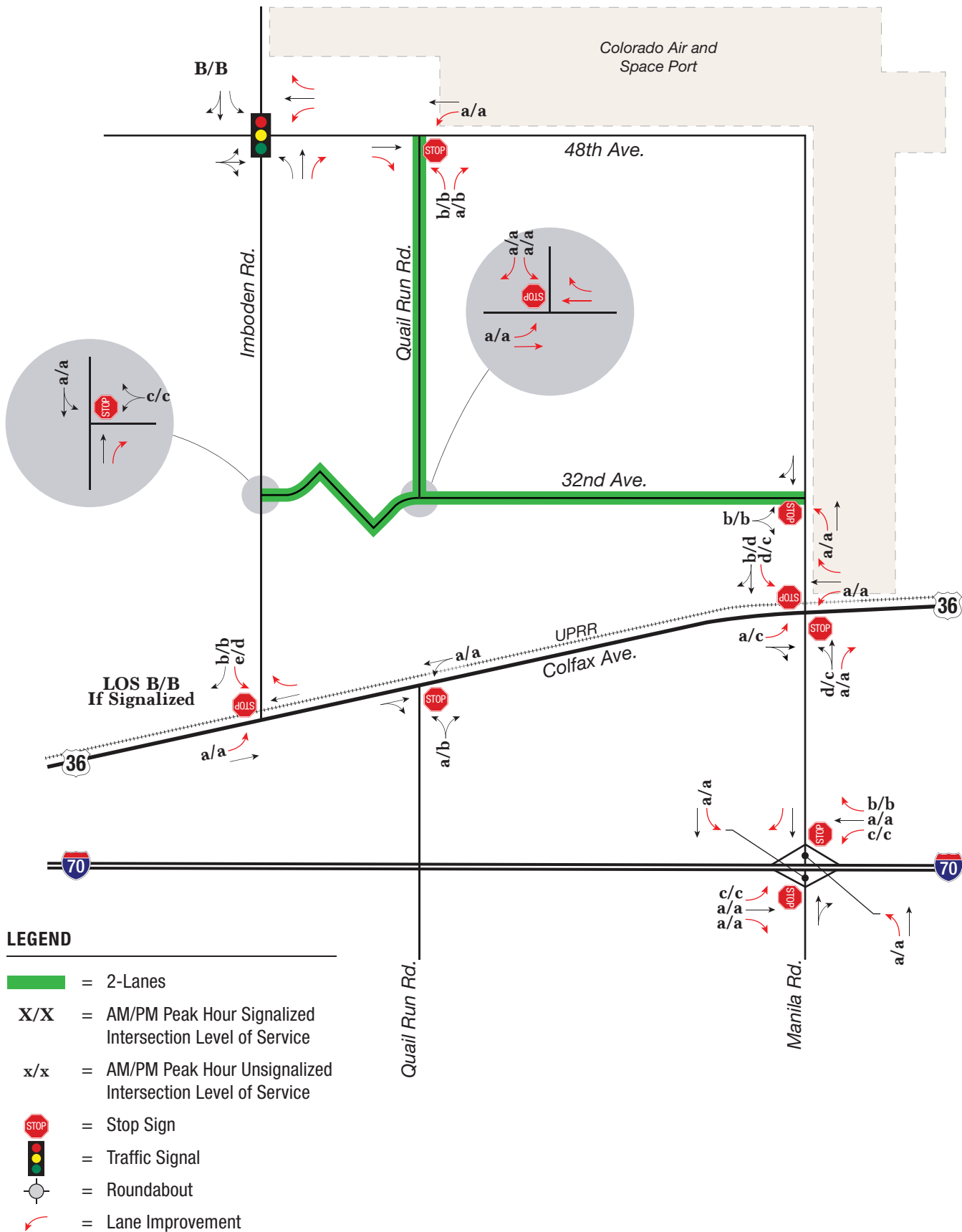
Some of the operational results included in the previous section rely on the construction of 32<sup>nd</sup> Avenue between an Imboden Road/Quail Run Road realignment and Manila Road. Evaluation on the timing of this improvement will be necessary as development construction proceeds. All intersections are projected to operate well and can continue to have stop sign control for the side street intersection movements except at the Imboden Road/48<sup>th</sup> Avenue intersection where a new traffic signal may be required by Build-Out of Subarea 2. Analyses of MUTCD traffic signalization warrants will be conducted at this intersection as new parcels are proposed to understand if/when this intersection will require a traffic signal.

### VII.E. Improvements Summary

**Table 8** summarizes the projected improvements needed for the Build-Out of Subarea 2. Similar to Subarea 1, the Development Acreage column represents the approximate amount of acreage that can be constructed before the identified improvement is required. Individual analyses of traffic volumes, intersection operations, and auxiliary lane requirements will be conducted for each parcel when they are proposed for development to understand the exact improvements that are required based on the planned land use type and density. The information contained in **Table 8** should be used only as a guide for the transition from one improvement to another as Subarea 2 develops.

As noted in the City's review comments on the first version of this study, several movements at the I-70 ramp terminal intersections meet *State Highway Access Code* criteria for installation of auxiliary lanes. While the criteria for exclusive left turn or right turn lanes are met, operational analyses find that each movement at each ramp terminal will operate at LOS C or better without the addition of new laneage.

Recognizing that the I-70 interchange will be reconstructed as TransPort Colorado moves toward its Build-Out scenario, possibly during the development of Subarea 2, the construction of auxiliary lanes may only provide minimal additional value to interchange operations and, therefore, is likely an unnecessary improvement. Regardless, **Figure 25** shows the laneage and levels of service with the additional auxiliary lanes that the *State Highway Access Code* would dictate.



**NORTH**

**FIGURE 25**

## Subarea 2 Total Operational Conditions and Roadway Recommendations

To specifically answer a City of Aurora comment, grade-separations along US 36 that have been identified in *NEATS Refresh* (see **Figure 5** also) are not required for the Build-Out of Subarea 2 (or Subarea 1) when considered individually. The timing and location of the first grade-separation will be evaluated as parcels are being planned. It is not anticipated that a grade-separation will be required for many years, but it depends on the advancement of new parcel development, traffic operations, and coordination with UPRR.

**Table 8. Subarea 2 Improvement Recommendations**

Location	Improvement	Approximate Development Acreage Corresponding to Identified Improvement	Approximate Year Corresponding to Identified Improvement <sup>1</sup>
32 <sup>nd</sup> Avenue	Construct a two-lane cross-section between Imboden Road and Manila Road	Concurrent with Development of PA's 7 or 9	Dependent on PA 7 or 9 Development
Quail Run Road	Construct a two-lane cross-section between 32 <sup>nd</sup> Avenue and 48 <sup>th</sup> Avenue	Concurrent with Development of PA's 7 or 9	
US 36/Imboden Road Intersection	Construct eastbound left turn lane	240–260 Acres	2024 – 2025
Imboden Road/48 <sup>th</sup> Avenue Intersection	Construct westbound left turn lane	240–260 Acres	2024 – 2025
Imboden Road/48 <sup>th</sup> Avenue Intersection	Monitor for installation of a traffic signal	Build-Out	2040

<sup>1</sup>Improvement years assume a linear rate of development.

## VIII. SUMMARY AND RECOMMENDATIONS

TransPort Colorado is planning to develop a master-planned business environment of approximately 5,378 acres in the city of Aurora, Colorado. The project is known as TransPort Colorado and will be developed with industrial, data center, warehousing, and commercial land uses with several parcels having a rail-service component. The project will have access to national highway and rail transportation corridors and to national and international air infrastructure.

The project is located adjacent to the Colorado Air and Space Port (Space Port), formerly known as Front Range Airport, and it is also within close proximity of Denver International Airport (DEN). The project will have access to I-70, a major east-west interstate highway system via existing and planned interchanges. I-25 is located approximately 23 miles to the west of the project site and is the primary interstate access route between New Mexico and Montana. Complementing these two vital interstate highway links is the alignment of the UPRR tracks along the north side of US 36. One of TransPort Colorado's economic benefits will be its rail access for rail-served properties and transload facilities.

The majority of the project is bounded by US 36, the UPRR, and I-70 along its south edge, by 48th Avenue to the north, by Imboden Road on the west, and by Manila Road to the east. Two additional properties are included in the development, the largest of which is located to the east of the Space Port north-south runaway. This parcel consists of approximately 1,100 acres and is bounded by US 36 on the south, 48th Avenue to the north, and between Petterson and Schumaker Roads. The second parcel is about 300 acres and is adjacent to Imboden Road between 56th and 64th Avenues.

TransPort Colorado will take more than 20 years to completely develop. At completion of the project, the site will generate over 200,000 vehicle-trips per day, with about 153,000 of them added to the external roadway network after reductions for internal and pass-by trips.

The existing roadway network surrounding TransPort Colorado is somewhat limited with certain roadways still being constructed of gravel. TransPort Colorado will construct several new roadways that will serve the proposed land use types, and certain improvements replicate information contained in the recently updated *NEATS Refresh*. By Build-Out of the entire TransPort Colorado, the following roadway improvements will be necessary (see **Figure I4**):

- Widening and/or paving of existing roadways
- Construction of new roadways
- A realigned connection of Imboden Road with Quail Run Road
- A new interchange along I-70 at the Quail Run Road alignment
- A reconstructed I-70/Manila Road interchange
- Construction of roadway grade-separations at the UPRR crossings along Quail Run and Manila Roads
- Installation of traffic signalization at numerous locations (refer to **Figure I1**)
- Construction of the TransPort Colorado portion of the Bear Gulch Trail system

The development of TransPort Colorado will be gradual over many years, and traffic operational analyses will continue as parcels develop to support the confirmation and construction timeframes for infrastructure improvements. Analyses of individual parcels will confirm intersection laneage and traffic control recommendations. Particular recommendations for the development of Subareas 1 and 2 are contained in **Sections VI** and **VII**.

## APPENDIX A. RECORDED TRAFFIC VOLUMES

**All Traffic Data**  
Wheat Ridge, CO 80033

Date Start: 06-Sep-18  
Date End: 06-Sep-18  
Site Code: 7  
IMBODEN RD N.O. US 36

Start Time	06-Sep-18 Thu	NB	SB							Total
12:00 AM		8	5							13
01:00		6	0							6
02:00		2	3							5
03:00		6	6							12
04:00		23	8							31
05:00		64	40							104
06:00		99	99							198
07:00		83	99							182
08:00		78	79							157
09:00		96	72							168
10:00		56	53							109
11:00		74	62							136
12:00 PM		82	78							160
01:00		70	51							121
02:00		76	61							137
03:00		82	79							161
04:00		96	121							217
05:00		102	80							182
06:00		51	71							122
07:00		43	32							75
08:00		33	25							58
09:00		24	16							40
10:00		12	21							33
11:00		7	14							21
Total		1273	1175							2448
Percent		52.0%	48.0%							
AM Peak	-	06:00	06:00	-	-	-	-	-	-	06:00
Vol.	-	99	99	-	-	-	-	-	-	198
PM Peak	-	17:00	16:00	-	-	-	-	-	-	16:00
Vol.	-	102	121	-	-	-	-	-	-	217
Grand Total		1273	1175							2448
Percent		52.0%	48.0%							
ADT		ADT 2,448	AADT 2,448							

## All Traffic Data

Wheat Ridge, CO 80033

Date Start: 06-Sep-18  
Date End: 06-Sep-18  
Site Code: 8  
N MANILA RD N.O. US 369

Start Time	06-Sep-18	NB	SB							Total
12:00 AM		0	0							0
01:00		0	0							0
02:00		0	0							0
03:00		0	0							0
04:00		0	0							0
05:00		3	1							4
06:00		11	2							13
07:00		19	3							22
08:00		13	5							18
09:00		7	7							14
10:00		8	8							16
11:00		11	8							19
12:00 PM		11	13							24
01:00		13	8							21
02:00		16	6							22
03:00		19	21							40
04:00		3	19							22
05:00		20	13							33
06:00		7	22							29
07:00		2	22							24
08:00		2	9							11
09:00		4	8							12
10:00		1	1							2
11:00		0	1							1
Total		170	177							347
Percent		49.0%	51.0%							
AM Peak	-	07:00	10:00	-	-	-	-	-	-	07:00
Vol.	-	19	8	-	-	-	-	-	-	22
PM Peak	-	17:00	18:00	-	-	-	-	-	-	15:00
Vol.	-	20	22	-	-	-	-	-	-	40
Grand Total		170	177							347
Percent		49.0%	51.0%							
ADT		ADT 347	AADT 347							



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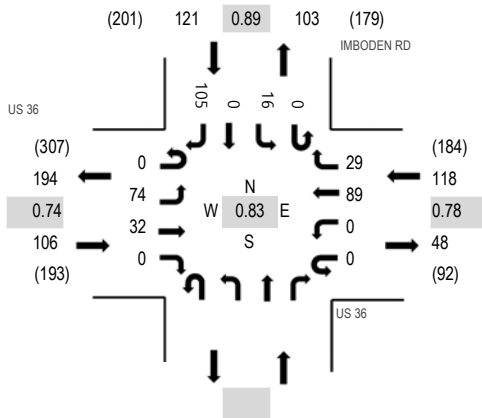
**Location:** 1 IMBODEN RD & US 36 AM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 06:30 AM - 07:30 AM

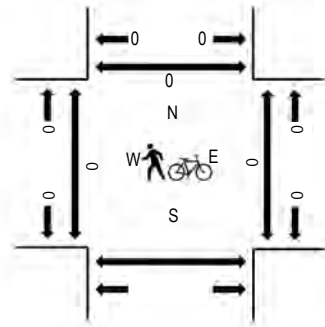
**Peak 15-Minutes:** 06:30 AM - 06:45 AM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	US 36 Eastbound				US 36 Westbound				Northbound				IMBODEN RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
6:30 AM	0	23	13	0	0	0	0	30	8				0	2	0	28	104	345	0	0	0	0
6:45 AM	0	27	7	0	0	0	0	18	5				0	7	0	27	91	303	0	0	0	0
7:00 AM	0	17	8	0	0	0	0	19	8				0	3	0	21	76	272	0	0	0	0
7:15 AM	0	7	4	0	0	0	0	22	8				0	4	0	29	74	250	0	0	0	0
7:30 AM	0	14	8	0	0	0	0	20	4				0	4	0	12	62	233	0	0	0	0
7:45 AM	0	16	4	0	0	0	0	15	3				0	7	0	15	60		0	0	0	0
8:00 AM	0	10	10	0	0	0	0	7	5				0	5	0	17	54		0	0	0	0
8:15 AM	0	20	5	0	0	0	0	8	4				0	1	0	19	57		0	0	0	0
Count Total	0	134	59	0	0	0	0	139	45				0	33	0	168	578		0	0	0	0
Peak Hour	0	74	32	0	0	0	0	89	29				0	16	0	105	345		0	0	0	0





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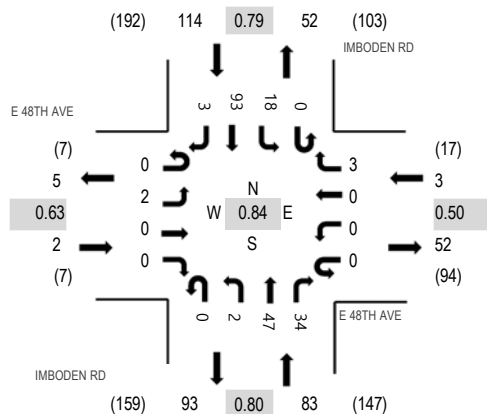
**Location:** 2 IMBODEN RD & E 48TH AVE AM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 06:30 AM - 07:30 AM

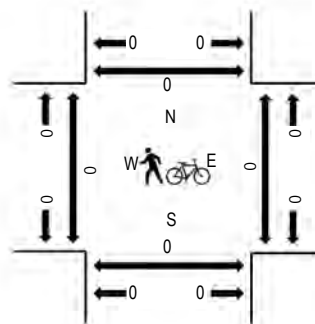
**Peak 15-Minutes:** 06:45 AM - 07:00 AM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	E 48TH AVE Eastbound				E 48TH AVE Westbound				IMBODEN RD Northbound				IMBODEN RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
6:30 AM	0	0	0	0	0	0	0	2	0	0	9	12	0	5	30	1	59	202	0	0	0	0
6:45 AM	0	0	0	0	0	0	0	0	0	2	13	9	0	5	29	2	60	178	0	0	0	0
7:00 AM	0	0	0	0	0	0	0	0	0	0	17	9	0	5	14	0	45	160	0	0	0	0
7:15 AM	0	2	0	0	0	0	0	1	0	0	8	4	0	3	20	0	38	150	0	0	0	0
7:30 AM	0	2	0	0	0	1	0	1	0	0	12	3	0	4	12	0	35	161	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	3	0	0	10	8	0	6	14	1	42		0	0	0	0
8:00 AM	0	0	0	1	0	2	0	0	0	1	5	5	0	5	16	0	35		0	0	0	0
8:15 AM	0	2	0	0	0	6	0	1	0	0	15	5	0	6	14	0	49		0	0	0	0
Count Total	0	6	0	1	0	9	0	8	0	3	89	55	0	39	149	4	363		0	0	0	0
Peak Hour	0	2	0	0	0	0	0	3	0	2	47	34	0	18	93	3	202		0	0	0	0



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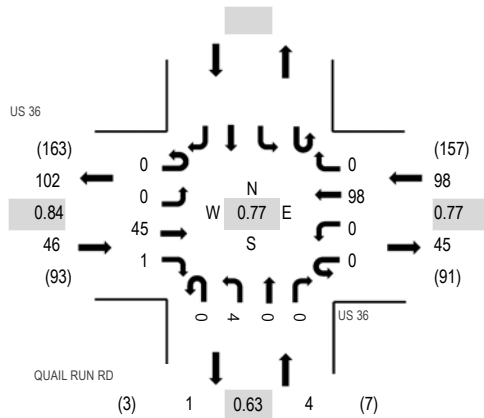
**Location:** 3 QUAIL RUN RD & US 36 AM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 06:30 AM - 07:30 AM

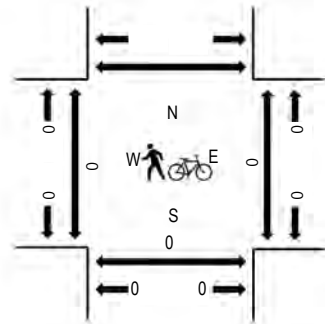
**Peak 15-Minutes:** 06:30 AM - 06:45 AM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

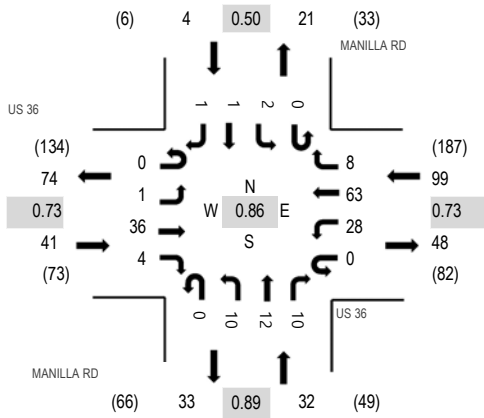
Interval Start Time	US 36 Eastbound				US 36 Westbound				QUAIL RUN RD Northbound				Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
6:30 AM	0	0	15	0	0	0	32	0	0	1	0	0					48	148	0	0	0	
6:45 AM	0	0	16	0	0	0	20	0	0	0	0	0					36	136	0	0	0	
7:00 AM	0	0	9	0	0	0	20	0	0	1	0	0					30	129	0	0	0	
7:15 AM	0	0	5	1	0	0	26	0	0	2	0	0					34	128	0	0	0	
7:30 AM	0	0	14	0	0	0	20	0	0	1	0	1					36	109	0	0	0	
7:45 AM	0	0	10	2	0	0	17	0	0	0	0	0					29		0	0	0	
8:00 AM	0	0	14	0	0	0	14	0	0	1	0	0					29		0	0	0	
8:15 AM	0	0	7	0	0	0	8	0	0	0	0	0					15		0	0	0	
Count Total	0	0	90	3	0	0	157	0	0	6	0	1					257		0	0	0	
Peak Hour	0	0	45	1	0	0	98	0	0	4	0	0					148		0	0	0	



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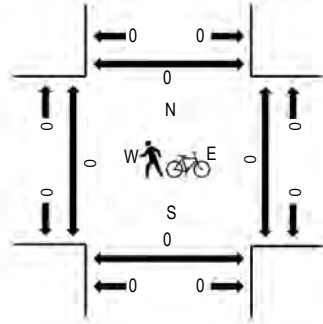
**Location:** 4 MANILLA RD & US 36 AM  
**Date:** Thursday, September 6, 2018  
**Peak Hour:** 06:45 AM - 07:45 AM  
**Peak 15-Minutes:** 07:30 AM - 07:45 AM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	US 36 Eastbound				US 36 Westbound				MANILLA RD Northbound				MANILLA RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
6:30 AM	0	0	6	0	0	7	27	3	0	0	0	1	0	0	0	0	44	169	0	0	0	0
6:45 AM	0	0	9	2	0	6	14	2	0	3	2	2	0	1	0	0	41	176	0	0	0	0
7:00 AM	0	0	9	1	0	11	13	1	0	2	3	2	0	1	1	0	44	174	0	0	0	0
7:15 AM	0	0	5	1	0	2	20	2	0	3	3	3	0	0	0	1	40	164	0	0	0	0
7:30 AM	0	1	13	0	0	9	16	3	0	2	4	3	0	0	0	0	51	146	0	0	0	0
7:45 AM	0	0	6	3	0	10	13	1	0	1	2	3	0	0	0	0	39		0	0	0	0
8:00 AM	0	0	10	1	0	6	11	2	0	2	0	1	0	0	1	0	34		0	0	0	0
8:15 AM	0	1	5	0	0	4	3	1	0	3	2	2	0	0	1	0	22		0	0	0	0
Count Total	0	2	63	8	0	55	117	15	0	16	16	17	0	2	3	1	315		0	0	0	0
Peak Hour	0	1	36	4	0	28	63	8	0	10	12	10	0	2	1	1	176		0	0	0	0



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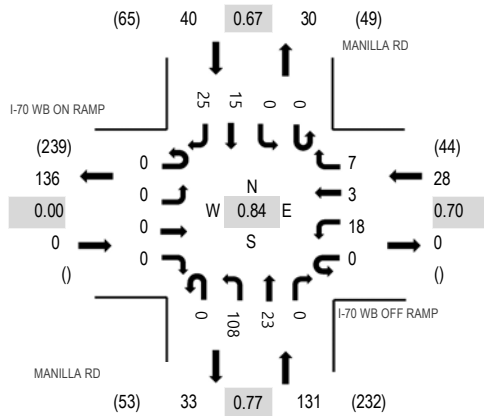
**Location:** 5 MANILLA RD & I-70 WB OFF RAMP AM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 07:00 AM - 08:00 AM

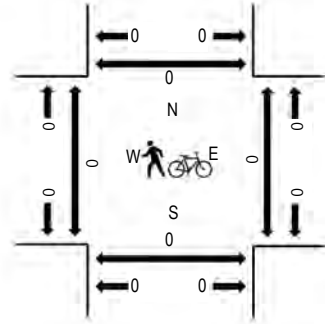
**Peak 15-Minutes:** 07:15 AM - 07:30 AM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	I-70 WB ON RAMP Eastbound				I-70 WB OFF RAMP Westbound				MANILLA RD Northbound				MANILLA RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
6:30 AM	0	0	0	0	0	3	0	2	0	32	2	0	0	0	0	6	45	194	0	0	0	0
6:45 AM	0	0	0	0	0	2	1	1	0	25	4	0	0	0	2	3	38	192	0	0	0	0
7:00 AM	0	0	0	0	0	3	1	3	0	23	7	0	0	0	6	9	52	199	0	0	0	0
7:15 AM	0	0	0	0	0	7	2	1	0	36	9	0	0	0	1	3	59	182	0	0	0	0
7:30 AM	0	0	0	0	0	1	0	1	0	26	6	0	0	0	3	6	43	147	0	0	0	0
7:45 AM	0	0	0	0	0	7	0	2	0	23	1	0	0	0	5	7	45		0	0	0	0
8:00 AM	0	0	0	0	0	2	1	2	0	19	2	0	0	0	6	3	35		0	0	0	0
8:15 AM	0	0	0	0	0	2	0	0	0	11	6	0	0	0	3	2	24		0	0	0	0
Count Total	0	0	0	0	0	27	5	12	0	195	37	0	0	0	26	39	341		0	0	0	0
Peak Hour	0	0	0	0	0	18	3	7	0	108	23	0	0	0	15	25	199		0	0	0	0



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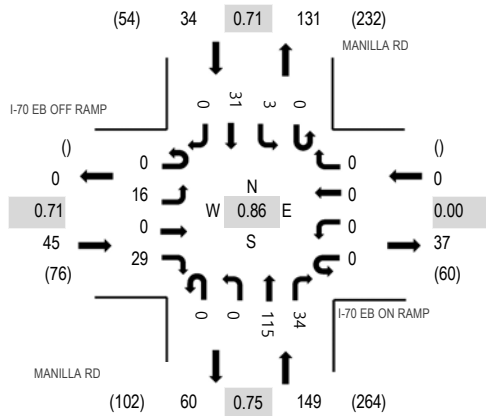
**Location:** 6 MANILLA RD & I-70 EB ON RAMP AM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 07:00 AM - 08:00 AM

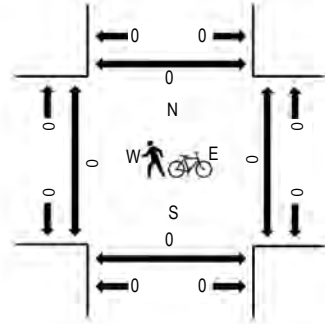
**Peak 15-Minutes:** 07:15 AM - 07:30 AM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	I-70 EB OFF RAMP Eastbound				I-70 EB ON RAMP Westbound				MANILLA RD Northbound				MANILLA RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
6:30 AM	0	2	0	3	0	0	0	0	0	0	32	2	0	1	2	0	42	200	0	0	0	0
6:45 AM	0	1	0	4	0	0	0	0	0	0	28	3	0	1	2	0	39	212	0	0	0	0
7:00 AM	0	3	0	7	0	0	0	0	0	0	28	5	0	1	9	0	53	228	0	0	0	0
7:15 AM	0	4	0	4	0	0	0	0	0	0	40	10	0	1	7	0	66	225	0	0	0	0
7:30 AM	0	8	0	9	0	0	0	0	0	0	23	10	0	0	4	0	54	194	0	0	0	0
7:45 AM	0	1	0	9	0	0	0	0	0	0	24	9	0	1	11	0	55		0	0	0	0
8:00 AM	0	1	0	12	0	0	0	0	0	0	20	9	0	1	7	0	50		0	0	0	0
8:15 AM	0	1	0	7	0	0	0	0	0	0	16	5	0	1	5	0	35		0	0	0	0
Count Total	0	21	0	55	0	0	0	0	0	0	211	53	0	7	47	0	394		0	0	0	0
Peak Hour	0	16	0	29	0	0	0	0	0	0	115	34	0	3	31	0	228		0	0	0	0



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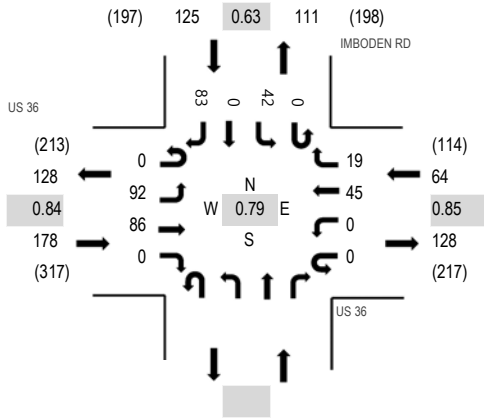
**Location:** 1 IMBODEN RD & US 36 PM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 04:15 PM - 05:15 PM

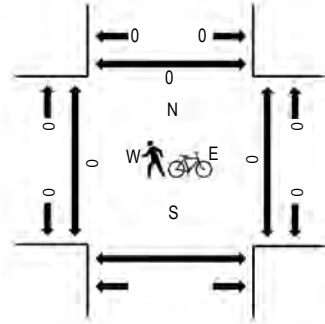
**Peak 15-Minutes:** 04:45 PM - 05:00 PM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	US 36 Eastbound				US 36 Westbound				Northbound				IMBODEN RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	15	17	0	0	0	0	15	2				0	5	0	14	68	346	0	0		0
4:15 PM	0	18	20	0	0	0	0	13	4				0	5	0	15	75	367	0	0		0
4:30 PM	0	19	19	0	0	0	0	16	5				0	9	0	19	87	363	0	0		0
4:45 PM	0	25	24	0	0	0	0	8	8				0	19	0	32	116	344	0	0		0
5:00 PM	0	30	23	0	0	0	0	8	2				0	9	0	17	89	282	0	0		0
5:15 PM	0	18	14	0	0	0	0	12	4				0	11	0	12	71		0	0		0
5:30 PM	0	21	21	0	0	0	0	5	4				0	5	0	12	68		0	0		0
5:45 PM	0	22	11	0	0	0	0	7	1				0	5	0	8	54		0	0		0
Count Total	0	168	149	0	0	0	0	84	30				0	68	0	129	628		0	0		0
Peak Hour	0	92	86	0	0	0	0	45	19				0	42	0	83	367		0	0		0



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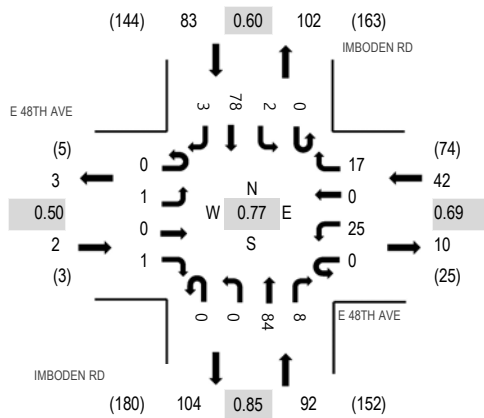
**Location:** 2 IMBODEN RD & E 48TH AVE PM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 04:30 PM - 05:30 PM

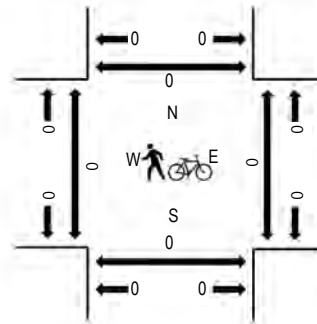
**Peak 15-Minutes:** 04:45 PM - 05:00 PM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	E 48TH AVE Eastbound				E 48TH AVE Westbound				IMBODEN RD Northbound				IMBODEN RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	0	0	0	0	4	0	1	0	0	11	4	0	4	12	1	37	196	0	0	0	0
4:15 PM	0	0	0	0	0	11	0	2	0	0	7	2	0	0	17	0	39	215	0	0	0	0
4:30 PM	0	0	0	0	0	7	0	3	0	0	23	0	0	1	14	1	49	219	0	0	0	0
4:45 PM	0	0	0	1	0	5	0	2	0	0	23	4	0	1	34	1	71	212	0	0	0	0
5:00 PM	0	0	0	0	0	8	0	9	0	0	25	2	0	0	11	1	56	177	0	0	0	0
5:15 PM	0	1	0	0	0	5	0	3	0	0	13	2	0	0	19	0	43		0	0	0	0
5:30 PM	0	0	0	0	0	2	0	3	0	0	19	3	0	2	13	0	42		0	0	0	0
5:45 PM	0	1	0	0	0	5	0	4	0	1	13	0	0	0	12	0	36		0	0	0	0
Count Total	0	2	0	1	0	47	0	27	0	1	134	17	0	8	132	4	373		0	0	0	0
Peak Hour	0	1	0	1	0	25	0	17	0	0	84	8	0	2	78	3	219		0	0	0	0



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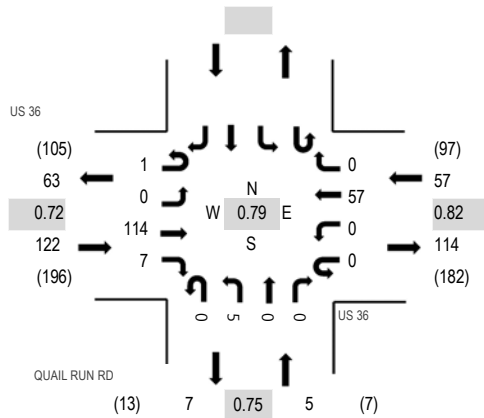
**Location:** 3 QUAIL RUN RD & US 36 PM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 04:15 PM - 05:15 PM

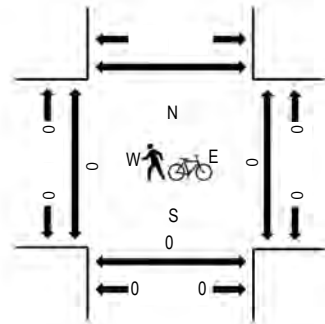
**Peak 15-Minutes:** 04:45 PM - 05:00 PM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	US 36 Eastbound				US 36 Westbound				QUAIL RUN RD Northbound				Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	0	14	3	0	0	13	0	0	1	0	0					31	175	0	0	0	
4:15 PM	0	0	18	3	0	0	14	0	0	2	0	0					37	184	0	0	0	
4:30 PM	1	0	25	3	0	0	18	0	0	2	0	0					49	181	0	0	0	
4:45 PM	0	0	42	1	0	0	14	0	0	1	0	0					58	165	0	0	0	
5:00 PM	0	0	29	0	0	0	11	0	0	0	0	0					40	125	0	0	0	
5:15 PM	0	0	22	0	0	0	11	0	0	1	0	0					34		0	0	0	
5:30 PM	0	0	21	3	0	0	9	0	0	0	0	0					33		0	0	0	
5:45 PM	0	0	11	0	0	0	7	0	0	0	0	0					18		0	0	0	
Count Total	1	0	182	13	0	0	97	0	0	7	0	0					300		0	0	0	
Peak Hour	1	0	114	7	0	0	57	0	0	5	0	0					184		0	0	0	





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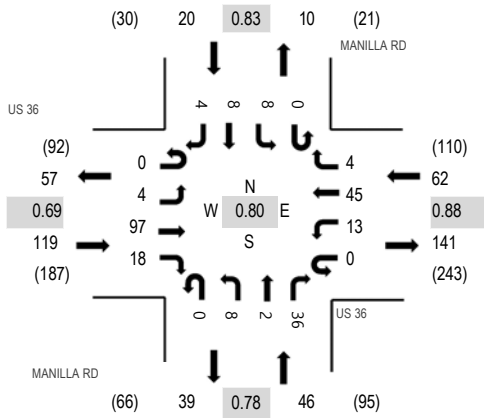
**Location:** 4 MANILLA RD & US 36 PM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 04:30 PM - 05:30 PM

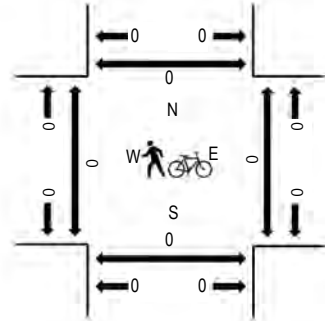
**Peak 15-Minutes:** 04:45 PM - 05:00 PM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	US 36 Eastbound				US 36 Westbound				MANILLA RD Northbound				MANILLA RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	0	17	0	0	6	7	0	0	2	2	8	0	3	1	0	46	227	0	0	0	0
4:15 PM	0	0	20	0	0	6	11	0	0	0	1	7	0	0	4	0	49	239	0	0	0	0
4:30 PM	0	0	22	2	0	3	15	0	0	2	0	5	0	3	1	2	55	247	0	0	0	0
4:45 PM	0	2	32	9	0	5	8	0	0	4	0	13	0	2	2	0	77	235	0	0	0	0
5:00 PM	0	0	19	6	0	3	10	2	0	2	0	10	0	3	2	1	58	195	0	0	0	0
5:15 PM	0	2	24	1	0	2	12	2	0	0	2	8	0	0	3	1	57		0	0	0	0
5:30 PM	0	0	16	3	0	2	6	1	0	1	2	11	0	0	1	0	43		0	0	0	0
5:45 PM	0	0	12	0	0	3	5	1	0	3	4	8	0	0	1	0	37		0	0	0	0
Count Total	0	4	162	21	0	30	74	6	0	14	11	70	0	11	15	4	422		0	0	0	0
Peak Hour	0	4	97	18	0	13	45	4	0	8	2	36	0	8	8	4	247		0	0	0	0



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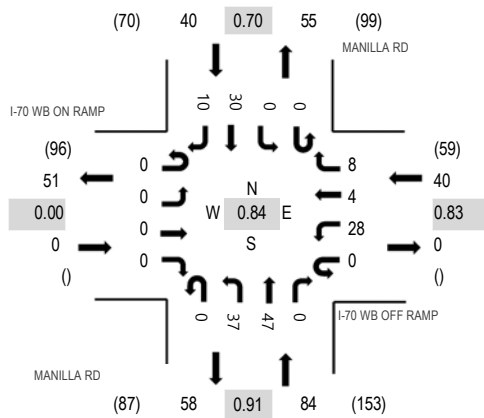
**Location:** 5 MANILLA RD & I-70 WB OFF RAMP PM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 04:45 PM - 05:45 PM

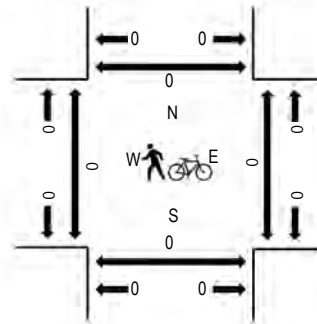
**Peak 15-Minutes:** 04:45 PM - 05:00 PM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	I-70 WB ON RAMP Eastbound				I-70 WB OFF RAMP Westbound				MANILLA RD Northbound				MANILLA RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	0	0	0	0	5	0	1	0	6	14	0	0	0	3	5	34	140	0	0	0	0
4:15 PM	0	0	0	0	0	1	0	0	0	11	8	0	0	0	6	4	30	149	0	0	0	0
4:30 PM	0	0	0	0	0	3	1	1	0	8	7	0	0	0	4	3	27	152	0	0	0	0
4:45 PM	0	0	0	0	0	7	0	3	0	9	14	0	0	0	13	3	49	164	0	0	0	0
5:00 PM	0	0	0	0	0	8	1	0	0	9	13	0	0	0	10	2	43	142	0	0	0	0
5:15 PM	0	0	0	0	0	5	2	2	0	12	7	0	0	0	1	4	33		0	0	0	0
5:30 PM	0	0	0	0	0	8	1	3	0	7	13	0	0	0	6	1	39		0	0	0	0
5:45 PM	0	0	0	0	0	5	0	2	0	4	11	0	0	0	2	3	27		0	0	0	0
Count Total	0	0	0	0	0	42	5	12	0	66	87	0	0	0	45	25	282		0	0	0	0
Peak Hour	0	0	0	0	0	28	4	8	0	37	47	0	0	0	30	10	164		0	0	0	0



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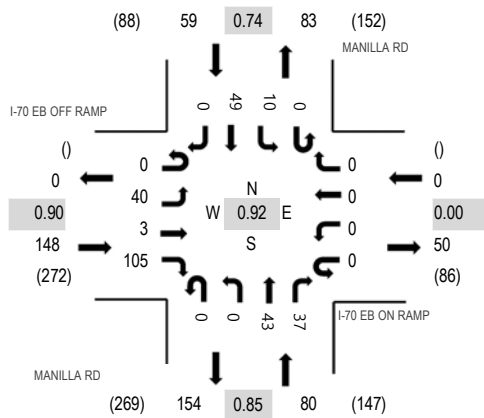
**Location:** 6 MANILLA RD & I-70 EB ON RAMP PM

**Date:** Thursday, September 6, 2018

**Peak Hour:** 04:45 PM - 05:45 PM

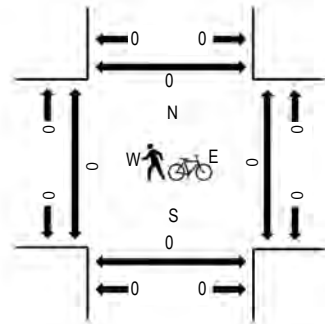
**Peak 15-Minutes:** 04:45 PM - 05:00 PM

### Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

### Peak Hour - Pedestrians/Bicycles on Crosswalk



### Traffic Counts

Interval Start Time	I-70 EB OFF RAMP Eastbound				I-70 EB ON RAMP Westbound				MANILLA RD Northbound				MANILLA RD Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	10	0	21	0	0	0	0	0	0	10	8	0	2	6	0	57	241	0	0	0	0
4:15 PM	0	9	0	24	0	0	0	0	0	0	10	7	0	3	3	0	56	261	0	0	0	0
4:30 PM	0	5	0	24	0	0	0	0	0	0	9	4	0	0	8	0	50	267	0	0	0	0
4:45 PM	0	12	3	26	0	0	0	0	0	0	11	6	0	2	18	0	78	287	0	0	0	0
5:00 PM	0	11	0	23	0	0	0	0	0	0	11	13	0	5	14	0	77	266	0	0	0	0
5:15 PM	0	7	0	30	0	0	0	0	0	0	12	7	0	1	5	0	62		0	0	0	0
5:30 PM	0	10	0	26	0	0	0	0	0	0	9	11	0	2	12	0	70		0	0	0	0
5:45 PM	0	9	0	22	0	0	0	0	0	0	7	12	0	0	7	0	57		0	0	0	0
Count Total	0	73	3	196	0	0	0	0	0	0	79	68	0	15	73	0	507		0	0	0	0
Peak Hour	0	40	3	105	0	0	0	0	0	0	43	37	0	10	49	0	287		0	0	0	0

## APPENDIX B. LEVEL OF SERVICE CRITERIA

**TABLE B1**  
**LEVEL OF SERVICE CRITERIA FOR**  
**TWO-WAY STOP CONTROLLED (TWSC) INTERSECTIONS AND ROUNDABOUTS**

Level of Service	Delay Range (sec/veh)
A	0.0 – 10.0
B	>10.0 – 15.0
C	>15.0 – 25.0
D	>25.0 – 35.0
E	>35.0 – 50.0
F	> 50.0

Adapted from *Highway Capacity Manual*, Transportation Research Board, 2010.

**TABLE B2**  
**LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS**

Level of Service	Control Delay (sec/veh)	Qualitative Description
A	$\leq 10.0$	Good progression, short cycles, very few vehicle-stops.
B	>10.0 – 20.0	Good progression, and/or short cycle lengths, more vehicle-stops.
C	>20.0 – 35.0	Fair progression and/or longer cycle lengths, some individual cycle failures, many vehicle-stops
D	>35.0 – 55.0	Noticeable congestion and cycle failures, unfavorable progression, high v/c ratios, several stops.
E	>55.0 – 80.0	Limit of acceptable delay, poor progression, long cycles, high v/c ratios, frequent cycle failures.
F	> 80.0	Delay is unacceptable to most drivers, volume exceeds capacity, breakdown of traffic flow.

Adapted from *Highway Capacity Manual*, Transportation Research Board, 2010.

## APPENDIX C. ANALYSIS WORKSHEETS – EXISTING CONDITIONS

Intersection												
Int Delay, s/veh	1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Vol, veh/h	2	0	0	0	0	3	2	47	34	18	93	3
Future Vol, veh/h	2	0	0	0	0	3	2	47	34	18	93	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	11	11	11	11	11	11	11	11	11	11	11	11
Mvmt Flow	2	0	0	0	0	4	2	56	40	21	111	4




Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	237	255	113	235	237	76	115	0	0	96	0	0
Stage 1	155	155	-	80	80	-	-	-	-	-	-	-
Stage 2	82	100	-	155	157	-	-	-	-	-	-	-
Critical Hdwy	7.21	6.61	6.31	7.21	6.61	6.31	4.21	-	-	4.21	-	-
Critical Hdwy Stg 1	6.21	5.61	-	6.21	5.61	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.21	5.61	-	6.21	5.61	-	-	-	-	-	-	-
Follow-up Hdwy	3.599	4.099	3.399	3.599	4.099	3.399	2.299	-	-	2.299	-	-
Pot Cap-1 Maneuver	699	634	916	701	649	961	1420	-	-	1443	-	-
Stage 1	826	752	-	907	811	-	-	-	-	-	-	-
Stage 2	904	795	-	826	751	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	688	624	916	693	639	961	1420	-	-	1443	-	-
Mov Cap-2 Maneuver	688	624	-	693	639	-	-	-	-	-	-	-
Stage 1	825	741	-	906	810	-	-	-	-	-	-	-
Stage 2	899	794	-	814	740	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	10.3		8.8		0.2		1.2	
HCM LOS	B		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1420	-	-	688	961	1443	-
HCM Lane V/C Ratio	0.002	-	-	0.003	0.004	0.015	-
HCM Control Delay (s)	7.5	-	-	10.3	8.8	7.5	-
HCM Lane LOS	A	-	-	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-

Intersection

Int Delay, s/veh 5.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	74	32	89	29	16	105
Future Vol, veh/h	74	32	89	29	16	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	11	11	11	11	11	11
Mvmt Flow	89	39	107	35	19	127




Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	142	0	0 342 125
Stage 1	-	-	- 125 -
Stage 2	-	-	- 217 -
Critical Hdwy	4.21	-	- 6.51 6.31
Critical Hdwy Stg 1	-	-	- 5.51 -
Critical Hdwy Stg 2	-	-	- 5.51 -
Follow-up Hdwy	2.299	-	- 3.599 3.399
Pot Cap-1 Maneuver	1387	-	- 636 902
Stage 1	-	-	- 879 -
Stage 2	-	-	- 798 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1387	-	- 594 902
Mov Cap-2 Maneuver	-	-	- 594 -
Stage 1	-	-	- 821 -
Stage 2	-	-	- 798 -

Approach	EB	WB	SB
HCM Control Delay, s	5.4	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1387	-	-	-	844
HCM Lane V/C Ratio	0.064	-	-	-	0.173
HCM Control Delay (s)	7.8	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.6

Intersection

Int Delay, s/veh 0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	45	1	0	98	4	0
Future Vol, veh/h	45	1	0	98	4	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	77	77	77	77	77	77
Heavy Vehicles, %	13	13	13	13	13	13
Mvmt Flow	58	1	0	127	5	0




Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	59
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.23
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.317
Pot Cap-1 Maneuver	-	-	1477
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1477
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	779	-	-	1477	-
HCM Lane V/C Ratio	0.007	-	-	-	-
HCM Control Delay (s)	9.7	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-



Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	36	4	28	63	8	10	12	10	2	1	1
Future Vol, veh/h	1	36	4	28	63	8	10	12	10	2	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	11	11	11	11	11	11	11	11	11	11	11	11
Mvmt Flow	1	42	5	33	73	9	12	14	12	2	1	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	82	0	0	47	0	0	192	195	45	204	193	78
Stage 1	-	-	-	-	-	-	47	47	-	144	144	-
Stage 2	-	-	-	-	-	-	145	148	-	60	49	-
Critical Hdwy	4.21	-	-	4.21	-	-	7.21	6.61	6.31	7.21	6.61	6.31
Critical Hdwy Stg 1	-	-	-	-	-	-	6.21	5.61	-	6.21	5.61	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.21	5.61	-	6.21	5.61	-
Follow-up Hdwy	2.299	-	-	2.299	-	-	3.599	4.099	3.399	3.599	4.099	3.399
Pot Cap-1 Maneuver	1460	-	-	1505	-	-	748	685	1000	735	686	958
Stage 1	-	-	-	-	-	-	944	838	-	838	761	-
Stage 2	-	-	-	-	-	-	837	758	-	929	837	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1460	-	-	1505	-	-	732	669	1000	702	670	958
Mov Cap-2 Maneuver	-	-	-	-	-	-	732	669	-	702	670	-
Stage 1	-	-	-	-	-	-	943	837	-	837	743	-
Stage 2	-	-	-	-	-	-	815	741	-	902	836	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			2.1			9.9			9.9		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	769	1460	-	-	1505	-	-	743				
HCM Lane V/C Ratio	0.048	0.001	-	-	0.022	-	-	0.006				
HCM Control Delay (s)	9.9	7.5	0	-	7.4	0	-	9.9				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0				

Intersection												
Int Delay, s/veh	5.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	18	3	7	108	23	0	0	15	25
Future Vol, veh/h	0	0	0	18	3	7	108	23	0	0	15	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	11	11	11	11	11	11	11	11	11	11	11	11
Mvmt Flow	0	0	0	21	4	8	129	27	0	0	18	30

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	318	333	27	48	0	-	0
Stage 1	285	285	-	-	-	-	-
Stage 2	33	48	-	-	-	-	-
Critical Hdwy	6.51	6.61	6.31	4.21	-	-	-
Critical Hdwy Stg 1	5.51	5.61	-	-	-	-	-
Critical Hdwy Stg 2	5.51	5.61	-	-	-	-	-
Follow-up Hdwy	3.599	4.099	3.399	2.299	-	-	-
Pot Cap-1 Maneuver	657	573	1023	1503	-	0	-
Stage 1	743	660	-	-	-	0	-
Stage 2	967	837	-	-	-	0	-
Platoon blocked, %					-	-	-
Mov Cap-1 Maneuver	600	0	1023	1503	-	-	-
Mov Cap-2 Maneuver	600	0	-	-	-	-	-
Stage 1	678	0	-	-	-	-	-
Stage 2	967	0	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	6.3	0
HCM LOS	B		







Minor Lane/Major Mvmt	NBL	NBTWBLn1	SBT	SBR
Capacity (veh/h)	1503	-	679	-
HCM Lane V/C Ratio	0.086	-	0.049	-
HCM Control Delay (s)	7.6	0	10.6	-
HCM Lane LOS	A	A	B	-
HCM 95th %tile Q(veh)	0.3	-	0.2	-

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↕			↕	
Traffic Vol, veh/h	16	0	29	0	0	0	0	115	34	3	31	0
Future Vol, veh/h	16	0	29	0	0	0	0	115	34	3	31	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	15	15	15	15	15	15	15	15	15	15	15	15
Mvmt Flow	19	0	34	0	0	0	0	134	40	3	36	0

Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	196	216	36	-	0	0	174	0	0
Stage 1	42	42	-	-	-	-	-	-	-
Stage 2	154	174	-	-	-	-	-	-	-
Critical Hdwy	6.55	6.65	6.35	-	-	-	4.25	-	-
Critical Hdwy Stg 1	5.55	5.65	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.55	5.65	-	-	-	-	-	-	-
Follow-up Hdwy	3.635	4.135	3.435	-	-	-	2.335	-	-
Pot Cap-1 Maneuver	764	660	1001	0	-	-	1328	-	0
Stage 1	948	835	-	0	-	-	-	-	0
Stage 2	843	731	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	762	0	1001	-	-	-	1328	-	-
Mov Cap-2 Maneuver	762	0	-	-	-	-	-	-	-
Stage 1	948	0	-	-	-	-	-	-	-
Stage 2	841	0	-	-	-	-	-	-	-




Approach	EB	NB	SB
HCM Control Delay, s	9.2	0	0.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	901	1328	-
HCM Lane V/C Ratio	-	-	0.058	0.003	-
HCM Control Delay (s)	-	-	9.2	7.7	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	0	1	25	0	17	0	84	8	2	78	3
Future Vol, veh/h	1	0	1	25	0	17	0	84	8	2	78	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	100	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	10	10	10	10	10	10	10	10	10	10	10	10
Mvmt Flow	1	0	1	32	0	22	0	109	10	3	101	4
Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	234	228	103	224	225	114	105	0	0	119	0	0
Stage 1	109	109	-	114	114	-	-	-	-	-	-	-
Stage 2	125	119	-	110	111	-	-	-	-	-	-	-
Critical Hdwy	7.2	6.6	6.3	7.2	6.6	6.3	4.2	-	-	4.2	-	-
Critical Hdwy Stg 1	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.2	5.6	-	6.2	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4.09	3.39	3.59	4.09	3.39	2.29	-	-	2.29	-	-
Pot Cap-1 Maneuver	704	658	930	715	660	917	1438	-	-	1421	-	-
Stage 1	877	790	-	872	786	-	-	-	-	-	-	-
Stage 2	860	782	-	876	788	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	686	657	930	713	659	917	1438	-	-	1421	-	-
Mov Cap-2 Maneuver	686	657	-	713	659	-	-	-	-	-	-	-
Stage 1	877	788	-	872	786	-	-	-	-	-	-	-
Stage 2	839	782	-	873	786	-	-	-	-	-	-	-
Approach	EB		WB			NB			SB			
HCM Control Delay, s	9.6		9.9			0			0.2			
HCM LOS	A		A									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	1438	-	-	790	784	1421	-	-				
HCM Lane V/C Ratio	-	-	-	0.003	0.07	0.002	-	-				
HCM Control Delay (s)	0	-	-	9.6	9.9	7.5	-	-				
HCM Lane LOS	A	-	-	A	A	A	-	-				
HCM 95th %tile Q(veh)	0	-	-	0	0.2	0	-	-				

Intersection

Int Delay, s/veh 5.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	92	86	45	19	42	83
Future Vol, veh/h	92	86	45	19	42	83
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	116	109	57	24	53	105




Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	81	0	0 410 69
Stage 1	-	-	- - 69 -
Stage 2	-	-	- - 341 -
Critical Hdwy	4.2	-	- - 6.5 6.3
Critical Hdwy Stg 1	-	-	- - 5.5 -
Critical Hdwy Stg 2	-	-	- - 5.5 -
Follow-up Hdwy	2.29	-	- - 3.59 3.39
Pot Cap-1 Maneuver	1467	-	- - 583 972
Stage 1	-	-	- - 934 -
Stage 2	-	-	- - 703 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1467	-	- - 534 972
Mov Cap-2 Maneuver	-	-	- - 534 -
Stage 1	-	-	- - 856 -
Stage 2	-	-	- - 703 -

Approach	EB	WB	SB
HCM Control Delay, s	4	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1467	-	-	-	762
HCM Lane V/C Ratio	0.079	-	-	-	0.208
HCM Control Delay (s)	7.7	0	-	-	11
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.3	-	-	-	0.8

Intersection





Int Delay, s/veh 0.3




Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	114	7	0	57	5	0
Future Vol, veh/h	114	7	0	57	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	75	75	75	75
Heavy Vehicles, %	10	10	10	10	10	10
Mvmt Flow	152	9	0	76	7	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	161
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.2
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.29
Pot Cap-1 Maneuver	-	-	1371
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1371
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	738	-	-	1371	-
HCM Lane V/C Ratio	0.009	-	-	-	-
HCM Control Delay (s)	9.9	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection												
Int Delay, s/veh	3.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	97	18	13	45	4	8	2	36	8	8	4
Future Vol, veh/h	4	97	18	13	45	4	8	2	36	8	8	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	83	83	83	83	83	83	83	83	83	83	83	83
Heavy Vehicles, %	8	8	8	8	8	8	8	8	8	8	8	8
Mvmt Flow	5	117	22	16	54	5	10	2	43	10	10	5
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	59	0	0	139	0	0	234	229	128	250	238	57
Stage 1	-	-	-	-	-	-	138	138	-	89	89	-
Stage 2	-	-	-	-	-	-	96	91	-	161	149	-
Critical Hdwy	4.18	-	-	4.18	-	-	7.18	6.58	6.28	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.18	5.58	-	6.18	5.58	-
Follow-up Hdwy	2.272	-	-	2.272	-	-	3.572	4.072	3.372	3.572	4.072	3.372
Pot Cap-1 Maneuver	1507	-	-	1408	-	-	708	660	906	691	653	993
Stage 1	-	-	-	-	-	-	851	771	-	904	810	-
Stage 2	-	-	-	-	-	-	896	808	-	827	763	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1507	-	-	1408	-	-	688	649	906	648	643	993
Mov Cap-2 Maneuver	-	-	-	-	-	-	688	649	-	648	643	-
Stage 1	-	-	-	-	-	-	848	768	-	900	800	-
Stage 2	-	-	-	-	-	-	870	798	-	782	760	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			1.6			9.6			10.4		
HCM LOS							A			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	845	1507	-	-	1408	-	-	694				
HCM Lane V/C Ratio	0.066	0.003	-	-	0.011	-	-	0.035				
HCM Control Delay (s)	9.6	7.4	0	-	7.6	0	-	10.4				
HCM Lane LOS	A	A	A	-	A	A	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	28	4	8	37	47	0	0	30	10
Future Vol, veh/h	0	0	0	28	4	8	37	47	0	0	30	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	2	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	84	84	84	84	84	84	84	84	84	84	84	84
Heavy Vehicles, %	15	15	15	15	15	15	15	15	15	15	15	15
Mvmt Flow	0	0	0	33	5	10	44	56	0	0	36	12
Major/Minor				Minor1		Major1		Major2				
Conflicting Flow All				186	192	56	48	0	-	-	-	0
Stage 1				144	144	-	-	-	-	-	-	-
Stage 2				42	48	-	-	-	-	-	-	-
Critical Hdwy				6.55	6.65	6.35	4.25	-	-	-	-	-
Critical Hdwy Stg 1				5.55	5.65	-	-	-	-	-	-	-
Critical Hdwy Stg 2				5.55	5.65	-	-	-	-	-	-	-
Follow-up Hdwy				3.635	4.135	3.435	2.335	-	-	-	-	-
Pot Cap-1 Maneuver				774	680	975	1480	-	0	0	-	-
Stage 1				852	754	-	-	-	0	0	-	-
Stage 2				948	830	-	-	-	0	0	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver				750	0	975	1480	-	-	-	-	-
Mov Cap-2 Maneuver				750	0	-	-	-	-	-	-	-
Stage 1				826	0	-	-	-	-	-	-	-
Stage 2				948	0	-	-	-	-	-	-	-
Approach				WB		NB		SB				
HCM Control Delay, s				9.8		3.3		0				
HCM LOS				A								
Minor Lane/Major Mvmt		NBL	NBTWBLn1	SBT	SBR							
Capacity (veh/h)		1480	-	791	-	-						
HCM Lane V/C Ratio		0.03	-	0.06	-	-						
HCM Control Delay (s)		7.5	0	9.8	-	-						
HCM Lane LOS		A	A	A	-	-						
HCM 95th %tile O(veh)		0.1	-	0.2	-	-						



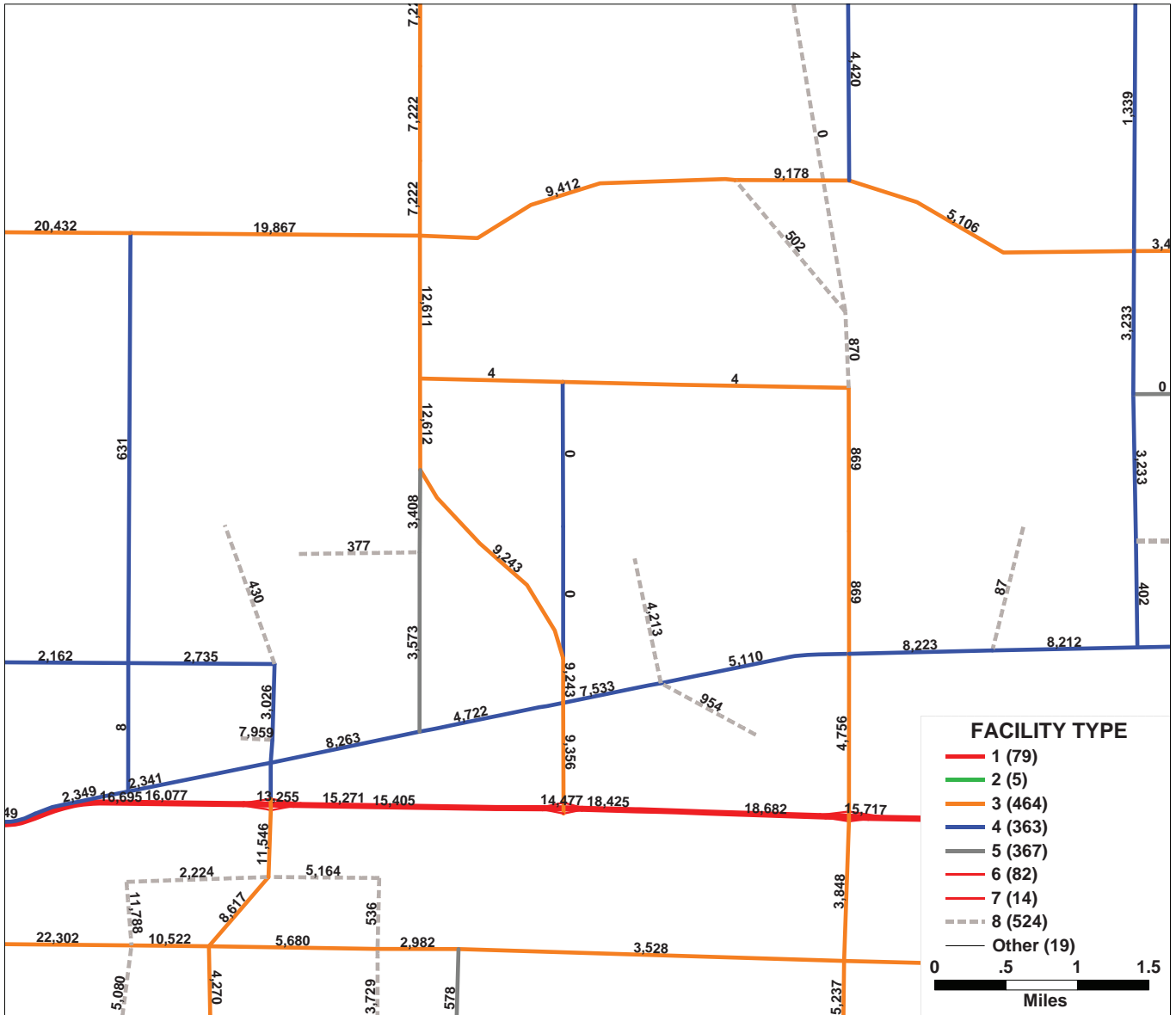
Intersection												
Int Delay, s/veh	5.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕						↕			↕	
Traffic Vol, veh/h	40	3	105	0	0	0	0	43	37	10	49	0
Future Vol, veh/h	40	3	105	0	0	0	0	43	37	10	49	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	13	13	13	13	13	13	13	13	13	13	13	13
Mvmt Flow	43	3	114	0	0	0	0	47	40	11	53	0

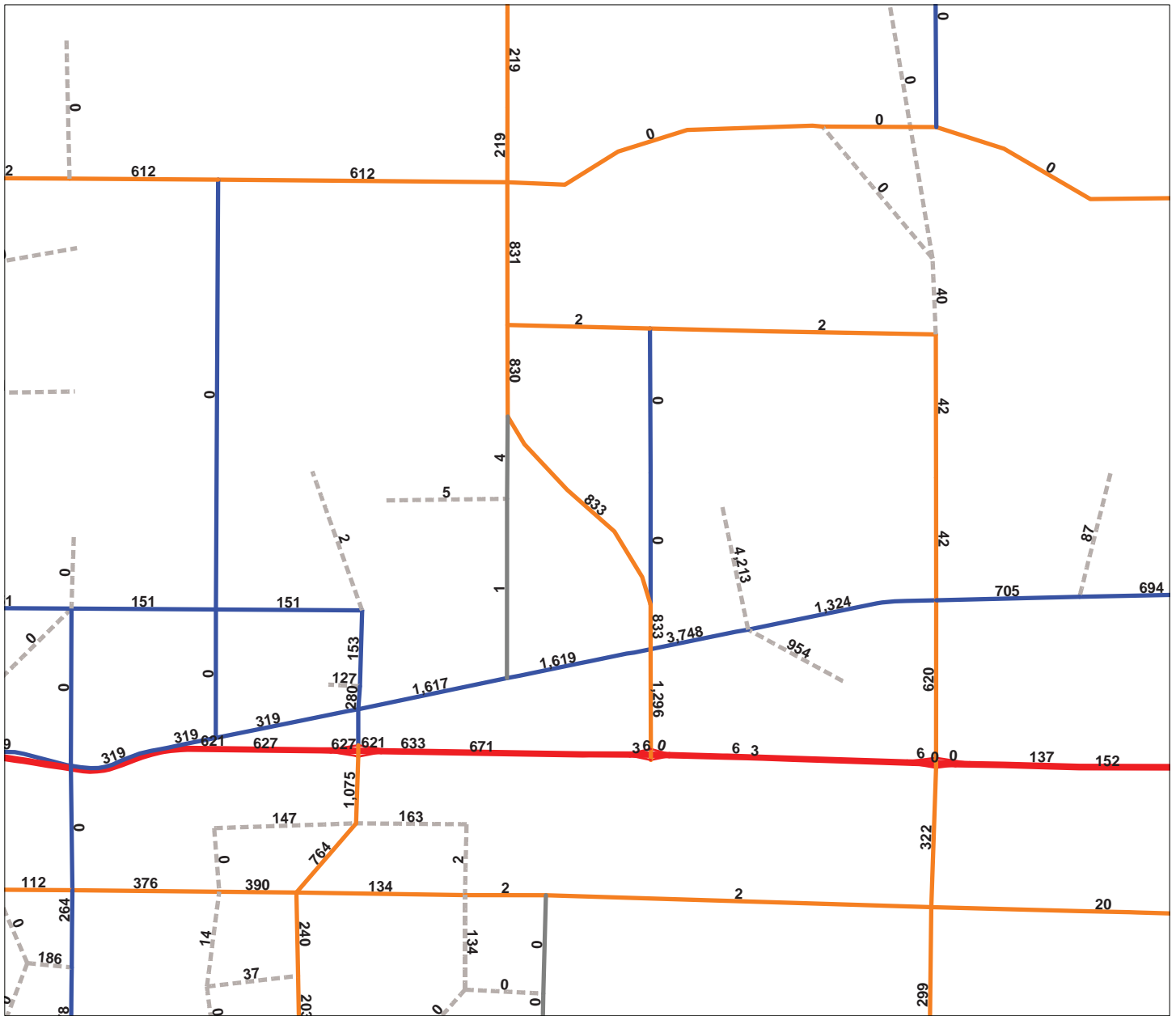
Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	142	162	53	-	0	0	87	0	0
Stage 1	75	75	-	-	-	-	-	-	-
Stage 2	67	87	-	-	-	-	-	-	-
Critical Hdwy	6.53	6.63	6.33	-	-	-	4.23	-	-
Critical Hdwy Stg 1	5.53	5.63	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.53	5.63	-	-	-	-	-	-	-
Follow-up Hdwy	3.617	4.117	3.417	-	-	-	2.317	-	-
Pot Cap-1 Maneuver	825	711	984	0	-	-	1442	-	0
Stage 1	921	811	-	0	-	-	-	-	0
Stage 2	929	802	-	0	-	-	-	-	0
Platoon blocked, %				-	-	-	-	-	-
Mov Cap-1 Maneuver	818	0	984	-	-	-	1442	-	-
Mov Cap-2 Maneuver	818	0	-	-	-	-	-	-	-
Stage 1	921	0	-	-	-	-	-	-	-
Stage 2	922	0	-	-	-	-	-	-	-

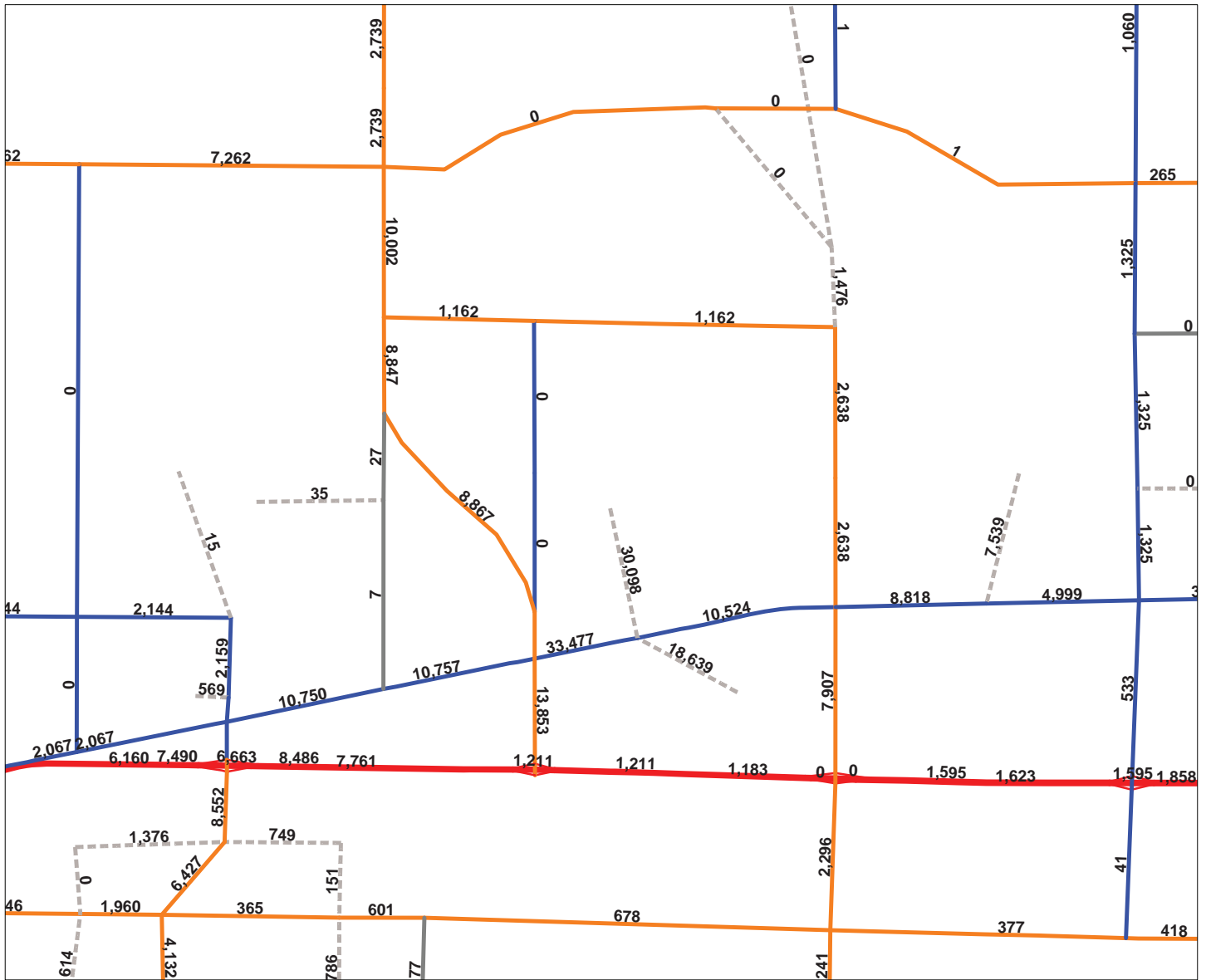
Approach	EB	NB	SB
HCM Control Delay, s	9.7	0	1.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	SBL	SBT
Capacity (veh/h)	-	-	932	1442	-
HCM Lane V/C Ratio	-	-	0.173	0.008	-
HCM Control Delay (s)	-	-	9.7	7.5	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.6	0	-

## APPENDIX D.      NEATS *REFRESH* BUILD-OUT TRAVEL DEMAND MODEL INFORMATION









## APPENDIX E. TRIP GENERATION ESTIMATES

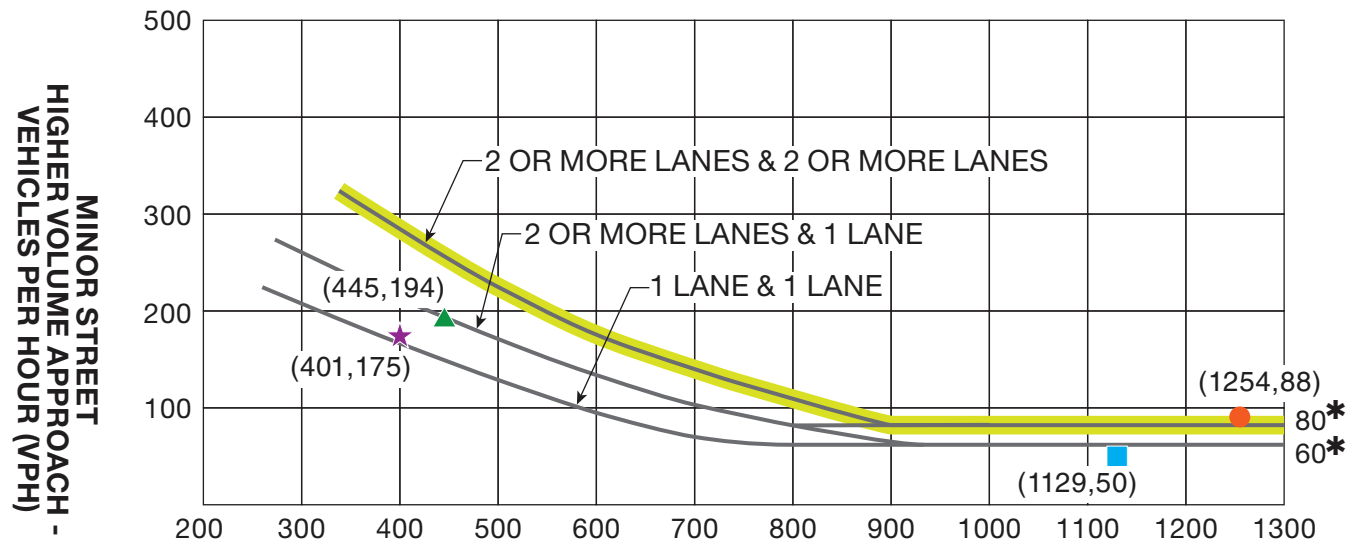
### TransPort Colorado Build-Out Trip Generation Estimates

Planning Area	Land Use	Developable Acreage	Potential Building Square Footage (KSF) <sup>1</sup>	Land Use % of SF	Land Use Size (KSF)	Daily Vehicle-Trips
PA-1a	Warehouse	115.5	754.7	100%	754.7	1,238
PA-1b	Warehouse	107.9	705.0	100%	705.0	1,159
PA-2a	Data Center	39.3	615.5	50%	307.8	305
	Warehouse	39.3		50%	307.8	532
	<b>Sub Total</b>	<b>78.5</b>		<b>100%</b>	<b>615.5</b>	<b>837</b>
PA-2b	Data Center	14.1	220.3	50%	110.2	109
	Warehouse	14.1		50%	110.2	220
	<b>Sub Total</b>	<b>28.1</b>		<b>100%</b>	<b>220.3</b>	<b>329</b>
PA-3	Data Center	60.1	942.5	50%	471.2	467
	Warehouse	60.1		50%	471.2	790
	<b>Sub Total</b>	<b>120.2</b>		<b>100%</b>	<b>942.5</b>	<b>1,257</b>
PA-4	Data Center	18.3	286.2	50%	143.1	142
	Warehouse	18.3		50%	143.1	272
	<b>Sub Total</b>	<b>36.5</b>		<b>100%</b>	<b>286.2</b>	<b>414</b>
PA-5	Data Center	68.5	1,073.4	50%	536.7	531
	Warehouse	68.5		50%	536.7	894
	<b>Sub Total</b>	<b>136.9</b>		<b>100%</b>	<b>1,073.4</b>	<b>1,425</b>
PA-6	Data Center	51.4	806.0	50%	403.0	399
	Warehouse	51.4		50%	403.0	682
	<b>Sub Total</b>	<b>102.8</b>		<b>100%</b>	<b>806.0</b>	<b>1,081</b>
PA-7	Data Center	157.2	2,465.1	50%	1,232.6	1,220
	Warehouse	157.2		50%	1,232.6	1,993
	<b>Sub Total</b>	<b>314.4</b>		<b>100%</b>	<b>2,465.1</b>	<b>3,213</b>
PA-8	Data Center	75.9	1,190.2	50%	595.1	589
	Warehouse	75.9		50%	595.1	986
	<b>Sub Total</b>	<b>151.8</b>		<b>100%</b>	<b>1,190.2</b>	<b>1,575</b>
PA-9	Data Center	77.2	1,210.6	50%	605.3	599
	Warehouse	77.2		50%	605.3	1,002
	<b>Sub Total</b>	<b>154.4</b>		<b>100%</b>	<b>1,210.6</b>	<b>1,601</b>
PA-10	Industrial	151.1	987.3	100%	987.3	3,800
PA-11	Industrial	116.0	757.9	100%	757.9	2,931
PA-12	Industrial	63.2	412.9	100%	888.6	1,623
PA-13	Industrial	154.2	1,007.5	100%	1,007.5	3,877
PA-14	Industrial	246.5	1,610.6	100%	1,610.6	6,162
PA-15	Industrial	150.0	980.1	100%	980.1	3,773

Planning Area	Land Use	Developable Acreage	Potential Building Square Footage (KSF) <sup>1</sup>	Land Use % of SF	Land Use Size (KSF)	Daily Vehicle-Trips
PA-16	Industrial	93.1	709.7	86%	608.3	2,363
	Rail Transload Facility	78.3		14%	101.3	162
	<b>Sub Total</b>	<b>171.4</b>		<b>100%</b>	<b>709.7</b>	<b>2,525</b>
PA-17	Industrial	21.9	143.1	100%	143.1	600
PA-18	Industrial	512.5	3,348.7	100%	3,348.7	12,749
PA-19	Industrial	557.8	3,644.7	100%	3,644.7	13,871
PA-20	Warehouse	60.2	472.0	100%	472.0	791
PA-21	Warehouse	70.7	554.3	100%	554.3	921
PA-22	Warehouse	58.3	457.1	100%	457.1	768
PA-23a	Warehouse	19.7	128.7	100%	128.7	249
PA-23b	Warehouse	73.7	481.6	100%	481.6	806
PA-24	Industrial	154.7	1,213.0	100%	1,213.0	4,655
PA-25	Warehouse	127.6	1,000.5	100%	1,000.5	1,626
PA-26	Warehouse	71.5	560.6	100%	560.6	931
PA-27a	Warehouse	36.8	288.5	100%	288.5	501
PA-27b	Warehouse	17.5	137.2	100%	137.2	262
PA-28	Industrial	185.0	1,208.8	100%	1,208.8	4,639
PA-29	Warehouse	63.1	494.8	100%	494.8	827
PA-30	Mixed Use	29.7	388.1	100%	405.1	15,199
PA-31	Mixed Use	502.4	6,565.4	100%	483.5	103,456
<b>Totals</b>		<b>4,962.5</b>	<b>37,822.7</b>			<b>201,671</b>
Industrial =		2,484.3	16,024.3			61,205
Data Center =		561.8	10,440.0			4,361
Warehouse =		1,384.3	4,405.0			17,450
Mixed Use =		532.1	6,953.5			118,655
Mixed Use Internal Capture Reductions <sup>2</sup>						-42,715
Mixed Use Pass-By Reductions <sup>3</sup>						-5,933
<b>Net External Trip Generation</b>						<b>153,059</b>
<sup>1</sup> Potential square footage amounts and percentage breakout were estimated by LAI Design Group and represent the maximum allowable development. Floor-Area-Ratios are 0.15 for Industrial, 0.18 for Data Center and Warehouse, and 0.3 for Mixed-Use. <sup>2</sup> Internal Capture reductions for the mixed-use sites in Planning Areas 30 and 31 are at a rate of 36 percent, the average rate reported for mixed-use sites in NCHRP Report 684. <sup>3</sup> Pass-by reductions for Planning Areas 30 and 31 are at a rate of 5 percent.						



## APPENDIX F. SUBAREA I WARRANT GRAPHS

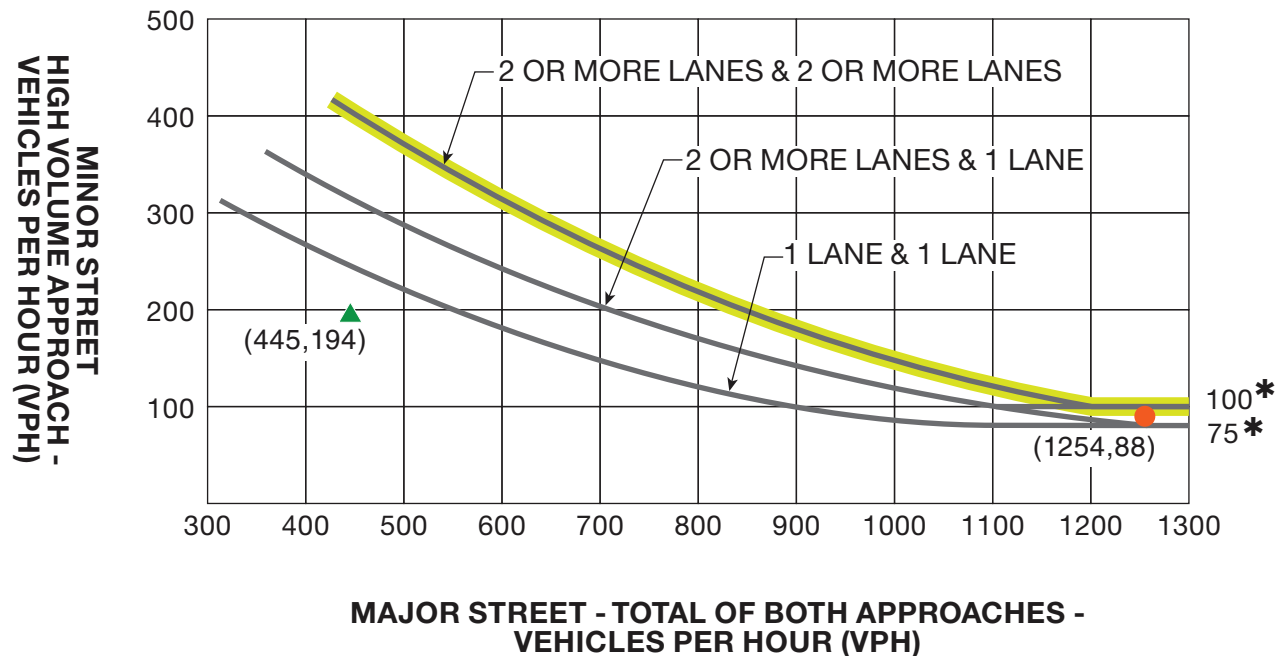


**MAJOR STREET - TOTAL OF BOTH APPROACHES -  
VEHICLES PER HOUR (VPH)**

\* Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor street approach with one lane.

**LEGEND**

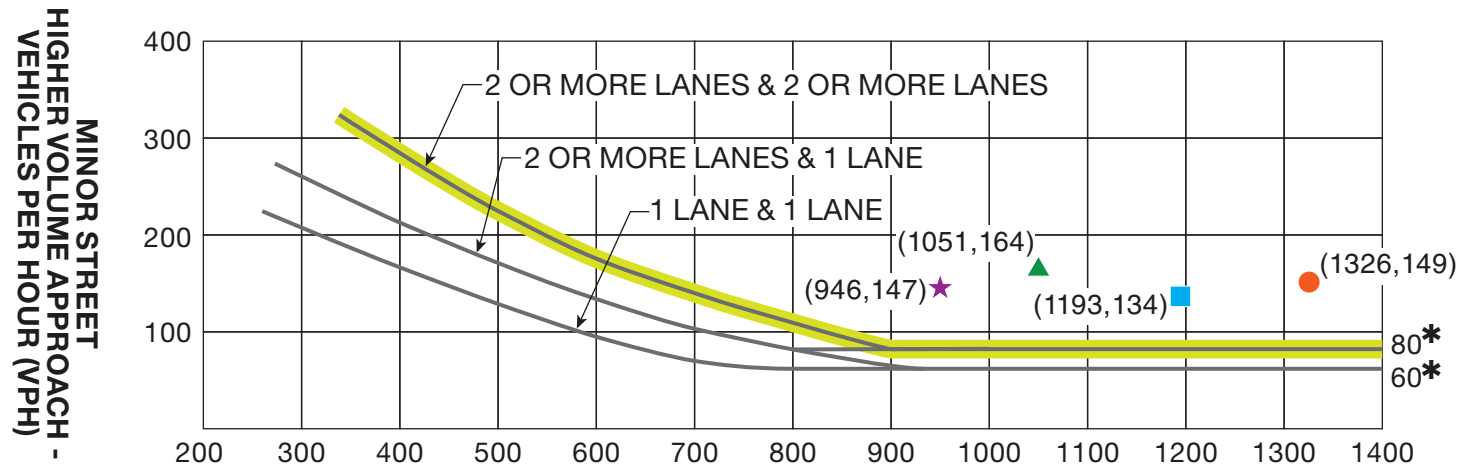
- = AM
- = 90% AM
- ▲ = PM
- ★ = 90% PM



\* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

#### LEGEND

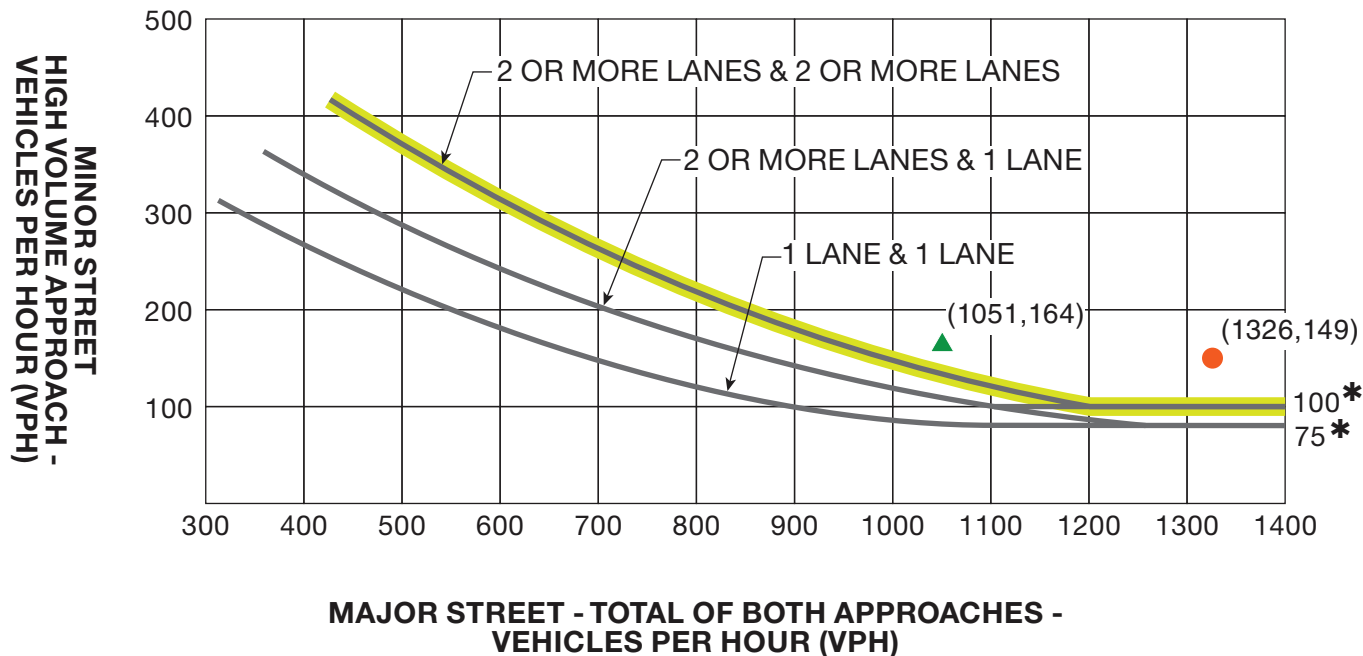
- = Peak Hour AM
- ▲ = Peak Hour PM



\* Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor street approach with one lane.

#### LEGEND

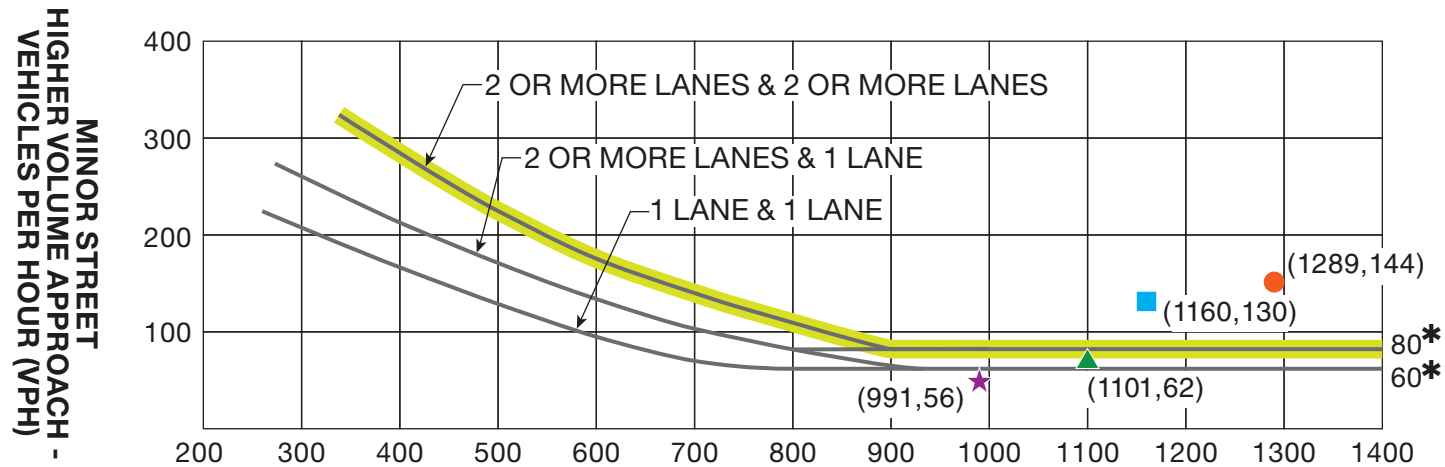
- = AM
- = 90% AM
- ▲ = PM
- ★ = 90% PM



\* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

#### LEGEND

- = Peak Hour AM
- ▲ = Peak Hour PM

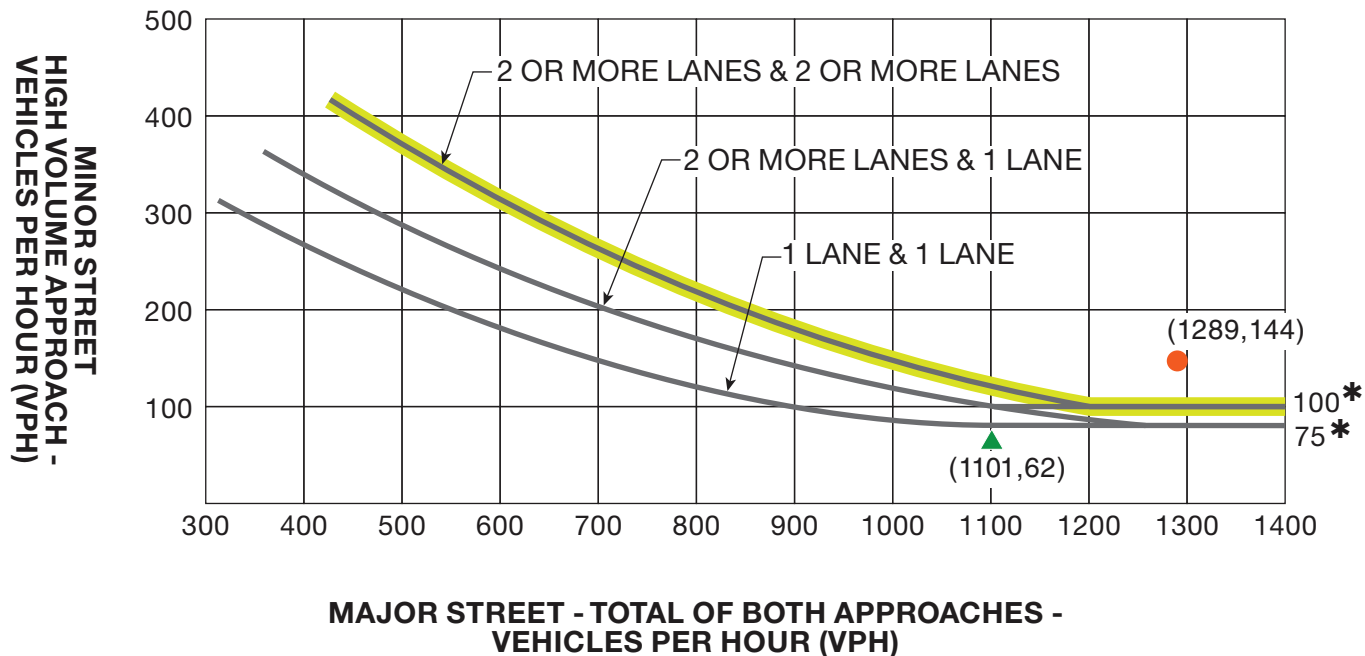


**MAJOR STREET - TOTAL OF BOTH APPROACHES -  
VEHICLES PER HOUR (VPH)**

\* Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor street approach with one lane.

**LEGEND**

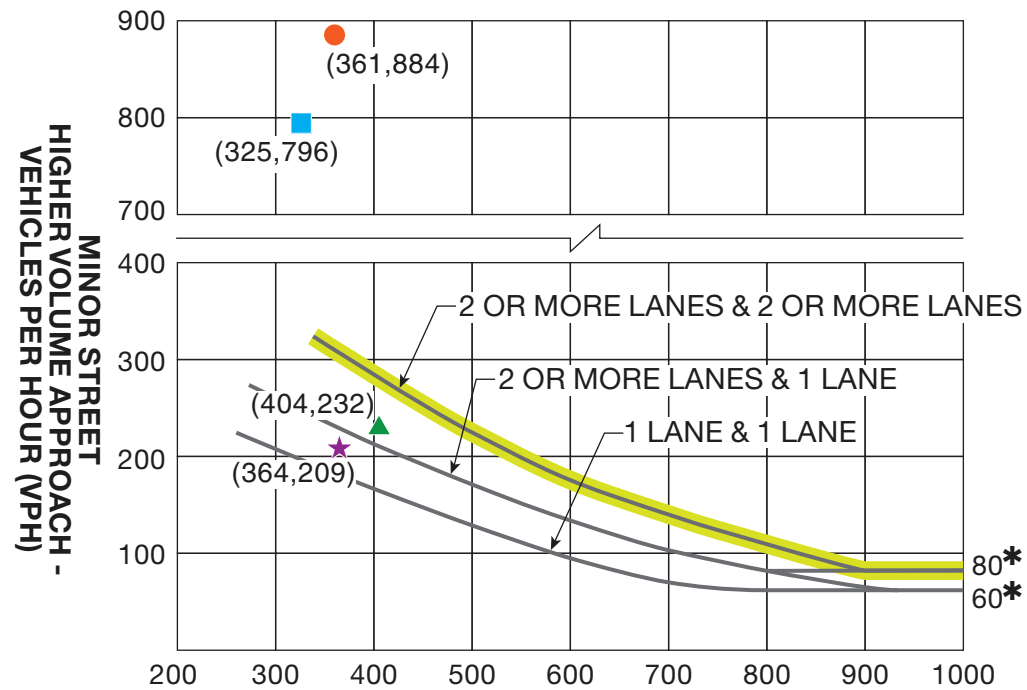
- = AM
- = 90% AM
- ▲ = PM
- ★ = 90% PM



\* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

#### LEGEND

- = Peak Hour AM
- ▲ = Peak Hour PM

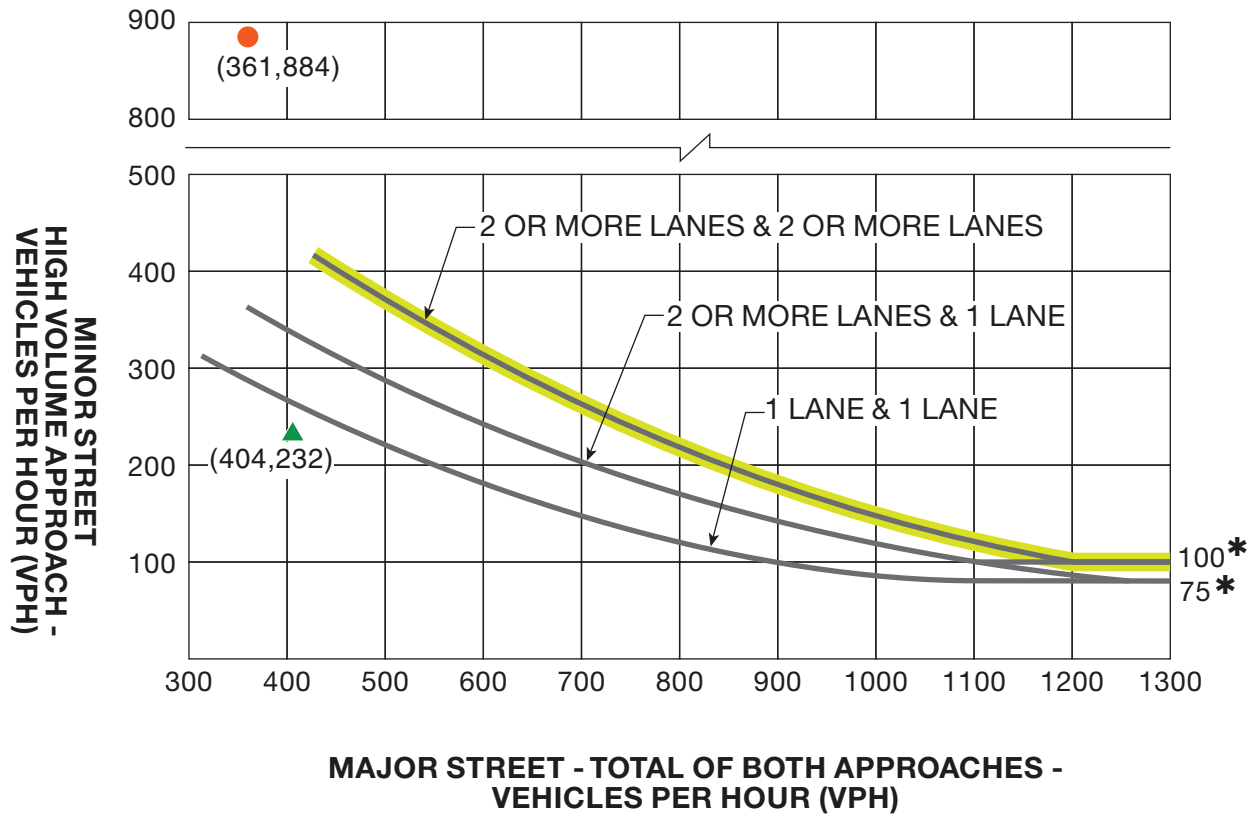


#### LEGEND

- = AM
- = 90% AM
- ▲ = PM
- ★ = 90% PM

\* Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor street approach with one lane.





#### LEGEND

- = Peak Hour AM
- ▲ = Peak Hour PM

## APPENDIX G. ANALYSIS WORKSHEETS – SUBAREA I

Intersection												
Int Delay, s/veh	3.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕	↕	↕	↕	↕	↕	↕	
Traffic Vol, veh/h	5	5	5	5	5	26	5	87	50	173	263	5
Future Vol, veh/h	5	5	5	5	5	26	5	87	50	173	263	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	100	0	-	0	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	20	20	20	20	20	20	20	20	20	20	20	20
Mvmt Flow	6	6	6	6	6	31	6	102	59	204	309	6







Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	882	893	312	840	837	102	315	0	0	161	0	0
Stage 1	720	720	-	114	114	-	-	-	-	-	-	-
Stage 2	162	173	-	726	723	-	-	-	-	-	-	-
Critical Hdwy	7.3	6.7	6.4	7.3	6.7	6.4	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.3	5.7	-	6.3	5.7	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.3	5.7	-	6.3	5.7	-	-	-	-	-	-	-
Follow-up Hdwy	3.68	4.18	3.48	3.68	4.18	3.48	2.38	-	-	2.38	-	-
Pot Cap-1 Maneuver	248	263	688	265	284	906	1150	-	-	1316	-	-
Stage 1	392	406	-	849	768	-	-	-	-	-	-	-
Stage 2	799	723	-	389	405	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	206	221	688	226	239	906	1150	-	-	1316	-	-
Mov Cap-2 Maneuver	206	221	-	226	239	-	-	-	-	-	-	-
Stage 1	390	343	-	845	764	-	-	-	-	-	-	-
Stage 2	762	719	-	320	342	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	18.9		12.4		0.3		3.2	
HCM LOS	C		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1WBLn2WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1150	-	-	277 226 239 906	1316	-	-
HCM Lane V/C Ratio	0.005	-	-	0.064 0.026 0.025 0.034	0.155	-	-
HCM Control Delay (s)	8.1	-	-	18.9 21.4 20.4 9.1	8.2	-	-
HCM Lane LOS	A	-	-	C C C A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2 0.1 0.1 0.1	0.5	-	-

Intersection




Int Delay, s/veh 5.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	142	45	130	40	25	155
Future Vol, veh/h	142	45	130	40	25	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	100	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	20	20	20	20	20	20
Mvmt Flow	167	53	153	47	29	182

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	200	0	0 540 153
Stage 1	-	-	- 153 -
Stage 2	-	-	- 387 -
Critical Hdwy	4.3	-	- 6.6 6.4
Critical Hdwy Stg 1	-	-	- 5.6 -
Critical Hdwy Stg 2	-	-	- 5.6 -
Follow-up Hdwy	2.38	-	- 3.68 3.48
Pot Cap-1 Maneuver	1272	-	- 473 848
Stage 1	-	-	- 833 -
Stage 2	-	-	- 649 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1272	-	- 411 848
Mov Cap-2 Maneuver	-	-	- 411 -
Stage 1	-	-	- 724 -
Stage 2	-	-	- 649 -

Approach	EB	WB	SB
HCM Control Delay, s	6.3	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1272	-	-	-	411	848
HCM Lane V/C Ratio	0.131	-	-	-	0.072	0.215
HCM Control Delay (s)	8.3	-	-	-	14.4	10.4
HCM Lane LOS	A	-	-	-	B	B
HCM 95th %tile Q(veh)	0.5	-	-	-	0.2	0.8

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	65	5	5	140	5	5
Future Vol, veh/h	65	5	5	140	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	20	20	20	20	20	20
Mvmt Flow	76	6	6	165	6	6





















Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	82
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.3
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.38
Pot Cap-1 Maneuver	-	-	1409
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1409
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	795	-	-	1409	-
HCM Lane V/C Ratio	0.015	-	-	0.004	-
HCM Control Delay (s)	9.6	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

# Timings 4: Manila Rd & E Colfax Ave

TransPort  
11/12/2019

										
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	5	50	40	90	38	15	1125	15	9	157
Future Volume (vph)	5	50	40	90	38	15	1125	15	9	157
Turn Type	Perm	NA	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		4		8		5	2		1	6
Permitted Phases	4		8		8	2		2	6	
Detector Phase	4	4	8	8	8	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5
Total Split (s)	30.0	30.0	30.0	30.0	30.0	12.0	78.0	78.0	12.0	78.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	25.0%	10.0%	65.0%	65.0%	10.0%	65.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	Min	None	Min
Act Effect Green (s)	10.6	10.6	11.0	11.0	11.0	41.0	41.6	41.6	40.9	41.5
Actuated g/C Ratio	0.18	0.18	0.19	0.19	0.19	0.69	0.71	0.71	0.69	0.70
v/c Ratio	0.03	0.23	0.22	0.36	0.15	0.02	0.62	0.02	0.04	0.09
Control Delay	27.0	26.3	28.6	29.3	8.9	3.8	9.0	0.1	4.0	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.0	26.3	28.6	29.3	8.9	3.8	9.0	0.1	4.0	5.1
LOS	C	C	C	C	A	A	A	A	A	A
Approach Delay		26.3		24.5			8.8			5.0
Approach LOS		C		C			A			A

## Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 59

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.62

Intersection Signal Delay: 10.8


Intersection LOS: B

Intersection Capacity Utilization 50.7%

ICU Level of Service A

Analysis Period (min) 15
























Splits and Phases: 4: Manila Rd & E Colfax Ave

		
Ø1	Ø2	Ø4
12 s	78 s	30 s
		
Ø5	Ø6	Ø8
12 s	78 s	30 s

# HCM 6th Signalized Intersection Summary















## 4: Manila Rd & E Colfax Ave

TransPort  
11/12/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	50	5	40	90	38	15	1125	15	9	157	5
Future Volume (veh/h)	5	50	5	40	90	38	15	1125	15	9	157	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1604	1604	1604	1604	1604	1604	1604	1604	1604	1604	1604	1604
Adj Flow Rate, veh/h	6	59	6	47	106	45	18	1324	18	11	185	6
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	20	20	20	20	20	20	20	20	20	20	20	20
Cap, veh/h	201	178	18	234	200	169	756	1858	829	264	1813	59
Arrive On Green	0.12	0.12	0.12	0.12	0.12	0.12	0.02	0.61	0.61	0.01	0.60	0.60
Sat Flow, veh/h	1060	1432	146	1146	1604	1359	1527	3047	1359	1527	3012	97
Grp Volume(v), veh/h	6	0	65	47	106	45	18	1324	18	11	93	98
Grp Sat Flow(s),veh/h/ln	1060	0	1577	1146	1604	1359	1527	1523	1359	1527	1523	1586
Q Serve(g_s), s	0.3	0.0	2.0	2.1	3.3	1.6	0.2	16.1	0.3	0.1	1.4	1.4
Cycle Q Clear(g_c), s	3.6	0.0	2.0	4.1	3.3	1.6	0.2	16.1	0.3	0.1	1.4	1.4
Prop In Lane	1.00		0.09	1.00		1.00	1.00		1.00	1.00		0.06
Lane Grp Cap(c), veh/h	201	0	197	234	200	169	756	1858	829	264	917	955
V/C Ratio(X)	0.03	0.00	0.33	0.20	0.53	0.27	0.02	0.71	0.02	0.04	0.10	0.10
Avail Cap(c_a), veh/h	572	0	750	636	762	646	936	4173	1861	456	2087	2172
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	23.7	0.0	21.4	23.3	22.0	21.3	3.9	7.2	4.1	6.3	4.5	4.5
Incr Delay (d2), s/veh	0.1	0.0	1.0	0.4	2.2	0.8	0.0	0.5	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.7	0.5	1.1	0.5	0.0	3.3	0.1	0.0	0.2	0.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.8	0.0	22.4	23.7	24.2	22.1	3.9	7.7	4.2	6.4	4.6	4.6
LnGrp LOS	C	A	C	C	C	C	A	A	A	A	A	A
Approach Vol, veh/h	71			198			1360			202		
Approach Delay, s/veh	22.5			23.6			7.6			4.7		
Approach LOS	C			C			A			A		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.3	37.2		11.2	5.7	36.8		11.2				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	7.5	73.5		25.5	7.5	73.5		25.5				
Max Q Clear Time (g_c+I1), s	2.1	18.1		5.6	2.2	3.4		6.1				
Green Ext Time (p_c), s	0.0	14.6		0.2	0.0	1.0		0.7				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				9.6								
HCM 6th LOS				A								

# Timings 5: Manila Rd & I-70 WB Ramp

TransPort  
11/12/2019

							
Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	25	5	228	155	917	58	149
Future Volume (vph)	25	5	228	155	917	58	149
Turn Type	Perm	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases		8		5	2	6	
Permitted Phases	8		8	2			6
Detector Phase	8	8	8	5	2	6	6
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	9.5	22.5	22.5	22.5
Total Split (s)	45.0	45.0	45.0	18.0	75.0	57.0	57.0
Total Split (%)	37.5%	37.5%	37.5%	15.0%	62.5%	47.5%	47.5%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag				Lead		Lag	Lag
Lead-Lag Optimize?				Yes		Yes	Yes
Recall Mode	None	None	None	None	Min	Min	Min
Act Effect Green (s)	14.0	14.0	14.0	27.1	27.1	11.3	11.3
Actuated g/C Ratio	0.28	0.28	0.28	0.53	0.53	0.22	0.22
v/c Ratio	0.07	0.01	0.61	0.31	0.67	0.19	0.40
Control Delay	16.4	16.2	18.3	8.5	11.5	18.6	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.4	16.2	18.3	8.5	11.5	18.6	6.7
LOS	B	B	B	A	B	B	A
Approach Delay		18.0			11.1	10.0	
Approach LOS		B			B	B	

## Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 50.8

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 12.1

Intersection LOS: B

Intersection Capacity Utilization 66.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 5: Manila Rd & I-70 WB Ramp
























# HCM 6th Signalized Intersection Summary















## 5: Manila Rd & I-70 WB Ramp

TransPort  
11/12/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	25	5	228	155	917	0	0	58	149
Future Volume (veh/h)	0	0	0	25	5	228	155	917	0	0	58	149
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1604	1604	1604	1604	1604	0	0	1604	1604
Adj Flow Rate, veh/h				29	6	268	182	1079	0	0	68	175
Peak Hour Factor				0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %				20	20	20	20	20	0	0	20	20
Cap, veh/h				384	403	342	613	1598	0	0	481	407
Arrive On Green				0.25	0.25	0.25	0.11	0.52	0.00	0.00	0.30	0.30
Sat Flow, veh/h				1527	1604	1359	1527	3127	0	0	1604	1359
Grp Volume(v), veh/h				29	6	268	182	1079	0	0	68	175
Grp Sat Flow(s),veh/h/ln				1527	1604	1359	1527	1523	0	0	1604	1359
Q Serve(g_s), s				0.6	0.1	7.4	2.9	10.5	0.0	0.0	1.2	4.2
Cycle Q Clear(g_c), s				0.6	0.1	7.4	2.9	10.5	0.0	0.0	1.2	4.2
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				384	403	342	613	1598	0	0	481	407
V/C Ratio(X)				0.08	0.01	0.78	0.30	0.68	0.00	0.00	0.14	0.43
Avail Cap(c_a), veh/h				1541	1618	1371	955	5350	0	0	2097	1777
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				11.5	11.3	14.0	6.8	7.0	0.0	0.0	10.3	11.3
Incr Delay (d2), s/veh				0.1	0.0	4.0	0.3	0.5	0.0	0.0	0.1	0.7
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.2	0.0	2.1	0.4	1.2	0.0	0.0	0.3	0.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				11.6	11.3	18.0	7.0	7.5	0.0	0.0	10.4	12.0
LnGrp LOS				B	B	B	A	A	A	A	B	B
Approach Vol, veh/h					303			1261			243	
Approach Delay, s/veh					17.2			7.5			11.6	
Approach LOS					B			A			B	
Timer - Assigned Phs	2			5		6	8					
Phs Duration (G+Y+Rc), s	25.6			9.0		16.5	14.6					
Change Period (Y+Rc), s	4.5			4.5		4.5	4.5					
Max Green Setting (Gmax), s	70.5			13.5		52.5	40.5					
Max Q Clear Time (g_c+I1), s	12.5			4.9		6.2	9.4					
Green Ext Time (p_c), s	8.6			0.3		0.9	1.1					
Intersection Summary												
HCM 6th Ctrl Delay	9.7											
HCM 6th LOS	A											

# Timings 6: Manila Rd & I-70 EB Ramp

TransPort  
11/12/2019





							
Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	859	5	40	223	50	35	53
Future Volume (vph)	859	5	40	223	50	35	53
Turn Type	Perm	NA	Perm	NA	Perm	pm+pt	NA
Protected Phases		4		2		1	6
Permitted Phases	4		4		2	6	
Detector Phase	4	4	4	2	2	1	6
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	68.0	68.0	68.0	40.0	40.0	12.0	52.0
Total Split (%)	56.7%	56.7%	56.7%	33.3%	33.3%	10.0%	43.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag				Lag	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	
Recall Mode	None	None	None	Min	Min	None	Min
Act Effect Green (s)	36.9	36.9	36.9	19.8	19.8	25.5	25.5
Actuated g/C Ratio	0.50	0.50	0.50	0.27	0.27	0.35	0.35
v/c Ratio	0.70	0.71	0.07	0.61	0.15	0.14	0.11
Control Delay	21.7	22.0	3.2	35.1	10.4	19.9	19.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.7	22.0	3.2	35.1	10.4	19.9	19.3
LOS	C	C	A	D	B	B	B
Approach Delay		21.0		30.6			19.6
Approach LOS		C		C			B

## Intersection Summary

Cycle Length: 120  
Actuated Cycle Length: 73.2  
Natural Cycle: 65  
Control Type: Actuated-Uncoordinated  
Maximum v/c Ratio: 0.71  
Intersection Signal Delay: 23.0  
Intersection Capacity Utilization 64.3%  
Analysis Period (min) 15

Intersection LOS: C  
ICU Level of Service C




















## Splits and Phases: 6: Manila Rd & I-70 EB Ramp

		
Ø1	Ø2	Ø4
12 s	40 s	68 s
		
Ø6		
52 s		

# HCM 6th Signalized Intersection Summary







## 6: Manila Rd & I-70 EB Ramp

TransPort  
11/12/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	859	5	40	0	0	0	0	223	50	35	53	0
Future Volume (veh/h)	859	5	40	0	0	0	0	223	50	35	53	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1604	1604	1604				0	1604	1604	1604	1604	0
Adj Flow Rate, veh/h	1015	0	47				0	262	59	41	62	0
Peak Hour Factor	0.85	0.85	0.85				0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	20	20	20				0	20	20	20	20	0
Cap, veh/h	1321	0	588				0	364	309	295	594	0
Arrive On Green	0.43	0.00	0.43				0.00	0.23	0.23	0.04	0.37	0.00
Sat Flow, veh/h	3054	0	1359				0	1604	1359	1527	1604	0
Grp Volume(v), veh/h	1015	0	47				0	262	59	41	62	0
Grp Sat Flow(s),veh/h/ln	1527	0	1359				0	1604	1359	1527	1604	0
Q Serve(g_s), s	12.9	0.0	0.9				0.0	6.9	1.6	0.9	1.2	0.0
Cycle Q Clear(g_c), s	12.9	0.0	0.9				0.0	6.9	1.6	0.9	1.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	1321	0	588				0	364	309	295	594	0
V/C Ratio(X)	0.77	0.00	0.08				0.00	0.72	0.19	0.14	0.10	0.00
Avail Cap(c_a), veh/h	4253	0	1892				0	1248	1058	478	1670	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	0.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	11.0	0.0	7.6				0.0	16.3	14.2	11.9	9.4	0.0
Incr Delay (d2), s/veh	1.0	0.0	0.1				0.0	2.7	0.3	0.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	0.0	0.2				0.0	2.1	0.4	0.2	0.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.0	0.0	7.7				0.0	19.0	14.5	12.1	9.5	0.0
LnGrp LOS	B	A	A				A	B	B	B	A	A
Approach Vol, veh/h	1062						321			103		
Approach Delay, s/veh	11.8						18.2			10.5		
Approach LOS	B						B			B		
Timer - Assigned Phs	1	2	4		6							
Phs Duration (G+Y+Rc), s	6.5	14.9	24.2		21.4							
Change Period (Y+Rc), s	4.5	4.5	4.5		4.5							
Max Green Setting (Gmax), s	7.5	35.5	63.5		47.5							
Max Q Clear Time (g_c+I1), s	2.9	8.9	14.9		3.2							
Green Ext Time (p_c), s	0.0	1.5	4.8		0.3							
Intersection Summary												
HCM 6th Ctrl Delay	13.1											
HCM 6th LOS	B											
Notes												
User approved pedestrian interval to be less than phase max green.												
User approved volume balancing among the lanes for turning movement.												

Intersection







Int Delay, s/veh 2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	17	145	37	128	175
Future Vol, veh/h	5	17	145	37	128	175
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	100	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	20	20	20	20	20	20
Mvmt Flow	6	20	171	44	151	206

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	679	171	0
Stage 1	171	-	-
Stage 2	508	-	-
Critical Hdwy	6.6	6.4	-
Critical Hdwy Stg 1	5.6	-	-
Critical Hdwy Stg 2	5.6	-	-
Follow-up Hdwy	3.68	3.48	-
Pot Cap-1 Maneuver	391	828	-
Stage 1	817	-	-
Stage 2	569	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	344	828	-
Mov Cap-2 Maneuver	344	-	-
Stage 1	817	-	-
Stage 2	501	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	3.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	- 344 828	1255	-
HCM Lane V/C Ratio	-	- 0.017 0.024	0.12	-
HCM Control Delay (s)	-	- 15.6 9.5	8.3	-
HCM Lane LOS	-	- C A	A	-
HCM 95th %tile Q(veh)	-	- 0.1 0.1	0.4	-

Intersection						
Int Delay, s/veh	8.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	3	105	763	405	66	20
Future Vol, veh/h	3	105	763	405	66	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	20	20	20	20	20	20
Mvmt Flow	4	124	898	476	78	24

Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	2124	51	102	0	-	0
Stage 1	90	-	-	-	-	-
Stage 2	2034	-	-	-	-	-
Critical Hdwy	7.2	7.3	4.5	-	-	-
Critical Hdwy Stg 1	6.2	-	-	-	-	-
Critical Hdwy Stg 2	6.2	-	-	-	-	-
Follow-up Hdwy	3.7	3.5	2.4	-	-	-
Pot Cap-1 Maneuver	34	951	1366	-	-	-
Stage 1	872	-	-	-	-	-
Stage 2	70	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	12	951	1366	-	-	-
Mov Cap-2 Maneuver	12	-	-	-	-	-
Stage 1	299	-	-	-	-	-
Stage 2	70	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.3	8.2	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1366	-	12	951	-	-
HCM Lane V/C Ratio	0.657	-	0.294	0.13	-	-
HCM Control Delay (s)	12.5	-	\$ 401	9.4	-	-
HCM Lane LOS	B	-	F	A	-	-
HCM 95th %tile Q(veh)	5.3	-	0.7	0.4	-	-

# Timings 20: Manila Rd & 32nd Ave

TransPort  
11/12/2019



Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	3	105	763	405	66
Future Volume (vph)	3	105	763	405	66
Turn Type	Prot	Perm	pm+pt	NA	NA
Protected Phases	4		5	2	6
Permitted Phases		4	2		
Detector Phase	4	4	5	2	6
Switch Phase					
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	9.5	22.5	22.5
Total Split (s)	26.0	26.0	71.0	94.0	23.0
Total Split (%)	21.7%	21.7%	59.2%	78.3%	19.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag
Lead-Lag Optimize?			Yes		Yes
Recall Mode	None	None	None	Min	Min
Act Effect Green (s)	7.2	7.2	65.7	65.7	7.9
Actuated g/C Ratio	0.09	0.09	0.80	0.80	0.10
v/c Ratio	0.03	0.54	0.83	0.20	0.34
Control Delay	40.7	17.5	14.8	2.2	34.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	40.7	17.5	14.8	2.2	34.9
LOS	D	B	B	A	C
Approach Delay	18.3			10.4	34.9
Approach LOS	B			B	C

## Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 82.3

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 12.6

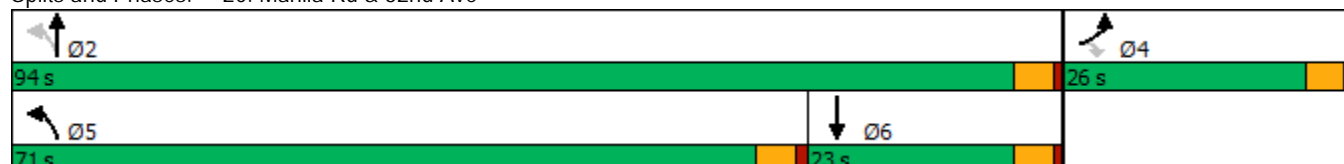
Intersection LOS: B

Intersection Capacity Utilization 60.6%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 20: Manila Rd & 32nd Ave









# HCM 6th Signalized Intersection Summary 20: Manila Rd & 32nd Ave

TransPort  
11/12/2019









Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	105	763	405	66	20
Future Volume (veh/h)	3	105	763	405	66	20
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1604	1604	1604	1604	1604	1604
Adj Flow Rate, veh/h	4	124	898	476	78	24
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	20	20	20	20	20	20
Cap, veh/h	171	152	1041	2213	208	61
Arrive On Green	0.11	0.11	0.56	0.73	0.09	0.09
Sat Flow, veh/h	1527	1359	1527	3127	2399	685
Grp Volume(v), veh/h	4	124	898	476	50	52
Grp Sat Flow(s),veh/h/ln	1527	1359	1527	1523	1523	1480
Q Serve(g_s), s	0.1	5.0	25.3	2.8	1.7	1.8
Cycle Q Clear(g_c), s	0.1	5.0	25.3	2.8	1.7	1.8
Prop In Lane	1.00	1.00	1.00			0.46
Lane Grp Cap(c), veh/h	171	152	1041	2213	137	133
V/C Ratio(X)	0.02	0.81	0.86	0.22	0.37	0.39
Avail Cap(c_a), veh/h	589	524	2015	4894	506	491
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.0	24.2	7.2	2.5	23.9	23.9
Incr Delay (d2), s/veh	0.1	10.0	2.3	0.0	1.6	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.4	2.6	0.1	0.6	0.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	22.1	34.2	9.4	2.5	25.5	25.8
LnGrp LOS	C	C	A	A	C	C
Approach Vol, veh/h	128			1374	102	
Approach Delay, s/veh	33.8			7.0	25.6	
Approach LOS	C			A	C	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		45.0		10.7	35.5	9.5
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		89.5		21.5	66.5	18.5
Max Q Clear Time (g_c+I1), s		4.8		7.0	27.3	3.8
Green Ext Time (p_c), s		3.0		0.3	3.7	0.3
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			10.4			
HCM 6th LOS			B			

Intersection						
Int Delay, s/veh	3.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	25	184	165	116	41
Future Vol, veh/h	6	25	184	165	116	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	0	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	20	20	20	20	20	20
Mvmt Flow	7	29	216	194	136	48
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	762	136	184	0	-	0
Stage 1	136	-	-	-	-	-
Stage 2	626	-	-	-	-	-
Critical Hdwy	6.6	6.4	4.3	-	-	-
Critical Hdwy Stg 1	5.6	-	-	-	-	-
Critical Hdwy Stg 2	5.6	-	-	-	-	-
Follow-up Hdwy	3.68	3.48	2.38	-	-	-
Pot Cap-1 Maneuver	348	867	1290	-	-	-
Stage 1	848	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	290	867	1290	-	-	-
Mov Cap-2 Maneuver	290	-	-	-	-	-
Stage 1	706	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	10.9	4.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1290	-	290	867	-	-
HCM Lane V/C Ratio	0.168	-	0.024	0.034	-	-
HCM Control Delay (s)	8.4	-	17.7	9.3	-	-
HCM Lane LOS	A	-	C	A	-	-
HCM 95th %tile Q(veh)	0.6	-	0.1	0.1	-	-



Intersection

Int Delay, s/veh 1.1







Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	43	151	430	170	23	6
Future Vol, veh/h	43	151	430	170	23	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	100	0	100
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	20	20	20	20	20	20
Mvmt Flow	51	178	506	200	27	7

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	706	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.3	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.38	-	-
Pot Cap-1 Maneuver	815	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	815	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0	16.3
HCM LOS			C




Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	815	-	-	-	316	532
HCM Lane V/C Ratio	0.062	-	-	-	0.086	0.013
HCM Control Delay (s)	9.7	-	-	-	17.5	11.9
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.3	0

Intersection												
Int Delay, s/veh	4.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↑	↕	↕	↑	↕	↕	↕	
Traffic Vol, veh/h	5	5	5	35	5	139	5	215	10	21	129	5
Future Vol, veh/h	5	5	5	35	5	139	5	215	10	21	129	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	100	100	-	0	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	19	19	19	19	19	19	19	19	19	19	19	19
Mvmt Flow	6	6	6	41	6	164	6	253	12	25	152	6
Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	561	482	155	476	473	253	158	0	0	265	0	0
Stage 1	205	205	-	265	265	-	-	-	-	-	-	-
Stage 2	356	277	-	211	208	-	-	-	-	-	-	-
Critical Hdwy	7.29	6.69	6.39	7.29	6.69	6.39	4.29	-	-	4.29	-	-
Critical Hdwy Stg 1	6.29	5.69	-	6.29	5.69	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.29	5.69	-	6.29	5.69	-	-	-	-	-	-	-
Follow-up Hdwy	3.671	4.171	3.471	3.671	4.171	3.471	2.371	-	-	2.371	-	-
Pot Cap-1 Maneuver	413	460	848	472	465	746	1324	-	-	1207	-	-
Stage 1	760	701	-	704	659	-	-	-	-	-	-	-
Stage 2	628	651	-	754	699	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	313	448	848	455	453	746	1324	-	-	1207	-	-
Mov Cap-2 Maneuver	313	448	-	455	453	-	-	-	-	-	-	-
Stage 1	756	686	-	700	656	-	-	-	-	-	-	-
Stage 2	484	648	-	727	684	-	-	-	-	-	-	-
Approach	EB		WB		NB			SB				
HCM Control Delay, s	13.3		11.7		0.2			1.1				
HCM LOS	B		B									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1WBLn2WBLn3	SBL	SBT	SBR					
Capacity (veh/h)	1324	-	-	454	455	453	746	1207	-	-		
HCM Lane V/C Ratio	0.004	-	-	0.039	0.09	0.013	0.219	0.02	-	-		
HCM Control Delay (s)	7.7	-	-	13.3	13.7	13.1	11.2	8	-	-		
HCM Lane LOS	A	-	-	B	B	B	B	A	-	-		
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	0	0.8	0.1	-	-		

Intersection						
Int Delay, s/veh	6.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	139	125	65	30	60	148
Future Vol, veh/h	139	125	65	30	60	148
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	100	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	19	19	19	19	19	19
Mvmt Flow	164	147	76	35	71	174
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	111	0	-	0	551	76
Stage 1	-	-	-	-	76	-
Stage 2	-	-	-	-	475	-
Critical Hdwy	4.29	-	-	-	6.59	6.39
Critical Hdwy Stg 1	-	-	-	-	5.59	-
Critical Hdwy Stg 2	-	-	-	-	5.59	-
Follow-up Hdwy	2.371	-	-	-	3.671	3.471
Pot Cap-1 Maneuver	1379	-	-	-	468	940
Stage 1	-	-	-	-	906	-
Stage 2	-	-	-	-	592	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1379	-	-	-	412	940
Mov Cap-2 Maneuver	-	-	-	-	412	-
Stage 1	-	-	-	-	798	-
Stage 2	-	-	-	-	592	-
Approach	EB	WB		SB		
HCM Control Delay, s	4.2	0		11.4		
HCM LOS	B					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1379	-	-	-	412	940
HCM Lane V/C Ratio	0.119	-	-	-	0.171	0.185
HCM Control Delay (s)	8	-	-	-	15.5	9.7
HCM Lane LOS	A	-	-	-	C	A
HCM 95th %tile Q(veh)	0.4	-	-	-	0.6	0.7

Intersection

Int Delay, s/veh 0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	165	10	5	85	5	5
Future Vol, veh/h	165	10	5	85	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	19	19	19	19	19	19
Mvmt Flow	194	12	6	100	6	6





















Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	206
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.29
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.371
Pot Cap-1 Maneuver	-	-	1270
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1270
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	714	-	-	1270	-
HCM Lane V/C Ratio	0.016	-	-	0.005	-
HCM Control Delay (s)	10.1	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

# Timings 4: Manila Rd & E Colfax Ave






TransPort  
11/12/2019

										
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	5	140	20	65	8	10	127	50	31	828
Future Volume (vph)	5	140	20	65	8	10	127	50	31	828
Turn Type	Perm	NA	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		4		8		5	2		1	6
Permitted Phases	4		8		8	2		2	6	
Detector Phase	4	4	8	8	8	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5
Total Split (s)	40.0	40.0	40.0	40.0	40.0	12.0	68.0	68.0	12.0	68.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%	10.0%	56.7%	56.7%	10.0%	56.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	Min	None	Min
Act Effect Green (s)	13.3	13.3	13.3	13.3	13.3	27.2	25.1	25.1	28.2	27.3
Actuated g/C Ratio	0.26	0.26	0.26	0.26	0.26	0.53	0.48	0.48	0.54	0.53
v/c Ratio	0.02	0.48	0.10	0.19	0.02	0.04	0.10	0.09	0.06	0.61
Control Delay	18.6	22.0	19.3	18.7	0.1	5.9	9.8	4.1	5.9	11.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	22.0	19.3	18.7	0.1	5.9	9.8	4.1	5.9	11.7
LOS	B	C	B	B	A	A	A	A	A	B
Approach Delay		21.9		17.3			8.1			11.5
Approach LOS		C		B			A			B

## Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 51.8
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 12.8
Intersection Capacity Utilization 49.9%
Analysis Period (min) 15
Intersection LOS: B
ICU Level of Service A
























Splits and Phases: 4: Manila Rd & E Colfax Ave

		
Ø1	Ø2	Ø4
12 s	68 s	40 s
		
Ø5	Ø6	Ø8
12 s	68 s	40 s

# HCM 6th Signalized Intersection Summary

## 4: Manila Rd & E Colfax Ave

TransPort  
11/12/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	140	25	20	65	8	10	127	50	31	828	5
Future Volume (veh/h)	5	140	25	20	65	8	10	127	50	31	828	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1618	1618	1618	1618	1618	1618	1618	1618	1618	1618	1618	1618
Adj Flow Rate, veh/h	6	165	29	24	76	9	12	149	59	36	974	6
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	19	19	19	19	19	19	19	19	19	19	19	19
Cap, veh/h	347	254	45	255	307	260	311	1344	600	655	1450	9
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.02	0.44	0.44	0.04	0.46	0.46
Sat Flow, veh/h	1136	1340	236	1029	1618	1372	1541	3075	1372	1541	3133	19
Grp Volume(v), veh/h	6	0	194	24	76	9	12	149	59	36	478	502
Grp Sat Flow(s),veh/h/ln	1136	0	1576	1029	1618	1372	1541	1537	1372	1541	1537	1615
Q Serve(g_s), s	0.2	0.0	4.6	0.9	1.6	0.2	0.2	1.2	1.0	0.5	9.9	9.9
Cycle Q Clear(g_c), s	1.8	0.0	4.6	5.5	1.6	0.2	0.2	1.2	1.0	0.5	9.9	9.9
Prop In Lane	1.00		0.15	1.00		1.00	1.00		1.00	1.00		0.01
Lane Grp Cap(c), veh/h	347	0	299	255	307	260	311	1344	600	655	711	747
V/C Ratio(X)	0.02	0.00	0.65	0.09	0.25	0.03	0.04	0.11	0.10	0.05	0.67	0.67
Avail Cap(c_a), veh/h	1124	0	1376	958	1413	1198	571	4803	2142	876	2402	2523
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.8	0.0	15.2	17.8	14.0	13.4	7.1	6.8	6.7	5.7	8.5	8.5
Incr Delay (d2), s/veh	0.0	0.0	2.4	0.2	0.4	0.1	0.1	0.0	0.1	0.0	1.1	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.3	0.2	0.4	0.1	0.0	0.3	0.2	0.1	2.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.8	0.0	17.6	17.9	14.4	13.5	7.2	6.8	6.8	5.7	9.6	9.6
LnGrp LOS	B	A	B	B	B	B	A	A	A	A	A	A
Approach Vol, veh/h	200			109			220			1016		
Approach Delay, s/veh	17.5			15.1			6.8			9.5		
Approach LOS	B			B			A			A		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.2	22.3		12.2	5.1	23.3		12.2				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	7.5	63.5		35.5	7.5	63.5		35.5				
Max Q Clear Time (g_c+I1), s	2.5	3.2		6.6	2.2	11.9		7.5				
Green Ext Time (p_c), s	0.0	1.2		1.0	0.0	7.0		0.4				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay	10.5											
HCM 6th LOS	B											

# Timings 5: Manila Rd & I-70 WB Ramp

TransPort  
11/12/2019

Lane Group	WBL	WBT	WBR	NBL	NBT	SBT	SBR
Lane Configurations							
Traffic Volume (vph)	40	5	34	55	168	248	630
Future Volume (vph)	40	5	34	55	168	248	630
Turn Type	Perm	NA	Perm	pm+pt	NA	NA	Perm
Protected Phases		8		5	2	6	
Permitted Phases	8		8	2			6
Detector Phase	8	8	8	5	2	6	6
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	9.5	22.5	22.5	22.5
Total Split (s)	30.0	30.0	30.0	12.0	90.0	78.0	78.0
Total Split (%)	25.0%	25.0%	25.0%	10.0%	75.0%	65.0%	65.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag				Lead		Lag	Lag
Lead-Lag Optimize?				Yes		Yes	Yes
Recall Mode	None	None	None	None	Min	Min	Min
Act Effect Green (s)	7.3	7.3	7.3	30.3	32.8	26.7	26.7
Actuated g/C Ratio	0.18	0.18	0.18	0.73	0.79	0.64	0.64
v/c Ratio	0.18	0.02	0.14	0.09	0.08	0.28	0.65
Control Delay	20.3	19.0	6.7	3.2	2.8	9.5	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.3	19.0	6.7	3.2	2.8	9.5	4.4
LOS	C	B	A	A	A	A	A
Approach Delay		14.4			2.9	5.8	
Approach LOS		B			A	A	

## Intersection Summary

Cycle Length: 120  
Actuated Cycle Length: 41.4  
Natural Cycle: 60  
Control Type: Actuated-Uncoordinated  
Maximum v/c Ratio: 0.65  
Intersection Signal Delay: 5.8  
Intersection LOS: A  
Intersection Capacity Utilization 58.6%  
ICU Level of Service B  
Analysis Period (min) 15

Splits and Phases: 5: Manila Rd & I-70 WB Ramp



# HCM 6th Signalized Intersection Summary 5: Manila Rd & I-70 WB Ramp















TransPort  
11/12/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	40	5	34	55	168	0	0	248	630
Future Volume (veh/h)	0	0	0	40	5	34	55	168	0	0	248	630
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach				No			No				No	
Adj Sat Flow, veh/h/ln				1618	1618	1618	1618	1618	0	0	1618	1618
Adj Flow Rate, veh/h				47	6	40	65	198	0	0	292	741
Peak Hour Factor				0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %				19	19	19	19	19	0	0	19	19
Cap, veh/h				110	116	98	477	2315	0	0	981	831
Arrive On Green				0.07	0.07	0.07	0.06	0.75	0.00	0.00	0.61	0.61
Sat Flow, veh/h				1541	1618	1372	1541	3156	0	0	1618	1372
Grp Volume(v), veh/h				47	6	40	65	198	0	0	292	741
Grp Sat Flow(s),veh/h/ln				1541	1618	1372	1541	1537	0	0	1618	1372
Q Serve(g_s), s				1.5	0.2	1.4	0.7	0.9	0.0	0.0	4.4	23.7
Cycle Q Clear(g_c), s				1.5	0.2	1.4	0.7	0.9	0.0	0.0	4.4	23.7
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				110	116	98	477	2315	0	0	981	831
V/C Ratio(X)				0.43	0.05	0.41	0.14	0.09	0.00	0.00	0.30	0.89
Avail Cap(c_a), veh/h				767	805	682	611	5129	0	0	2320	1967
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh				22.8	22.2	22.8	2.8	1.7	0.0	0.0	4.9	8.6
Incr Delay (d2), s/veh				2.6	0.2	2.7	0.1	0.0	0.0	0.0	0.2	3.6
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln				0.6	0.1	0.5	0.0	0.0	0.0	0.0	0.8	4.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				25.4	22.4	25.5	2.9	1.7	0.0	0.0	5.0	12.2
LnGrp LOS				C	C	C	A	A	A	A	A	B
Approach Vol, veh/h					93			263			1033	
Approach Delay, s/veh					25.2			2.0			10.2	
Approach LOS					C			A			B	
Timer - Assigned Phs		2			5	6		8				
Phs Duration (G+Y+Rc), s		43.1			7.5	35.6		8.2				
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5				
Max Green Setting (Gmax), s		85.5			7.5	73.5		25.5				
Max Q Clear Time (g_c+I1), s		2.9			2.7	25.7		3.5				
Green Ext Time (p_c), s		1.2			0.0	5.3		0.2				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				9.6								
HCM 6th LOS				A								



# Timings 6: Manila Rd & I-70 EB Ramp


TransPort  
11/12/2019

							
Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Configurations							
Traffic Volume (vph)	152	5	150	66	55	175	113
Future Volume (vph)	152	5	150	66	55	175	113
Turn Type	Perm	NA	Perm	NA	Perm	pm+pt	NA
Protected Phases		4		2		1	6
Permitted Phases	4		4		2	6	
Detector Phase	4	4	4	2	2	1	6
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	9.5	22.5
Total Split (s)	46.0	46.0	46.0	34.0	34.0	40.0	74.0
Total Split (%)	38.3%	38.3%	38.3%	28.3%	28.3%	33.3%	61.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag				Lag	Lag	Lead	
Lead-Lag Optimize?				Yes	Yes	Yes	
Recall Mode	None	None	None	Min	Min	None	Min
Act Effect Green (s)	8.3	8.3	8.3	6.6	6.6	20.0	20.0
Actuated g/C Ratio	0.22	0.22	0.22	0.18	0.18	0.53	0.53
v/c Ratio	0.29	0.29	0.40	0.15	0.22	0.37	0.16
Control Delay	15.4	15.3	6.1	15.1	7.6	7.2	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.4	15.3	6.1	15.1	7.6	7.2	5.4
LOS	B	B	A	B	A	A	A
Approach Delay		10.8		11.7			6.5
Approach LOS		B		B			A

## Intersection Summary

Cycle Length: 120	
Actuated Cycle Length: 37.5	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.40	
Intersection Signal Delay: 9.2	Intersection LOS: A
Intersection Capacity Utilization 58.6%	ICU Level of Service B
Analysis Period (min) 15	




















## Splits and Phases: 6: Manila Rd & I-70 EB Ramp

		
Ø1	Ø2	Ø4
40 s	34 s	46 s
		
Ø6		
74 s		

# HCM 6th Signalized Intersection Summary

## 6: Manila Rd & I-70 EB Ramp

TransPort  
11/12/2019







												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	152	5	150	0	0	0	0	66	55	175	113	0
Future Volume (veh/h)	152	5	150	0	0	0	0	66	55	175	113	0
Initial Q (Qb), veh	0	0	0				0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No						No			No		
Adj Sat Flow, veh/h/ln	1618	1618	1618				0	1618	1618	1618	1618	0
Adj Flow Rate, veh/h	183	0	176				0	78	65	206	133	0
Peak Hour Factor	0.85	0.85	0.85				0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	19	19	19				0	19	19	19	19	0
Cap, veh/h	665	0	296				0	529	236	638	768	0
Arrive On Green	0.22	0.00	0.22				0.00	0.17	0.17	0.15	0.47	0.00
Sat Flow, veh/h	3083	0	1372				0	3156	1372	1541	1618	0
Grp Volume(v), veh/h	183	0	176				0	78	65	206	133	0
Grp Sat Flow(s),veh/h/ln	1541	0	1372				0	1537	1372	1541	1618	0
Q Serve(g_s), s	1.4	0.0	3.4				0.0	0.6	1.2	2.7	1.4	0.0
Cycle Q Clear(g_c), s	1.4	0.0	3.4				0.0	0.6	1.2	2.7	1.4	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	665	0	296				0	529	236	638	768	0
V/C Ratio(X)	0.28	0.00	0.59				0.00	0.15	0.28	0.32	0.17	0.00
Avail Cap(c_a), veh/h	4398	0	1957				0	3118	1391	2291	3867	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	9.5	0.0	10.3				0.0	10.2	10.5	6.4	4.4	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.9				0.0	0.1	0.6	0.3	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.8				0.0	0.1	0.2	0.4	0.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.7	0.0	12.2				0.0	10.4	11.1	6.7	4.5	0.0
LnGrp LOS	A	A	B				A	B	B	A	A	A
Approach Vol, veh/h	359						143			339		
Approach Delay, s/veh	10.9						10.7			5.8		
Approach LOS	B						B			A		
Timer - Assigned Phs	1	2	4		6							
Phs Duration (G+Y+Rc), s	8.8	9.5	10.8		18.3							
Change Period (Y+Rc), s	4.5	4.5	4.5		4.5							
Max Green Setting (Gmax), s	35.5	29.5	41.5		69.5							
Max Q Clear Time (g_c+I1), s	4.7	3.2	5.4		3.4							
Green Ext Time (p_c), s	0.6	0.6	1.3		0.7							

### Intersection Summary

HCM 6th Ctrl Delay	8.8
HCM 6th LOS	A







### Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	2.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	28	95	165	4	14	180
Future Vol, veh/h	28	95	165	4	14	180
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	100	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	19	19	19	19	19	19
Mvmt Flow	33	112	194	5	16	212
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	438	194	0	0	199	0
Stage 1	194	-	-	-	-	-
Stage 2	244	-	-	-	-	-
Critical Hdwy	6.59	6.39	-	-	4.29	-
Critical Hdwy Stg 1	5.59	-	-	-	-	-
Critical Hdwy Stg 2	5.59	-	-	-	-	-
Follow-up Hdwy	3.671	3.471	-	-	2.371	-
Pot Cap-1 Maneuver	545	806	-	-	1278	-
Stage 1	800	-	-	-	-	-
Stage 2	758	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	538	806	-	-	1278	-
Mov Cap-2 Maneuver	538	-	-	-	-	-
Stage 1	800	-	-	-	-	-
Stage 2	748	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	10.6	0	0.6			
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 538 806 1278	-	-		
HCM Lane V/C Ratio	-	- 0.061 0.139 0.013	-	-		
HCM Control Delay (s)	-	- 12.1 10.2 7.9	-	-		
HCM Lane LOS	-	- B B A	-	-		
HCM 95th %tile Q(veh)	-	- 0.2 0.5 0	-	-		

Intersection

Int Delay, s/veh 7.7

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	362	81	59	302	3
Future Vol, veh/h	13	362	81	59	302	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	19	19	19	19	19	19
Mvmt Flow	15	426	95	69	355	4











Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	582	180	359
Stage 1	357	-	-
Stage 2	225	-	-
Critical Hdwy	7.18	7.28	4.48
Critical Hdwy Stg 1	6.18	-	-
Critical Hdwy Stg 2	6.18	-	-
Follow-up Hdwy	3.69	3.49	2.39
Pot Cap-1 Maneuver	406	781	1083
Stage 1	631	-	-
Stage 2	742	-	-
Platoon blocked, %			
Mov Cap-1 Maneuver	370	781	1083
Mov Cap-2 Maneuver	370	-	-
Stage 1	575	-	-
Stage 2	742	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15	5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1083	-	370	781	-	-
HCM Lane V/C Ratio	0.088	-	0.041	0.545	-	-
HCM Control Delay (s)	8.6	-	15.1	15	-	-
HCM Lane LOS	A	-	C	C	-	-
HCM 95th %tile Q(veh)	0.3	-	0.1	3.3	-	-

# Timings 20: Manila Rd & 32nd Ave

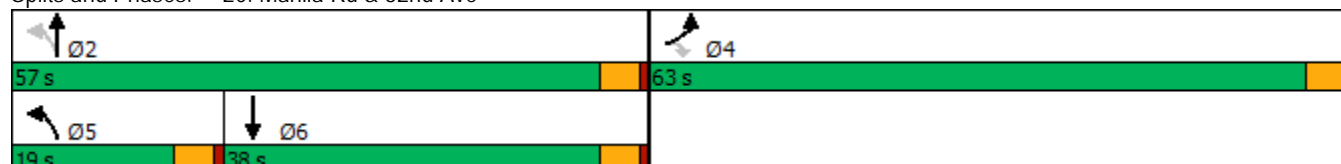
TransPort  
11/12/2019

					
Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	13	362	81	59	302
Future Volume (vph)	13	362	81	59	302
Turn Type	Prot	Perm	pm+pt	NA	NA
Protected Phases	4		5	2	6
Permitted Phases		4	2		
Detector Phase	4	4	5	2	6
Switch Phase					
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	9.5	22.5	22.5
Total Split (s)	63.0	63.0	19.0	57.0	38.0
Total Split (%)	52.5%	52.5%	15.8%	47.5%	31.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag
Lead-Lag Optimize?			Yes		Yes
Recall Mode	None	None	None	Min	Min
Act Effect Green (s)	8.1	8.1	17.9	17.9	10.9
Actuated g/C Ratio	0.22	0.22	0.49	0.49	0.30
v/c Ratio	0.04	0.67	0.18	0.05	0.39
Control Delay	14.8	8.3	5.5	4.5	14.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.8	8.3	5.5	4.5	14.0
LOS	B	A	A	A	B
Approach Delay	8.5			5.1	14.0
Approach LOS	A			A	B

## Intersection Summary

Cycle Length: 120  
Actuated Cycle Length: 36.2  
Natural Cycle: 55  
Control Type: Actuated-Uncoordinated  
Maximum v/c Ratio: 0.67  
Intersection Signal Delay: 9.9  
Intersection LOS: A  
Intersection Capacity Utilization 38.4%  
ICU Level of Service A  
Analysis Period (min) 15

Splits and Phases: 20: Manila Rd & 32nd Ave














# HCM 6th Signalized Intersection Summary

## 20: Manila Rd & 32nd Ave

TransPort  
11/12/2019









Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	362	81	59	302	3
Future Volume (veh/h)	13	362	81	59	302	3
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1618	1618	1618	1618	1618	1618
Adj Flow Rate, veh/h	15	426	95	69	355	4
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	19	19	19	19	19	19
Cap, veh/h	572	509	398	1228	630	7
Arrive On Green	0.37	0.37	0.08	0.40	0.20	0.20
Sat Flow, veh/h	1541	1372	1541	3156	3195	35
Grp Volume(v), veh/h	15	426	95	69	175	184
Grp Sat Flow(s),veh/h/ln	1541	1372	1541	1537	1537	1612
Q Serve(g_s), s	0.2	11.1	1.7	0.5	4.0	4.0
Cycle Q Clear(g_c), s	0.2	11.1	1.7	0.5	4.0	4.0
Prop In Lane	1.00	1.00	1.00			0.02
Lane Grp Cap(c), veh/h	572	509	398	1228	311	326
V/C Ratio(X)	0.03	0.84	0.24	0.06	0.56	0.56
Avail Cap(c_a), veh/h	2299	2046	842	4117	1313	1377
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	7.8	11.2	9.7	7.2	14.1	14.1
Incr Delay (d2), s/veh	0.0	3.7	0.3	0.0	1.6	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.5	0.4	0.1	1.1	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.8	15.0	10.0	7.3	15.7	15.6
LnGrp LOS	A	B	B	A	B	B
Approach Vol, veh/h	441			164	359	
Approach Delay, s/veh	14.7			8.9	15.6	
Approach LOS	B			A	B	
Timer - Assigned Phs	2			4	5	6
Phs Duration (G+Y+Rc), s	20.2			19.1	7.7	12.4
Change Period (Y+Rc), s	4.5			4.5	4.5	4.5
Max Green Setting (Gmax), s	52.5			58.5	14.5	33.5
Max Q Clear Time (g_c+I1), s	2.5			13.1	3.7	6.0
Green Ext Time (p_c), s	0.4			1.6	0.1	1.9
Intersection Summary						
HCM 6th Ctrl Delay			14.1			
HCM 6th LOS			B			

Intersection						
Int Delay, s/veh	4.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	30	134	20	97	123	5
Future Vol, veh/h	30	134	20	97	123	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	0	-	-	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	19	19	19	19	19	19
Mvmt Flow	35	158	24	114	145	6
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	307	145	151	0	-	0
Stage 1	145	-	-	-	-	-
Stage 2	162	-	-	-	-	-
Critical Hdwy	6.59	6.39	4.29	-	-	-
Critical Hdwy Stg 1	5.59	-	-	-	-	-
Critical Hdwy Stg 2	5.59	-	-	-	-	-
Follow-up Hdwy	3.671	3.471	2.371	-	-	-
Pot Cap-1 Maneuver	651	859	1332	-	-	-
Stage 1	842	-	-	-	-	-
Stage 2	827	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	639	859	1332	-	-	-
Mov Cap-2 Maneuver	639	-	-	-	-	-
Stage 1	827	-	-	-	-	-
Stage 2	827	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	10.3	1.3		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1332	-	639	859	-	-
HCM Lane V/C Ratio	0.018	-	0.055	0.184	-	-
HCM Control Delay (s)	7.8	-	11	10.1	-	-
HCM Lane LOS	A	-	B	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	0.7	-	-

Intersection

Int Delay, s/veh 3.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	368	36	18	123	31
Future Vol, veh/h	5	368	36	18	123	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	100	0	100
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	19	19	19	19	19	19
Mvmt Flow	6	433	42	21	145	36

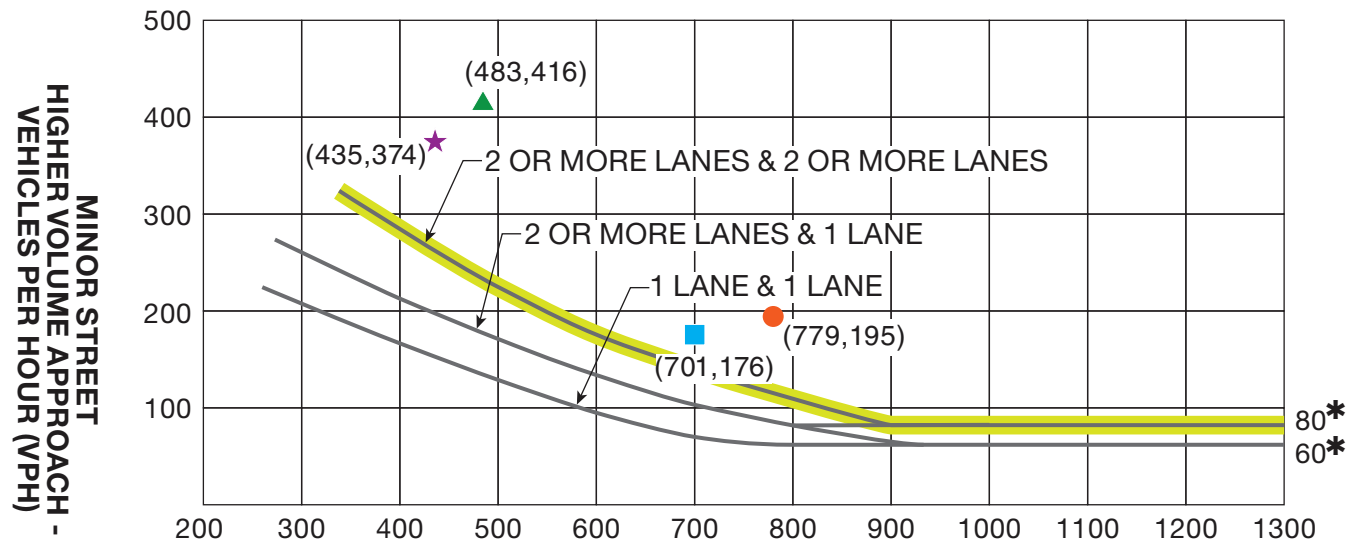
Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	63	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.29	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.371	-	-
Pot Cap-1 Maneuver	1438	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1438	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	13.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1438	-	-	-	508	982
HCM Lane V/C Ratio	0.004	-	-	-	0.285	0.037
HCM Control Delay (s)	7.5	-	-	-	14.9	8.8
HCM Lane LOS	A	-	-	-	B	A
HCM 95th %tile Q(veh)	0	-	-	-	1.2	0.1



## APPENDIX H. SUBAREA 2 WARRANT GRAPHS

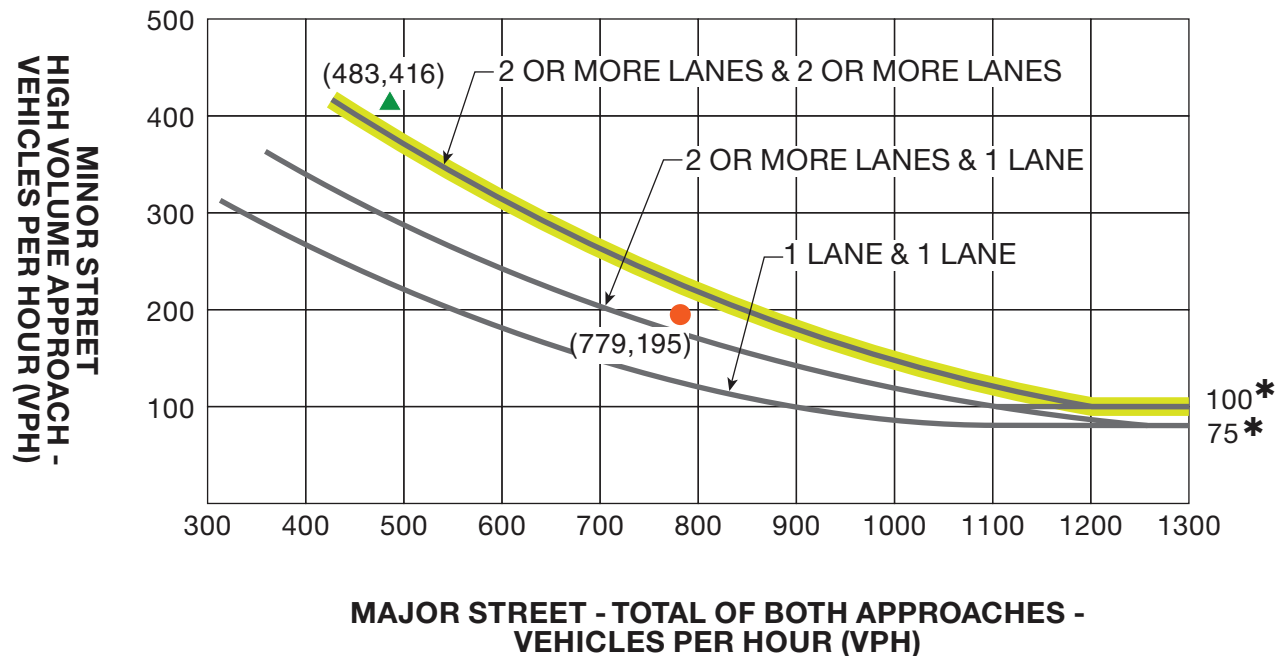


**MAJOR STREET - TOTAL OF BOTH APPROACHES -  
VEHICLES PER HOUR (VPH)**

\* Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor street approach with one lane.

**LEGEND**

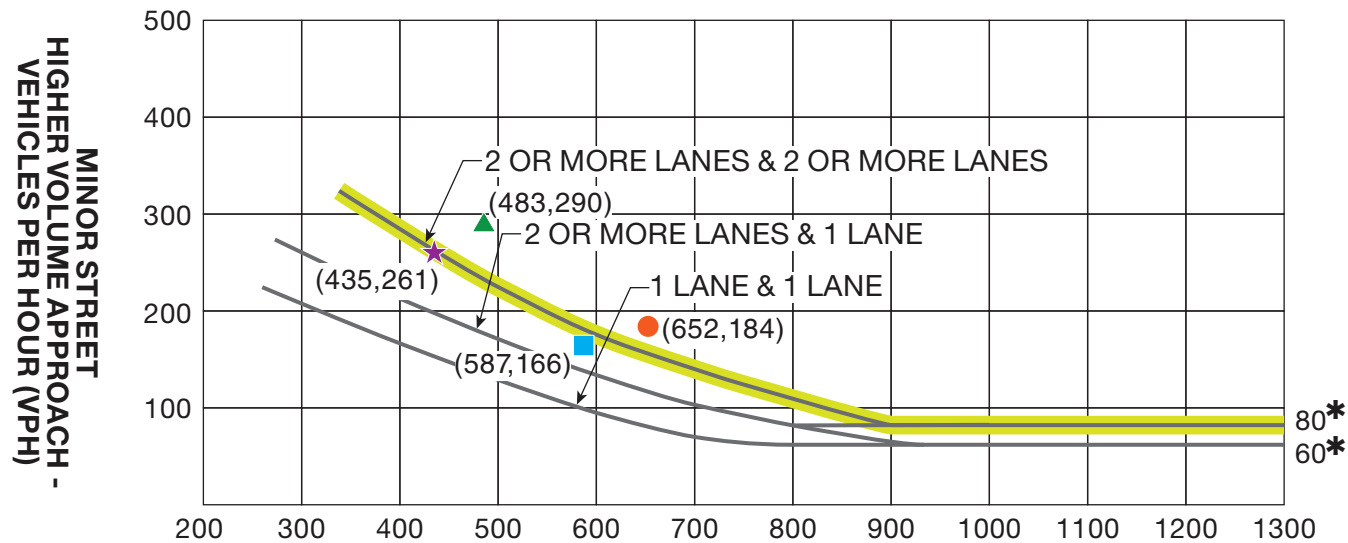
- = AM
- = 90% AM
- ▲ = PM
- ★ = 90% PM



\* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.

#### LEGEND

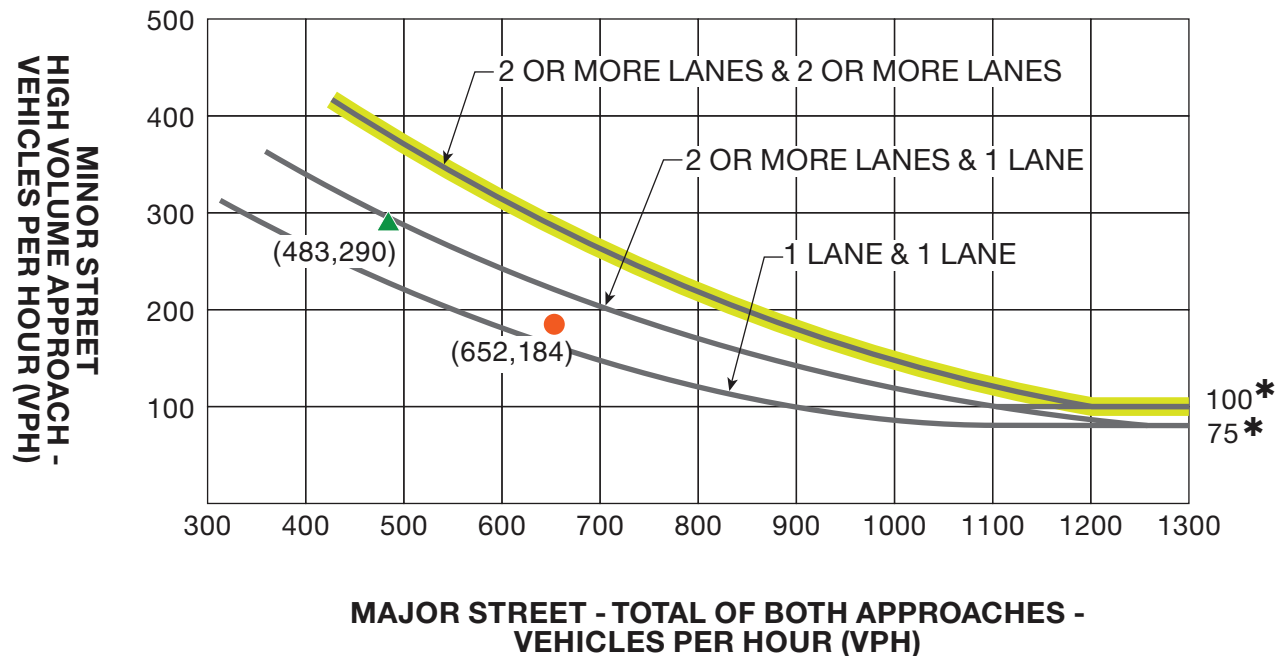
- = Peak Hour AM
- ▲ = Peak Hour PM



\* Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor street approach with one lane.

#### LEGEND

- = AM
- = 90% AM
- ▲ = PM
- ★ = 90% PM



\* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor street approach with one lane.






















#### LEGEND

- = Peak Hour AM
- ▲ = Peak Hour PM

## APPENDIX I. ANALYSIS WORKSHEETS – SUBAREA 2

# Timings 1: Imboden Rd & E 48th Ave

TransPort  
11/08/2019

											
Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	
Lane Configurations											
Traffic Volume (vph)	5	5	133	5	114	5	87	346	194	142	
Future Volume (vph)	5	5	133	5	114	5	87	346	194	142	
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		4	3	8		5	2		1	6	
Permitted Phases	4		8		8	2		2	6		
Detector Phase	4	4	3	8	8	5	2	2	1	6	
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	22.5	22.5	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5	
Total Split (s)	23.0	23.0	21.0	44.0	44.0	12.0	54.0	54.0	22.0	64.0	
Total Split (%)	19.2%	19.2%	17.5%	36.7%	36.7%	10.0%	45.0%	45.0%	18.3%	53.3%	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None	Min	Min	None	Min	
Act Effect Green (s)		6.9	11.5	11.1	11.1	16.5	10.0	10.0	25.7	26.3	
Actuated g/C Ratio		0.16	0.27	0.26	0.26	0.38	0.23	0.23	0.59	0.61	
v/c Ratio		0.07	0.39	0.01	0.29	0.01	0.27	0.64	0.33	0.17	
Control Delay		20.5	18.3	14.4	5.5	8.0	19.6	8.1	8.1	9.5	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		20.5	18.3	14.4	5.5	8.0	19.6	8.1	8.1	9.5	
LOS		C	B	B	A	A	B	A	A	A	
Approach Delay		20.5		12.4			10.4			8.7	
Approach LOS		C		B			B			A	

## Intersection Summary

Cycle Length: 120

Actuated Cycle Length: 43.3

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 10.5

Intersection LOS: B

Intersection Capacity Utilization 47.6%

ICU Level of Service A

Analysis Period (min) 15






















Splits and Phases: 1: Imboden Rd & E 48th Ave









# HCM 6th Signalized Intersection Summary

## 1: Imboden Rd & E 48th Ave

TransPort  
11/08/2019

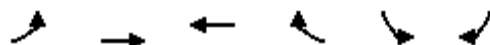
												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	5	5	133	5	114	5	87	346	194	142	5
Future Volume (veh/h)	5	5	5	133	5	114	5	87	346	194	142	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1663	1663	1663	1663	1663	1663	1663	1663	1663	1663	1663	1663
Adj Flow Rate, veh/h	6	6	6	156	6	134	6	102	407	228	167	6
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	16	16	16	16	16	16	16	16	16	16	16	16
Cap, veh/h	113	58	41	482	469	397	515	567	481	568	731	26
Arrive On Green	0.08	0.08	0.08	0.11	0.28	0.28	0.01	0.34	0.34	0.12	0.46	0.46
Sat Flow, veh/h	277	682	479	1584	1663	1409	1584	1663	1409	1584	1595	57
Grp Volume(v), veh/h	18	0	0	156	6	134	6	102	407	228	0	173
Grp Sat Flow(s),veh/h/ln	1438	0	0	1584	1663	1409	1584	1663	1409	1584	0	1653
Q Serve(g_s), s	0.0	0.0	0.0	4.5	0.1	4.0	0.1	2.3	14.3	4.5	0.0	3.4
Cycle Q Clear(g_c), s	0.6	0.0	0.0	4.5	0.1	4.0	0.1	2.3	14.3	4.5	0.0	3.4
Prop In Lane	0.33		0.33	1.00		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	211	0	0	482	469	397	515	567	481	568	0	757
V/C Ratio(X)	0.09	0.00	0.00	0.32	0.01	0.34	0.01	0.18	0.85	0.40	0.00	0.23
Avail Cap(c_a), veh/h	565	0	0	790	1227	1039	724	1537	1303	888	0	1836
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.7	0.0	0.0	17.4	13.9	15.3	11.4	12.4	16.3	8.0	0.0	8.8
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.4	0.0	0.5	0.0	0.2	4.2	0.5	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	1.4	0.0	1.1	0.0	0.6	4.1	1.0	0.0	0.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.9	0.0	0.0	17.8	13.9	15.8	11.4	12.5	20.6	8.4	0.0	8.9
LnGrp LOS	C	A	A	B	B	B	B	B	C	A	A	A
Approach Vol, veh/h	18			296			515			401		
Approach Delay, s/veh	22.9			16.8			18.9			8.6		
Approach LOS	C			B			B			A		
Timer - Assigned Phs	1	2	3	4	5	6	8					
Phs Duration (G+Y+Rc), s	11.2	22.8	10.6	9.0	4.9	29.0	19.6					
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5					
Max Green Setting (Gmax), s	17.5	49.5	16.5	18.5	7.5	59.5	39.5					
Max Q Clear Time (g_c+I1), s	6.5	16.3	6.5	2.6	2.1	5.4	6.0					
Green Ext Time (p_c), s	0.4	1.9	0.3	0.0	0.0	0.9	0.4					
Intersection Summary												
HCM 6th Ctrl Delay				15.1								
HCM 6th LOS				B								



Intersection						
Int Delay, s/veh	9.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	437	45	130	40	25	317
Future Vol, veh/h	437	45	130	40	25	317
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	0	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	16	16	16	16	16	16
Mvmt Flow	514	53	153	47	29	373
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	200	0	-	0	1234	153
Stage 1	-	-	-	-	153	-
Stage 2	-	-	-	-	1081	-
Critical Hdwy	4.26	-	-	-	6.56	6.36
Critical Hdwy Stg 1	-	-	-	-	5.56	-
Critical Hdwy Stg 2	-	-	-	-	5.56	-
Follow-up Hdwy	2.344	-	-	-	3.644	3.444
Pot Cap-1 Maneuver	1293	-	-	-	183	858
Stage 1	-	-	-	-	842	-
Stage 2	-	-	-	-	306	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1293	-	-	-	110	858
Mov Cap-2 Maneuver	-	-	-	-	110	-
Stage 1	-	-	-	-	507	-
Stage 2	-	-	-	-	306	-
Approach	EB	WB		SB		
HCM Control Delay, s	8.7	0		15.1		
HCM LOS	C					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1293	-	-	-	110	858
HCM Lane V/C Ratio	0.398	-	-	-	0.267	0.435
HCM Control Delay (s)	9.6	-	-	-	49.3	12.4
HCM Lane LOS	A	-	-	-	E	B
HCM 95th %tile Q(veh)	1.9	-	-	-	1	2.2

# Timings 2: E Colfax Ave & Imboden Rd

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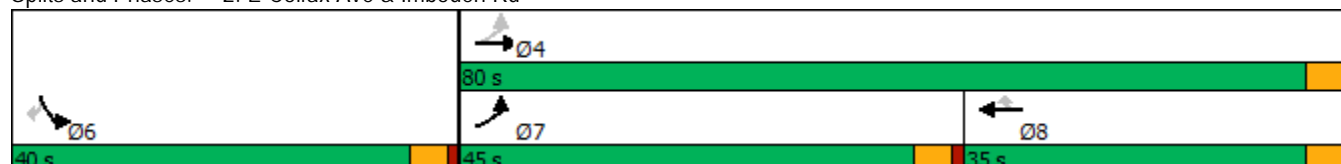


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	437	45	130	40	25	317
Future Volume (vph)	437	45	130	40	25	317
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	45.0	80.0	35.0	35.0	40.0	40.0
Total Split (%)	37.5%	66.7%	29.2%	29.2%	33.3%	33.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	Min	Min	Min	None	None
Act Effect Green (s)	40.5	40.5	10.2	10.2	8.0	8.0
Actuated g/C Ratio	0.70	0.70	0.18	0.18	0.14	0.14
v/c Ratio	0.59	0.05	0.53	0.17	0.14	0.73
Control Delay	7.1	3.0	32.9	10.8	27.9	13.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.1	3.0	32.9	10.8	27.9	13.0
LOS	A	A	C	B	C	B
Approach Delay		6.7	27.7		14.0	
Approach LOS		A	C		B	

## Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 58.1  
 Natural Cycle: 65  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.73  
 Intersection Signal Delay: 12.8  
 Intersection LOS: B  
 Intersection Capacity Utilization 46.5%  
 ICU Level of Service A  
 Analysis Period (min) 15

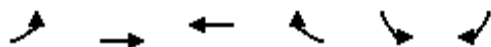
## Splits and Phases: 2: E Colfax Ave & Imboden Rd






# HCM 6th Signalized Intersection Summary

## 2: E Colfax Ave & Imboden Rd

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Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	437	45	130	40	25	317
Future Volume (veh/h)	437	45	130	40	25	317
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1663	1663	1663	1663	1663	1663
Adj Flow Rate, veh/h	514	53	153	47	29	373
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	16	16	16	16	16	16
Cap, veh/h	676	882	229	194	488	434
Arrive On Green	0.31	0.53	0.14	0.14	0.31	0.31
Sat Flow, veh/h	1584	1663	1663	1409	1584	1409
Grp Volume(v), veh/h	514	53	153	47	29	373
Grp Sat Flow(s),veh/h/ln	1584	1663	1663	1409	1584	1409
Q Serve(g_s), s	13.8	0.9	4.9	1.7	0.7	13.9
Cycle Q Clear(g_c), s	13.8	0.9	4.9	1.7	0.7	13.9
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	676	882	229	194	488	434
V/C Ratio(X)	0.76	0.06	0.67	0.24	0.06	0.86
Avail Cap(c_a), veh/h	1336	2257	912	773	1011	899
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.6	6.3	22.8	21.4	13.6	18.1
Incr Delay (d2), s/veh	1.8	0.0	3.3	0.6	0.1	5.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	0.2	1.8	0.5	0.2	0.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	13.4	6.4	26.1	22.0	13.6	23.2
LnGrp LOS	B	A	C	C	B	C
Approach Vol, veh/h		567	200		402	
Approach Delay, s/veh		12.7	25.1		22.5	
Approach LOS		B	C		C	
Timer - Assigned Phs			4		6	7
Phs Duration (G+Y+Rc), s			34.0		21.6	21.8
Change Period (Y+Rc), s			4.5		4.5	4.5
Max Green Setting (Gmax), s			75.5		35.5	40.5
Max Q Clear Time (g_c+I1), s			2.9		15.9	15.8
Green Ext Time (p_c), s			0.2		1.3	1.6
Green Ext Time (p_c), s					0.8	
<b>Intersection Summary</b>						
HCM 6th Ctrl Delay			18.2			
HCM 6th LOS			B			

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	65	5	5	140	5	5
Future Vol, veh/h	65	5	5	140	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	16	16	16	16	16	16
Mvmt Flow	76	6	6	165	6	6

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	82
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.26
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.344
Pot Cap-1 Maneuver	-	-	1431
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1431
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	803	-	-	1431	-
HCM Lane V/C Ratio	0.015	-	-	0.004	-
HCM Control Delay (s)	9.6	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-








Intersection												
Int Delay, s/veh	19.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	50	5	40	90	27	10	369	10	13	175	5
Future Vol, veh/h	5	50	5	40	90	27	10	369	10	13	175	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	100	-	-	0	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	16	16	16	16	16	16	16	16	16	16	16	16
Mvmt Flow	6	59	6	47	106	32	12	434	12	15	206	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	138	0	0	65	0	0	396	306	62	497	277	106
Stage 1	-	-	-	-	-	-	74	74	-	200	200	-
Stage 2	-	-	-	-	-	-	322	232	-	297	77	-
Critical Hdwy	4.26	-	-	4.26	-	-	7.26	6.66	6.36	7.26	6.66	6.36
Critical Hdwy Stg 1	-	-	-	-	-	-	6.26	5.66	-	6.26	5.66	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.26	5.66	-	6.26	5.66	-
Follow-up Hdwy	2.344	-	-	2.344	-	-	3.644	4.144	3.444	3.644	4.144	3.444
Pot Cap-1 Maneuver	1364	-	-	1452	-	-	540	585	965	461	608	911
Stage 1	-	-	-	-	-	-	902	807	-	771	710	-
Stage 2	-	-	-	-	-	-	661	687	-	682	804	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1364	-	-	1452	-	-	380	564	965	163	586	911
Mov Cap-2 Maneuver	-	-	-	-	-	-	380	564	-	163	586	-
Stage 1	-	-	-	-	-	-	898	804	-	768	687	-
Stage 2	-	-	-	-	-	-	445	665	-	309	801	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.6			1.9			31.9			15.4		
HCM LOS							D			C		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2		
Capacity (veh/h)	557	965	1364	-	-	1452	-	-	163	592		
HCM Lane V/C Ratio	0.801	0.012	0.004	-	-	0.032	-	-	0.094	0.358		
HCM Control Delay (s)	32.5	8.8	7.7	-	-	7.6	-	-	29.4	14.4		
HCM Lane LOS	D	A	A	-	-	A	-	-	D	B		
HCM 95th %tile Q(veh)	7.7	0	0	-	-	0.1	-	-	0.3	1.6		

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↱	↰	↰	↱			↱	↰
Traffic Vol, veh/h	0	0	0	25	5	140	155	259	0	0	98	127
Future Vol, veh/h	0	0	0	25	5	140	155	259	0	0	98	127
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	0	0	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	16	16	16	16	16	16	16	16	16	16	16	16
Mvmt Flow	0	0	0	29	6	165	182	305	0	0	115	149

Major/Minor	Minor1		Major1		Major2		
Conflicting Flow All	859	933	305	264	0	-	0
Stage 1	669	669	-	-	-	-	-
Stage 2	190	264	-	-	-	-	-
Critical Hdwy	6.56	6.66	6.36	4.26	-	-	-
Critical Hdwy Stg 1	5.56	5.66	-	-	-	-	-
Critical Hdwy Stg 2	5.56	5.66	-	-	-	-	-
Follow-up Hdwy	3.644	4.144	3.444	2.344	-	-	-
Pot Cap-1 Maneuver	309	252	703	1223	-	0	-
Stage 1	484	435	-	-	0	0	-
Stage 2	810	665	-	-	0	0	-
Platoon blocked, %					-	-	-
Mov Cap-1 Maneuver	263	0	703	1223	-	-	-
Mov Cap-2 Maneuver	263	0	-	-	-	-	-
Stage 1	412	0	-	-	-	-	-
Stage 2	810	0	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s		3.2	0
HCM LOS	-		

Minor Lane/Major Mvmt	NBL	NBTWBLn1WBLn2WBLn3	SBT	SBR
Capacity (veh/h)	1223	- 263	- 703	-
HCM Lane V/C Ratio	0.149	- 0.112	- 0.234	-
HCM Control Delay (s)	8.5	- 20.4	- 11.7	-
HCM Lane LOS	A	- C	- B	-
HCM 95th %tile Q(veh)	0.5	- 0.4	- 0.9	-

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	214	5	40	0	0	0	0	200	50	67	61	0
Future Vol, veh/h	214	5	40	0	0	0	0	200	50	67	61	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	0	-	-	-	-	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	16	16	16	16	16	16	16	16	16	16	16	16
Mvmt Flow	252	6	47	0	0	0	0	235	59	79	72	0





Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	495	524	72	-	0	0	294	0	0
Stage 1	230	230	-	-	-	-	-	-	-
Stage 2	265	294	-	-	-	-	-	-	-
Critical Hdwy	6.56	6.66	6.36	-	-	-	4.26	-	-
Critical Hdwy Stg 1	5.56	5.66	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.56	5.66	-	-	-	-	-	-	-
Follow-up Hdwy	3.644	4.144	3.444	-	-	-	2.344	-	-
Pot Cap-1 Maneuver	510	439	953	0	-	-	1192	-	0
Stage 1	776	689	-	0	-	-	-	-	0
Stage 2	748	645	-	0	-	-	-	-	0
Platoon blocked, %				-	-	-	-	-	-
Mov Cap-1 Maneuver	476	0	953	-	-	-	1192	-	-
Mov Cap-2 Maneuver	476	0	-	-	-	-	-	-	-
Stage 1	776	0	-	-	-	-	-	-	-
Stage 2	699	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s		0	4.3
HCM LOS	-		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	EBLn3	SBL	SBT
Capacity (veh/h)	-	-	476	-	953	1192	-
HCM Lane V/C Ratio	-	-	0.529	-	0.049	0.066	-
HCM Control Delay (s)	-	-	20.7	-	9	8.2	-
HCM Lane LOS	-	-	C	-	A	A	-
HCM 95th %tile Q(veh)	-	-	3	-	0.2	0.2	-

Intersection

Int Delay, s/veh 0.6






Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	22	5	431	46	5	320
Future Vol, veh/h	22	5	431	46	5	320
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	16	16	16	16	16	16
Mvmt Flow	26	6	507	54	6	376

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	895	507	0
Stage 1	507	-	-
Stage 2	388	-	-
Critical Hdwy	6.56	6.36	-
Critical Hdwy Stg 1	5.56	-	-
Critical Hdwy Stg 2	5.56	-	-
Follow-up Hdwy	3.644	3.444	-
Pot Cap-1 Maneuver	294	539	-
Stage 1	577	-	-
Stage 2	656	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	292	539	-
Mov Cap-2 Maneuver	292	-	-
Stage 1	577	-	-
Stage 2	651	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.5	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	319	944
HCM Lane V/C Ratio	-	-	0.1	0.006
HCM Control Delay (s)	-	-	17.5	8.8
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.3	0



Intersection						
Int Delay, s/veh	2.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	50	102	299	143	5
Future Vol, veh/h	5	50	102	299	143	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	16	16	16	16	16	16
Mvmt Flow	6	59	120	352	168	6

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	763	171	174	0	-	0
Stage 1	171	-	-	-	-	-
Stage 2	592	-	-	-	-	-
Critical Hdwy	6.56	6.36	4.26	-	-	-
Critical Hdwy Stg 1	5.56	-	-	-	-	-
Critical Hdwy Stg 2	5.56	-	-	-	-	-
Follow-up Hdwy	3.644	3.444	2.344	-	-	-
Pot Cap-1 Maneuver	353	838	1322	-	-	-
Stage 1	826	-	-	-	-	-
Stage 2	526	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	321	838	1322	-	-	-
Mov Cap-2 Maneuver	321	-	-	-	-	-
Stage 1	751	-	-	-	-	-
Stage 2	526	-	-	-	-	-







Approach	EB	NB	SB
HCM Control Delay, s	10.4	2	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1322	-	731	-	-
HCM Lane V/C Ratio	0.091	-	0.089	-	-
HCM Control Delay (s)	8	-	10.4	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.3	-	-

Intersection						
Int Delay, s/veh	1.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↘	↑	↘	↗
Traffic Vol, veh/h	214	54	26	254	27	13
Future Vol, veh/h	214	54	26	254	27	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	0	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	16	16	16	16	16	16
Mvmt Flow	252	64	31	299	32	15
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	316	0	613	252
Stage 1	-	-	-	-	252	-
Stage 2	-	-	-	-	361	-
Critical Hdwy	-	-	4.26	-	6.56	6.36
Critical Hdwy Stg 1	-	-	-	-	5.56	-
Critical Hdwy Stg 2	-	-	-	-	5.56	-
Follow-up Hdwy	-	-	2.344	-	3.644	3.444
Pot Cap-1 Maneuver	-	-	1169	-	434	754
Stage 1	-	-	-	-	758	-
Stage 2	-	-	-	-	675	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1169	-	422	754
Mov Cap-2 Maneuver	-	-	-	-	422	-
Stage 1	-	-	-	-	758	-
Stage 2	-	-	-	-	657	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.8		12.8	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	422	754	-	-	1169	-
HCM Lane V/C Ratio	0.075	0.02	-	-	0.026	-
HCM Control Delay (s)	14.2	9.9	-	-	8.2	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0.1	-

Intersection

Int Delay, s/veh 4.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	46	5	5	102	50	22
Future Vol, veh/h	46	5	5	102	50	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	16	16	16	16	16	16
Mvmt Flow	54	6	6	120	59	26

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	126	0	0 120 6
Stage 1	-	-	- - 6 -
Stage 2	-	-	- - 114 -
Critical Hdwy	4.26	-	- - 6.56 6.36
Critical Hdwy Stg 1	-	-	- - 5.56 -
Critical Hdwy Stg 2	-	-	- - 5.56 -
Follow-up Hdwy	2.344	-	- - 3.644 3.444
Pot Cap-1 Maneuver	1378	-	- - 843 1037
Stage 1	-	-	- - 982 -
Stage 2	-	-	- - 877 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1378	-	- - 810 1037
Mov Cap-2 Maneuver	-	-	- - 810 -
Stage 1	-	-	- - 944 -
Stage 2	-	-	- - 877 -




















Approach	EB	WB	SB
HCM Control Delay, s	7	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1378	-	-	-	810	1037
HCM Lane V/C Ratio	0.039	-	-	-	0.073	0.025
HCM Control Delay (s)	7.7	-	-	-	9.8	8.6
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2	0.1

# Timings

## 1: Imboden Rd & E 48th Ave









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Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	5	5	311	5	199	5	126	113	102	132
Future Volume (vph)	5	5	311	5	199	5	126	113	102	132
Turn Type	Perm	NA	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		4	3	8		5	2		1	6
Permitted Phases	4		8		8	2		2	6	
Detector Phase	4	4	3	8	8	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5
Total Split (s)	24.0	24.0	43.0	67.0	67.0	12.0	34.0	34.0	19.0	41.0
Total Split (%)	20.0%	20.0%	35.8%	55.8%	55.8%	10.0%	28.3%	28.3%	15.8%	34.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	Min	None	Min
Act Effect Green (s)		7.0	17.6	17.6	17.6	15.8	11.4	11.4	21.4	20.1
Actuated g/C Ratio		0.14	0.35	0.35	0.35	0.32	0.23	0.23	0.43	0.41
v/c Ratio		0.08	0.67	0.01	0.36	0.01	0.39	0.31	0.24	0.24
Control Delay		23.9	21.2	11.8	3.8	11.4	24.4	7.3	11.5	14.1
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		23.9	21.2	11.8	3.8	11.4	24.4	7.3	11.5	14.1
LOS		C	C	B	A	B	C	A	B	B
Approach Delay		23.9		14.4			16.2			13.0
Approach LOS		C		B			B			B

### Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 49.6  
 Natural Cycle: 65  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.67  
 Intersection Signal Delay: 14.6  
 Intersection LOS: B  
 Intersection Capacity Utilization 47.4%  
 ICU Level of Service A  
 Analysis Period (min) 15





















Splits and Phases: 1: Imboden Rd & E 48th Ave







			
Ø1	Ø2	Ø3	Ø4
19 s	34 s	43 s	24 s
			
Ø5	Ø6	Ø8	
12 s	41 s	67 s	

# HCM 6th Signalized Intersection Summary

## 1: Imboden Rd & E 48th Ave

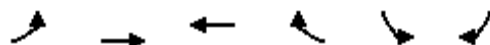
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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (veh/h)	5	5	5	311	5	199	5	126	113	102	132	5	
Future Volume (veh/h)	5	5	5	311	5	199	5	126	113	102	132	5	
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach	No			No			No			No			
Adj Sat Flow, veh/h/ln	1678	1678	1678	1678	1678	1678	1678	1678	1678	1678	1678	1678	
Adj Flow Rate, veh/h	6	6	6	366	6	234	6	148	133	120	155	6	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	
Percent Heavy Veh, %	15	15	15	15	15	15	15	15	15	15	15	15	
Cap, veh/h	135	76	51	765	762	646	342	262	222	373	377	15	
Arrive On Green	0.11	0.11	0.11	0.25	0.45	0.45	0.01	0.16	0.16	0.09	0.23	0.23	
Sat Flow, veh/h	251	703	477	1598	1678	1422	1598	1678	1422	1598	1604	62	
Grp Volume(v), veh/h	18	0	0	366	6	234	6	148	133	120	0	161	
Grp Sat Flow(s),veh/h/ln	1431	0	0	1598	1678	1422	1598	1678	1422	1598	0	1667	
Q Serve(g_s), s	0.0	0.0	0.0	8.0	0.1	4.8	0.1	3.6	3.9	2.7	0.0	3.6	
Cycle Q Clear(g_c), s	0.5	0.0	0.0	8.0	0.1	4.8	0.1	3.6	3.9	2.7	0.0	3.6	
Prop In Lane	0.33		0.33	1.00		1.00	1.00		1.00	1.00		0.04	
Lane Grp Cap(c), veh/h	262	0	0	765	762	646	342	262	222	373	0	391	
V/C Ratio(X)	0.07	0.00	0.00	0.48	0.01	0.36	0.02	0.57	0.60	0.32	0.00	0.41	
Avail Cap(c_a), veh/h	697	0	0	1753	2353	1994	599	1111	941	755	0	1365	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	
Uniform Delay (d), s/veh	17.9	0.0	0.0	10.5	6.7	7.9	15.6	17.4	17.5	13.3	0.0	14.4	
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.5	0.0	0.3	0.0	1.9	2.6	0.5	0.0	0.7	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	1.9	0.0	0.9	0.0	1.2	1.2	0.7	0.0	1.0	
Unsig. Movement Delay, s/veh													
LnGrp Delay(d),s/veh	18.1	0.0	0.0	10.9	6.7	8.3	15.7	19.3	20.1	13.8	0.0	15.1	
LnGrp LOS	B	A	A	B	A	A	B	B	C	B	A	B	
Approach Vol, veh/h	18			606				287				281	
Approach Delay, s/veh	18.1			9.9				19.6				14.6	
Approach LOS	B			A				B				B	
Timer - Assigned Phs	1	2	3	4	5	6	8						
Phs Duration (G+Y+Rc), s	8.4	11.4	15.4	9.3	4.9	15.0	24.7						
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5	4.5						
Max Green Setting (Gmax), s	14.5	29.5	38.5	19.5	7.5	36.5	62.5						
Max Q Clear Time (g_c+I1), s	4.7	5.9	10.0	2.5	2.1	5.6	6.8						
Green Ext Time (p_c), s	0.2	1.1	1.1	0.0	0.0	0.7	0.8						
Intersection Summary													
HCM 6th Ctrl Delay	13.4												
HCM 6th LOS	B												

Intersection						
Int Delay, s/veh	9.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	263	125	65	30	60	459
Future Vol, veh/h	263	125	65	30	60	459
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	309	147	76	35	71	540
Major/Minor	Major1	Major2		Minor2		
Conflicting Flow All	111	0	-	0	841	76
Stage 1	-	-	-	-	76	-
Stage 2	-	-	-	-	765	-
Critical Hdwy	4.25	-	-	-	6.55	6.35
Critical Hdwy Stg 1	-	-	-	-	5.55	-
Critical Hdwy Stg 2	-	-	-	-	5.55	-
Follow-up Hdwy	2.335	-	-	-	3.635	3.435
Pot Cap-1 Maneuver	1402	-	-	-	318	950
Stage 1	-	-	-	-	915	-
Stage 2	-	-	-	-	437	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1402	-	-	-	248	950
Mov Cap-2 Maneuver	-	-	-	-	248	-
Stage 1	-	-	-	-	714	-
Stage 2	-	-	-	-	437	-
Approach	EB	WB		SB		
HCM Control Delay, s	5.6	0		15		
HCM LOS	C					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1402	-	-	-	248	950
HCM Lane V/C Ratio	0.221	-	-	-	0.285	0.568
HCM Control Delay (s)	8.3	-	-	-	25.2	13.7
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.8	-	-	-	1.1	3.7

# Timings 2: E Colfax Ave & Imboden Rd

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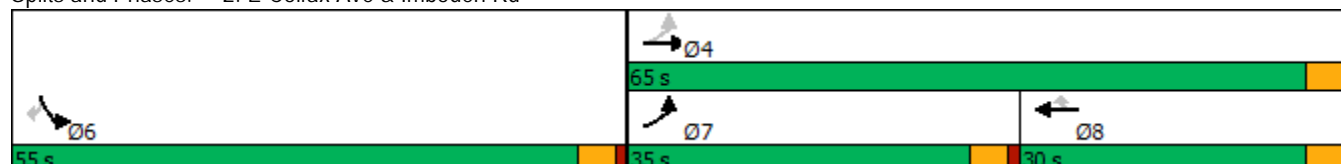


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	263	125	65	30	60	459
Future Volume (vph)	263	125	65	30	60	459
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases	4			8		6
Detector Phase	7	4	8	8	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	35.0	65.0	30.0	30.0	55.0	55.0
Total Split (%)	29.2%	54.2%	25.0%	25.0%	45.8%	45.8%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	Min	Min	Min	None	None
Act Effect Green (s)	27.5	27.5	7.6	7.6	8.8	8.8
Actuated g/C Ratio	0.60	0.60	0.17	0.17	0.19	0.19
v/c Ratio	0.43	0.15	0.28	0.13	0.24	0.77
Control Delay	7.0	4.9	22.9	10.5	19.5	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.0	4.9	22.9	10.5	19.5	10.6
LOS	A	A	C	B	B	B
Approach Delay		6.3	19.0		11.6	
Approach LOS		A	B		B	

## Intersection Summary

Cycle Length: 120  
Actuated Cycle Length: 45.8  
Natural Cycle: 60  
Control Type: Actuated-Uncoordinated  
Maximum v/c Ratio: 0.77  
Intersection Signal Delay: 10.2  
Intersection LOS: B  
Intersection Capacity Utilization 40.1%  
ICU Level of Service A  
Analysis Period (min) 15

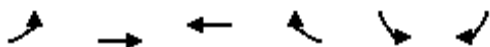
## Splits and Phases: 2: E Colfax Ave & Imboden Rd









# HCM 6th Signalized Intersection Summary

## 2: E Colfax Ave & Imboden Rd

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Movement	EBL	EBT	WBT	WBR	SBL	SBR	
Lane Configurations							
Traffic Volume (veh/h)	263	125	65	30	60	459	
Future Volume (veh/h)	263	125	65	30	60	459	
Initial Q (Qb), veh	0	0	0	0	0	0	
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	
Work Zone On Approach		No	No		No		
Adj Sat Flow, veh/h/ln	1678	1678	1678	1678	1678	1678	
Adj Flow Rate, veh/h	309	147	76	35	71	540	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	
Percent Heavy Veh, %	15	15	15	15	15	15	
Cap, veh/h	537	661	163	138	689	613	
Arrive On Green	0.21	0.39	0.10	0.10	0.43	0.43	
Sat Flow, veh/h	1598	1678	1678	1422	1598	1422	
Grp Volume(v), veh/h	309	147	76	35	71	540	
Grp Sat Flow(s),veh/h/ln	1598	1678	1678	1422	1598	1422	
Q Serve(g_s), s	8.1	3.0	2.2	1.2	1.4	17.9	
Cycle Q Clear(g_c), s	8.1	3.0	2.2	1.2	1.4	17.9	
Prop In Lane	1.00			1.00	1.00	1.00	
Lane Grp Cap(c), veh/h	537	661	163	138	689	613	
V/C Ratio(X)	0.58	0.22	0.47	0.25	0.10	0.88	
Avail Cap(c_a), veh/h	1149	1972	831	704	1567	1395	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	
Uniform Delay (d), s/veh	13.9	10.4	22.0	21.5	8.7	13.4	
Incr Delay (d2), s/veh	1.0	0.2	2.1	1.0	0.1	4.3	
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	
%ile BackOfQ(50%),veh/ln	2.2	0.8	0.8	0.4	0.4	12.8	
Unsig. Movement Delay, s/veh							
LnGrp Delay(d),s/veh	14.9	10.5	24.0	22.5	8.8	17.7	
LnGrp LOS	B	B	C	C	A	B	
Approach Vol, veh/h		456	111		611		
Approach Delay, s/veh		13.5	23.5		16.7		
Approach LOS		B	C		B		
Timer - Assigned Phs				4	6	7	8
Phs Duration (G+Y+Rc), s				24.8	26.7	15.3	9.5
Change Period (Y+Rc), s				4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s				60.5	50.5	30.5	25.5
Max Q Clear Time (g_c+I1), s				5.0	19.9	10.1	4.2
Green Ext Time (p_c), s				0.7	2.3	0.8	0.4
Intersection Summary							
HCM 6th Ctrl Delay			16.1				
HCM 6th LOS			B				



Intersection










Int Delay, s/veh 0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	165	10	5	85	5	5
Future Vol, veh/h	165	10	5	85	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	194	12	6	100	6	6

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	206
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.25
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.335
Pot Cap-1 Maneuver	-	-	1291
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1291
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	721	-	-	1291	-
HCM Lane V/C Ratio	0.016	-	-	0.005	-
HCM Control Delay (s)	10.1	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-








Intersection												
Int Delay, s/veh	17.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	140	25	20	65	11	10	145	40	28	369	5
Future Vol, veh/h	5	140	25	20	65	11	10	145	40	28	369	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	100	-	-	100	-	100	-	-	0	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	15	15	15	15	15	15	15	15	15	15	15	15
Mvmt Flow	6	165	29	24	76	13	12	171	47	33	434	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	89	0	0	194	0	0	543	329	180	425	330	76
Stage 1	-	-	-	-	-	-	192	192	-	124	124	-
Stage 2	-	-	-	-	-	-	351	137	-	301	206	-
Critical Hdwy	4.25	-	-	4.25	-	-	7.25	6.65	6.35	7.25	6.65	6.35
Critical Hdwy Stg 1	-	-	-	-	-	-	6.25	5.65	-	6.25	5.65	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.25	5.65	-	6.25	5.65	-
Follow-up Hdwy	2.335	-	-	2.335	-	-	3.635	4.135	3.435	3.635	4.135	3.435
Pot Cap-1 Maneuver	1428	-	-	1305	-	-	431	569	830	518	569	950
Stage 1	-	-	-	-	-	-	781	718	-	850	769	-
Stage 2	-	-	-	-	-	-	639	759	-	681	708	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1428	-	-	1305	-	-	150	556	830	367	556	950
Mov Cap-2 Maneuver	-	-	-	-	-	-	150	556	-	367	556	-
Stage 1	-	-	-	-	-	-	778	715	-	847	755	-
Stage 2	-	-	-	-	-	-	265	745	-	487	705	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			1.6			15.7			30.1		
HCM LOS							C			D		
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2		
Capacity (veh/h)	473	830	1428	-	-	1305	-	-	367	559		
HCM Lane V/C Ratio	0.386	0.057	0.004	-	-	0.018	-	-	0.09	0.787		
HCM Control Delay (s)	17.3	9.6	7.5	-	-	7.8	-	-	15.8	31.2		
HCM Lane LOS	C	A	A	-	-	A	-	-	C	D		
HCM 95th %tile Q(veh)	1.8	0.2	0	-	-	0.1	-	-	0.3	7.4		

Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰	↱	↰	↰	↱			↱	↰
Traffic Vol, veh/h	0	0	0	40	5	61	55	159	0	0	213	206
Future Vol, veh/h	0	0	0	40	5	61	55	159	0	0	213	206
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	0	0	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	15	15	15	15	15	15	15	15	15	15	15	15
Mvmt Flow	0	0	0	47	6	72	65	187	0	0	251	242

Major/Minor	Minor1	Major1	Major2									
Conflicting Flow All	689	810	187	493	0	-	-	-	-	0		
Stage 1	317	317	-	-	-	-	-	-	-	-		
Stage 2	372	493	-	-	-	-	-	-	-	-		
Critical Hdwy	6.55	6.65	6.35	4.25	-	-	-	-	-	-		
Critical Hdwy Stg 1	5.55	5.65	-	-	-	-	-	-	-	-		
Critical Hdwy Stg 2	5.55	5.65	-	-	-	-	-	-	-	-		
Follow-up Hdwy	3.635	4.135	3.435	2.335	-	-	-	-	-	-		
Pot Cap-1 Maneuver	392	300	823	1007	-	0	0	-	-	-		
Stage 1	710	632	-	-	-	0	0	-	-	-		
Stage 2	669	526	-	-	-	0	0	-	-	-		
Platoon blocked, %					-			-		-		
Mov Cap-1 Maneuver	367	0	823	1007	-	-	-	-	-	-		
Mov Cap-2 Maneuver	367	0	-	-	-	-	-	-	-	-		
Stage 1	664	0	-	-	-	-	-	-	-	-		
Stage 2	669	0	-	-	-	-	-	-	-	-		

Approach	WB	NB	SB
HCM Control Delay, s		2.3	0
HCM LOS	-		

Minor Lane/Major Mvmt	NBL	NBTWBLn1WBLn2WBLn3	SBT	SBR
Capacity (veh/h)	1007	- 367 - 823	-	-
HCM Lane V/C Ratio	0.064	- 0.128 - 0.087	-	-
HCM Control Delay (s)	8.8	- 16.2 - 9.8	-	-
HCM Lane LOS	A	- C - A	-	-
HCM 95th %tile Q(veh)	0.2	- 0.4 - 0.3	-	-

Intersection												
Int Delay, s/veh	1.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	136	5	150	0	0	0	0	73	55	148	105	0
Future Vol, veh/h	136	5	150	0	0	0	0	73	55	148	105	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	0	-	-	-	-	-	0	0	-	-
Veh in Median Storage, #	-	0	-	-	16979	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	15	15	15	15	15	15	15	15	15	15	15	15
Mvmt Flow	160	6	176	0	0	0	0	86	65	174	124	0





Major/Minor	Minor2			Major1			Major2		
Conflicting Flow All	591	623	124	-	0	0	151	0	0
Stage 1	472	472	-	-	-	-	-	-	-
Stage 2	119	151	-	-	-	-	-	-	-
Critical Hdwy	6.55	6.65	6.35	-	-	-	4.25	-	-
Critical Hdwy Stg 1	5.55	5.65	-	-	-	-	-	-	-
Critical Hdwy Stg 2	5.55	5.65	-	-	-	-	-	-	-
Follow-up Hdwy	3.635	4.135	3.435	-	-	-	2.335	-	-
Pot Cap-1 Maneuver	449	386	893	0	-	-	1354	-	0
Stage 1	601	538	-	0	-	-	-	-	0
Stage 2	875	748	-	0	-	-	-	-	0
Platoon blocked, %					-	-		-	
Mov Cap-1 Maneuver	391	0	893	-	-	-	1354	-	-
Mov Cap-2 Maneuver	391	0	-	-	-	-	-	-	-
Stage 1	601	0	-	-	-	-	-	-	-
Stage 2	762	0	-	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s		0	4.7
HCM LOS	-		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	EBLn2	EBLn3	SBL	SBT
Capacity (veh/h)	-	-	391	-	893	1354	-
HCM Lane V/C Ratio	-	-	0.409	-	0.198	0.129	-
HCM Control Delay (s)	-	-	20.4	-	10	8.1	-
HCM Lane LOS	-	-	C	-	B	A	-
HCM 95th %tile Q(veh)	-	-	1.9	-	0.7	0.4	-

Intersection





Int Delay, s/veh 1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	46	5	274	19	5	473
Future Vol, veh/h	46	5	274	19	5	473
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	54	6	322	22	6	556

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	890	322	0
Stage 1	322	-	-
Stage 2	568	-	-
Critical Hdwy	6.55	6.35	-
Critical Hdwy Stg 1	5.55	-	-
Critical Hdwy Stg 2	5.55	-	-
Follow-up Hdwy	3.635	3.435	-
Pot Cap-1 Maneuver	297	690	-
Stage 1	706	-	-
Stage 2	542	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	295	690	-
Mov Cap-2 Maneuver	295	-	-
Stage 1	706	-	-
Stage 2	538	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.2	0	0.1
HCM LOS	C		





Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	313	1146
HCM Lane V/C Ratio	-	-	0.192	0.005
HCM Control Delay (s)	-	-	19.2	8.2
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	0.7	0

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	5	40	121	300	5
Future Vol, veh/h	0	5	40	121	300	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	0	6	47	142	353	6

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	592	356	359	0	-	0
Stage 1	356	-	-	-	-	-
Stage 2	236	-	-	-	-	-
Critical Hdwy	6.55	6.35	4.25	-	-	-
Critical Hdwy Stg 1	5.55	-	-	-	-	-
Critical Hdwy Stg 2	5.55	-	-	-	-	-
Follow-up Hdwy	3.635	3.435	2.335	-	-	-
Pot Cap-1 Maneuver	448	660	1131	-	-	-
Stage 1	681	-	-	-	-	-
Stage 2	774	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	429	660	1131	-	-	-
Mov Cap-2 Maneuver	429	-	-	-	-	-
Stage 1	652	-	-	-	-	-
Stage 2	774	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.5	2.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1131	-	660	-	-
HCM Lane V/C Ratio	0.042	-	0.009	-	-
HCM Control Delay (s)	8.3	-	10.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0	-	-

Intersection						
Int Delay, s/veh	2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	264	21	10	185	56	26
Future Vol, veh/h	264	21	10	185	56	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	311	25	12	218	66	31







Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	336
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.25
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.335
Pot Cap-1 Maneuver	-	-	1154
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1154
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	13
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	458	688	-	-	1154	-
HCM Lane V/C Ratio	0.144	0.044	-	-	0.01	-
HCM Control Delay (s)	14.2	10.5	-	-	8.2	0
HCM Lane LOS	B	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0	-

Intersection

Int Delay, s/veh 7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	19	5	5	40	102	46
Future Vol, veh/h	19	5	5	40	102	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	15	15	15	15	15	15
Mvmt Flow	22	6	6	47	120	54

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	53	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.25	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.335	-	-
Pot Cap-1 Maneuver	1473	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1473	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	5.9	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1473	-	-	-	906	1040
HCM Lane V/C Ratio	0.015	-	-	-	0.132	0.052
HCM Control Delay (s)	7.5	-	-	-	9.6	8.7
HCM Lane LOS	A	-	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0.5	0.2